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Gaming motivations and gaming disorder symptoms: A systematic review and meta-analysis

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REVIEW ARTICLE



ABSTRACT

Background and aims: The present systematic review and meta-analysis aimed to synthesize the available literature on the relationship between gaming motivations and gaming disorder symptoms. Specifically, to (1) explore what gaming motivation questionnaires and classifications are used in studies on gaming disorder symptoms and (2) investigate the relationship between motivational factors and symptoms of gaming disorder. **Method:** An electronic database search was conducted via EBSCO (MEDLINE and PsycINFO) and the Web of Science Core Collection. All studies using validated measurements on gaming disorder symptoms and gaming motivations and available correlation coefficients of the relationship between gaming disorder and gaming motivations were included. The meta-analyses were conducted using a random-effects model. **Results:** In total, 49 studies ($k = 58$ independent sub-samples), including 51,440 participants, out of which 46 studies ($k = 55$ sub-samples, $n = 49,192$ participants) provided data for the meta-analysis. The synthesis identified fourteen different gaming motivation instruments, seven unique motivation models, and 26 motivational factors. The meta-analysis showed statistically significant associations between gaming disorder symptoms and 23 out of 26 motivational factors, with the majority of the pooled mean effect sizes ranging from small to moderate. Moreover, large heterogeneity was observed, and the calculated prediction intervals indicated substantial variation in effects across populations and settings. Motivations related to emotional escape were robustly associated with gaming disorder symptoms. **Discussion and conclusions:** The present meta-analysis reinforces the importance of motivational factors in understanding problematic gaming behavior. The analysis showed significant heterogeneity in most outcomes, warranting further investigation. **Registration detail:** PROSPERO (CRD42020220050).

KEYWORDS

meta-analysis, systematic review, gaming disorder, addiction, problematic gaming, motivation

INTRODUCTION

Video games have a considerable influence on our society; 50% of the European population ages 6 to 64 is estimated to play video games (ISFE & EGDF, 2021). Most individuals perceive video games as a source of enjoyment and encounter numerous benefits from playing, including positive social relationships and increased well-being (Halbrook, O'Donnell, & Msetfi, 2019; Johannes, Vuorre, & Przybylski, 2021; Ryan, Rigby, & Przybylski, 2006). Nevertheless, some individuals endure harmful outcomes due to maladaptive video game play (King & Delfabbro, 2019; Männikkö, Ruotsalainen, Miettunen, Pontes, & Käriäinen, 2017).

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Consequently, two major classification systems of mental disorders have recognized the validity of this condition. The American Psychiatric Association (APA, 2013) included Internet Gaming Disorder (IGD) as a condition needing further study in the fifth revised version of the Diagnostic and Statistical Manual of Mental Disorders (DSM–5). Additionally, the World Health Organization (WHO) has officially incorporated Gaming Disorder (GD) as a mental health disorder in the 11th revision of the International Classification of Diseases (ICD-11; World Health Organization, 2019). A recent meta-analysis showed a worldwide prevalence rate for gaming disorder of 1.96% (Stevens, Dorstyn, Delfabbro, & King, 2020), highlighting this new condition's public health relevance. Several psychological factors, including cognitions (Casale, Musicò, & Spada, 2021; Forrest, King, & Delfabbro, 2016), emotion regulation (Marchica, Mills, Derevensky, & Montreuil, 2019), personality (Akbari et al., 2021), and gaming motivations, play a crucial role in developing problematic gaming behavior (Demetrovics et al., 2011; Griffiths & Pontes, 2019; Kuss & Griffiths, 2011; Montag et al., 2019). Thus, the present systematic review and meta-analysis objective is to explore and investigate the literature that studies this relationship.

Gaming disorder symptoms

During the last decade, researchers have debated the conceptualization and assessment of addictive-like gaming behavior (Castro-Calvo et al., 2021; Griffiths et al., 2016; Kuss, Griffiths, & Pontes, 2017; Saunders et al., 2017; Van Rooij & Prause, 2014; Van Rooij, Van Looy, & Billieux, 2016). Some of the nomenclature describing the most maladaptive form of gaming behavior includes game addiction (Lemmens, Valkenburg, & Peter, 2009), pathological video game use (Sim, Gentile, Bricolo, Serpelloni, & Gulamoydeen, 2012), and problematic gaming behavior (Männikkö, Billieux, & Käriäinen, 2015). Moreover, terminology related to problematic internet behavior, such as internet addiction (Young, 1998a) and problematic internet use (Chang & Lin, 2019), is widely used in studies focusing on gaming-related problems (King et al., 2020). The ICD-11 characterizes gaming disorder as a pattern of persistent or recurrent gaming behavior manifested by (i) impaired control; (ii) increasing priority given to gaming to the extent that gaming takes precedence over other life interests and daily activities; and (iii) continuation or escalation of gaming despite the incidence of negative consequences. Moreover, the gaming pattern must result in distress or significant impairment in personal, family, social, and/or other important areas of functioning (World Health Organization, 2019). Following the vocabulary of the ICD-11, the current study will use the term gaming disorder symptoms as an umbrella term when referring to various measurements of symptoms for problematic gaming behavior in previous literature.

Motivation for playing video games

Human motivation is the internal process that activates and maintains physical and psychological activity and impacts the

direction and strength to move towards our goals (Gerrig, Zimbardo, Campbell, Cumming, & Wilkes, 2011). Motivation has been regarded as a crucial factor in understanding the development, maintenance, and treatment of addictive behaviors (Cooper, 1994; Lambe, Mackinnon, & Stewart, 2014; Simpson & Joe, 1993; Stewart & Zack, 2008). Specific motivations associated with emotional escape or coping have been especially significant in theories on addiction (Blaszczynski & Nower, 2002; Bravo et al., 2018; Bresin & Mekawi, 2019; Jacobs, 1986).

Research on gaming motivations uses different classifications and measurement tools, containing overlapping and various factors (Demetrovics et al., 2011; Lafrenière, Verner-Filion, & Vallerand, 2012; Yee, 2006a). Most of the models on gaming motivations follow either an empirical or a theoretical approach in their development (López-Fernández, Mezquita, Griffiths, Ortet, & Ibáñez, 2020). Bartle (1996) introduced one of the first classifications of motivations related to playing video games through observing Multi-User Dungeon (MUD) players. Drawing from Bartle's theories Yee (2006b) created a five-factor model (achievement, relationship, immersion, escapism, and manipulation) for gaming motivations using exploratory factor analysis. Yee (2006a) later revised his model and created the widely used Motivation to Play in Online Games Questionnaire (MPOGQ) using principal component analysis on a large sample of massively multiplayer online role-playing games (MMORPG) players. Yee's model of video game motives consists of a hierarchical structure with three second-order and ten first-order factors (Yee, 2006a). These factors are achievement (advancement, mechanics, competition), social (socializing, relationship, teamwork), and immersion (discovery, role-playing, customization, escapism). Advancement motives cover the importance of progression within the game and being part of a successful gaming group. The mechanics factors involve the urge to understand the underlying rules of the game to optimize performance. Competition motives concern challenges with other players, including aspects of provocation towards other players. Socializing motive regards helping and getting to know players within the game, and relationship motive relates to having meaningful connections with other players. Teamwork motives cover the enjoyment of playing with other players. The Discovery factor concerns the amount of pleasure that comes from exploring within the game. Role-playing motives are associated with finding happiness in creating a broader narrative for the character within the game. The customization factors target the player's desire to match outfits and create a distinct look within the game. Escapism motives involve the avoidance of real-life problems (Yee, 2006a). Yee's famous classification has been studied and updated over the years (Caplan et al., 2009; Williams, Yee, & Caplan, 2008; Yee, Ducheneaut, & Nelson, 2012) and inconsistently titled across studies applying the model (Kuss, Louws, & Wiers, 2012; Billieux et al., 2013; Lopez-Fernandez, Williams, & Kuss, 2019). MPOGQ will be used as an umbrella term when referring to studies using Yee's hierarchical model for the remainder of the review and meta-analysis.



While the MPOGQ focuses on a specific video game genre, Demetrovics et al. (2011) created the Motive for Online Gaming Questionnaire (MOGQ) to measure general online gaming motives. After conducting a literature review and survey study, the final questionnaire consisted of 27-items sorted into seven dimensions (social, escape, competition, coping, skill development, fantasy, and recreation). The social factor captures social and relational aspects of video gameplay. Escape covers motives to play video games to forget daily difficulties and withdraw from reality. Competition motives include enjoyment from challenges with other people. The coping dimension focuses on the motivation to use games to endure and reduce negative emotions or tension. The skill development factor concerns the desire to improve concentration, coordination, or other skills by playing video games. Fantasy motive relates to the feeling of being someone else and being part of another world. Recreational motives concern seeking enjoyment and entertainment from online video games (Demetrovics et al., 2011).

Moreover, Lafrenière et al. (2012) developed the Gaming Motivation Scale (GAMS) to target specific gaming motivations based on the Organismic Integration Theory (OIT) embedded in Self-Determination Theory (SDT; Deci & Ryan, 1985; Ryan & Deci, 2000). GAMS contains 18 items on a 6-point scale and includes intrinsic motivation (autonomous desire towards an activity), four distinct sub-factors of extrinsic motivation (integrated regulation, identified regulation, introjected regulation, and external regulation), and amotivation (i.e., lack of motivation) (Lafrenière et al., 2012; Ryan & Deci, 2000). The integrated regulation factor involves the assimilation of an individual's sense of self with an activity. Identified regulation motives refer to engagement in the activity congruent with an individual's values and needs. Introjected regulation entails a need to be involved in an activity to avoid guilt or anxiety and avoid feeling bad about oneself. The external regulation factor refers to activity engagement to receive rewards or avoid unforeseen punishment from external sources (Ryan & Deci, 2000). Ryan et al. (2006) created the Player Experience of Need Satisfaction (PENS) questionnaire based on Cognitive Evaluation Theory (CET). CET is an embedded theory within SDT that centers on three psychological needs affecting intrinsic motivation (Deci & Ryan, 1985). The three psychological needs are autonomy (feeling ownership over decisions), competence (feeling adequate capability), and relatedness (feeling close and connected to other people) measured by the 9-item PENS on a 7-point scale. The Electronic Gaming Motives Questionnaire (EGMQ) is adapted from the Gambling Motives Questionnaire-Revised (GMQ-R). The questionnaire contains 14-items and covers four gaming motivations, including enhancement, coping, social, and self-gratification (Myrseth, Notelaers, Strand, Borud, & Olsen, 2017). Finally, through exploratory factor analysis, Hilgard, Engelhardt, and Bartholow (2013) developed the Gaming Attitudes, Motives, and Experiences Scales (GAMES). The analysis resulted in nine video gaming motives: story, violent catharsis, violent reward, social interaction, escapism, loss-

sensitivity, customization, grinding, and autonomy. See Fig. 1 for a visual overview of the different gaming motivation models.

The rationale and aim of the current study

Motivational factors may have a crucial role in differentiating between high commitment and pathological engagement in video games (Király, Tóth, Urbán, Demetrovics, & Maraz, 2017), which is essential to avoid overdiagnosis and pathologize normal behavior (Billieux, Flayelle, Rumpf, & Stein, 2019). Additionally, specific gaming motivations may guide in personalizing treatment of gaming disorder (Steadman, 2019). Despite the evident utility of motivational factors regarding gaming disorder, the current classification and measurement inconsistencies affect the generalizability of the research findings. Therefore, the present systematic review and meta-analysis aim to synthesize the literature on the relationship between gaming motivations and gaming disorder symptoms. To the best of the authors' knowledge, no previous comprehensive overview has been conducted of the relationship between the considerable number of models of gaming motivations and gaming disorder symptoms. The specific objective is to (1) examine what gaming motivation questionnaires and classifications are used in studies on gaming disorder symptoms and (2) investigate the relationship between specific motivational factors and symptoms of gaming disorder.

METHOD

The present systematic review and meta-analysis was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) guidelines (Moher, Liberati, Tetzlaff, & Altman, 2009; Page et al., 2021). The protocol was prospectively registered on PROSPERO (CRD42020220050).

Search strategy and study selection

A primary electronic database search was conducted from inception to 20 November 2020, and an updated search was conducted between 20 November 2020 to 31 January 2022 via EBSCO (MEDLINE and PsychINFO) and the Web of Science core collection. No language, publication type, or time restrictions were applied during the search. The database search was complemented by a citation search using the Web of Science cited reference function on four validation studies for gaming motivation questionnaires (Demetrovics et al., 2011; Lafrenière et al., 2012; Yee, 2006a; Yee et al., 2012). See Supplementary material A for the complete search strategy. Following the literature search, the titles and abstracts were screened for relevancy by one reviewer (CB). Two reviewers (CB & PE), independently and blinded to each other, conducted the full-text screening. Disagreements were resolved by a consensus-based detailed discussion or by the involvement of a third author (HMG or DES). Most disagreements and discussions concerned adapted or

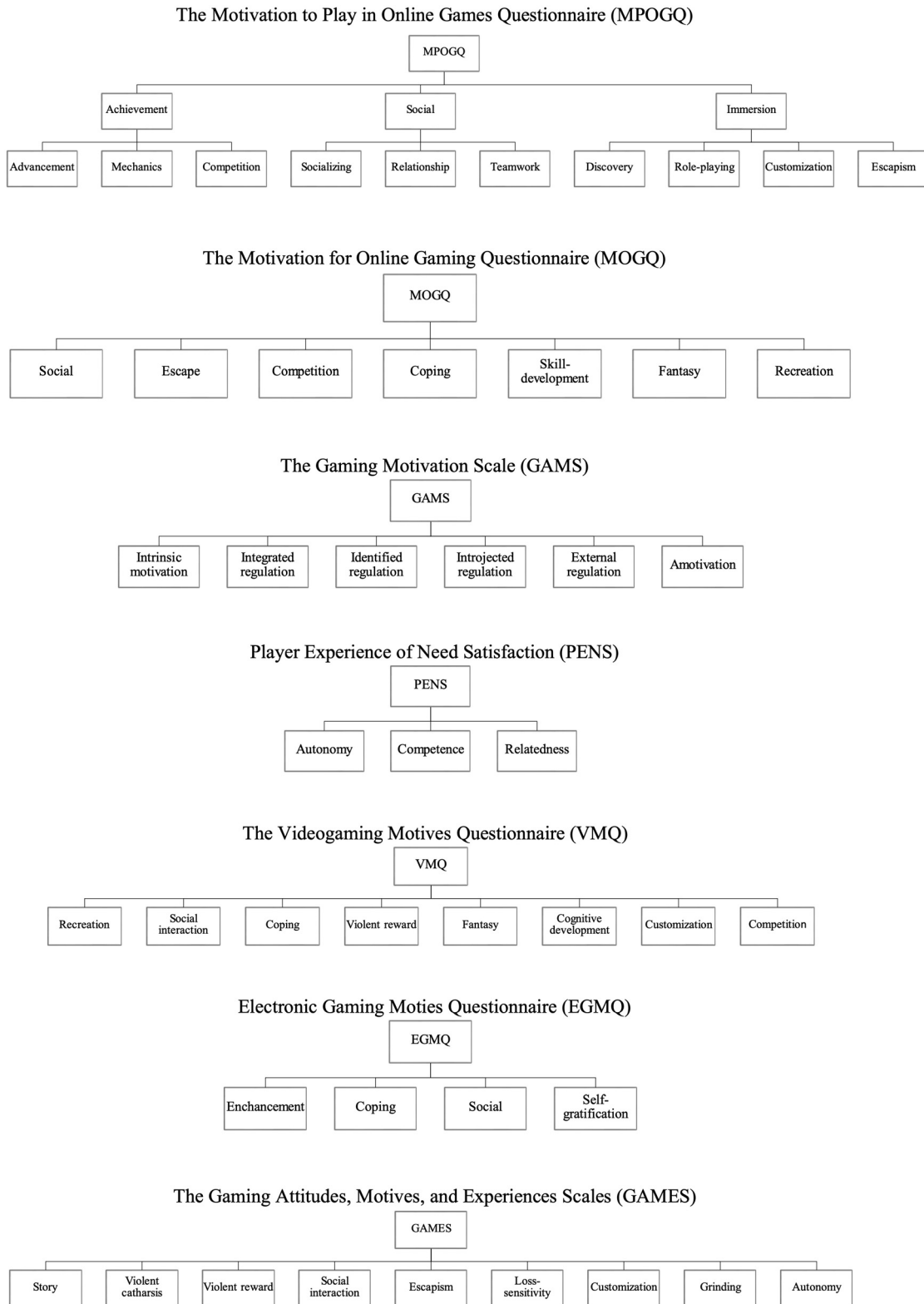


Fig. 1. Visual overview of gaming motivations models

modified measurement of gaming disorder symptoms and gaming motivation. Non-English papers were translated (Berdot-Talmier & Zaouche-Gaudron, 2020; Bogacheva, Epishin, & Milianskaya, 2021; Lemerrier-Dugarin, Romo, & Zerhouni, 2021; Plessis, Altintas, Romo, & Guerrien, 2021; Zhang, Chen, Liu, & Zhao, 2013; Zheng et al., 2006).

Eligibility criteria

The studies identified through the literature search were screened against the following inclusion criteria (i) cross-sectional or longitudinal study design with available baseline data, (ii) validated assessment of gaming disorder symptoms,



(iii) validated assessment of gaming motivations, (iv) capability to supply one or more correlation coefficients of the relationship between gaming disorder symptoms and gaming motivations. First or corresponding authors were contacted in cases when the article did not provide the variables of interest. A decision was made during the review process (post PROSPERO registration) to include studies using validated gaming disorder symptoms and/or gaming motivation instruments with minor modifications (e.g., Kardefelt-Winther, 2014), as well as studies using instruments focusing on pathological internet use (e.g., Billieux et al., 2013; Di Blasi et al., 2020), DSM-5 criteria for Internet Gaming Disorder (IGD) without specifying a validated screening tool (Hui, Wu, & Pun, 2019; Schimmenti, Infanti, Badoud, Laloyaux, & Billieux, 2017; Wu, Lai, Yu, Lau, & Lei, 2017), and adapted pathological gambling criteria to measure gaming-related problems (e.g., Kwok & Khoo, 2011; Li, Liao, & Khoo, 2011).

Data extraction

If reported, the following data were extracted for each article by one reviewer (CB), and 20% of the data was checked by a second reviewer (PE) with no errors found: (a) source information (author's and year); (b) sample characteristics (i.e., gender, age, sample size); (c) methodological characteristics (cross-sectional or longitudinal study design); (d) gaming disorder symptom screening tool; (e) measurement tool for gaming motivations; (f) gaming motivation factors; and (g) the reported Pearson correlation coefficient, r , of the relationship between gaming motivation and gaming disorder symptoms.

Quality assessment

The quality of included studies was assessed independently by two authors (CB & PE) using the adopted and modified version of the Joanna Briggs Institute Critical Appraisal tools checklist for analytical cross-sectional studies (JBI; Moola et al., 2020; see online repository (osf.io/24qyk) for adapted critical appraisal tool). Disagreements were resolved by consensus or by the involvement of a third author (DES).

Statistical analysis

The meta-analysis was conducted in Comprehensive Meta-Analysis Version 3 (CMA-3; Borenstein, Hedges, Higgins, & Rothstein, 2013), and Microsoft Excel was used to create illustrations of the forest plots. Most motivational models and associated factors measure distinct gaming motivations despite some overlap (e.g., escapism (MPOGQ) and escape (MOGQ)). Consequently, pooling of outcomes across studies was conducted using a random-effects model and executed separately for each gaming motivation factor. Pooled analyses were contingent on the availability of at least three studies for analysis. One study consisted of several language-based sub-samples (see Results- Study selection),

each contributing independent information. We used subgroup within study as the unit of analysis to appropriately handle between subgroup variation, thereby treating each subgroup as a separate study (Borenstein, Hedges, Higgins, & Rothstein, 2009). The effect measure was Pearson r correlation, and effect sizes were coded so that positive associations represented that a higher score of gaming disorder symptoms was related to a higher score of gaming motivation. The effect sizes were analyzed using Fischer's z transformed to stabilize the variance of the correlation coefficients (Fisher, 1925) and transformed back to r after the analysis (Cooper, Hedges, & Valentine, 2009). Correlation coefficient values of 0.1 were regarded as a small effect size, 0.3 as a moderate effect size, and 0.5 as a large effect size (Cohen, 1988).

The presence of between-study heterogeneity was assessed using the Q statistic and further quantified using τ^2 and expressed as a proportion of overall observed variance using the I^2 statistic (Borenstein, Higgins, Hedges, & Rothstein, 2017). I^2 indicates what proportion of the total variability in observed effects is due to heterogeneity in true effects rather than sampling error (i.e., an I^2 of 80% indicates that 20% of the observed heterogeneity is due to sampling error) and is not an absolute value of heterogeneity (Borenstein et al., 2017). An I^2 value of 25% is considered low, of 50% moderate, and of 75% high (Higgins, 2003). Random-effects 95% prediction intervals (PI; 95%) were calculated for meta-analyses with at least 10 studies to ensure accurate estimates (Borenstein, 2019; Borenstein et al., 2009; Higgins et al., 2019; Riley et al., 2011). The PI shows a quantified expected range of effects for comparable future studies based on the present studies' results (Borenstein et al., 2017). Small-study effect was assessed by visually inspecting funnel plots of the effect size versus standard error and tested formally using Egger's intercept test when at least 10 studies were available for analysis (Egger, Smith, Schneider, & Minder, 1997; Sterne et al., 2011). If statistically significant asymmetry was detected ($P < 0.10$) (Egger, Smith, Schneider, & Minder, 1997), Duval and Tweedie's Trim and Fill method (Duval & Tweedie, 2000) was used to adjust the pooled effect size after accounting for bias. The present study planned to analyze age as a moderator (PROSPERO: CRD42020220050). However, the analysis was not conducted due to the narrow distribution of mean age (e.g., only two studies with a mean age < 20 used the same gaming motivation factors, and no studies with a mean age > 30 utilized the same factors). All meta-analytic data are publicly available at the current study's associated page on the Open Science Framework (osf.io/24qyk).

A sensitivity analysis (Borenstein et al., 2009; Egger, Smith, & Phillips, 1997) was conducted to examine the robustness of findings with studies that met the initial inclusion criteria stated in the prospectively registered protocol, excluding studies that were included during the review process (e.g., validated studies with minor modification and adapted pathological gambling criteria) and one study that combined two motivational factors into one (Evren, Evren, Dalbudak, Topcu, & Kutlu, 2020).



RESULTS

Study selection

The literature search yielded 8,279 records. After duplicates were removed, 6,461 titles and abstracts were screened for relevancy, from which 177 full-text documents were reviewed against inclusion criteria, resulting in 53 included papers. A list of the excluded studies with reasons is provided in [Supplementary material B](#). One study consisted of a cross-cultural research project with 10 language-based samples exploring gaming motivations and gaming disorder symptoms (Király et al., 2019), reported across four additional publications (Ballabio et al., 2017; Kim et al., 2016; Király et al., 2017; Rafiemanesh et al., 2022). These were combined into a single study, and each of the language-based sub-samples were treated as separate subgroups. This process resulted in 49 studies included in the review, and the final dataset consisted of 58 independent samples ($k = 58$ studies including the subgroups). See [Fig. 2](#) for the flowchart illustrating the selection process. Three studies were excluded from the meta-analysis because of unique motivation measurements and were only included in the

narrative synthesis (Engelhardt, Mazurek, & Hilgard, 2017; Myrseth et al., 2017; López-Fernández et al., 2020). Thus, the computation of the meta-analysis included 46 studies ($k = 55$ studies, including the subgroups). We contacted the authors of 20 studies, of which 10 provided additional data or information; see online repository (osf.io/24qyk) for a list of contacted authors and for a separate reference list of all included articles. The present authors calculated the correlation coefficient for variables of interest using SPSS V.27 for one study (Kosa & Uysal, 2021), with data available in an online repository.

Characteristics of included studies

The characteristics of the included studies are presented in [Table 1](#). The 58 included studies encompassed 51,440 participants ($n = 49,102$ across the 55 studies included in the meta-analysis). The mean participant age ranged from 12.9 to 35.08, and the sample sizes varied between 64 and 5,222. The included studies showed a gender imbalance, with 31 studies reporting $\geq 60\%$ male participants and 13 studies reporting between 47.2 and 59.4% male participation. The review identified 24 unique screening and assessment tools

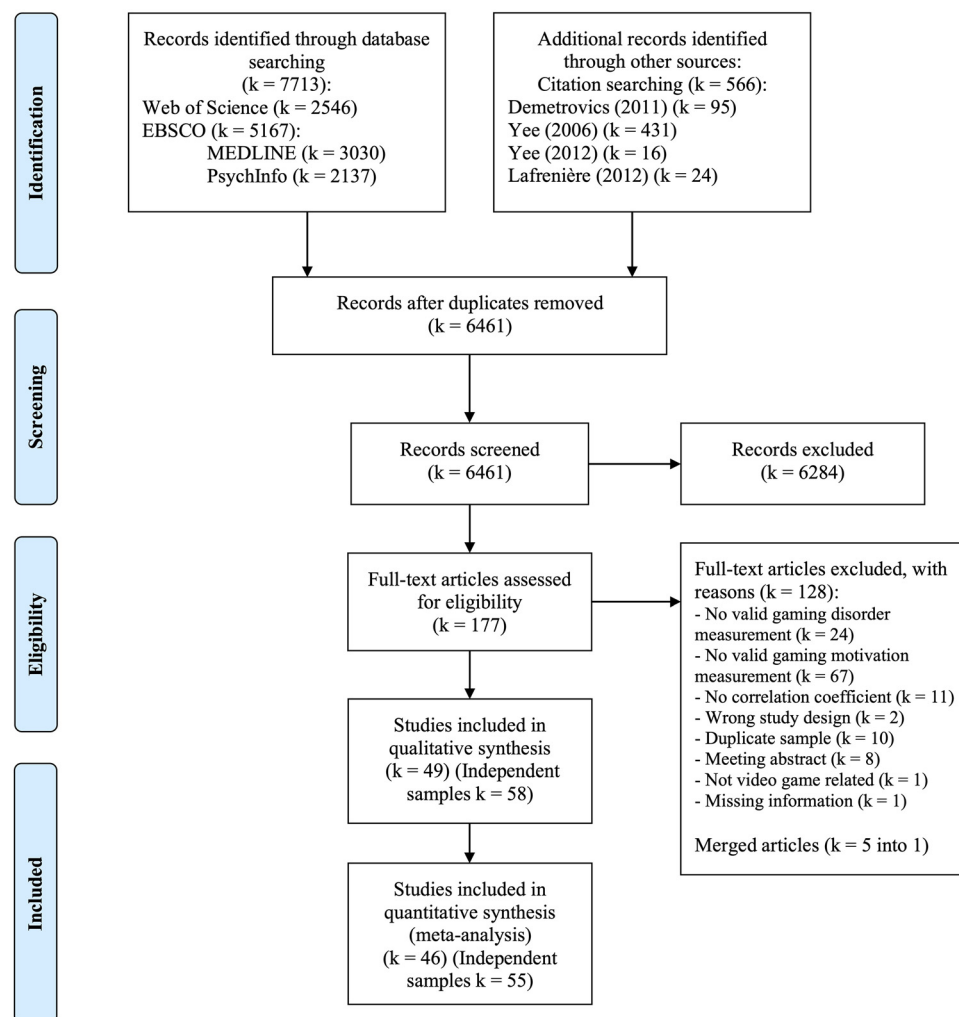


Fig. 2. Flowchart illustrating the selection process

Table 1. Descriptive overview and quality assessment score

First author (year)	Sub-sample	Type of study (n)	Gaming disorder Questionnaire	Gaming motivation Questionnaire	Game details	Country/Language of participants	Gender (male)	Mean age (SD)	Video game motive factors	Quality assessment (JBI)
Bányai, Griffiths, Demetrovics, and Király (2019)		Cross-sectional (4,284)	IGDT-10	MOGQ	–	Hungary	89.89%	23.08 (6.57)	Social, Escape, Competition, Coping, Skill Development, Fantasy & Recreation	6
Beard and Wickham (2016)		Cross-sectional (600)	IGD-20	OGMS	–		65%	30.15 (9.145)	Achievement, Social & Immersion	5.5
Biegun, Edgerton, and Roberts (2019)		Cross-sectional (651)	PVGT	MOGQ	–		47.2%	Approximately 21	Social, Escape, Competition, Coping, Skill Development, Fantasy & Recreation	7
Billieux et al. (2013)		Cross-sectional (690)	YIAT-WoW	MPOGQ-WoW	WoW	French-speaking living in France (73.6%), Switzerland (18.8%), Belgium (4.8%) or other countries (2.1%)	87.1%	26.22 (8.14)	Advancement, Mechanics, Competition, Socializing, Relationship, Teamwork, Discovery, Role-play, Customization & Escapism	6.5
Biolcati, Passini, and Pupi (2021)		Cross-sectional (645)	IGDS9-SF	MOGQ	–	Italian	45%	27.27 (7.54)	Social, Escape, Competition, Coping, Skill Development, Fantasy & Recreation	7
Carlisle (2018)		Cross-sectional (1,881)	IGD-10 (2015)	OGMS	MMOG	United States	59.4%	28.27	Achievement, Social & Immersion	7
Chang, Hsieh, and Lin (2018)		Baseline data from longitudinal dataset (389)	PIU	MPOGQ (modified)	–		72%	19.43 (0.67)	Achievement, Socializing & Immersion	3.5
Cross (2017)		Cross-sectional (542)	Petry IGD	MPOGQ	LoL, WoW, CoD, GTA, Runescape, Destiny, The Sims & Minecraft	US (94%), AU, CA, DK, FR, GE, HU, IT, JP, PH, SK, ES, SE & UK.	59%	21.8 (3.7)	Advancement, Mechanics, Competition, Socializing, Relationship, Teamwork, Discovery, Role-play, Customization & Escapism	6.5
Deleuze, Long, Liu, Maurage, and Billieux (2018)		Cross-sectional (268)	Petry IGD	MPOGQ-WoW	-	French-speaking	82%	21.52 (3.0)	Advancement, Mechanics, Competition, Socializing, Relationship, Teamwork, Discovery, Role-play, Customization & Escapism	6
Di Blasi et al. (2020)		Cross-sectional (405)	YIAT-WoW	MPOGQ-WoW	WoW		75%	28.1 (8.0)	Escapism	5.5
Engelhardt et al. (2017)		Cross-sectional (119)	Adapted DSM-IV	GAMES	–		86.55%	20.48 (1.71)	Escapism	5.5
Evren et al. (2020)		Cross-sectional (752)	IGDT-10	MOGQ	–	Turky/Turkish-speaking	69%	23.09 (5.10)	Social, Coping-Escape, Competition, Skill Development, Fantasy & Recreation	6
Hagström and Kaldo (2014)		Cross-sectional (201)	YDQ-8	MPOGQ & NE	MMORPG	Swedish and English-speaking	91.5%	22.6 (7.99)	Socializing, Mechanics, Escapism & Negative Escapism	4

(continued)





Table 1. Continued

First author (year)	Sub-sample	Type of study (<i>n</i>)	Gaming disorder Questionnaire	Gaming motivation Questionnaire	Game details	Country/Language of participants	Gender (male)	Mean age (SD)	Video game motive factors	Quality assessment (JBI)
Holding, Verner-Filion, Lalande, Schellenberg, and Vallerand (2021)		Cross-sectional (377)	PVP	PENS			57,3%	26.15 (8.26)	Autonomy, Competence & Relatedness	4.5
Hui et al., (2019)		Cross-sectional (3,348)	DSM-5	MOGQ	–	China	52.53%	18.20 (2.05)	Escape	5.5
Kardefelt-Winther (2014)		Cross-sectional (702)	5-item mix of negative outcomes from gaming	Gaming motivations, drawing on Yee's inventory of MMO motivations (Mix)	WoW		89%	23.6 (6.7)	Achievement, Socializing & Immersion	4
Khan and Muqtadir (2016)		Cross-sectional (357)	POGQ-12	OGMS	–	Pakistan	83.47%	16.8 (3.13)	Achievement, Social & Immersion	5.5
Király et al. (2019)	Czech	Cross-sectional (496)	IGDT-10	MOGQ	–	Czech			Social, Escape, Competition, Coping, Skill Development, Fantasy & Recreation	
Király et al. (2019)	English-speaking	Cross-sectional (754)	IGDT-10	MOGQ	–	English-speaking			Social, Escape, Competition, Coping, Skill Development, Fantasy & Recreation	
Király et al. (2019)	French-speaking	Cross-sectional (421)	IGDT-10	MOGQ	–	French-speaking			Social, Escape, Competition, Coping, Skill Development, Fantasy & Recreation	
Király et al. (2019)	Király et al. (2017) Hungarian	Cross-sectional (5,222)	IGDT-10	MOGQ	–	Hungary	92.6%	22.2 (6.4)	Social, Escape, Competition, Coping, Skill Development, Fantasy & Recreation	
Király et al. (2019)	Ballabio et al. (2017) Italian	Cross-sectional (327)	POGQ-18	MOGQ	MMORPG, MOFPS, MMORTS	Italian	83.7%	23.08 (7.00)	Social, Escape, Competition, Coping, Skill Development, Fantasy & Recreation	
Király et al. (2019)	Kim et al. (2016) Korean	Cross-sectional (3,040)	POGQ-18	MOGQ	FPS, RPG, RTS & other online games	Korea	60%		Social, Escape, Competition, Coping, Skill Development, Fantasy & Recreation	
Király et al. (2019)	Norwegian	Cross-sectional (721)	POGQ-18	MOGQ	–	Norway			Social, Escape, Competition, Coping, Skill Development, Fantasy & Recreation	
Király et al. (2019)	Rafiemanesh et al. (2022) Persian (Iranian)	Cross-sectional (791)	IGDT-10	MOGQ	–	Persian (Iranian)			Social, Escape, Competition, Coping, Skill Development, Fantasy & Recreation	
Király et al. (2019)	Spanish (Peruvian)	Cross-sectional (612)	IGDT-10	MOGQ	–	Spanish (Peruvian)			Social, Escape, Competition, Coping, Skill Development, Fantasy & Recreation	
Király et al. (2019)	Slovenian	Cross-sectional (274)	POGQ-18	MOGQ	–	Slovenian			Social, Escape, Competition, Coping, Skill Development, Fantasy & Recreation	

(continued)

Table 1. Continued

First author (year)	Sub-sample	Type of study (<i>n</i>)	Gaming disorder Questionnaire	Gaming motivation Questionnaire	Game details	Country/Language of participants	Gender (male)	Mean age (SD)	Video game motive factors	Quality assessment (JBI)
Király et al. (2015)		Cross-sectional (3,186)	POGQ-18	MOGQ	Majority played MMORPG & MOFPS	Hungary	89.74%	21.1 (5.9)	Social, Escape, Competition, Coping, Skill Development, Fantasy & Recreation	5.5
Kircaburun, et al. (2020)		Cross-sectional (478)	IGDT-10	MOGQ-14	MMORPG, MOFPS & MMORTS	Turky	96%	20.88 (4.79)	Social, Escape, Competition, Coping, Skill Development, Fantasy & Recreation	4.5
Kircaburun, Jonason, and Griffiths, (2018)		Cross-sectional (421)	POGQ-18	MOGQ-14	MMORPG, MOFPS & MMORTS	Turky	100%	20.82 (4.70)	Social, Escape, Competition, Coping, Skill Development, Fantasy & Recreation	5
Koban, Biehl, Bornemeier, and Ohler (2021)		Cross-sectional (3,655)	5-item mix of negative outcomes from gaming	MPOGQ (adaptation)	–		85.88%	25.22 (6.68)	Achievement, Social & Immersion	5
Kosa and Uysal (2021)		Cross-sectional (390)	8-AE-Q	PENS & NE	MMORPG, FPS, MOBA, ARPG, OCG & SNG	US		35.08 (10.00)	Autonomy, Competence, Relatedness & Negative Escapism	5
Kuss, Louws, and Wiers (2012)		Cross-sectional (265)	PVP	MPOGQ	MMORPG	Dutch, GE & Belgium	71.32%	21 (6.5)	Advancement, Mechanics, Competition, Socializing, Relationship, Discovery, Role-play, Customization & Escapism	5.5
Kwok and Khoo (2011)		Cross-sectional (128)	PGQ	MPOGQ	WoW	Singapore	85.3%		Achievement, Social & Immersion	3
Laconi, Pires, and Chabrol (2017)		Cross-sectional (418)	IGDT-10 (2015)	MOGQ	MMORPG, MOBA, RTS, casual & action and adventure	French	50.71%	22 (3)	Social, Escape, Competition, Coping, Skill Development, Fantasy & Recreation	7
Lewis (2017)		Cross-sectional (246)	POGUS	MPOGQ	MMORPG		80.9%	28.69 (7.31)	Achievement, Social & Immersion	6
Li et al. (2011)		Cross-sectional (161)	Adapted DSM-IV	MPOGQ	MMO	China, Malay & India	49.1%	14.04 (0.73)	Escapism	4
Li, Liau, Gentile, Khoo, and Cheong (2013)		Baseline data from longitudinal dataset (275)	Adapted DSM-IV	MPOGQ	MMO	China, Malay & India	81%	12.9 (0.77)	Achievement, Social & Immersion	4
López-Fernández et al. (2020)		Cross-sectional (1,106 & 260)	DG & IGD-20	VMQ	Strategy Games, Sports Games, Social Simulation Games, Online Card Games, Social Network Games, FPS, MOBA, MMORPG, RPG, AAG.	Spanish & online	68.2% & 41.9%	14.99 (1.13) & 20.53 (3.63)	Recreation, Social interaction, Coping, Violent reward, Fantasy, Cognitive development, Customization & Competition	5.5

(continued)





Table 1. Continued

First author (year)	Sub-sample	Type of study (<i>n</i>)	Gaming disorder Questionnaire	Gaming motivation Questionnaire	Game details	Country/Language of participants	Gender (male)	Mean age (SD)	Video game motive factors	Quality assessment (JBI)
Lopez-Fernandez et al. (2019)		Cross-sectional (548)	IGDS9-SF	OGMS	FPS, MMORPG, MOBA, RPG, Simulations, RTS, Causal games, Action adventure, Adventure point and clicks, Platformer & puzzle	US, CA, BR, PE, UK, GE, NE, FI, PL, FR, IT, SE, RO, AT, CZ, PT, DK, GR, HU, NO, ES, BE, LV, RU, CH, HR, LT, LU, MT, RS, SK, SI, TR, NG, SG, IN, KR, HK, ID, IQ, IL, JP, TH, AE, AU, NZ	0%	26.87 (6.9)	Achievement, Social & Immersion	5.5
Marino et al. (2020)		Cross-sectional (543)	IGDS9-SF	MOGQ	MMORPG, MOBA, MMOFPS, MMORTS & MMOSG	Italian-speaking	84.7%	23.9 (6.15)	Social, Escape, Competition, Coping, Skill Development, Fantasy & Recreation	7
Maroney et al. (2019)		Cross-sectional (2,261)	PVGT	MPOGQ	FPS & MMORPG	America, Europe, Africa & Australasia	88.68%	23.78 (5.47)	Escapism	4
Mills et al. (2017)		Cross-sectional (1,029)	IGDS-9	GAMS	-	US, CA, Europe & Asia	72.8%	22.96 (4.13)	Integrated- Identified Regulation, Introjected Regulation, External Regulation & Amotivation	6
Mills, Milyavskaya, Mettler, and Heath (2018)		Cross-sectional (922)	Petry IGD	PENS	-	CA, US, Europe, Aisa and Pacific & Lation Marica and Caribbean	59.1%	23.53 (6.84)	Autonomy, Competence & Relatedness	4.5
Mills and Allen (2020)		Cross-sectional (487)	IGDS-27	GAMS	-		49.7%	19.50 (1.90)	Intrinsic motivation, Integrated regulation, Identified regulation, Introjected Regulation, External Regulation & Amotivation	6
Montag et al. (2019)		Cross-sectional (1,429)	IGDS9-SF	MOGQ	-	Germany	80%	29.74 (12.37)	Social, Escape, Competition, Coping, Skill Development, Fantasy & Recreation	6
Moudiab and Spada (2019)		Cross-sectional (64)	IGDT-10	MOGQ	-	English-speaking	39.06%	21.3 (3.2)	Social, Escape, Competition, Coping, Skill Development, Fantasy & Recreation	5
Mun and Lee (2021)		Cross-sectional (356)	YDQ-8 (translated and modified)	MPOGQ (adapted)	-	Korea	6.7%	16.78 (2.43)	Social	5.5
Myrseth et al. (2017)		Cross-sectional (853)	GAS	EGMQ	-	Norway	86.6%	19.4 (0.9)	Enhancement, Social, Self-gratification & Coping	6

(continued)

Table 1. Continued

First author (year)	Sub-sample	Type of study (<i>n</i>)	Gaming disorder Questionnaire	Gaming motivation Questionnaire	Game details	Country/Language of participants	Gender (male)	Mean age (SD)	Video game motive factors	Quality assessment (JBI)
Peracchia, Presaghi, and Curcio (2019)		Cross-sectional (388)	AICA-S	GAMS	Adventure, action, quiz, strategy, arcade, fighting game, RPG, simulation, sports, educational, and FPS	Italy	48.45%	15.12 (1.34)	Intrinsic motivation, Integrated regulation, Identified regulation, Introjected Regulation, External Regulation & Amotivation	5
Schimmenti et al. (2017)		Cross-sectional (83)	DSM-5	MPOGQ-WoW	WoW	French-speaking	75.9%	23.95 (8.07)	Advancement, Mechanics, Competition, Socializing, Relationship, Teamwork, Discovery, Role-play, Customization & Escapism	5.5
Sporcic and Glavak-Tkalic (2018)		Cross-sectional (509)	IGDS-9	MOGQ	–	Croatia	91.2%	23.14 (4.66)	Social, Escape, Competition, Coping, Skill Development, Fantasy & Recreation	6
Stenseng, Falch-Madsen, and Hygen (2021)		Cross-sectional (126)	IGDT-10	PENS & ES	God of War, Fortnite & WoW	Norway	83.3%	18.3 (3.15)	Autonomy, Competence & Relatedness	6
Tóth-Király, Bóthe, Márki, Rigó, and Orosz (2019)		Cross-sectional (215)	IGDT-10	MOGQ	–		77.67%	24.96 (6.11)	Skill Development & Recreation	4
Wang, Abdelhamid, and Sanders (2021)		Cross-sectional (436)	GAS	MPOGQ (adapted)	–		–	–	Achievement, Social & Escapism	4.5
Wolfe (2013)		Cross-sectional (440)	A-EQ-WoW	MPOGQ-10	WoW	United States	49.8%	28.26 (7.97)	Achievement, Social & Immersion	5
Wu et al. (2017)		Cross-sectional (383)	DSM-5	MOGQ Chinese version	54.6% played MMO games	China	54.6%	23.7 (6.7)	Social, Escape, Competition, Coping, Skill Development, Fantasy & Recreation	6.5
Zsila et al. (2018)		Cross-sectional (510)	POGQ-12	MOGQ	Pokémon Go	Hungary	55.88%	26.64 (7.80)	Social, Escape, Competition, Coping, Skill Development, Fantasy & Recreation	7

Note. WoW = World of Warcraft, LoL = League of Legends, CoD = Call of Duty, GTA = Grand Theft Auto, RTS = Real Time Strategy, FPS = First-person shooter, RPG = Role playing games, MMORPG = Massively Multiplayer Online Role-playing Games, ARPG = Action Role Playing Game, AAG = Action-Adventure Games, CG = Construction Games, MOFPS = Multiplayer Online First-person Shooter, MMORTS = Massively Multiplayer Online Real-time Strategy Games, MMOG = Massively Multiplayer Online Games, MOBA = Massive Online Battle Arena.

Adapted DSM-IV = 10-item measure adapted from DSM-IV criteria for pathological gambling (Gentile, 2009; Hilgard et al., 2013); 8-AE-Q = 8-item Addiction-Engagement Questionnaire (Charlton & Danforth, 2007); A-EQ-WoW: Addiction-Engagement Questionnaire- World of Warcraft version (Charlton & Danforth, 2007; Peters & Malesky, 2008); AICA-S = Assessment of Internet and Computer Game Addiction Scale (Wölfling et al., 2010); DG = Disordered gaming - Spanish adaptation (Gentile, 2009); DSM-5 = DSM-5 criteria for Internet Gaming Disorder (IGD) without using a validated screening tool; GAS = Gaming Addiction Scale (Lemmens et al., 2009); IGDT-10 = Ten-Item Internet Gaming Disorder Test (Király et al., 2017); IGDT-10 (2015) = The Internet Gaming Disorder Test-10 (Király et al., 2015); IGD-20 = The Internet Gaming Disorder Test-20 (Fuster, Carbonell, Pontes, & Griffiths, 2016; Pontes et al., 2014); IGDS9-SF = Internet Gaming Disorder Scale – Short Form (Monacis et al., 2016; Pontes & Griffiths, 2015); IGDS-9 = The 9-item Internet Gaming Disorder Scale (Lemmens et al., 2015); IGDS-27 = 27-item version of the Internet Gaming Disorder Scale (Lemmens et al., 2015); Petry IGD = Petry et al. (2014) consensus statement on IGD criteria; PGQ = Problematic gaming questionnaire, 22-item adapted from gambling (Gentile, 2009; Charlton, 2002); PIU = Problematic Internet Use scale (PIU) (Chen, Lo, & Lin, 2015); POGQ-18 = Problematic Online Gaming Questionnaire



(Demetrovics et al., 2012); POGQ-12 = Problematic Online Gaming Questionnaire (Pápay et al., 2013); POGUS = Problematic Online Gaming Use Scale (Kim & Kim, 2010); PVGT = Problem Video Game Playing Test (King et al., 2011); PVP = Problem Video Game Playing Questionnaire (Salguero & Morán, 2002); YDQ-8 = Young Diagnostic Questionnaire - 8 item (Young, 1998b); YIAT-WoW Internet Addiction Test - World of Warcraft version (Young, 1998a; Khazaal et al., 2008; Billieux et al., 2013).
 ES = the Escapism Scale (Stenseng et al., 2021); EGMQ = Electronic Gaming Motives Questionnaire (Myrseth et al., 2017); GAMES = The gaming attitudes, motives, and experiences scales (Hilgard et al., 2013); GAMS = Gaming Motivations Scale (Lafrenière et al., 2012); MOGQ = The Motives for Online Gaming Questionnaire (Demetrovics et al., 2011); MOGQ-14 = Motives for Online Gaming Questionnaire -14 (Demetrovics et al., 2011); MPOGQ = Motivations for Play in Online Games (Yee, 2006a); MPOGQ-WoW = Motivations for Play in Online Games adapted to World of Warcraft (Billieux et al., 2013; Yee, 2006b); MPOGQ-10 = Motivations for Play in Online Games (Williams et al., 2008); NE = The Negative escapism scale (Hagström & Kaldø, 2014); OGMS = Online Gaming Motivations Scale (Yee et al., 2012); PENS = Player Experience of Need Satisfaction (Ryan et al., 2006); VMQ = Videogaming Motives Questionnaire (López-Fernández et al., 2020).
 US = United States, CA = Canada, BR = Brazil, PE = Peru, UK = United Kingdom, GE = Germany, NE = Netherlands, FI = Finland, PL = Poland, FR = France, IT = Italy, SE = Sweden, RO = Romania, AT = Austria, CZ = Czechia, PT = Portugal, DK = Denmark, GR = Greece, HU = Hungary, NO = Norway, ES = Spain, BE = Belgium, LV = Latvia, RU = Russia, CH = Switzerland, HR = Croatia, LT = Lithuania, LU = Luxembourg, MT = Malta, RS = Serbia, SK = Slovakia, SI = Slovenia, TR = Turkey, NG = Nigeria, SG = Singapore, IN = India, KR = South Korea, HK = Hong Kong, ID = Indonesia, IQ = Iraq, IL = Israel, JP = Japan, TH = Thailand, AE = United Arab Emirates, AU = Australia, NZ = New Zealand and PH = Philippines (the).

for gaming disorder symptoms. Most studies ($k = 44$) used validated assessment tools that target various aspects of maladaptive gaming behavior. Three studies used the DSM-5 criteria for Internet Gaming Disorder without specifying a validated screening tool. Four studies used screening tools adapted from pathological gambling criteria to cover pathological gaming. Five studies used assessment tools that target Internet addiction; two were adapted to target a specific world of warcraft behavior. Two studies used five items adapted from previous studies to capture negative gaming outcomes. Moreover, the current review identified 14 unique measurements of gaming motivations following seven separate classifications. In total, 26 studies used the Motives for Online Gaming Questionnaire (MOGQ); of these, 24 studies used the original or translated 27-item version, and two studies used the short 14-item version. The Motivations for Play in Online Games (MPOGQ) classification was used in 22 studies, utilizing five different measurements; eight of those studies used the original 39-item version of the MPOGQ. Four studies used Motivations for Play in Online Games adapted to World of Warcraft. Four studies used the Online Gaming Motivations Scale (OGMS). Additionally, one study used the 10-item Motivations for Play in Online Games (MPOGQ-10). Five studies modified the MPOGQ by reducing the number of items and adjusting the factor structure. Three studies used the Gaming Motivations Scale (GAMS). Four studies used the Player Experience of Need Satisfaction (PENS). The Electronic Gaming Motives Questionnaire (EGMQ), the Gaming Attitude, Motives, and Experience Scale (GAMES) and the Videogaming Motives Questionnaire (VMQ) were all used in one study each.

Quality assessment

The quality assessment included 49 studies, showing that 28 studies (57%) clearly defined the inclusion criteria, 18 studies (37%) described their study participants in detail, and 25 studies (51%) presented strategies to deal with confounding factors (age, gender, or gaming time). The quality assessment required a third reviewer (DES) involvement in 10 (3%) out of 343 cases. See [Supplementary material C](#) for a complete overview of the quality assessment.

Meta-analysis

An overview of the pooled effect sizes between gaming motivations and gaming disorder symptoms can be seen in [Fig. 3](#), and see [Supplementary material E](#) for separate forest plots for each motivational factor. The Q-statistics showed statistically significant heterogeneity for all outcomes except for two gaming motivation factors (MPOGQ: role-play and customization; See [Supplementary material E](#)).

The motive for Online Gaming Questionnaire (MOGQ) and gaming disorder symptoms. Four motivational factors of the MOGQ showed a moderate association with gaming disorder symptoms: *escape* ($k = 25$, $n = 30,243$, $r = 0.497$, 95% CI = 0.453–0.539, $\tau^2 = 0.019$, $I^2 = 96\%$), *fantasy* ($k = 24$, $n = 26,876$, $r = 0.401$, 95% CI = 0.336–0.463, $\tau^2 = 0.034$,



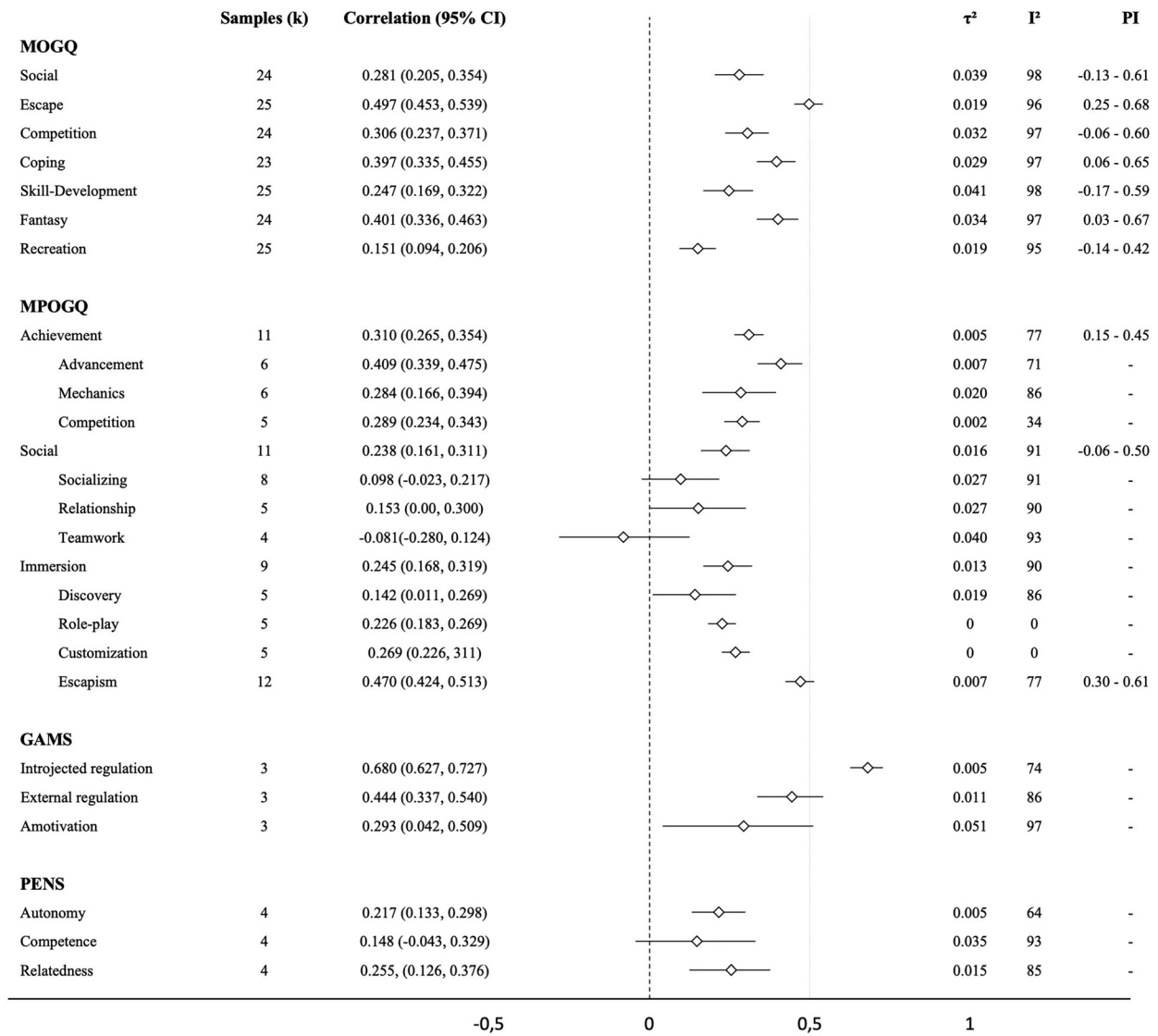


Fig. 3. Pooled effect sizes for the association between gaming motivations and gaming disorder symptoms.

Note. MOGQ = The Motive for Online Gaming Questionnaire; MPOGQ = Motivations for Play in Online Games; GAMS = The Gaming Motivation Scale; PENS = Player Experience of Need Satisfaction

$I^2 = 97\%$), *coping* ($k = 23, n = 26,105, r = 0.397, 95\% CI = 0.335-0.455, \tau^2 = 0.029, I^2 = 97\%$) and *competition* ($k = 24, n = 26,892, r = 0.306, 95\% CI = 0.237-0.371, \tau^2 = 0.032, I^2 = 97\%$). Three motivational factors of the MOGQ showed a small association: *social* ($k = 24, n = 26,847, r = 0.281, 95\% CI = 0.205-0.354, \tau^2 = 0.039, I^2 = 98\%$), *skill-development* ($k = 25, n = 27,045, r = 0.247, 95\% CI = 0.169-0.322, \tau^2 = 0.041, I^2 = 98\%$) and *recreation* ($k = 25, n = 27,080, r = 0.151, 95\% CI = 0.094-0.206, \tau^2 = 0.019, I^2 = 95\%$). No significant funnel plot asymmetry was detected, see Supplementary material F for funnel plots and results from Egger’s regression test.

The motivations For play in Online Games questionnaire (MPOGQ) and gaming disorder symptoms. The pooled effect size concerning the second-order factor *achievement* was moderate ($k = 11, n = 9,234, r = 0.310, 95\% CI = 0.265-0.354, \tau^2 = 0.005, I^2 = 77\%$). No significant funnel

plot asymmetry was detected, see Supplementary material F. For the first-order factors, the pooled effect size concerning the *advancement* factor was moderate ($k = 6, n = 2,237, r = 0.409, 95\% CI = 0.339-0.475, \tau^2 = 0.007, I^2 = 71\%$), whereas a small effect size was found for *mechanics* ($k = 6, n = 2,049, r = 0.284, 95\% CI = 0.166-0.394, \tau^2 = 0.020, I^2 = 86\%$) and *competition* ($k = 5, n = 1,848, r = 0.289, 95\% CI = 0.234-0.343, \tau^2 = 0.002, I^2 = 34\%$).

The pooled effect size concerning the second-order *social* factor was small ($k = 11, n = 8,881, r = 0.238, 95\% CI = 0.161-0.311, \tau^2 = 0.016, I^2 = 91\%$). Significant funnel plot asymmetry was detected concerning the social factor (MPOGQ) (Egger’s intercept = 4.25, $P = 0.04$, see Supplementary material F). The adjusted effect size based on Duval and Tweedie’s trim-and-fill procedure showed identical values as the observed and no imputed studies. For the first-order factors, the pooled effect size was small for *relationship* ($k = 5, n = 1,848, r = 0.153, 95\% CI = 0.00-0.300,$

$\tau^2 = 0.027$, $I^2 = 90\%$), whereas a negligible and statistically non-significant effect size was found for *socializing* ($k = 8$, $n = 3,140$, $r = 0.098$, 95% CI = -0.023 – 0.217 , $\tau^2 = 0.027$, $I^2 = 91\%$) and *teamwork* ($k = 4$, $n = 1,583$, $r = -0.081$, 95% CI = -0.280 – 0.124 , $\tau^2 = 0.040$, $I^2 = 93\%$).

The pooled effect size concerning the second-order *immersion* factor was small ($k = 9$, $n = 8,093$, $r = 0.245$, 95% CI = 0.168 – 0.319 , $\tau^2 = 0.013$, $I^2 = 90\%$). For the first-order factors, the pooled effect size was small for *discovery* ($k = 5$, $n = 1,848$, $r = 0.142$, 95% CI = 0.011 – 0.269 , $\tau^2 = 0.019$, $I^2 = 86\%$), *role-play* ($k = 5$, $n = 1,848$, $r = 0.226$, 95% CI = 0.183 – 0.269 , $\tau^2 = 0.000$, $I^2 = 0\%$) and *customization* ($k = 5$, $n = 1,848$, $r = 0.269$, 95% CI = 0.226 – 0.311 , $\tau^2 = 0.000$, $I^2 = 0\%$). Regarding the first-order *escapism* factor, the effect size was moderate ($k = 12$, $n = 6,403$, $r = 0.470$, 95% CI = 0.424 – 0.513 , $\tau^2 = 0.007$, $I^2 = 77\%$). Significant funnel plot asymmetry was detected concerning the escapism factor (MPOGQ) (Egger's intercept = -3.43 , $P = 0.01$, see Supplementary material F). Duval and Tweedie's trim-and-fill procedure imputed three missing studies. The adjusted effect size then increased to $r = 0.496$ (95% CI = 0.455 – 0.535 ; Q -value = 64.264).

The Gaming Motivation Scale (GAMS) and gaming disorder symptoms. The pooled effect size of the *introjected regulation* factor was large ($k = 3$, $n = 1,904$, $r = 0.680$, 95% CI = 0.627 – 0.727 , $\tau^2 = 0.005$, $I^2 = 74\%$). The pooled effect size of the *external regulation* factor was moderate ($k = 3$, $n = 1,904$, $r = 0.444$, 95% CI = 0.337 – 0.540 , $\tau^2 = 0.011$, $I^2 = 86\%$). The pooled effect size of the *amotivation* factor was small ($k = 3$, $n = 1,904$, $r = 0.293$, 95% CI = 0.042 – 0.509 , $\tau^2 = 0.051$, $I^2 = 97\%$).

Player Experience of Need Satisfaction (PENS) and gaming disorder symptoms. The pooled effect size of the *autonomy* ($k = 4$, $n = 1,765$, $r = 0.217$, 95% CI = 0.133 – 0.298 , $\tau^2 = 0.005$, $I^2 = 64\%$) and the *relatedness* ($k = 4$, $n = 1,764$, $r = 0.255$, 95% CI = 0.126 – 0.376 , $\tau^2 = 0.015$, $I^2 = 85\%$) factor was small, whereas a small and statistically non-significant effect size was found for the *competence* factor ($k = 4$, $n = 1,765$, $r = 0.148$, 95% CI = -0.043 – 0.329 , $\tau^2 = 0.035$, $I^2 = 93\%$).

Sensitivity analysis

The results from the sensitivity analysis were consistent with the main meta-analysis (i.e., same interpretation of small, moderate or large effects and heterogeneity), indicating that the overall result and conclusions are not affected by the different decisions made during the review process (see Supplementary material D). The sensitivity analysis excluded studies that used adapted or modified measurements of gaming motivation and gaming disorder symptoms (e.g., adapted pathological gambling criteria).

DISCUSSION

The current systematic review and meta-analysis provide the first comprehensive overview of the relationship between

gaming motivations and symptoms of gaming disorder. Moreover, the present study also investigated gaming motivation models and questionnaires used to study gaming disorder symptoms. The current study identified 14 different instruments for measuring gaming motivations across seven motivation models (MPOGQ; MOGQ; GAMS; PENS; EGMQ; GAMES; VMQ). The MPOGQ is the only model that targets a specific game genre (MMORPG), while the other models assess motivation across all video games. The meta-analysis showed statistically significant associations between gaming disorder symptoms and 23 out of 26 gaming motivation factors, although some of the findings need to be cautiously interpreted due to the small number of studies. Moreover, large heterogeneity was observed and the calculated PI indicated substantial variation in the expected range of effects for comparable future studies. However, the PI concerning the escapism (MPOGQ), achievement (MPOGQ), and escape (MOGQ) factors showed small to moderate positive effect sizes at the lower end of the interval, highlighting the importance of these motivation factors concerning gaming disorder symptoms.

Main findings

The analysis showed that motivation to play video games to avoid feeling bad or improve feelings about oneself (introjected regulation), desire to escape from reality to avoid negative emotions (MOGQ: escape and MPOGQ: escapism), and control stress, tension, or anger (coping) were significantly associated with gaming disorder symptoms. Moreover, reviewing the content of the questionnaires shows that introjected regulation (GAMS), escapism (MPOGQ), escape (MOGQ), and coping (MOGQ) overlap concerning the desire to use video games as an instrument to regulate emotions (Demetrovics et al., 2011; Lafrenière et al., 2012; Yee, 2006a). The current results are consistent with previous findings showing an association between emotional escape and various addictive disorders (Bravo et al., 2018; Bresin & Mekawi, 2019; Cooper, 1994; Jacobs, 1986; Lee, Chae, Lee, & Kim, 2007; Simons, Correia, Carey, & Borsari, 1998; Stewart & Zack, 2008;). Previous research has shown that motivation concerning emotional escape appears to mediate between general psychiatric distress (e.g., depression, anxiety, and psychoticism), social anxiety, loneliness, and gaming disorder symptoms (Ballabio et al., 2017; Király et al., 2015; Maroney, Williams, Thomas, Skues, & Moulding, 2019). Furthermore, researchers investigating escape motives related to gaming disorder symptoms suggest extending the self-medication hypothesis to video games (Balhara, Garg, Kumar, & Bhargava, 2018; Ballabio et al., 2017; Montag et al., 2019). The self-medication hypothesis is a theory that proposes that individuals use substances to regulate painful emotional states and self-esteem as a consequence of insufficient functional coping skills (Khantzian, 1997). The significant relationship between emotional escape and gaming disorder symptoms may indicate that individuals who play video games to avoid negative emotions may lack

functional strategies to deal with distress, resulting in playing video games as a dysfunctional coping strategy.

The association between gaming disorder symptoms and motivational factors related to elements within video games (MOGQ: fantasy; MPOGQ: achievement, advancement, mechanics, discovery, role-play, and customization; GAMS: external regulation) suggest that structural characteristics of video games (e.g., duration of the game, game dynamics, character development, and reward features) and gaming genres (e.g., action, role-playing or strategy) may be relevant factors in this relationship. Previous research has recognized that some video games implement various reward systems (e.g., intermittent rewards and meta-game rewards) constructed to make players spend more time within the game and possibly contribute to problematic gameplay (King, Delfabbro, & Griffiths, 2009; Klemm & Pieters, 2017). Moreover, video games that require a large amount of gameplay (e.g., completing 100% of the game, mastering the video game, and gathering experience points) are significantly associated with problematic gameplay (Griffiths & Nuyens, 2017). Thus, individuals motivated by in-game elements may have difficulty stopping playing video games with no endpoint and consequently experience symptoms of gaming disorder.

The desire to compete against other players (MOGQ and MPOGQ: competition) was significantly associated with gaming disorder symptoms. Previous research has shown that competitiveness is a significant predictor of pathological gambling, and the authors hypothesize that competitive gamblers are less likely to accept a loss, thus extending the gambling frequency (Parke, Griffiths, & Irwing, 2004). Similarly, video game players motivated by competition may also be less willing to accept losses against other players. Thus, competitive video game players may prioritize continued gameplay, attempting to ensure a win instead of attending to obligations outside video games.

The current analysis showed that social motives (MOGQ and MPOGQ: social) were associated with gaming disorder symptoms, while two specific types of social motives aimed to capture the enjoyment of playing with others and working together in groups (MPOGQ: socializing and teamwork) were not significantly associated with gaming disorder symptoms. Wu et al. (2017) observed that social factors were related to spending more time in the game, and Männikkö, Billieux, Nordström, Koivisto, and Kääriäinen (2016) proposed that individuals who prefer social interactions in video games might be more likely to show symptoms of gaming disorder. Previous research suggests that some players might find social acceptance in online gaming communities compared to people outside of games (King & Delfabbro, 2014), thus feeling more motivated to spend time on social interactions in video games. Different gaming genres may also contribute to the variation in effect sizes since some video games are designed to progress alone while other games may have elements that require several people to complete (Griffiths & Nuyens, 2017), possibly leading to high involvement in games for some individuals due to peer pressure.

Playing video games for enjoyment and entertaining motives (recreational) and experiencing a lack of motivation (amotivation) towards playing showed a significant association to gaming disorder symptoms. Playing for recreational reasons has been related to gaming frequency (López-Fernández et al., 2020), which may contribute to developing a maladaptive gaming pattern. Moreover, experiencing negative consequences (gaming disorder symptoms) from video games may not oppose finding enjoyment in playing for some individuals. The relation between amotivation and gaming disorder symptoms has been suggested to result from being aware of the negative consequences of gaming and feeling helpless due to being unable to stop playing (Mills, Milyavskaya, Heath, & Derevensky, 2017).

In the current meta-analysis, the observed mean effect sizes need to be interpreted in light of the large heterogeneity observed in the majority of the analyses. The calculated PIs showed that the dispersion of true effects ranged from trivial, or even negative, to large for several of the investigated outcomes. Moreover, while escape (MOGQ) and escapism (MPOGQ) motives were ubiquitously associated with gaming disorder symptoms, the correlation as indexed by the PIs varied from small to large. Taken together, this indicates that the strength of the association between gaming disorder symptoms and gaming motivations varies substantially across populations and settings. Further investigation into the sources of this heterogeneity remains an important area for future research.

Practical implications

The results from the meta-analysis highlight the role of motivational factors in understanding problematic gaming behavior. Considering the association between gaming disorder symptoms and comorbid psychopathology (González-Bueso et al., 2018), assessing motivational factors together with screening of gaming disorder symptoms may contribute to understanding the role of video games for individuals in a clinical context (e.g., whether video games are used for a self-medicating purpose). Previous research has suggested that motivations for playing video games may be an essential guide to identify appropriate intervention strategies (Steadman, 2019), and similar recommendations have been proposed concerning interventions regarding problematic marijuana use (Bresin & Mekawi, 2019). Thus, motivational factors may be clinically relevant regarding assessment and intervention strategies for gaming disorder.

Limitations and future research

The current study follows a priori registered protocol in PROSPERO (CRD42020220050), provides transparency through publicly available data (osf.io/24qyk), and is the first comprehensive systematic overview of the association between gaming motivations and gaming disorder symptoms. Still, the conclusions in the current study need to be considered taking into account the study limitations. First, the quality assessment indicates that several studies suffer from methodological shortcomings, thus affecting

reproducibility. These studies lacked clearly defined inclusion criteria, a clear description of study participants, and a declaration of strategies to deal with confounding variables. Researchers should consider addressing these shortcomings when planning and conducting future studies. Furthermore, the review process revealed that only one study (Myrseth et al., 2017) used a randomized sample selection and that most studies included primarily male participants. Future studies should gather representative samples and recruit more females (King & Potenza, 2020). Second, the current study included cross-sectional data, preventing any investigation of causality. Future studies should consider utilizing longitudinal research design to explore the direction between gaming motivations and gaming disorder symptoms. Third, the current study did not investigate the sources concerning the large heterogeneity observed in most analyses; thus, further exploration is warranted. Future studies should explore the potential moderating effect of variables such as demographic factors (e.g., gender, age, and country), date of publication, type of measurement tool, video game type (e.g., MOBA, MMORPG, and FPS), video game characteristics (e.g., reward features, social features, and narrative features) and video game context (e.g., recreational and professional gamers). Previous research has shown that different game types are associated with different motivations (Wu et al., 2017) and symptoms for gaming disorder (King et al., 2019). Thus, future research should consider investigating a specific game or game genre when researching motivation and gaming disorder symptoms.

The review showed several different measurements for gaming motivation and gaming disorder symptoms, which may have contributed to the observed heterogeneity. Moreover, several motivational factors demonstrate various overlaps (conceptual and in terms of content) in the current meta-analysis, warranting further investigation. Future research should unify and reach a consensus regarding measuring gaming disorder symptoms (King et al., 2020) and consider using motivational models comparable between different video games and validated gaming motivation questionnaires when studying gaming disorder symptoms to achieve consistency in the research field.

CONCLUSIONS

The current study systematically reviews the relationship between gaming motivations and gaming disorder symptoms. The meta-analysis showed significant associations between 23 out of 26 gaming motivation factors and gaming disorder symptoms, reinforcing the importance of motivational factors in understanding problematic gaming behavior. Moreover, gaming motivation related to emotional escape showed a robust relationship with gaming disorder symptoms. The analyses showed a high degree of heterogeneity, requiring further investigation. The included studies used several different screening tools for gaming disorder symptoms and gaming motivations, affecting the generalizability of the

findings. The findings could aid the development of assessment and treatment programs.

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SUPPLEMENTARY MATERIALS

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