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The dark and the light side of gaming

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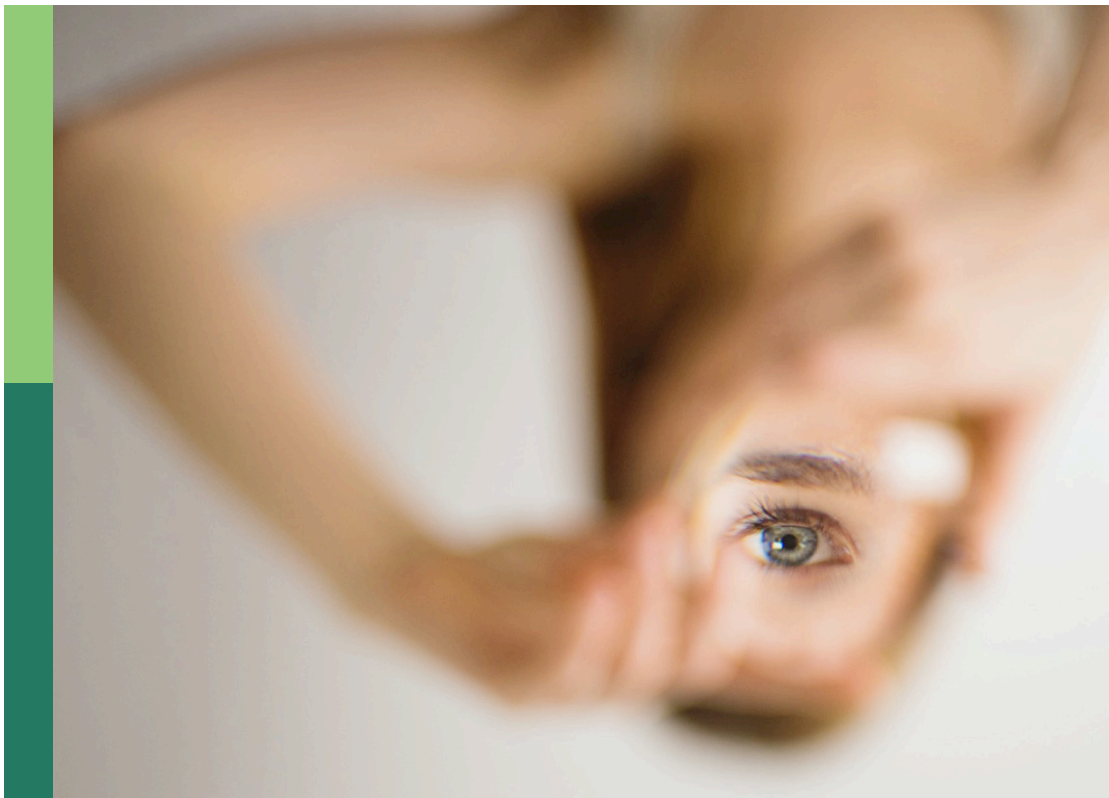

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The dark and the light side of gaming

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Editorial: The dark and the light side of gaming

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Editorial on the Research Topic
The dark and the light side of gaming

Debates about the effects of digital gaming date back to the 1980s and 1990s when first affordable home computer systems were introduced. Early research often concentrated on exploring the potential *dark side of gaming*, trying to shed light into the social discourses that established relationships between gaming and negative effects in players and gaming communities. These studies have explored, for example, the purported influence of playing violent games on aggressiveness (e.g., Cooper and Mackie, 1986) or focused on the addictive potentials of games (e.g., Fisher, 1994). However, it should be noted that some studies in these research areas have been criticized for methodological reasons and that researchers' opinions on potential negative effects of gaming differ (Drummond et al., 2018; Nielsen and Kardefelt-Winther, 2018; Pontes, 2018; Scharrer et al., 2018). In spite of these ongoing discussions, there has been a notable shift in the last decades and interest in *the light side of gaming* has increased. For example, studies have examined the positive potentials of games in terms of skill development (e.g., Bediou et al., 2023), learning (e.g., Clark et al., 2016), and stress reduction (e.g., Pallavicini et al., 2021).

With this Research Topic, we wanted to demonstrate how multifaceted and complex games and play are. Our aim was to bring together research on both positive and negative aspects related to games and play, as well as research that sheds light on the many gray areas between these two extremes.

The dark side

Three articles of the current Research Topic focus on exploring the relationship between gaming and potential negative effects, trying to provide understanding to the dark side of games and play.

The study by Olejarnik and Romano examines how personality aspects (narcissism and self-esteem) as well as violent video game choice (classified according to the Pan European Game Information rating; PEGI) are related to different indicators of aggressiveness (anger, hostility, physical aggression, verbal aggression). Conducting a cross-sectional survey among 166 game users, the study found that violent video game choice and narcissism predict verbal aggression, while hostility is predicted by violent video game choice and lower self-esteem. The authors stress the importance of adequate age rating systems and safeguard procedures to protect younger users.

Rather than focusing on violent content of particular games, Cook et al. take a closer look on aggressive behaviors between online gamers. Their interview study takes an innovative approach by contrasting and comparing toxic behaviors on gaming platforms and on social media. The authors found that online gaming is in general perceived as more toxic than social media use. Further, trolling in gaming contexts is mainly understood as unfair behavior toward fellow players (e.g., disadvantaging one's team), while trolling on social media is defined in a broader way.

A topic that has received growing attention is the question of whether playing online games can serve as a so-called breeding ground for extremism. To prevent such developments, it is important to increase the understanding of the underlying mechanism of the radicalization of gamers. Against this background, Kowert et al. conducted three quantitative surveys and identified several relevant factors, including fusing with gamer identity (i.e., a deep alignment with gaming culture and the group of gamers), problematic personality traits (narcissism, psychopathy), individual differences (i.e., loneliness, insecure attachment), and enthusiasm for violent games (i.e., Call of Duty).

The light side

The Research Topic also includes five articles that examine the possible positive effects of gaming.

Rüth et al. conducted a systematic literature review of research that investigates the potentials of commercial exergames for rehabilitation and the improvement of physical health. Analyzing 20 empirical studies, they report promising evidence for positive effects of playing on quality of life and physical health. Although more research is still needed, it can be concluded that commercial exergames can usefully complement conventional rehabilitations measures.

Exergames are one example of how gaming technologies can be used to enhance people's lives and to teach useful skills. Another example is the many serious games that have been developed to help improving media literacy. Focusing on how media literacy is understood in such games and how such games are designed, Glas et al. conducted a thematic analysis of 100 games. The authors found that misinformation is the predominant theme, while other important topics, such as cyberbullying prevention or cybersecurity, are underrepresented.

However, players do not only learn from serious games designed to teach particular skills. Also, commercial entertainment games can serve as a source for informal learning. Vahlo et al. conducted a survey among 1,202 gamers from the UK and the USA and found that gaming can lead to a wide spectrum of learning outcomes. Further, it was found that learning outcomes were positively related to wellbeing as well as to eudaimonic gaming motivations (i.e., self-attributive motives like mastery or socializing that go beyond hedonic motivations, such as fun or relaxation).

Eudaimonia (in contrast to hedonia) also plays a central role in the theoretical piece by Possler et al.. They define meaningful or eudaimonic gaming experiences as "experiences that reflect human virtues and encourage players to develop their potential as human beings fully." Their overview systematizes relevant theoretical approaches along four central game elements (social, narrative, agency, and aesthetics) and considers the degree of interactivity to explain how eudaimonic experiences develop in different types of games.

A good example of how gaming can become a meaningful, eudaimonic experience to players is provided by Eum and Doh. For their study, twelve individuals that had experienced the loss of a loved one were asked to play two different games that deal with the topic of death and remembrance. Drawing on game diaries and in-depth interviews, their study illustrates how playing these games can be a meaningful experience for the participants and help them to cope with their grief.

The gray area in between

Of course, many aspects and effects related to gaming cannot be defined as simply light or dark. Rather, they have to be located somewhere in the large gray area between the two extremes.

For example, Kasdorf presents a qualitative analysis that deals with the representation of mental illness in video games published between 2018 and 2019. She argues that video games often portray psychological problems in a discriminatory and stigmatizing manner. However, some newer games by independent developers have taken a more balanced perspective on the topic that may help to counter stereotypes. Her findings and the category system she created could inspire further research on the topic and contribute to the development of games that offer a more empathetic and multidimensional portrayal of mental illness.

There has also been some progress in the representation of LGBTQ+ characters in video games in recent years: as discussed by Gaudszun and Elmezeny, the portrayal of queer protagonists in games has become more frequent, even if it is still too one-dimensional in many cases. Conducting an analysis of the social media communication surrounding two games that feature queer characters, the authors investigate the strategic communication of gaming companies and how they can successfully align with LGBTQ+ stakeholders. The results emphasize the importance of authenticity and a communication strategy that is in line with corporate practices, avoiding *rainbow washing*.

In general, it can be assumed that the way in which topics are presented and framed in video games can have an influence on our perception and thinking. Groen and Jacobs focused on persuasive games, i.e., games that were designed with the explicit intention of drawing our attention to specific real-world issues and shaping our attitudes. Their experimental study shows that games were more effective when the persuasive intent was clear. Further, playing intentions were stronger when the game was recommended by a peer (in contrast to system-based recommendations).

A specific form of persuasive games are advergames, i.e., games designed for marketing purposes. Cañete Sanz and De La Hera present a systematic review of research on advergames published between 2005 and 2021. They found that most academic studies in this area focus either on the effects of advergames on children (especially in terms of health and nutrition) or on purchase intentions, while studies on brand narratives and brand loyalty have been conducted less frequently.

Finally, based on statements of 180 players aged 15 to 25 years, Meriläinen and Ruotsalainen present an extensive analysis

of the way young people use games, the meanings they attach to gaming and the effects they experience. Their results emphasize how complex young people's relationship to digital games can be and how many factors and aspects need to be taken into account when trying to understand them. It is difficult and probably misleading to frame gaming as an *either or* between beneficial and detrimental, but more holistic approaches are needed to better understand individual gaming experiences.

We hope that the articles published as part of this Research Topic will contribute to a more diverse picture of the many different facets of digital games and will stimulate a fruitful dialog among researchers.

Author contributions

FR: Conceptualization, Project administration, Writing – original draft, Writing – review & editing. MS: Conceptualization, Writing – review & editing. TD: Conceptualization, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Not just a game: Identity fusion and extremism in gaming cultures

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Extremist ideologies have clearly become increasingly prevalent in the world of video games. What is less clear, however, is the mechanism through which these ideologies make their way into the psyches of gamers. Here we focus on the potential role of identity fusion in the radicalization of video gamers. In three studies, we show that fusion with gaming culture is uniquely predictive of a host of socially pernicious outcomes, including racism, sexism, and endorsement of extreme behaviors. We also show that specific personality attributes (e.g., insecure attachment, loneliness) may interact with fusion with gaming culture to further amplify support for extreme behavior, and that specific gaming communities (e.g., *Call of Duty*) may serve as catalysts that encourage strongly fused gamers to embrace antisocial attitudes and behaviors. These findings contribute to a theoretical understanding of the psychological processes that foment radicalization and guide the development of strategies for discouraging extremist ideologies in gaming spaces.

KEYWORDS

identity fusion, digital games, extremism and radicalization, extremism, video games

Introduction

There are growing concerns that online platforms have become breeding grounds for extremist ideologies (Gaudette et al., 2020). Such concerns are warranted. In fact, the "us vs. them" exclusionary identities inherent in game content and communities are well-suited for the development and perpetuation of extremist ideologies (Kowert and Newhouse, 2022). Even so, the psychological mechanisms through which identities come to organize the activities of gamers have not yet been identified. In this report, we propose that identity fusion with gamer cultures ßßß gamers to internalize and act upon extremist beliefs. We begin with a brief description of the role of identities and identity fusion in extreme behavior.

Gamer cultures, identity fusion, and extremism

Identity fusion is a deep, visceral sense of alignment with an abstracting such as a group, cause, or other people. Identify fusion is distinct from traditional forms of alignment with groups such as group identification (Tajfel and Turner, 1979; Turner et al., 1987). Whereas, group identification emphasizes collective ties to the group only,

identity fusion also emphasizes the personal self and relational ties to other group members (for emperical evidence, see Gómez et al., 2019). The incorporation of these three distinct motivators of pro-group behavior (i.e., the personal self, relational and collective ties) theoretically explains why measures of identity fusion are exceptionally strong predictors of *extreme* pro-group behavior. That is, relative to identification, identify fusion has been shown to be a stronger predictor of the endorsement of fighting and dying for ingroup members (Swann et al., 2009; Gómez et al., 2011b) and choosing self-sacrifice to save imperiled ingroup members in variations of the trolley dilemma (Swann et al., 2010a; Gómez et al., 2011b). Identity fusion is so powerful that it compels people to enact pro-group behaviors even when it is personally costly to do so (e.g., sacrificing one's life for the group; Swann et al., 2010b).

It is important to note that fusion resembles an attitude rather than a personality trait. For example, fusion scores are independent of each of the Big Five Personality traits (extraversion, agreeableness, openness, conscientiousness, neuroticism; Gómez and Vázquez, 2015). Moreover, the tendency to fuse with one's religion was uncorrelated with the tendency to fuse with other abstractions such as one's country (Swann et al., 2012). The tendency for fusion to be attached to specific abstractions to the exclusion of other abstractions likely reflects the fact that fusion requires significant emotional investment and a given individual is only capable of a finite amount of emotional investment.

Gaming spaces may be particularly conducive to identity fusion. By their nature, digital gaming environments are characterized by shared and arguably stressful activities (e.g., working as a group to kill formidable enemies). Shared experiences are particularly effective in facilitating identity fusion, especially when the experiences are challenging (Newson et al., 2016) and engaging. Supporting this, friendships formed within games have been found to be highly intimate with greater levels of self-disclosure and closeness than friendships made in other online spaces (Williams, 2006a; Cole and Griffiths, 2007; Kowert, 2015). These bonds are doubtlessly conducive to identity fusion with gaming culture (i.e., a deep emotional bond with gaming culture).

Identity fusion has been studied in a variety of groups including members of the military (Hart and Lancaster, 2019), nationalist groups (Raffield et al., 2016; Siromahov, 2020), and competitive sports (Bortolini et al., 2018; Newson et al., 2018, 2022; Newson, 2019). Within these varied contexts, fusion has been found to align with several pro-social outcomes, such as the willingness to help others (Swann et al., 2010a; Gómez et al., 2011a; Hart and Lancaster, 2019), and anti-social outcomes, such as hostility, aggression, and violence (Newson et al., 2018, 2022).

The distinctive psychological profile of game players may also foster identity fusion. It is well-documented that many people seek gaming communities for social connection. Historically, online game players have been found to be highly socially motivated (Yee, 2006; Hilvert-Bruce and Neill, 2020) and particularly likely to suffer from loneliness (Kim et al., 2008), social anxiety (Kim et al., 2008), and insecure attachment (Kowert and Oldmeadow, 2014). A major appeal of gaming communities, then, is "*the capacity to offer a sense of attachment (i.e., closeness, belonging, and security) for individuals who need it the most*" (Kowert and Oldmeadow, 2014, p. 564).

The salubrious effects of games notwithstanding, gamer cultures also represent spaces where hateful, harassing, and "toxic" behaviors are commonplace (Consalvo, 2012; Anti-Defamation League, 2019; Kowert and Cook, 2022). This includes chronic racism (Gray, 2012) and misogyny (Jenson and DeCastell, 2013). Extremist ideologies in gaming and game-adjacent spaces are particularly pervasive. In 2019, the ADL reported that 23% of online game players are exposed to discussions about white supremist ideology while gaming. A 2021 report from the Institute for Strategic Dialogue (ISD) also found *Steam* (an online gaming platform) to house a diverse range of public servers created for violent neo-Nazi groups and noted that *Discord* (a third-party chat system often used by gaming groups) actively hosts white nationalist and white supremist groups featuring neo-Nazi content (Institute for Strategic Dialogue, 2021).

Gamer communities therefore represent a double-edged sword. On the one hand, they may provide a sense of connection and purpose for individuals who suffer from loneliness and insecurity (Kim et al., 2008; Kowert and Oldmeadow, 2014). On the other hand, they may expose gamers to hateful speech and social toxicity (Consalvo, 2012) that can increase their susceptibility to extremist propaganda (Braddock et al., 2022). In the worst-case scenario, gamers may be lured into embracing extremist beliefs that lead them down the path to radicalization.

The studies reported in this article were not preregistered. The data have not been made available on a permanent third-party archive; however, requests for data can be sent to the corresponding author.

Current research

To examine the links between identity fusion and extremism among gamers, we conducted a series of three studies. Study 1 explored the correlates of identity fusion among gamers. To this end, we assessed fusion with gaming culture and three broad classes of outcomes: (a) endorsement of extreme behaviors; (b) attitudes that have traditionally been linked to antisocial behaviors; and (c) demographic variables and frequency of engagement in gaming. In Study 1, we predicted that identity fusion with gamer culture would predict the first two classes of outcomes (endorsement of extreme behaviors and antisocial attitudes), even while controlling for (a) gameplay predictors

and relevant demographics (i.e., weekly play time, years gaming, most played genre, and gender) and (b) established political identity predictors (i.e., right wing identity and white nationalist identity).

Building on the findings from Study 1, Study 2 focused on the potential individual differences that could amplify the effects of fusion with gaming culture. Based on evidence that insecure attachment is associated with intragroup marginalization and the endorsement of extreme pro-group actions (Ferenczi et al., 2016), we included a measure of both anxious and avoidant attachment styles. Further, given evidence that emotional comfort is a powerful motivator of online engagement, particularly among the insecurely attached (Kowert and Oldmeadow, 2014), we included a measure of positive and negative gameplay motivations (i.e., motivated to play when feeling happy, excited, stressed, anxious, sad, or lonely) as well as a measure of loneliness. Relatedly, we also added measures of gaming companions and play modality (online vs. offline) to Study 2 to also see if these measures would interact with fusion to predict extreme behaviors. Our hypotheses in Study 2 were 2-fold: (1) the unique predictive effects of identity fusion on the outcomes from Study 1 would replicate while controlling for the established political predictors, and (2) identity fusion would interact with our novel measures (i.e., insecure attachment styles, loneliness, positive and negative gameplay motivations, gaming companions, and play modality) to predict extreme behaviors (i.e., willingness to fight/die for gaming culture and recent aggressive behaviors).

Study 3 asked if contextual factors may impact gamer fusion and its relationship to extreme outcomes. Specifically, whether the relations between identity fusion and extreme behavior and attitudes generalized to players of relatively benign games (e.g., *Minecraft*) or were limited to games with more violent content, competitive mechanics, and toxic social environments (e.g., *Call of Duty*). Our hypothesis in Study 3 was that fusion would be more strongly predictive of the antisocial outcomes among Call of Duty gamers compared to Minecraft gamers.

Due to the politically sensitive nature of this work, it is important to note that the authors took several personal safety precautions prior to the administration of this research. First, we ensured that the questions within the survey were non-invasive, self-report measures, we did not expose participants to experimental manipulations or upsetting content, and we guaranteed participants anonymity with their participation, reducing the likelihood they would feel threatened in any way from participating within the study. We also consulted with third parties to prevent the authors' personal information from being made available online apart from their intuitional contact information which is required by the University of Texas internal review board to be made publicly accessible to participants.

Study 1

In Study 1, we were interested in exploring identity fusion with gamer communities and potentially related individual differences. Given the paucity of prior research on this topic, we cast a wide net by including measures of several potentially relevant constructs.

Method

Participants

We ran an a priori power analyses using the GPower software. With 3 predictors in a regression model we would have 90% power to detect an effect size of $f^2 = 0.05$ or larger with at least 288 participants. Using Amazon Mechanical Turk (Mturk), we recruited 310 American video gamers. We excluded participants who failed attention checks or did not complete the survey. After exclusions we had 304 participants (gender: 146 males, 155 females, 3 non-binary; age: 19–77; ethnicity: 22 Asian/Pacific Islander, 29 Black, 3 American Indian, 16 Hispanic, 219 White, 7 Multiracial, 6 Other, 1 Non-response; education: 2 Less than a high school degree, 37 High school degree or equivalent, 57 Some college but no degree, 46 Associate degree, 120 Bachelor degree, 42 Graduate degree).

Procedure

After providing informed consent, participants indicated whether they played video games. Participants who responded "yes" proceeded to complete all the scales below in random order, with the exception that right-wing identity, white nationalist identity and demographic questions were measured after the other scales to avoid the potential priming of these identities.

Measures

Gamer identity fusion

Identity fusion was measured with three different, 3-item scales targeting fusion with gamer identity, fusion with gaming culture, and fusion with other gamers. The three items in each fusion scale were adapted from the 7-item verbal identity fusion scale (Gómez et al., 2011b). All three items were measured on 1-7 Likert scales ranging from "Completely Disagree" to "Completely Agree." An example item from this scale is "*I make gaming culture strong*." Total scores on the three fusion scales were highly correlated with each other and mapped onto one factor. Given this strong overlap, we focused our analyses on the scale that had the highest internal consistency: identity fusion with gaming culture ($M = 3.14$, $SD = 1.80$, $\alpha = 0.95$).

Willingness to fight/die for gaming culture

A key correlate of identity fusion is the willingness to fight/die for the group (Swann et al., 2009). Participants were asked to respond to a single item "*I would fight someone insulting*

or making fun of gaming culture" on a 1-7 Likert scale ranging from "Completely Disagree" to "Completely Agree" ($M = 1.63$, $SD = 1.02$, $\alpha = 0.94$).

Dark triad personality traits

The Dark Triad of personality traits (Machiavellianism, narcissism, and psychopathy) has been linked to antisocial behavior in games (Tang et al., 2020) and the endorsement of extremist beliefs (Pavlović and Wertag, 2021). We measured each of the dark triad traits using a 4-item version of each trait utilized by related research on extremist populations (Forscher and Kteily, 2020). All items were measured on 1 - 7 Likert scales ranging from "Strongly Disagree" to "Strongly Agree." An example item for Machiavellianism ($M = 3.94$, $SD = 1.12$, $\alpha = 0.63$) is "*I like to use clever manipulation to get my way*." An example item for Narcissism ($M = 3.10$, $SD = 1.39$, $\alpha = 0.78$) is "*I know that I am special because everyone keeps telling me so*." An example item for Psychopathy ($M = 2.20$, $SD = 1.12$, $\alpha = 0.72$) is "*Payback needs to be quick and nasty*." Although the internal reliability of the four Machiavellianism items was less than an ideal of $\alpha \geqq 0.70$, we still included this measure as it is a key part of the Dark Triad and it had been used successfully in previous work (Forscher and Kteily, 2020).

Social dominance orientation

Social dominance is a trait associated with far-right extremism (Bai, 2019) and antisocial behavior in gaming spaces, including sexism (Fox and Tang, 2014) and harassment (Tang et al., 2020). We included eight items to measure social dominance orientation adapted from the original 12-item version of the scale from Pratto et al. (1994). All items were measured on 1-7 Likert scales ranging from "Strongly Disagree" to "Strongly Agree" ($M = 2.54$, $SD = 1.52$, $\alpha = 0.93$). An example item from this scale is "*Some groups of people are simply inferior to other groups*."

Right-wing authoritarianism

Authoritarianism is a belief system commonly associated with extremist action (Wintrobe, 2006). As such, we included six items designed to tap right-wing authoritarianism (Forscher and Kteily, 2020). All items were measured on 1-7 Likert scales ranging from "Strongly Disagree" to "Strongly Agree" ($M = 3.38$, $SD = 1.45$, $\alpha = 0.83$). An example item is "*Obedience and respect for authority are the most important virtues children should learn*."

Right-wing identity

Right-wing ideologies have been specifically associated with hate and harassment in gaming spaces, specifically the #GamerGate hate campaigns of 2014 (Aghazadeh et al., 2018). To assess the relationship between gamer fusion and right-wing identity, we created a single-item measure. First, we gave participants a brief text defining what we meant by right-wing identity: "*The right-wing nationalist movement is characterized by a rejection of mainstream politics and media, strong identification with one's own nation and support for its interests, and the belief that your own country is better than all others without question or doubt.* Then, participants were asked to indicate their level of agreement with the statement "*I identify with the right-wing nationalist movement*." Participants indicated their level of agreement to this statement using a 1-7 Likert scale ranging from "Strongly Disagree" to "Strongly Agree" ($M = 2.48$, $SD = 1.94$).

White nationalist identity

While extremist beliefs can take many forms, White Nationalist ideologies have been found to be particularly prevalent in gaming spaces (Anti-Defamation League, 2019; Institute for Strategic Dialogue, 2021). To assess the links between fusion and white nationalism, we created a single-item measure of identity with this movement. We first gave participants a brief text defining what we meant by white nationalism ("T*he alt-right movement is a right-wing, primarily online political movement or grouping based in the U.S. whose members reject mainstream conservative politics and espouse extremist beliefs and policies typically centered on ideas of white nationalism.*"). Then participants were asked to indicate their level of agreement with the statement "*I identify with the alt-right movement*." Participants indicated their level of agreement to this statement using a 1-7 Likert-scale from "Strongly Disagree" to "Strongly Agree" ($M = 1.98$, $SD = 1.59$). Note that although we referred to this identity as "alt-right identity," we later discovered this is a common term used by white nationalists to make their identity and ideology seem more palatable (Gallaher, 2020). As the definition presented to participants was explicitly framed as an endorsement of white nationalism, we will refer to it as that throughout the rest of the paper.

Sexism

Sexism is a cornerstone of "toxic gamer cultures" (Consalvo, 2012) and white nationalist ideologies (Forscher and Kteily, 2020). To assess the links between fusion and sexism, we used a three-item measure of both benevolent and hostile sexism taken from Forscher and Kteily (2020) that measures sentiments on 1-7 Likert scales from "Strongly Disagree" to "Strongly Agree." Benevolent sexism ($M = 4.15$, $SD = 1.70$, $\alpha = 0.82$) is characterized by a paternalistic, condescending view toward women. An example item of benevolent sexism is "*Women should be cherished and protected by men*." Hostile sexism ($M = 2.84$, $SD = 1.53$, $\alpha = 0.83$) is characterized by general dislike and disregard of women. An example item of hostile sexism is "*Once a woman gets a man to commit to her, she usually tries to put him on a tight leash*."

Racism

Racism is another cornerstone of "toxic gamer cultures" (Gray, 2012) and underpins extremist ideologies (Michael, 2003; Fuchs, 2016). We measured racism with two scales adapted from the motivations to express and inhibit bias scales used by Forscher and Kteily (2020). We changed the target of the items from "Black people" to "minorities" to target general racism beyond antipathy toward Blacks. Both measures used 1-7 Likert scales ranging from "Strongly Disagree" to "Strongly Agree." Extrinsic Racism ($M = 2.42$, $SD = 1.31$, $\alpha = 0.77$) was measured using four items drawn from the external motivation to express bias subscale. Intrinsic Racism ($M = 2.06$, $SD = 1.27$, $\alpha = 0.78$) was measured using four items drawn from the internal motivation to express bias subscale from the same measure.

Recent aggressive behaviors

To examine connections between fusion, extremist ideologies, and extreme pro group behavior, we also included a behavioral measure of recent aggressive behaviors (within the last month) using a six-item self-report scale from Forscher and Kteily (2020). All items were measured on a 1-7 Likert scale ranging from "Not at all" to "Frequently" ($M = 1.74$, $SD = 1.12$, $\alpha = 0.90$). Participants were asked to report their aggressive behaviors regardless of whether they occurred online or offline. An example item from this measure is "*Made a statement because others find it offensive*."

Belief in QAnon

QAnon is a conspiracy theory characterized by the belief that the world is run by a sinister cabal of child-molesting devil-worshiping elites and that Donald Trump is the only one who can thwart the designs of this sinister group. Belief in QAnon was included as an outcome of interest as it has been found to be strongly associated with white nationalist ideologies and beliefs (Anwar et al., 2021). To measure one's belief in QAnon conspiracies, we developed a seven-item measure. All items were measured on Likert scales ranging from "Completely Disagree" to "Completely Agree" ($M = 1.89$, $SD = 1.18$, $\alpha = 0.92$). An example item from this scale was "*Donald Trump is secretly working to overthrow the power of child molesters and devil worshipers who run this country*." Given that we developed this scale ourselves, we ran an exploratory factor analysis on the seven items. We found that all 7-items mapped strongly to 1 factor (factor loadings >0.60). The strong loadings to a single factor combined with the high Cronbach's alpha ($\alpha = 0.92$) suggests that this scale works well as a measure of a single construct.

Experience with games

To determine whether experience with gaming moderated our findings, we assessed three relevant variables. Participants were asked to report how many hours per week they currently played video games. They were also asked how many years they have been playing video games. These two measures were included to determine whether the relationships between fusion and the various outcomes could be related to prolonged exposure to the gaming community in the short-term (i.e., weekly play time) or long-term (i.e., number of years playing games). Responses to both of these open response questions were manually converted to numerical values to create two continuous measures where larger numbers indicated more weekly game play time ($M = 9.91$, $SD = 10.43$) or more years playing video games ($M = 20.14$, $SD = 10.15$), respectively. Finally, participants indicated which game genres they played the most in a multiple-choice question. Participants chose one option from a list of genres, including sandbox, real-time strategy, shooters, multiplayer online battle arena, role-playing, simulation and sports, puzzlers and party games, action-adventure, survival and horror, platformer, and Other (fill-in-the-blank). We measured this categorical variable to assess whether relationships between identity fusion and the outcome measures were limited to, or magnified within, players of a specific genre.

Demographics

Participants were also asked to indicate their gender, age, ethnicity, nationality, education level, political identity, political orientation, religion, and religiosity.

Results

We were primarily interested in the predictive power of fusion with gaming culture on our outcome measures (analyses of the other fusion scales supported the same conclusions that we present below). Our hypotheses in Study 1 were that fusion would uniquely predict the outcome measures when controlling for (a) gameplay predictors and gender and (b) political predictors, so we ran analyses to test these predictions. To determine if fusion with gaming culture had unique predictive power, we ran two sets of multiple regression models. The first set of regressions examined whether fusion effects held when controlling for competing game-related predictors to the model (e.g., specifically most played game genre, years playing games, weekly gameplay time) and gender. We chose gender as a relevant demographic predictor to control as gender differences have historically been found across a range of constructs (Veltri et al., 2014). The second set of regression models controlled for several potentially related political belief variables (e.g., right-wing identity and white nationalist identity).

Multiple predictor models

When controlling for most played game genre, years playing games, weekly play time, and gender, fusion with gaming culture predicted fight/die for gaming culture, narcissism, psychopathy, right-wing authoritarianism, benevolent sexism, hostile sexism,

TABLE 1 Regression results for identity fusion with gaming culture (controlling for gameplay factors and gender).

	β	[95% CI]
Fight/die for gaming culture	0.26***	[0.19, 0.21]
Machiavellianism	0.03	[−0.05, 0.11]
Narcissism	0.23***	[0.13, 0.33]
Psychopathy	0.10**	[0.02, 0.018]
Social dominance orientation	0.06	[−0.16, 0.05]
Right-wing authoritarianism	0.12*	[0.03, 0.22]
Benevolent sexism	0.16**	[0.04, 0.27]
Hostile sexism	0.11	[0.01, 0.22]
Extrinsic racism	0.19***	[0.11, 0.28]
Intrinsic racism	0.05	[0.05, 0.20]
Recent aggressive behaviors	0.13***	[0.11, 0.28]
Belief in QAnon	0.07	[−0.01, 0.15]

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

extrinsic racism, and recent aggressive behaviors. Fusion did not significantly predict Machiavellianism, social dominance, intrinsic racism, or belief in QAnon when game play factors and gender were included in the same model (p's >0.09). The regression betas and confidence intervals for identity fusion predicting these outcomes when controlling for gameplay factors and gender can be seen in Table 1.

When controlling for both right-wing identity and white nationalist identity in the same model as fusion (without the gameplay variables and gender), fusion with gaming culture predicted fight/die for gaming culture, narcissism, psychopathy, hostile sexism, extrinsic racism, and recent aggressive behaviors. In these models, fusion no longer predicted Machiavellianism, social dominance orientation, right-wing authoritarianism, benevolent sexism, intrinsic racism, or belief in QAnon. The regression betas and statistical significance for fusion as well as the political predictors controlling for each other in each multiple regression model can be seen in Table 2.

Notably, fusion was consistent in the outcomes that it predicted and did not predict between the sets of regressions (controlling for gameplay/gender or political predictors, respectively). The two exceptions were right-wing authoritarianism and benevolent sexism, which fusion no longer predicted when in the same model as the political predictors.

Conclusion

Fusion with gamer culture was linked to several factors associated with traditional forms of extremism, including the willingness to fight/die for gaming culture, Dark Triad personality traits, sexism, racism, and aggressive behavior. Supporting our hypotheses, fusion with gaming culture was found to have unique predictive power separate from (a) gameplay variables and gender and (b) established political predictors of these toxic attitudes (i.e., right-wing identity and white nationalist identity).

Although these findings in Study 1 revealed links between gamer fusion and several outcomes associated with extremism, little is known regarding whether individual differences could interact together with fusion with gaming culture to enhance its predictive power on key outcomes, such as the willingness to fight/die for the cause. For example, previous research has found that insecure attachment and emotional motivations for play can drive group attachments and motivate online game engagement (Kowert and Oldmeadow, 2014; DeMarco and Newheiser, 2018). Insecure attachment has also been found to predict endorsement of extreme pro-group actions (Ferenczi et al., 2016). We considered it likely that such individual differences could interact with fusion and potentially amplify fusion's predictive effects on our outcomes, in particular those outcomes associated with endorsement of extreme behavior (i.e., willingness to fight and die for gaming culture and recent aggressive behaviors). We tested this hypothesis in Study 2.

Study 2

Method

Participants

We recruited 304 American participants from Amazon Mechanical Turk who indicated that they play video games. We excluded participants who failed attention checks or failed to complete the survey. After exclusions we had 294 participants (gender: 132 males, 161 females, 1 non-binary; age: 19-74; ethnicity: 27 Asian/Pacific Islander, 25 Black, 1 American Indian, 19 Hispanic, 210 White, 9 Multiracial, 3 Other; education: 3 Less than high school degree, 42 High school degree or equivalent, 69 Some college but no degree, 48 Associate degree, 98 Bachelor degree, 34 Graduate degree).

Procedure

Study 2's procedure was identical to Study 1 except for the addition of the new measures. Participants completed a consent and screener question, then completed most measures in randomized order followed by the right-wing and white nationalist identity questions, then demographic questions and finally the debriefing form.

Measures

Study 2 included all the measures from Study 1 that demonstrated a significant relationship between fusion and gaming culture. We also added several additional measures to assess individual differences that may impact the nature of the relationships between identity fusion and extreme outcomes: insecure attachment, loneliness, and social motivations for play.

TABLE 2 Study 1 regression results for identity fusion with gaming culture, white nationalist identity, and right-wing identity.

	Fusion with gaming culture		White nationalist identity		Right-wing identity	
	β	[95% CI]	β	[95% CI]	β	[95% CI]
Fight/die for gaming culture	0.24***	[0.19, 30]	0.07	[−0.02, 16]	0.08*	[0.01, 0.15]
Machiavellianism	0.04	[−0.03, 0.12]	0.11*	[0.00, 0.23]	0.01	[−0.08, 0.10]
Narcissism	0.17***	[0.08, 0.25]	0.04	[−0.09, 0.18]	0.08	[−0.03, 0.18]
Psychopathy	0.12***	[0.05, 0.19]	0.13*	[0.02, 0.24]	0.00	[−0.08, 0.09]
Social dominance orientation	−0.08	[−0.16, 0.01]	0.18**	[0.05, 0.31]	0.30***	[0.19, 0.40]
Right-wing authoritarianism	0.04	[−0.04, 0.12]	0.05	[−0.07, 0.17]	0.40***	[0.30, 0.49]
Benevolent sexism	0.08	[−0.02, 0.19]	0.05	[−0.11, 0.21]	0.30***	[0.18, 0.43]
Hostile sexism	0.13**	[0.04, 0.22]	−0.01	[−0.15, 0.12]	0.33***	[0.22, 0.44]
Extrinsic racism	0.15***	[0.07, 0.23]	0.14*	[0.02, 0.26]	0.11*	[0.02, 0.21]
Intrinsic racism	0.04	[−0.03, 0.12]	0.23***	[0.11, 0.34]	0.12*	[0.03, 0.21]
Recent aggressive behaviors	0.12***	[0.06, 0.19]	0.19***	[0.09, 0.30]	0.05	[−0.03, 0.13]
Belief in QAnon	0.06	[−0.00, 0.12]	0.15**	[0.05, 0.24]	0.27***	[0.20, 0.35]

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

Finally, we measured two aspects of play modality (whether play was online/offline and social/alone).

Insecure attachment

To measure insecure attachment styles we used the 12-item Experiences in Close Relationship scale created by Wei et al. (2007). All items were measured on a 1-6 Likert scale ranging from "Strongly Disagree" to "Strongly Agree." The scale has 6 items tapping *Avoidant Attachment Style* ($M = 2.38$, $SD = 1.14$, $\alpha = 0.87$) and 6 items measuring *Anxious Attachment Style* ($M = 2.95$, $SD = 1.21$, $\alpha = 0.83$). An example of an Avoidant item is "*I try to avoid getting too close to my partner*"; a sample Anxious item is "*I need a lot of reassurance that I am loved by my partner*." To avoid the issue of whether participants were in an active romantic relationship or not, we asked them to respond based on their likely typical experiences in romantic relationships.

Positive and negative gameplay motivations

To assess whether players were seeking out online games for emotional comfort, we included 6 items to measure participants' emotional motivations for playing video games (Kowert, 2015). A list of emotions was preceded by the statement "*I play video games when I feel…*" All items were measured on a 1-5 Likert scale ranging from "Strongly Disagree" to "Strongly Agree "The six emotions were: Stressed, Anxious, Sad, Lonely, Happy, and Excited. This measure was used because it differentiates between positive gameplay motivations (happy, excited) and negative gameplay motivations (stressed, anxious, sad, lonely). We averaged the first 2 items to create a composite measure of *Positive Gameplay Motivations* ($M = 2.98$, $SD = 1.05$, $\alpha = 0.88$) and the last 4 items to create a composite measure of *Negative Gameplay Motivations* ($M = 3.75$, $SD = 0.91$, $\alpha = 0.84$).

Loneliness

In addition, we included a measure of loneliness (ULS-8; Hays and DiMatteo, 1987) to determine the degree to which individual gamers report feelings of loneliness in their daily lives. All 8 items were measured on a 1-6 Likert scale ranging from "Strongly Disagree" to "Strongly Agree" ($M = 2.75$, $SD = 1.22$, $\alpha = 0.88$). An example loneliness item is "*There is no one I can turn to*."

Play modality

To gain insight into the social environments the players are engaging in, we created a single-item measure of play modality to tap the degree to which participants played games offline vs. online ("Which statement best describes your play style?"). The scale was measured on a 1-5 Likert scale ranging from "Offline Exclusively" to "Online Exclusively" ($M = 2.98$, $SD = 1.18$).

Gaming companions

We created a single-item measure of gameplay companions to tap the degree to which participants played games by themselves vs. with other people ("Do you primarily play alone or with others?"). The scale was measured on a 1-5 Likert scale ranging from "Exclusively Alone" to "Exclusively with Others" ($M = 2.46$, $SD = 1.05$).

Results

To determine if fusion's unique predictive effects in Study 1 would replicate in Study 2, we ran the same multiple regressions from Study 1 that included the three predictors of identity fusion with gaming culture, right-wing identity, and white nationalist identity, controlling for each other. We wanted to determine

whether the unique predictive effects of fusion replicated when controlling for these established political predictors. They did. As shown in Table 3, all the unique predictive fusion effects from Study 1 replicated in Study 2.

To test our hypothesis that fusion would interact with individual difference variables to amplify endorsement of extreme behaviors, we ran a series of interaction models. We looked at the interaction of fusion and each of the following variables individually: loneliness, avoidant attachment style, anxious attachment style, play modality, gaming companions, positive gameplay motivations, and negative gameplay motivations. We were interested in any interactions that predicted the outcomes measuring endorsement of extreme behavior (i.e., willingness to fight and die for gaming culture and recent aggressive behaviors).

As shown in Figures 1–3, fusion interacted with 3 individual difference variables to predict willingness to fight/die for gaming culture: loneliness ($B = 0.06$, $p = 0.006$, 95% CI [0.02, 0.10], total model R^2 adj $= 0.26$), avoidant attachment style ($B = 0.09$, $p < 0.001$, 95% CI [0.04, 0.14], total model R^2 adj $= 0.30$), and anxious attachment style ($B = 0.06$, $p = 0.002$, 95% CI [0.02, 0.10], total model R^2 adj $= 0.26$). Fusion did not interact with any other individual difference variables to predict willingness to fight/die for gaming culture (i.e., play modality, gaming companions, positive gameplay motivations, negative gameplay motivations; p's > 0.05).

As shown in Figure 4, fusion interacted with avoidant attachment style to also predict recent aggressive behaviors ($B = 0.07$, $p = 0.023$, 95% CI [0.01, 0.13], total model R^2 adj $= 0.14$). However, fusion did not interact with any other individual difference variables to predict recent aggressive behaviors (i.e., loneliness, anxious attachment style, play modality, gaming companions, positive gameplay motivations, or negative gameplay motivations (p's > 0.15).

Conclusion

As in Study 1 and in line with our first hypothesis of Study 2, fusion with gamer culture was uniquely predictive of fight/die for gaming culture, narcissism, psychopathy, hostile sexism, extrinsic racism, and recent aggressive behaviors, even when controlling for established political predictors of right-wing and white nationalist identities. Replicating this finding suggests that there is something distinctive about gaming culture and those who strongly align themselves with it.

Partially supporting our second hypothesis, our findings also revealed that three individual-difference variables (loneliness, avoidant attachment, anxious attachment) interacted with fusion with gaming culture to predict greater willingness to fight/die for gaming culture. Likewise, avoidant attachment style interacted with fusion to also predict recent aggressive behaviors. Strongly fused gamers who are lonelier or have insecure attachment styles were particularly strong proponents of extreme behavior in defense of gaming culture. However, we did not find significant effects of fusion predicting either behavior outcome in interactions with positive gameplay motivations, negative gameplay motivations, gaming companions, or play modality. This suggests that trait-level individual differences such as insecure attachment style and loneliness are more pivotal to predicting extreme behavior when combining with fusion in the gaming context, as opposed to state-level differences such as emotional motivations for gameplay or the physical presence of others (e.g., gaming companions and play modality).

Building from this, Study 3 was designed to investigate whether certain gaming spaces were especially conducive to links between fusion and extreme behaviors. One possibility is that highly competitive and/or violent gaming spaces may be more prone to extremist radicalization and mobilization than other gaming spaces (Schlegel, 2020). To test this possibility, we compared the relationship between identity fusion and extreme behaviors in a highly competitive game (*Call of Duty*) vs. a relatively benign game (*Minecraft*). We hypothesized that the relationships between fusion and extremism would be stronger within *Call of Duty* communities, due to higher levels of hostility and toxicity in the community as compared to *Minecraft*.

Study 3

Method

Participants

We aimed to recruit at least 300 American participants from Amazon Mechanical Turk who indicated that they play video games and played either Minecraft or Call of Duty for at least a few hours per week. These games were chosen as contrasting gaming spaces as *Call of Duty* is a first-person shooter battlefield game known to have high levels of community toxicity (Anti-Defamation League, 2019) whereas *Minecraft* is a sandbox video game known to be highly social and cooperative (Wald, 2020). We collected data from 338 *Minecraft* gamers and 327 *Call of Duty* players. We excluded participants who failed attention checks or failed to complete the survey. After exclusions we had 330 participants who play Minecraft (gender: 163 males, 160 females, 7 non-binary; age: 18–80; ethnicity: 20 Asian/Pacific Islander, 25 Black, 1 American Indian, 33 Hispanic, 233 White, 14 Multiracial, 4 Other; education: 4 Less than high school degree, 35 High school degree or equivalent, 79 Some college but no degree, 43 Associate degree, 118 Bachelor degree, 51 Graduate degree) and 315 participants who play Call of Duty (gender: 184 males, 129 females, 2 non-binary; age: 19–80; ethnicity: 18 Asian/Pacific Islander, 38 Black, 2 American Indian, 37 Hispanic, 207 White, 7 Multiracial, 6 Other; education: 1 Less than high school degree, 42 High school degree or equivalent, 74 Some college but no degree, 47 Associate degree, 110 Bachelor degree, 41 Graduate degree).

TABLE 3 Study 2 regression results for identity fusion with gaming culture, white nationalist identity, and right-wing identity.

	Fusion with gaming culture		White nationalist identity		Right-wing identity	
	β	[95% CI]	β	[95% CI]	β	[95% CI]
Fight/die for gaming culture	0.23***	[0.18, 0.28]	0.18***	[0.11, 0.25]	0.04	[−0.02, 0.10]
Machiavellianism	0.11**	[0.04, 0.18]	0.06	[−0.03, 0.16]	0.02	[−0.06, 0.11]
Narcissism	0.14**	[0.05, 0.21]	0.20***	[0.08, 0.31]	−0.04	[−0.13, 0.06]
Psychopathy	0.13***	[0.06, 0.21]	0.24***	[0.14, 0.34]	−0.02	[−0.10, 0.07]
Right-wing authoritarianism	0.04	[−0.03, 0.12]	0.03	[−0.08, 0.13]	0.37***	[0.28, 0.46]
Benevolent sexism	0.10	[−0.01, 0.21]	0.00	[−0.14, 0.14]	0.27***	[0.15, 0.40]
Hostile sexism	0.20***	[0.10, 0.29]	0.08	[−0.05, 0.21]	0.32***	[0.20, 0.43]
Extrinsic racism	0.15***	[0.08, 0.23]	0.22***	[0.11, 0.32]	0.07	[−0.03, 0.16]
Intrinsic racism	0.05	[−0.03, 0.12]	0.35***	[0.25, 0.45]	0.07	[−0.02, 0.16]
Recent aggressive behaviors	0.13***	[0.06, 0.19]	0.25***	[0.16, 0.33]	0.09*	[0.02, 0.17]
Belief in QAnon	0.11***	[0.04, 0.17]	0.03	[−0.06, 0.11]	0.38***	[0.31, 0.46]

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

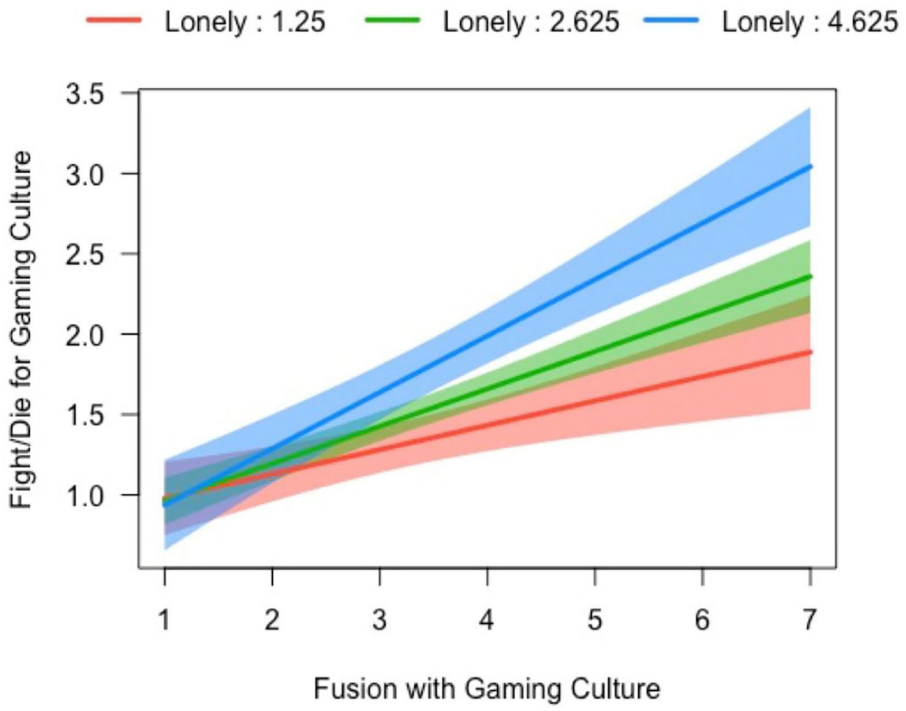

FIGURE 1
Interaction between fusion with gaming culture and loneliness predicting willingness to fight/die for gaming culture.

Procedure

The procedure for Study 3 was virtually identical to the previous two studies except for the addition of the new measures as well as a new screener question. After consenting to take the survey, participants were asked the initial screening question "Do you play video games?" followed by an additional screening question asking, "Do you play any of the following games for at least a few hours a week?." They were shown a list of similar games and were required to select *Minecraft* or *Call of Duty* (depending on which version of the survey they were taking) to be able to proceed. Then they completed most measures in randomized order followed by the right-wing and white nationalist identity questions, then demographic questions and finally the debriefing form.

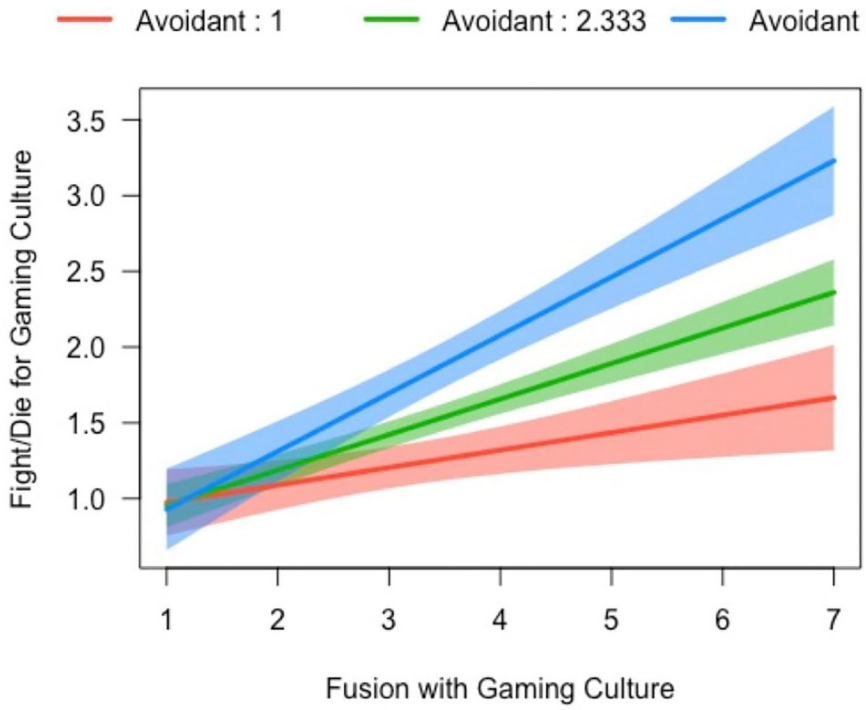

FIGURE 2
Interaction between fusion with gaming culture and avoidant attachment style predicting willingness to fight/die for gaming culture.

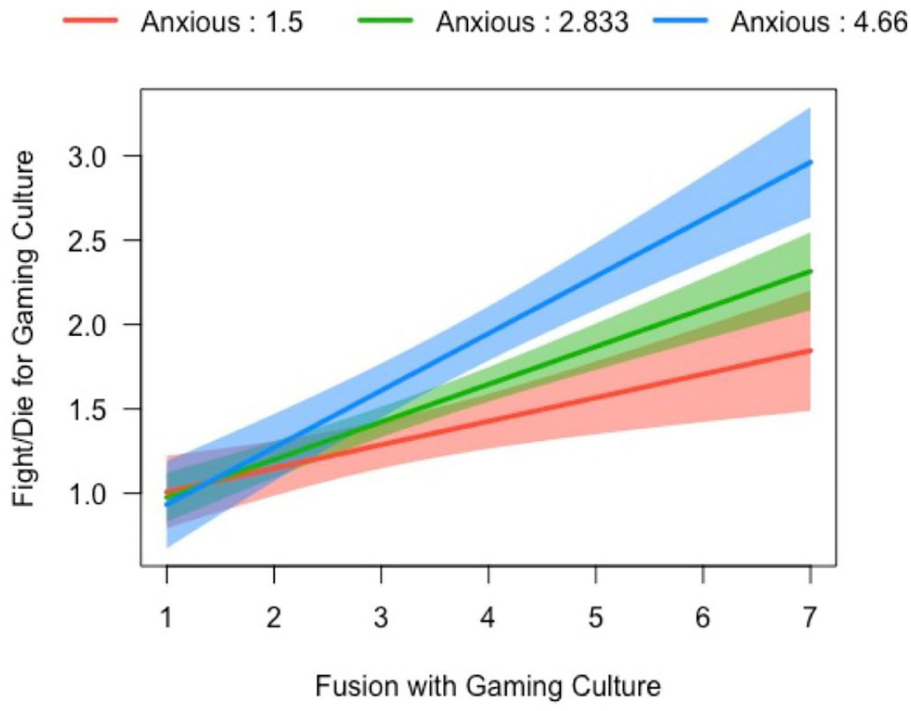

FIGURE 3
Interaction between fusion with gaming culture and anxious attachment style predicting willingness to fight/die for gaming culture.

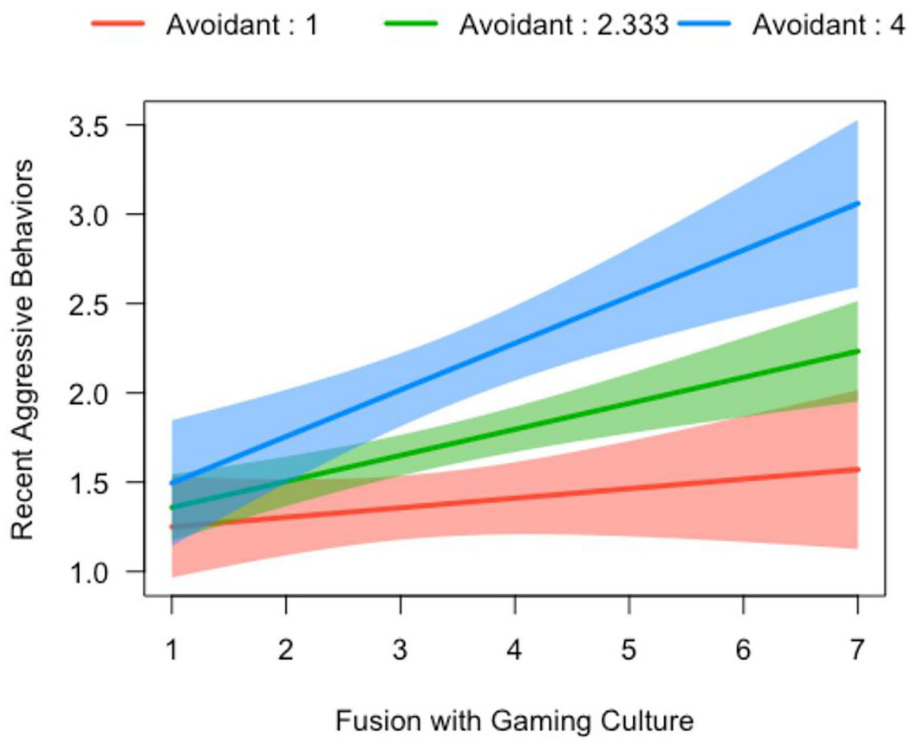

FIGURE 4
Interaction between fusion with gaming culture and anxious attachment style predicting recent aggressive behaviors.

Measures

We included all the measures from Studies 1 and 2 that were uniquely predicted by fusion with gaming culture in multiple predictor models controlling for right-wing and white nationalist identity (fight/die for gaming culture, Dark Triad personality traits, hostile sexism, extrinsic racism, recent aggressive behaviors). In Study 3 we also included a measure of identity fusion with the game itself (i.e., fusion with Call of Duty or fusion with Minecraft), in-game toxicity, game competitiveness, and prosocial measures (e.g., life satisfaction, self-esteem, online bonding, and relatedness). These new measures are discussed in more detail below. Overall means and standard deviations are given below but see Table 4 for descriptive statistics separated by gaming community (*Minecraft* and *Call of Duty*).

Identity fusion with game

To measure whether fusion with one's game of choice (*Minecraft* or *Call of Duty*) had a unique impact different from fusion with gaming culture, we added a measure of fusion with game using the same 3-item fusion scale but targeting *Minecraft* or *Call of Duty* ($M = 3.68$, $SD = 1.69$, $\alpha = 0.91$). All three items were measured on a 1-7 Likert scales ranging from "Completely Disagree" to "Completely Agree." An example item from this scale is "*I make [Minecraft/Call of Duty] strong.*"

In-game toxicity

To determine whether gamers who played *Minecraft* or *Call of Duty* perceived their gaming community as socially toxic we included a measure of in-game toxicity (Depping et al., 2018). This measure was included to quantify any differences in the nature of the social communities of these games. All items were measured on a 1-5 Likert scale from "Strongly Disagree" to "Strongly Agree." The scale has 8 items preceded by the statement "The people I play with are sometimes..." followed by the following options: angry, offensive, mean, good-natured, sympathetic, friendly, hurtful, and toxic. The three positive items (good-natured, sympathetic, friendly) were reverse coded then all 8 items were averaged ($M = 2.55$, $SD = 0.85$, $\alpha = 0.88$).

Game competitiveness

To determine whether gamers who played *Minecraft* or *Call of Duty* perceived their gaming community as more competitive or cooperative, we included a single 1-7 Likert-type item where participants responded to the statement "I would say that the gaming environment of [*Minecraft*/*Call of Duty*] is..." on a scale from "Cooperative" to "Competitive" ($M = 4.39$, $SD = 1.94$).

Life satisfaction

Life satisfaction was measured using the Riverside Life Satisfaction Scale (Margolis et al., 2019). We included this

TABLE 4 Means (SD) and *t*-tests comparing Minecraft and Call of Duty players.

	Minecraft players	Call of Duty players	
	Mean (SD)	Mean (SD)	*t*-test
Fusion with gaming culture	4.12 (1.69)	4.07 (1.78)	$t_{(637)} = 0.32$
Fusion with game (Minecraft/call of duty)	3.76 (1.63)	3.61 (1.75)	$t_{(635)} = 1.14$
Right-Wing Identity	2.53 (1.90)	2.55 (1.85)	$t_{(643)} = 0.17$
White Nationalist Identity	2.22 (1.68)	2.20 (1.69)	$t_{(641)} = 0.16$
In-Game Toxicity	2.33 (0.78)	2.78 (0.87)	$t_{(628)} = 7.02^{***}$
Game Competitiveness	3.47 (1.78)	5.35 (1.59)	$t_{(640)} = 14.15^{***}$
Fight/die gaming culture	1.90 (1.23)	1.96 (1.29)	$t_{(637)} = 0.64$
Machiavellianism	4.01 (1.15)	4.01 (1.14)	$t_{(642)} = 0.00$
Narcissism	3.60 (1.32)	3.55 (1.30)	$t_{(642)} = 0.42$
Psychopathy	2.44 (1.16)	2.57 (1.19)	$t_{(640)} = 1.37$
Hostile sexism	3.26 (1.76)	3.33 (1.68)	$t_{(643)} = 0.54$
Extrinsic racism	2.63 (1.32)	2.73 (1.39)	$t_{(637)} = 0.87$
Recent aggressive behaviors	1.97 (1.29)	2.09 (1.35)	$t_{(638)} = 1.21$
Life satisfaction	4.38 (1.41)	4.27 (1.45)	$t_{(640)} = 0.98$
Self-esteem	5.10 (1.30)	5.13 (1.38)	$t_{(635)} = 0.31$
Online bonding	3.66 (1.52)	3.61 (1.56)	$t_{(639)} = 0.42$
Relatedness	5.04 (1.04)	5.00 (1.03)	$t_{(642)} = 0.52$

$^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

measure to see if fusion with games/gaming culture predicted overall satisfaction with life. All items were measured on a 1-7 Likert scale from "Strongly Disagree" to "Strongly Agree" ($M = 4.33$, $SD = 1.43$, $\alpha = 0.89$). An example item is "I like how my life is going."

Self-esteem

Self-esteem was measured with the Rosenberg Self-Esteem Scale (Rosenberg, 1965). We included this measure to see if fusion with games/gaming culture were related to self-esteem. All items were measured on a 1-7 Likert scale ranging from "Strongly Disagree" to "Strongly Agree" ($M = 5.11$, $SD = 1.34$, $\alpha = 0.93$). An example item is "*On the whole, I am satisfied with myself.*"

Online bonding

Bonding social capital is indicative of close, tight-knit, and long-lasting friendship bonds (Putnam, 2000). To measure players' degree of online bonding social capital, we used the bonding subscale of the social capital scale developed by Williams (2006b). We included this measure to see if fusion with games/gaming culture predicted a perception of social bonding among gamers. All ten items were measured on a 1-7 Likert scale ranging from "Strongly Disagree" to "Strongly Agree" ($M = 3.64$, $SD = 1.54$, $\alpha = 0.93$). An example item was "*There are several people online I trust to help solve my problems.*"

Relatedness

As social connectedness is a critical component to extremist action (Horgan, 2008), we included a measure of relatedness to see if fusion with games/gaming culture predicted a sense of relatedness to other players. This was assessed using the relatedness items of the Basic Psychological Need Satisfaction Scale (Gagne, 2003). All seven items were measured on a 1-7 Likert-type scale ranging from "Not True" to "Very True," with a midpoint value at 4-Somewhat True ($M = 5.02$, $SD = 1.03$, $\alpha = 0.81$). An example item is "*I get along with people I come into contact with.*"

Results

For Study 3 we first ran *t*-tests to compare the strengths of the means for each measure between *Minecraft* and *Call of Duty* players to see if there were significant mean-level differences between the two gaming communities. Interestingly only two variables showed significant differences in their mean scores between groups. *Minecraft* players reported less in-game toxicity ($M = 2.33$) than *Call of Duty* gamers [$M = 2.78$, $t_{(628)} = 7.02$, $p < 0.001$]. Additionally, *Minecraft* players reported that their gaming community was less competitive ($M = 3.47$) than *Call of Duty* players [$M = 5.35$, $t_{(640)} = 14.15$, $p < 0.001$]. All other mean differences between *Minecraft* and *Call of Duty* gamers were non-significant ($ps > 0.171$). Descriptive Statistics and *t*-tests for each variable can be found in Table 4.

We then ran factor analyses and correlations between fusion with gaming culture and fusion with game (*Minecraft/Call of Duty*). Fusion with gaming culture and fusion with *Minecraft* both loaded well to the same factor and were highly correlated ($r = 0.66$, $p < 0.001$); likewise fusion with gaming culture and fusion with *Call of Duty* also mapped well to the same factor and were highly correlated ($r = 0.74$, $p < 0.001$). Fusion with gaming culture mapped more strongly to this factor, so we used that fusion measure as our primary predictor.

Then, as the primary test of our hypothesis that fusion would be more strongly predictive of the antisocial outcomes among *Call of Duty* players compared to *Minecraft* players, we ran multiple regressions with fusion with gaming culture as the predictors and the same antisocial outcomes from Studies 1 and 2 for both *Minecraft* and *Call of Duty* players, as well as the new prosocial outcomes added to Study 3. We controlled for right-wing and white nationalist identities. The outcome of these analyses is shown in Table 5.

TABLE 5 Regression results for identity fusion with gaming culture (controlling for right-wing and white nationalist identities) for Minecraft and Call of Duty players.

	Minecraft players		Call of Duty players	
	β	[95% CI]	β	[95% CI]
Fight/die gaming culture	0.23***	[0.16, 0.30]	0.26***	[0.19, 0.33]
Machiavellianism	0.03	[−0.04, 0.11]	0.08*	[0.01, 0.15]
Narcissism	0.17***	[0.09, 0.25]	0.17***	[0.09, 0.25]
Psychopathy	0.03	[−0.04, 0.11]	0.10**	[0.03, 0.17]
Hostile sexism	0.01	[−0.10, 0.12]	0.07	[−0.03, 0.17]
Extrinsic racism	0.02	[−0.06, 0.10]	0.12**	[0.04, 0.20]
Recent aggressive behaviors	0.05	[−0.03, 0.12]	0.11**	[0.03, 0.19]
Life satisfaction	0.05	[−0.04, 0.14]	−0.04	[−0.13, 0.05]
Self-esteem	0.06	[−0.03, 0.14]	−0.02	[−0.11, 0.06]
Online bonding	0.36***	[0.26, 0.45]	0.28***	[0.19, 0.37]
Relatedness	0.10**	[0.03, 0.16]	0.02	[−0.04, 0.09]

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

Conclusion

We found that fusion with gaming culture uniquely predicted more antisocial and extreme outcomes among *Call of Duty* than *Minecraft* players, including willingness to fight/die for gaming culture, all three Dark Triad measures, extrinsic racism, and recent aggressive behaviors. In contrast, *Minecraft* players' fusion with gaming culture only predicted willingness to fight/die for gaming culture and narcissism. Fusion among *Minecraft* players also predicted two prosocial outcomes (online bonding and relatedness), whereas among *Call of Duty* players only one (online bonding) was predicted. Notably, these effects emerged despite similar means for most measures between *Minecraft* and *Call of Duty* players. Apparently, although players in different gaming communities have similar levels of anti-social and pro-social sentiments, fusion with gaming culture is associated social toxicity and social positivity differently depending on the gaming environment.

Discussion

Although it is increasingly clear that online platforms have become breeding grounds for extremist ideologies, the psychological mechanisms that are responsible for this phenomenon remain unclear. Three studies provide converging evidence that identity fusion may play a key role in the radicalization of gamers. Study 1 revealed that identity fusion with gamer culture was uniquely associated with several markers of extremism, including the willingness to fight/die for gaming culture, Dark Triad personality traits, sexism, racism, and aggressive behavior, even while controlling for gameplay variables, gender, and established political predictors of these outcomes. Study 2 confirmed that there are individual differences among players that predispose them to fusion and extremism. Specifically, strongly fused gamers who were lonely or had insecure attachment styles were particularly strong proponents of extreme behavior in defense of gaming culture, and strongly fused gamers who had avoidant attachment styles also admitted to committing recent aggressive behaviors. Study 3 provided evidence that the gaming environment influenced the relationship between fusion with gaming culture and extreme outcomes. That is, enthusiasts of a relatively violent and competitive game with a toxic environment (*Call of Duty)* displayed a stronger relationship between fusion with gaming culture and antisocial outcomes compared to players of a less violent, less competitive game with a less toxic community (*Minecraft)*. Despite gamer identities being adaptive at the individual level (e.g., reduce loneliness, foster feelings of belonging, etc.; for more on this see Kowert, 2020), the current work demonstrates that fusion within toxic gaming spaces is associated with deleterious interpersonal and/or societal phenomena.

The contributions of this work notwithstanding, it has several limitations. First, participants were limited to American players. Further research should examine cultural differences that may exist between American players and the rest of the global gaming population. Second, while MTurk did allow for an assessment of the general impact of gamer fusion on extremism, it is unlikely that it captured players who are most likely to be mobilized to extremism through out-of-game or offline action. Further research is needed that specifically targets members of the gaming community who are especially vulnerable to offline recruitment. Future work could also consider the role

of out-group threat, which is a known predictor of extreme behaviors among strongly fused individuals (Fredman et al., 2017; Newson et al., 2018). Third, although our comparison of *Call of Duty* vs. *Minecraft* players was instructive, the key element contributing to the unique outcomes associated with these two games remains unclear. This is particularly the case as the narrative content of *Call of Duty* has heavy themes of American exceptionalism and militarism (Robinson, 2014; Ciută, 2016; Bos, 2018). Even though links between first-person shooter games and militarism has not been found in previous research (Festl et al., 2013), it is possible that the narrative themes of this game may be playing a role in these findings. Future research should consider contrasting gaming communities with similar levels of toxicity but differ in their use of violent content (for example, *Halo Infinite* vs. *FIFA* players) as well as militant verse non-militant games (for example, *Call of Duty* vs. *Team Fortress 2*). Additionally, our political identity measures (i.e., right-wing identity and white nationalist identity) tapped the underlying construct with only a single item. We did this to have a simple parsimonious measure of the construct that would be straightforward to our participants, but future work should include additional items tapping the same constructs. Finally, this work focused exclusively on the role of in-game spaces. However, gaming cultures do not exclusively live within the game space itself. Game adjacent spaces such as *Discord* and *Twitch*, fandom spaces, and online forums, all provide avenues where social relationships between game players can occur. Future research should not only further examine the gaming spaces but also game adjacent spaces.

In conclusion, we suggest that examining the impact of games through the lens of identity fusion provides insight into the role of identity in the propagation of extremist ideologies, radicalization, recruitment, and mobilization. Further documentation of the role of identity in extremism will not only contribute to a theoretical understanding of the processes underlying gaming but also pave the way for the development of safeguards designed to discourage toxicity in gaming spaces.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by the Institutional Review Board (IRB) at the University of Texas at Austin. The patients/participants provided their written informed consent to participate in this study.

Author contributions

RK had the original idea for the research project and contributed to planning, methodology, and writing. AM contributed to the planning of the research, methodology, analysis, and writing. WS contributed to the planning, methodology, and writing. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Informal learning and wellbeing outcomes of gameplay and their associations with gameplay motivation

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Educational functions of digital games are often seen only in the light of the serious and purposeful activities that aim for learning outcomes, in contrast with non-educational games that are designed for entertainment. The focus of this paper is in studying players' learning outcomes from playing non-educational games, and how these relate to wellbeing outcomes of playing, and gaming motivation. The data for this study was collected via a survey (N=1,202) in the United Kingdom and the United States. The survey respondents answered the question regarding what players perceive they have learnt by playing digital games. A generic data-driven qualitative content analysis of the responses to this question yielded 11 categories representing different types of game-based learning outcomes. A consequent cluster analysis suggested three groups of informal game-based learning, which differed in their emphasis on (1) learning persistence, (2) learning practices and community, and (3) learning to perform. Our analyses indicated substantial connections between the learning outcomes and gameplay motives and gameplay activity preferences. Such connections point out how gameplay activity has an inherently close relationship with learning. Moreover, the results yielded significant association between learning outcomes, wellbeing measures, and eudaimonic motives to play digital games. These results indicate that playing games because gaming is aligned with players' core values and need for self-realization are clear precedents for both wellbeing and learning outcomes.

KEYWORDS

informal learning, non-educational games, gameplay motivation, wellbeing outcomes, self-determination

1. Introduction

In comparison to purposeful activities of individuals and communities, in general, play does not seem to associate with clear goals. Play appears to epitomize humans' desire to act on a purely voluntary basis—often just for fun. However, this is not to say that play would not have any benefits. Play has been associated with spontaneous learning in activities that may seem aimless (e.g., Piaget, 1952; Lieberman, 1977). In contrast to play, the educational view on learning often emphasizes a formal curriculum, in which certain goals are to be reached. Likewise, the prevailing conceptualization of digital games tends to differentiate the domains of entertainment and serious gaming. Thus, educational functions of digital games are often seen only in the light of the serious and purposeful activities that aim for learning outcomes, in contrast with non-educational games that are designed for entertainment. The focus of the paper

is in building a bottom-up understanding of what players perceive they have learnt by playing digital games, without any pre-condition that these games should or would be educational in the first place. Secondly, we are interested in how these informal learning outcomes might be associated with wellbeing and with motives and preferences to play video games. In other words, we investigate players' learning outcomes from playing non-educational games, and how these relate to wellbeing outcomes of playing, and gaming motivation.

Previous research has identified the potential of non-educational games in increasing learning motivation, enhancing cognitive performance, and learning social skills (e.g., Gee, 2003; Reinders, 2012; Silva et al., 2021). However, there have been relatively few empirical studies attempting to investigate what kinds of informal learning take place while playing non-educational games. Moreover, despite the extensive previous research on both wellbeing impact of games and gameplay motivation, which has been associated with wellbeing effects especially in the framework of the Self-Determination Theory (SDT), there is a lack of research that would investigate the motivational and wellbeing aspects of gaming together in relation to the informal learning in games.

Non-educational game is a term used in the context of game-based learning to describe games designed for entertainment as opposed to educational games designed for learning. Our focus is on informal, spontaneous learning occurring when voluntarily playing non-educational games. Informal learning, where learning takes place even when it is not the main objective of an activity, is an integral part of modern video game design, as games are designed to teach their players how to play them (*cf.*, Gee, 2003). However, we are interested in the diversity of informal learning taking place when playing non-educational games. Instead of asking how games can be used in teaching, we study the perceived learning outcomes of playing games.

In this study, this is essentially done in an open-ended manner, giving people the opportunity to describe what they have learned without presenting them with any presuppositions. The main goals of this study are (1) to form an empirically based understanding of what players perceive they have learnt from non-educational games, and (2) to statistically test how these learning outcomes relate to measurable wellbeing outcomes of playing, and formal assessments of gaming motivation.

Before formulating our research questions and hypotheses, we briefly address existing research in learning from non-educational games. Then we discuss the potential interconnections between the motivational constructs of learning and playing activities, and their relevance to human wellbeing.

2. Informal learning from games

Non-educational games, despite their name, have been frequently used for educational purposes (Squire, 2003; Wastiau et al., 2009; Martinez et al., 2022). Research on the use of commercial off-the-shelf games in education has identified their potential in learning diverse skills including dealing with depression (Olson, 2016), teamwork and other social skills (Sherry, 2016; Silva et al., 2021), attention abilities (Franceschini et al., 2013), and enhancing cognitive performance (Dale and Green, 2016). Furthermore, non-educational games have been used in teaching subjects such as languages (Chen and Yang, 2012; Reinders, 2012), history (Squire, 2005), and science (de Aldama and Pozo, 2020). Majority of previous research has studied learning outcomes using skill-testing or other forms of formal learning assessment. There have been surprisingly few empirical studies tackling the question of what kinds of informal learning take place while playing and how players themselves perceive their learning (Gee, 2003; Iacovides et al., 2014; Matijević and Topolovčan, 2019; *cf.* Scolari and Contreras-Espinosa, 2019). This research aims to take a more comprehensive approach by mapping out the variety of informal learning taking place in non-educational games.

2.1. Learning and the pursuit of wellbeing as possible underlying motives for playing games

From the developmental and evolutionary perspectives, human play and games have functioned as crucial forms of learning (e.g., Bruner et al., 1976). For children, play might be just a fun activity, but unknowingly children develop physical or social skills that are relevant in their future. In the literature, *playfulness* is characterized with qualities such as curiosity, openness to explore and engage with different contexts, and creative use of imagination (see a review in Masek and Stenros, 2021). Such characteristics of exploratory and experimental orientation to environment appear beneficial for individual development, if the term "development" is taken as an organism's *actualizing tendency* toward maintaining and enhancing itself (Rogers, 1963 [2008]; see also Deci and Ryan, 1985). In general, one could argue playfulness having a role in the motivational attitude that fosters learning and self-enhancement. In particular, it is intriguing to conceive human play and playfulness within the framework of self-determined organismic growth. From this perspective, both the playful and "learnful" activities are seen to fulfill the basic needs of gaining experiences of autonomy, self-efficacy and social relatedness (Ryan and Deci, 2000). Therefore, according to the SDT, such actualizing tendencies not only should result in development, but through a genuine self-realization they should also constitute personal wellbeing (Ryan et al., 2008).

In the present study, we posit human development and wellbeing as being more or less intertwining constructs, both relating to organismic strive for "a good life" and being "fully functioning" in terms of optimal experience (Rogers, 1963 [2008]; Ryan and Deci, 2001). In the literature, there exist two principal views for defining wellbeing and conceptualizing what constitutes optimal functioning and experiences (see review in Ryan and Deci, 2001). Firstly, the hedonic view focuses on pleasure attainment (and pain avoidance), and the related desires and preferences of experiencing. The hedonic view on optimal experience, however, is not reducible to mere physical pleasures but more broadly relates to personal constructs about pleasure versus displeasure (Ryan and Deci, 2001, p. 143–145). Secondly, the eudaimonic view has its focus in doing things that are worth doing. From an eudaimonic perspective, activities yield wellbeing when they are in line with a person's true self-realization, acknowledging that desires and preferred outcomes of (hedonically motivated) activity do not necessarily constitute wellbeing that is self-congruent (Ryan and Deci, 2001, p. 145–146). Self-determined human activity, satisfying the basic psychological needs of autonomy, competence, and relatedness, is usually associated with the concept of eudaimonia, and considered essential for intrinsic motivation, self-congruence, psychological growth, and psychological wellbeing (Ryan and Deci, 2001, p. 146–147).

Due to the close relationship of play and learning, it is tempting to consider the possible connections between the motives to play games and the learning outcomes yielded by gameplay. Student motivation is known to have a connection to learning outcomes (e.g., Janosz, 2012), but there is a lack of research on the relationship between gaming motivations and informal learning in games. Motivational models regarding gameplay usually only touch on learning and development. In such models, self-enhancement or learning as motives to play games often relate to the desire of becoming better in answering the game's challenges or succeeding in competition (e.g., Sherry et al., 2006). In other words, they are limited to motives to become better at playing the game. However, few models of player motivation address a broader scope of learning. Demetrovics et al. (2011) Motives for Online Gaming Questionnaire (MOGQ) includes the Skill Development factor, concerning different sensorimotor and cognitive skills. Motives of the Autonomous Player (MAP) by Vahlo and Tuuri (submitted) is a model that incorporates a similar factor named Utility, referring to a motive to play games in order to train one's brain and one's memory and to develop oneself in general.

However, the somewhat marginal role of learning in the gameplay motivation models seems to be in conflict with the following argument by Crawford (1984), a game designer of the early era of video games in the seminal book "The Art of Computer Game Design":

> I claim that the fundamental motivation for all game-playing is to learn. This is the original motivation for game-playing, and it surely retains much of its importance. Game playing is a safe way to learn. The desire to learn, however, need not be conscious. Indeed, it may well take the form of a vague predilection to play games. Other motivations have little to do with learning and may assume greater local importance than the ancestral motivation to learn (Crawford, 1984, p. 13).

While it seems easy to agree with Crawford that learning is a fundamental motive to play games, it certainly does not appear to be a prominent theme in the current motivation research. A reason for such a discrepancy might be that people do not necessarily perceive their desire to learn in the form of explicit goal imagery (Schultheiss and Brunstein, 1999) and thus motives related to learning may retain an implicit or unconscious nature, as suggested by Crawford. With "other motivations" that "may assume greater local importance," Crawford (1984, p. 13) refers to fantasy and exploration as well as competition and other social motives. Such a set of motives are also prevalent in many of the current models of gameplay motivation (see review in Vahlo and Tuuri, submitted).

It remains an empirically open question, to what degree learning and development implicitly relate to our desire to play games. In any case, we may indeed posit wellbeing (consisting of optimal experiences in both hedonic and eudaimonic terms) as a construct that inherently overlaps and interacts with both the general needs to play games and the general needs to develop and enhance ourselves.

2.2. Research questions and hypotheses

This paper consists of two substudies that correspond with the above-mentioned main goals of the study. The first substudy applies qualitative methodology in investigating what people consider to have (informally) learned by playing non-educational games (RQ1). We are also interested in identifying groups of informal learners in our sample (RQ2).

In the second substudy, we investigate how motivation and preferences to play games connect with the outlined informal learning outcomes of gameplay (RQ3a) and the outlined groups of informal learners (RQ3b). Similarly, we make an investigation of how wellbeing outcomes of gameplay connect with the learning outcomes (RQ4a) and the groups of learners (RQ4b).

Furthermore, in the second substudy, we distinguish self-attributed (eudaimonic) and gratification-based (hedonic) motives to play games and investigate how they connect with wellbeing outcomes of gameplay (RQ5) as well as, how they associate with informal learning outcomes (RQ6). For these questions, we have formulated two hypotheses. Firstly (H1), we expect that eudaimonic motives predict wellbeing outcomes and learning outcomes more strongly than hedonic motives. Secondly (H2), we also expect to find interactions between wellbeing outcomes and eudaimonic and hedonic motives that embody complementary functions of eudaimonic and hedonic activities in constituting wellbeing (e.g., Huta and Ryan, 2010).

3. Materials and methods

The research data ($N = 1{,}202$) was collected by using a survey targeted at adult (ages 18–70) UK and USA residents, who reported playing digital games at least occasionally. Participants were recruited through Prolific Academic Ltd., which is a private company that holds an online panel of 130,000 participants worldwide. Prolific is specialized in providing participants for different academic research tasks including surveys. The data was collected by applying Prolific's option of balancing the sample between genders in both the UK and the US. From both countries, a total of 601 responses were collected, and the median time a user spent in taking the survey was approximately 18 min. All participants provided their written informed consent to participate in this study.

The survey consisted of three sections. In the first section survey participants responded to a short series of demographic questions. In the second section, the respondents were asked to specify their (1) reasons to play digital games, (2) gameplay preferences, and (3) their experienced wellbeing effects gained from playing digital games. Digital games referred to all games the participants had played on computers, consoles, and mobile devices. Stata 17.1/SE software was used for all quantitative analysis. In the final section of the survey, the participants were asked about their gaming habits and favorite games. They were also asked to describe in their own words what they had learned by playing games, and 95.2% (1,145) of the respondents answered this question. As the open-ended question about learning was presented at the end of the survey, the participants' reminiscing focus on their learning did not generate any bias for answering the structured closed questions. After excluding irrelevant responses, which did not answer the question, there were 1,040 open-ended responses which were analyzed using data-driven content analysis to identify perceived learning outcomes.

A primary goal of the study was to investigate what players perceived they had learnt from non-educational games. The content analysis began with reading through each open response and placing

it into one or more categories of learning outcomes. A data-driven approach, where categories were created as the analysis advanced, was used to ensure that all learning outcomes in the data were identified. This approach meant rereading the responses multiple times to include new categories in the analysis. In the next stage, a joint review of the learning outcomes was conducted by all authors and the learning outcome categories were grouped into main categories based on their similarities. An individual response could include learning outcomes from several main categories.

For studying gameplay motives, we used Motives for Autonomous Player (MAP) inventory, which is argued to be a general measure of gameplay motives that is applicable to all kinds of digital games, ranging from mobile puzzle games to massively-multiplayer online role-playing games (Vahlo and Tuuri, submitted). The MAP model incorporates nine factors, each representing a generic reason for playing games. Survey participants respond to the MAP inventory by selecting to what extent they agree or disagree that each motive item of the inventory accurately describes their reasons to play digital games (1 = Disagree completely, 7 = Agree completely). Since the validation study for the MAP model is still under review, we did an exploratory factor analysis for the combined data from the UK and the US to investigate the dimensionality of the 34-item inventory. The MAP inventory passed both the Kaiser-Meyer-Olkin (KMO) test (0.93) and The Bartlett test of sphericity (*Chi-square* = 22801.72, $df = 561$, $p = 0.000$) indicating that the inventory was suitable for a factor analysis. A parallel analysis (PA) test (Henson and Roberts, 2006) suggested a nine-factor solution, and therefore we extracted nine factors with promax rotation which does not assume factors to be orthogonal to each other. The factor model resulted in nine factors that can be described similarly to Vahlo and Tuuri (submitted) as *Immersive Agency* (4 items, $\alpha = 0.83$, 95% CI from 0.81 to 0.84), *Competitive Mastery* (4 items, $\alpha = 0.84$, 95% CI from 0.82 to 0.85), *Social* (4 items, $\alpha = 0.90$, 95% CI from 0.89 to 0.91), *Addiction* (4 items, $\alpha = 0.87$, 95% CI from 0.86 to 0.89), *Escapism* (4 items, $\alpha = 0.84$, 95% CI from 0.82 to 0.85), *Utility* (3 items, $\alpha = 0.86$, 95% CI from 0.85 to 0.87), *Affective Engagement* (4 items, $\alpha = 0.86$, 95% CI from 0.84 to 0.87), *Boredom* (3 items, $\alpha = 0.76$, 95% CI from 0.74 to 0.78), and *Nostalgia* (4 items, $\alpha = 0.88$, 95% CI from 0.87 to 0.89). For the purposes of this study, we calculated both factor score variables and factor sum variables for all nine MAP factors by including all 34 items.

Among the MAP factors (see Supplementary Appendix 1), for the RQ5 and RQ6 of the study, *Immersive Agency, Competitive Mastery*, *Social*, and *Utility* were identified as *eudaimonic* motives, as all of them are self-attributive and relate to the three SDT needs (autonomy, competence and relatedness). Additionally, *Affective Engagement* was identified as *hedonic* motive, due to its straightforward focus on situated pleasure and gratification.

For producing a broad empirically-based understanding of informal learning in games and its connection to gameplay motives, we applied the gameplay activity inventory (GAIN) for measuring gameplay appreciation preferences (Vahlo et al., 2018). GAIN is a psychometrically validated 15-item inventory for assessing five dimensions in players' preferences for videogame gameplay activities (1 = Very unpleasant, 7 = Very pleasant): *Aggression* (e.g., shooting, killing) $\alpha = 0.83$ (95% CI from 0.82 to 0.85), *Exploration* (e.g., gameplay exploration, character development) $\alpha = 0.75$ (95% CI from 0.72 to 0.77), *Coordinate* (e.g., balancing movements, running and evading) $\alpha = 0.65$ (95% CI from 0.61 to 0.68), *Caretaking* (e.g., choosing looks, dating) $\alpha = 0.73$ (95% CI from 0.70 to 0.76), and *Management* (e.g., resource management) $\alpha = 0.65$ (95% CI from 0.62 to 0.68). Factor sum variables for these five dimensions were calculated for the purpose of using them in statistical analyses of this study.

For studying wellbeing outcomes of gameplay, we applied a measure originally developed for assessing wellbeing effects of musical activity (WELLBEING), which is a 7-point Likert scale instrument (1 = Completely disagree, 7 = Completely agree). The original 36-item measure (Krause et al., 2018) identified five discrete dimensions: *mood and coping, esteem and worth, socialization, cognition,* and *self-actualization*. Since the items of this measure concern wellbeing outcomes in a manner that is not specified to musical context, applying the measure to a new activity was straightforward and only required minimal modifications to the items with respect to the updated framing of the main question, which was expressed as follows: "*Think about what kind of experiences you get from playing videogames. For each statement, choose the option that describes you the best. "Playing videogames…."* We also shortened the measure to a 23-item version by using only the items demonstrating the strongest loadings to its respective factor in Krause et al. (2018) study. Since we made minor modifications to the inventory and as it has not been validated yet in research, we made an exploratory factor analysis (EFA) also on this measure (see Supplementary Appendix 2).

The 23-item version of the WELLBEING inventory clearly passed the KMO test (0.97) and The Bartlett test of sphericity (*Chi-square* = 23398.45, $df = 253$, $p = 0.000$), and the PA test suggested a three-factor solution (promax rotation). The first factor included items that Krause et al. (2018) argued to measure mood and coping as well as esteem and worth. We call this dimension *Mood and Coping* as these items had the highest loadings on the factor. The second factor included all items of the socialization dimension as well as an item from the self-actualization dimension. We call this factor *Social Connectedness*. Finally, items that loaded on the third factor consisted both of those of self-actualization and cognition. Since the former had higher loading than the latter, we name this factor *Self-Actualization*. It was not our intention to validate this measure in the current study, and therefore we did not omit any items that had low loadings. Instead, we generated factor score variables by using all of the 23 items and their loadings on all three factors. We also constructed factor sum variables by using only those items that showed a loading over 0.50 on the corresponding factor. The Cronbach alphas for these items on their factors were: *Mood and Coping* (6 items, $\alpha = 0.90$, 9% CI 0.from 89 to 0.91), *Social Connectedness* (6 items, $\alpha = 0.96$, 95% CI from 0.95 to 0.96), and *Self-Actualization* (5 items, $\alpha = 0.89$, 95% CI from 0.88 to 0.90).

4. Results

4.1. Perceived learning outcomes

Our first task was to identify what the respondents perceived to have learnt by playing games (RQ1). Analyzing the experienced learning results yielded 117 subcategories of learning outcomes. Based on similarities between the subcategories, they were further categorized into 11 main categories (Table 1).

4.1.1. Learning to play

The self-reported learning outcomes in this main category included mentions of learning to play the game the respondents were engaged with at any given time. Some responses disregarded this kind of learning, indicating they felt this was not a relevant skill, or not the kind of response the survey question was meant to bring.

> I do not think I have learned anything from video games, apart from how to play the game in question. I think they are too limited and abstracted to be of any use in real life.

Learning to play also included mentions of gaining further understanding of game design or gaining skills applicable to any game in general or in a particular genre.

4.1.2. Learning about games

Learning results described by the respondents also included knowledge of game cultures. This included game literacy, as in a deeper and broader knowledge of games and their fictional world, as well as knowledge of different game communities and their dynamics. There were also mentions of gaining knowledge of online communication and online cultures more broadly.

> I've learned that people like to portray things within the games that they cannot in real life. They can be almost anything they want to be or do anything they want to do in a virtual world.

4.1.3. Learning about self

Self-discovery through gaming was described by many respondents. They described learning about their own skills and attributes, like one respondent, who described:

> I've learned how adaptable I am. How I react to certain situations as well as how I deal with failure.

In this category, there were also respondents mentioning how they learned about their own game preferences.

TABLE 1 Main categories of learning outcomes.

Main category	Freq.	Percent
Learning to play	103	9.2%
Learning about games	36	3.1%
Learning about self	91	8.4%
Thinking skills	451	54.2%
Interpersonal skills	236	24.5%
Embodied behaviors	236	25.0%
Subject matter	194	23.0%
Practical skills	236	23.4%
Coping skills	157	15.4%
Self-enhancement	156	14.1%
Learning to learn	18	1.5%

4.1.4. Thinking skills

Thinking skills were the most common learning outcomes mentioned by respondents, with an emphasis on problem-solving, strategizing, management skills, decision making, creativity, and long-term planning.

> Video games have taught me to be creative in using the character's skills to solve challenging puzzles in areas of the game that involve the main story plot or side quests. For open world survival video games, it has taught me to manage time and resources to continue surviving and learning the game world's harsh realities without real world consequences.

4.1.5. Interpersonal skills

Different forms of collaboration and teamwork as well as communication skills were frequently mentioned by respondents as results of their gameplay experience. Some mentioned learning to relate to others particularly in a high stress competitive setting. Other commonly mentioned learning outcomes in this main category included an increased understanding of people in general and learning how to form relationships.

> I have learned how to build team friendships and motivating fellow players and I have found I enjoy this.

4.1.6. Embodied behaviors

The most common learning outcomes in this main category were hand-eye coordination, muscle memory, reaction time, and dexterity, and there are also responses mentioning motor skills generally. This main category also included mentions of increased spatial awareness and better pattern recognition. Some respondents also described using games for a therapeutic purpose, such as improving their dexterity after a surgery. Responses in this category were usually quite brief, such as:

> My reactions are increased playing certain games.

4.1.7. Subject matter

Respondents recounted gaining more knowledge of a diverse range of topics. Mentions of learning about history, mathematics and science, and different cultures were frequent, but there was significant diversity in the responses, including trivia knowledge on many topics such as football, weapons, or cars, to mention a few.

> I have learned more about the rules of sports when playing games like Fifa.

4.1.8. Practical skills

Language skills were the most common practical skill mentioned as a learning outcome. There were also frequent mentions of learning skills related to technology, economy, and creative writing. Some respondents described how they had used these skills in their everyday lives outside of gaming, for instance, their skills in interpreting maps and using them for navigation.

> I now have a much firmer grasp of how maps translate into real world environments.

4.1.9. Coping skills

Skills related to self-regulation were exhibited in the responses most commonly through perseverance, "how to keep trying until you are the best," or as one respondent describes:

> I have learnt patience and perseverance to keep going even if I feel like there is no hope. You never know when that good day is coming.

This category also included mentions of skills such as emotional or behavioral control, mood management, and stress management. Gaming as a form of positive escapism was another prominent learning outcome in this category.

4.1.10. Self-enhancement

Some learning outcomes in the data, such as patience, determination, and flexibility, were related to attitudes or personality traits that are currently considered positive and worthy of pursuing and developing (in Western cultures). One respondent described learning, "[h]ow to be more patient, how to not rush at things and take your time to make the right moves."

Gaining confidence through playing was also frequently mentioned, and some respondents described games and gaming as particularly meaningful, stating for example that "gaming has given me a sense of purpose."

4.1.11. Learning to learn

A small number of respondents also described they had gained learning skills through playing games. These mentions pertained to specific learning strategies or techniques such as research skills or note-taking or learning skills in general as in the following quotation.

> Learned to pick out a certain skill or skillset and develop said skill(s) until they are mastered, or at least improved drastically.

4.2. Cluster analysis on informal game-based learning

The second task (RQ2) of this study concerned identifying groups of informal learners in our sample by applying cluster analysis. Based on the learning outcome categories derived from the data-driven analysis, we constructed 11 new dummy variables for each survey respondent in the data and assigned them a value of 0 or 1 based on whether their response included learning outcomes from the corresponding category. We report in Table 2 how many learning categories were mentioned by the survey participants of the survey.

To study the relationships between different learning outcome categories on the level of respondents, we conducted an exploratory cluster analysis on the generated 11 dummy variables. To identify the appropriate number of clusters, we examined the scree plots created from the within-cluster sum of squares (WSS) and its logarithm [log(WSS)] for all solutions between 2 and 20 clusters (Makles, 2012; Figure 1). Both suggested a three-cluster solution, which we proceeded to generate.

TABLE 2 Distribution of survey respondents (N=1,202) according to how many types of learning their answers represented.

Number of learning categories per a respondent	Freq.	Percent
0	162	13.5%
1	452	37.6%
2	378	31.4%
3	154	12.8%
4	41	3.4%
5	11	0.9%
6	3	0.2%
7	1	0.1%

An exploratory cluster analysis with Stata 17.1/SE software was then made with a three-cluster solution. The cluster analysis was conducted as an unsupervised K-Means clustering using the Jaccard index. The partitional clustering algorithm of K-Mean assigns n observations into non-overlapping clusters based on a predefined number of groups. K-Means is an iterative procedure that minimizes the total within-cluster variance while maximizing the variance between the clusters (Mehmetoglu and Venturini, 2021). The Jaccard coefficient is a procedure for calculating the similarity between two binary vectors based on the proportion of matches when the value of the included variables equals 1 (Hennig, 2007; Tan et al., 2021). The three clusters (Table 3) were constructed based on co-occurrences of the main learning categories in the data. The whole survey sample of 1,202 respondents was included in the cluster analysis.

The three resulting clusters represent distinct types of learners, based on their learning outcomes (Table 3). Only the *Subject matter* learning category was relatively equally distributed across the clusters. The first cluster denotes learning outcomes relating to learners themselves and especially to the development of patience and perseverance in overcoming the challenges of life (*coping skills*, *self-enhancement*). The categories that differentiate the second cluster from the other two emphasize practical everyday skills that are often embedded in social communities (*practical skills*, *interpersonal skills*). The third cluster appears to represent performance-oriented cognitive and sensorimotor competence (*thinking skills*, *embodied behaviors*) that seems most closely related to the gameplay-situated, strategical, logical, and embodied skills needed for performing well in a game.

4.3. Connections of player motivations and preferences with learning

Next, we investigated how the identified 11 categories of informal learning from digital games were associated with gameplay motives and preferences (RQ3). This was studied by exploring how gaming motives and gameplay activity type preferences were related to learning (RQ3a) and whether learner types, i.e., the three clusters, differed from each other in what motivated players of these learner types to play games, and which gameplay activities they preferred (RQ3b). These analyses were done by applying the nine-factor Motives

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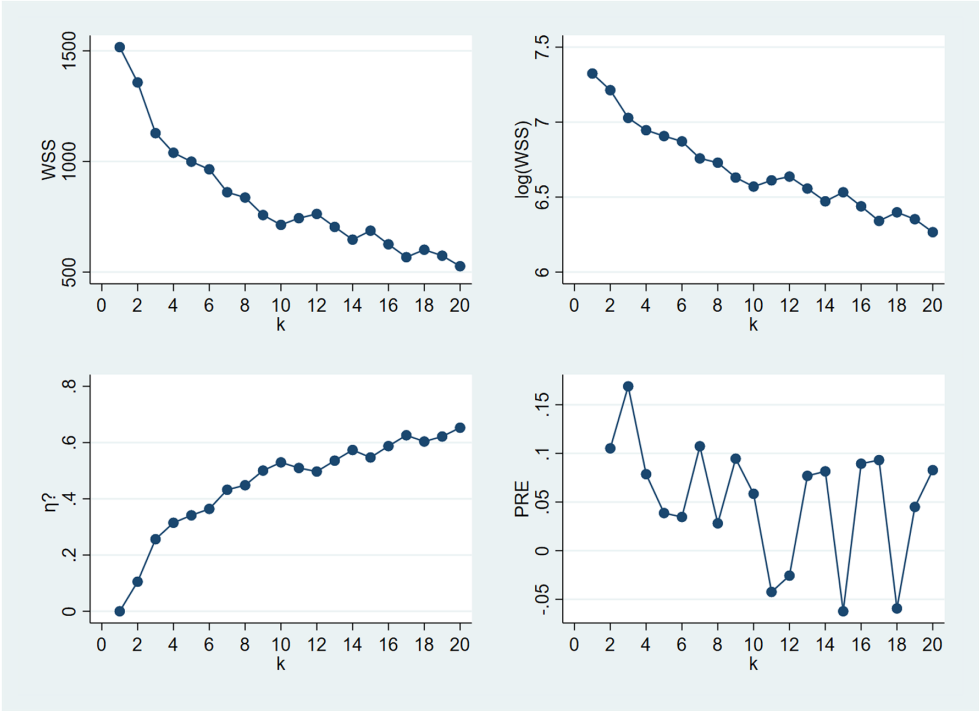

FIGURE 1
Scree plots for identifying the smallest justified number of clusters, based on which a 3-cluster solution was selected.

TABLE 3 Results of cluster analysis, reporting the three groups of informal learning from games, cluster sizes, and proportions in the learning outcome main categories.

	Cluster A	Cluster B	Cluster C
	Learning perseverance	Learning practices and communalities	Learning to perform
N	323	278	601
Learning to play	2.2%	5.4%	13.5%
Learning about games	1.2%	3.2%	3.8%
Learning about self	1.9%	6.1%	11.3%
Thinking skills	0.0%	5.0%	72.7%
Interpersonal skills	0.0%	55.4%	13.6%
Embodied behaviors	0.3%	15.8%	31.8%
Subject matter	15.5%	21.2%	14.1%
Practical skills	0.0%	59.7%	11.6%
Coping skills	24.1%	8.3%	9.3%
Self-enhancement	17.6%	11.2%	11.3%
Learning to learn	1.9%	1.1%	1.5%
Age	32.3	29.6	31.0
Male	47.1%	51.8%	49.1%
Female	52.3%	43.6%	48.3%
Non-binary	0.3%	4.3%	2.6%
Not disclosed	0.3%	0.3%	0.0%

of the Autonomous Player (MAP) inventory, and the five-factor gameplay activity inventory (GAIN), and by relating both of these measures to (a) learning types and (b) learner types.

To perform these analyses, we applied factor sum variables for the 15-GAIN and the 34-MAP factors. For studying how the MAP motives to play digital games and the GAIN factors of gameplay

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TABLE 4 Multiple logistic regression between gameplay preference factor sums, motive factor sums, age, and female gender and the dependent learning outcome variables.

Logistic regressions	Learn 1	Learn 2	Learn 3	Learn 4	Learn 5	Learn 6	Learn 7	Learn 8	Learn 9	Learn 10	Learn 11
N	103	36	91	451	236	236	194	236	157	156	18
Model 1: preferences											
Aggression	0.04	0.50**	−0.04	−0.09	0.13*	0.09	0.11	0.01	0.03	−0.08	0.08
Caretaking	0.10	0.11	−0.07	−0.04	0.00	−0.09	0.13	0.07	0.00	0.08	0.10
Coordinate	−0.01	−0.07	−0.06	−0.04	−0.06	0.11	−0.05	−0.10	0.11	0.08	0.42
Management	−0.02	−0.16	0.00	0.08	0.02	−0.05	0.00	0.05	−0.10	−0.04	0.02
Exploration	0.02	−0.02	0.18	0.20**	0.05	0.12	0.42***	0.19*	−0.03	0.16	−0.38
Age	0.01	0.02	0.01	−0.02**	−0.03***	0.01	−0.01	−0.02*	0.02**	0.02**	−0.03
Female	0.12	0.20	0.03	−0.18	−0.22	0.10	−0.48*	−0.40*	0.35	0.38	−0.41
Model 2: motives											
Imm.Agency	−0.10	0.05	0.02	0.07	0.05	−0.04	0.27**	0.14	−0.13	−0.25**	0.05
Nostalgia	0.21*	0.02	0.06	−0.02	−0.19**	0.03	0.03	−0.03	0.10	0.20*	−0.01
Social	−0.11	0.10	0.02	−0.02	0.56***	0.00	−0.11	0.00	−0.16*	−0.08*	0.03
Comp.Mast.	0.24*	0.25	0.02	−0.06	0.04	0.03	−0.05	−0.16*	0.08	0.02	0.30
Aff.Eng.	0.10	−0.05	−0.19	0.12	0.04	0.12	0.25*	0.14	−0.02	0.10	−0.75*
Utility	−0.13	−0.31*	−0.20*	0.21***	−0.05	0.19**	−0.03	0.19**	0.04	0.01	0.24
Escapism	−0.10	0.51*	0.22	−0.08	0.09	−0.11	−0.04	−0.08	0.24*	0.15	0.65*
Addiction	−0.07	−0.01	−0.01	−0.12*	−0.08	−0.06	−0.08	−0.01	−0.04	0.07	−0.21
Boredom	−0.09	−0.33*	−0.22*	0.06	0.00	−0.02	0.02	−0.06	0.00	0.10	0.00
Age	0.01	0.02	0.01	−0.02**	−0.01	0.00	−0.01	−0.02**	0.02*	0.03**	−0.03
Female	0.21	−0.02	0.04	−0.15	−0.11	−0.10	−0.55**	−0.35*	0.19	0.44	−0.44

Learn 1, Learning to play; Learn 2, Learning about games; Learn 3, Learning about self; Learn 4, Thinking skills; Learn 5, Interpersonal skills; Learn 6, Embodied behaviors; Learn 7, Subject matter; Learn 8, Practical skills; Learn 9, Coping skills; Learn 10, Self-enhancement; Learn 11, Learning to Learn. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

preferences were associated with learning outcomes (RQ3a), we calculated multiple logistic regressions in which each of the learning outcome categories were assigned as the dependent outcome variable at a time. Since earlier research has indicated that motives to play digital games and gameplay activity type appreciation are related to each other, we decided to calculate the logistic regressions separately for the GAIN factors and the MAP factors to avoid possible multicollinearity issues. The results of the logistic regressions are reported in Table 4.

By observing the results of the logistic regressions, we can note that motives to play were more clearly associated with learning outcomes than gameplay preference factors. All of the nine motives to play digital games were associated with at least one type of learning. In comparison, only *Aggression* and *Exploration* of the five GAIN factors were associated with any type of induced learning.

Playing because of *Nostalgia* and *Competitive Mastery* were associated with the learning outcome *Learning to Play*. *Competitive Mastery* motive was found to be associated with only one additional learning outcome, that of *Practical Skills*, and this association was negative. Female gender was also found to be a negative predictor of the *Practical Skills* learning outcome whereas younger age and the *Utility* motive positively predicted this type of learning.

The *Utility* motive was positively associated also with *Embodied Behaviors*. No other independent variables were found to be associated with this type of learning. However, the *Utility* motive, together with the *Exploration* gameplay preference, predicted even more clearly the *Thinking Skills* type of learning. This type of learning was negatively predicted by the *Addiction* motive and higher age. Together with the *Boredom* motive, the *Utility* motive negatively predicted *Learning about Self*.

The gameplay preference for *Aggression* was a clear predictor for *Learning about Games* alongside with the *Escapism* motive and negatively with the *Boredom* and the *Utility* motives. *Aggression* preference predicted also *Interpersonal Skills* type of learning, although the main precedent for this learning type was clearly the *Social* motive. Furthermore, lower age and lower *Nostalgia* motive also predicted this learning category. The *Social* motive was a negative precedent for *Coping Skills* while *Escapism* and a higher age predicted this type of learning positively. Together with the *Immersive Agency* motive, the *Social* motive was furthermore associated negatively also with *Self-Enhancement*. This type of learning was positively predicted by higher age and the *Nostalgia* motive, which implies an inclusion of autobiographical, self-reflective engagement in regard to gameplay.

Preference in the gameplay activity *Exploration* predicted the learning type of *Subject Matter* together with gameplay motives of *Immersive Agency* and *Affective Engagement*. The female gender was associated with this type of learning negatively. Finally, lower score in *Affective Engagement* motive and higher in *Escapism* were found to be precedents for the *Learning to Learn* outcome. No other predictors

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TABLE 5 Motive and gameplay activity type factor sum means and standard deviations for three learner clusters.

Factor sums	Cluster A (*N*=323)			Cluster B (*N*=278)			Cluster C (*N*=601)			Model
	Mean	*SD*	ANO	Mean	*SD*	ANO	Mean	*SD*	ANO	
Immersive agency	3.77	1.27		4.37	1.24	Ac	4.11	1.27	A	MAP
Competitive mastery	3.54	1.31		4.01	1.38	A	3.89	1.30	a	MAP
Affective engagement	5.58	1.03		5.97	0.88	A	5.84	0.86	A	MAP
Nostalgia	3.89	1.50		4.42	1.46	A	4.31	1.47	A	MAP
Utility	3.62	1.51		4.18	1.50	A	4.11	1.49	A	MAP
Social	3.70	1.58		4.64	1.57	AC	4.12	1.62	A	MAP
Addiction	2.43	1.23		2.65	1.31		2.50	1.37		MAP
Escapism	5.11	1.24		5.46	1.27	ac	5.27	1.07		MAP
Boredom	4.81	1.34		4.80	1.39		4.83	1.27		MAP
Aggression	4.19	1.58		4.69	1.49	A	4.48	1.61	a	GAIN
Caretaking	4.29	1.26		4.49	1.36		4.38	1.31		GAIN
Coordinate	4.33	1.30		4.33	1.35		4.40	1.25		GAIN
Management	4.45	1.17		4.66	1.17	a	4.60	1.17		GAIN
Exploration	5.38	1.16		5.71	1.10	A	5.66	1.08	A	GAIN
Average, motives	4.05	0.92		4.50	0.90	Ac	4.33	0.85	A	
Average GAIN	4.53	0.88		4.78	0.91	A	4.70	0.81	a	

One-way analyses of variance (ANOVAs) between the clusters means: a/c = $p < 0.05$, A/C = $p < 0.001$ in which the alphabets indicate between which two clusters there is a statistically significant difference. Cluster A, Learning perseverance; Cluster B, Learning practices and communalities; Cluster C, Learning to perform.

for this final type of learning were found due to the small number of observations of this type.

Gaming motives, gameplay preferences, and demographic variables showed clear and versatile associations to the learning outcomes (RQ3a). As a next step in analysis, we examined if these learning associations could also be found on the level of learner types, that is, the constructed three learner clusters (RQ3b). In these analyses, factor sum variables for both the GAIN and the MAP factors were utilized, and factor means as well as standard deviations were calculated for the nine-factor MAP and five-factor GAIN constructs. We then did a series of one-way analysis of variance (ANOVAs) between the three clusters for motive and gameplay activity factors to identify if there were statistically significant differences between the group means.

A series of pairwise *t*-tests for significance and effect sizes (Cohen's *d*) were next calculated to further analyze the statistically significant differences between the cluster means, as reported in Table 5. A pairwise *t*-test comparison of average motive sums between the three clusters revealed that participants of Cluster B were more motivated to play than those of Cluster C ($p = 0.0071$, Cohen's $d = 0.20$, 95% CI from 0.05 to 0.34) and Cluster A ($p = 0.0000$, Cohen's $d = 0.50$, 95% CI from 0.33 to 0.66). With the exceptions of *Addiction* and *Boredom*, there were statistically significant differences in all motive factors between the clusters. For Cluster A and Cluster B the effect sizes between the means were most notable in *Social* (Cohen's $d = 0.60$, 95% CI from 0.43 to 0.76), *Immersive Agency* (Cohen's $d = 0.48$, 95% CI from 0.32 to 0.64), *Utility* (Cohen's $d = 0.37$, 95% CI from 0.21 to 0.54), and *Nostalgia* (Cohen's $d = 0.36$, 95% CI from 0.20 to 0.52) in which Cluster 2 had clearly higher mean values than Cluster A. Cluster B and Cluster C were relatively similar to each other regarding their motive means. Yet the Welch *t*-test (one-sided) found statistically significant differences between these two clusters in *Social* ($p = 0.0000$, Cohen's $d = 0.33$, 95% CI from 0.18 to 0.47), *Immersive Agency* ($p = 0.0047$, Cohen's $d = 0.21$, 95% CI from 0.06 to 0.35), *Affective Engagement* ($p = 0.033$, Cohen's $d = 0.15$, 95% CI from 0.01 to 0.30), and *Escapism* ($p = 0.027$, Cohen's $d = 0.16$, 95% CI from 0.02 to 0.30) motives. In all of these cases, the mean values of Cluster B were higher than those of Cluster C.

As for the five types of gameplay activity preferences, only *Aggression* and *Exploration* sums differed between the clusters. Cluster A had lower *Aggression* preference than both Cluster B (Cohen's $d = 0.32$, 95% CI from 0.16 to 0.49) and Cluster C (Cohen's $d = 0.18$, 95% CI from 0.05 to 0.32). The same was true for the *Exploration* sum between Cluster A and Cluster B (Cohen's $d = 0.29$, 95% CI from 0.13 to 0.45) and Cluster A and Cluster C (Cohen's $d = 0.25$, 95% CI from 0.12 to 0.39).

4.4. Connections of wellbeing outcomes with learning

As with the analyses made on gameplay appreciation and gaming motives, we investigated how wellbeing outcomes of gameplay are connected with the learning outcomes (RQ4a) and the groups of learners (RQ4b). For this purpose, we applied the three wellbeing factor sum variables that were constructed after making an exploratory factor analysis on the 23-item version of the WELLBEING inventory. Analogously to the model reported above, we calculated multiple logistic regressions in which the 11 learning dummy variables were set as dependent outcome variables one by one, and the three factors of *Identity Actualization*, *Social Connectedness*, and *Mood and Coping* were assigned as independent predictors, accompanied again by age

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TABLE 6 Multiple logistic regression between wellbeing factor sum variables, age, and female gender and the dependent learning outcome variables.

Logistic regressions	Learn 1	Learn 2	Learn 3	Learn 4	Learn 5	Learn 6	Learn 7	Learn 8	Learn 9	Learn 10	Learn 11
N	103	36	91	451	236	236	194	236	157	156	18
Identity actualization	−0.12	−0.01	0.31**	0.15*	−0.15	0.04	0.01	0.12	0.11	0.07	0.22
Social connection	0.08	0.24	−0.14	−0.09	0.62***	−0.08	−0.08	−0.06	−0.16*	−0.11	−0.06
Mood and coping	0.08	−0.04	−0.24*	0.11	0.05	0.08	0.40***	0.10	0.21*	0.21*	−0.15
Age	0.01	0.02	0.01	−0.01*	−0.01	0.00	−0.01	−0.02*	0.02**	0.02**	−0.03
Female gender	0.14	−0.13	0.03	−0.10	−0.11	−0.16	−0.59***	−0.34*	0.27	0.48**	−0.45

Learn 1, Learning to play; Learn 2, Learning about games; Learn 3, Learning about self; Learn 4, Thinking skills; Learn 5, Interpersonal skills; Learn 6, Embodied behaviors; Learn 7, Subject matter; Learn 8, Practical skills; Learn 9, Coping skills; Learn 10, Self-enhancement; Learn 11, Learning to Learn. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

TABLE 7 Wellbeing factor sum means and standard deviations for three learner clusters.

	Cluster A (*N*=323)			Cluster B (*N*=278)			Cluster C (*N*=601)		
	Mean	*SD*	ANO	Mean	*SD*	ANO	Mean	*SD*	ANO
Identity actualization	3.77	1.27		4.37	1.24	Ac	4.11	1.27	A
Social connectedness	3.54	1.31		4.01	1.38	AC	3.89	1.30	A
Mood and coping	5.58	1.03		5.97	0.88	Ac	5.84	0.86	A
Average, wellbeing	4.05	0.92		4.50	0.90	AC	4.33	0.85	A

One-way analyses of variance (ANOVAs) between the clusters means: a/b/c = $p < 0.05$, A/B/C = $p < 0.00$ in which the alphabets indicate between which two clusters there is a statistically significant difference.

and female gender. The results of these regressions are reported in Table 6.

All the three wellbeing factors were found to be associated with learning outcomes, but only six of the learning types were related to wellbeing in a statistically significant fashion. From the wellbeing dimensions, *Identity Actualization* was associated with *Learning about Self* and *Thinking Skills*. The wellbeing factor *Social Connectedness* was positively related to *Interpersonal Skills* type of learning, and negatively to *Coping Skills*. The third wellbeing factor *Mood and Coping* was a positive precedent for *Subject Matter*, *Coping Skills*, and *Self-Enhancement* types of learning, and a negative precedent for *Learning about Self.* These logistic regressions were followed again by group comparisons between the three learner clusters and their factor sum means. Table 7 reports these comparisons.

There were several statistically significant differences between the three learner clusters and their wellbeing factor sum means, as indicated by ANOVAs (Table 7). As in the group comparisons made between gaming motives and gameplay appreciation factors, Cluster B had the highest values also for the experienced wellbeing, across all three of its factors.

Next, we did a series of pairwise *t*-tests for significance and effect sizes (Cohen's *d*) between the wellbeing factor sum means of the three clusters. In the case of all of the three wellbeing factors, participants of both Cluster B and Cluster C reported clearly higher wellbeing than participants of Cluster A. These differences were the most drastic between Clusters A and B in *Social Connectedness* ($p < 0.000$, Cohen's $d = 0.61$, 95% CI from 0.45 to 0.78), *Identity Actualization* ($p < 0.000$, Cohen's $d = 0.53$, 95% CI from 0.36 to 0.69), and *Mood and Coping* ($p < 0.000$, Cohen's $d = 0.42$, 95% CI from 0.26 to 0.58). Also, Cluster B and a clearly higher mean than Cluster C in *Social Connectedness* ($p < 0.000$, Cohen's $d = 0.36$, 95% CI from 0.21 to 0.50).

The analyses of this study have indicated that particular forms of gameplay appreciation and especially self-attributed motives to play are associated with game-based informal learning. Furthermore, we have seen that perceived wellbeing outcomes are also related to specific types and ways of learning. What remains unexplored, is how the motives that are associated with learning should be conceptualized, and how gaming motives and wellbeing as an outcome of gameplay are related to each other on a more general level. These latter themes are investigated in this last part of the present study, in which we distinguish self-attributed (eudaimonic) and gratification-based (hedonic) motives to play games and investigate how these two types of motives connect with wellbeing outcomes of gameplay (RQ5) as well as how they associate with informal learning outcomes (RQ6). Our hypotheses are that eudaimonic motives predict the wellbeing and learning outcomes more strongly that hedonic motives (H1), and that eudaimonic and hedonic motives to play games embody complementary functions in the constitution of wellbeing outcomes (H2).

4.5. Eudaimonic and hedonic gameplay motives

The analyses of this study have indicated that particular forms of gameplay appreciation and especially self-attributed motives to play are associated with game-based informal learning. Furthermore, we have seen that perceived wellbeing outcomes are also related to specific types and ways of learning. What remains unexplored, is how the motives that are associated with learning should be conceptualized, and how gaming motives and wellbeing as an outcome of gameplay are related to each other on a more general level. These latter themes are investigated in this last part of

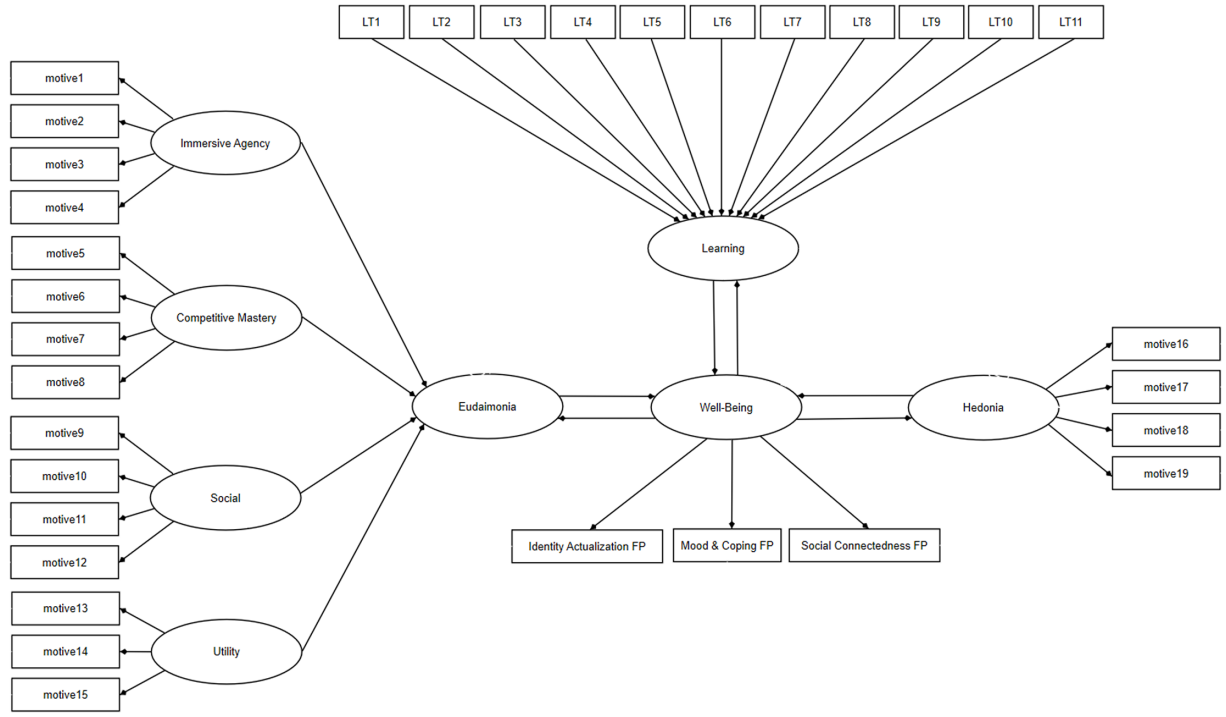

FIGURE 2
The PLS-SEM model by which the connections between eudaimonic and hedonic motives, wellbeing, and learning was explored. Manifest variables or indicators are reported as rectangles, and latent variables as ellipses.

the present study, in which we distinguish self-attributed (eudaimonic) and gratification-based (hedonic) motives to play games and investigate how these two types of motives connect with wellbeing outcomes of gameplay (RQ5) as well as how they associate with informal learning outcomes (RQ6). Our hypotheses are that eudaimonic motives predict the wellbeing and learning outcomes more strongly that hedonic motives (H1), and that eudaimonic and hedonic motives to play games embody complementary functions in the constitution of wellbeing outcomes (H2).

The hypotheses (H1, H2) concerning the eudaimonic and hedonic gaming motives' ability to predict wellbeing and learning outcomes of gameplay were tested by the means of partial-least squares structural equation modeling (PLS-SEM). In the model reported in Figure 2, the gameplay motive factors of *Immersive Agency*, *Competitive Mastery*, *Social*, and *Utility* were taken to be precedents of *Eudaimonic* gaming orientation whereas the gameplay motive factor of *Affective Engagement* was considered to represent a more *Hedonic* approach to gaming. Furthermore, all of the 11 learning categories were assigned to be precedents of *Learning*. All of the statistical analyses were made with Stata/SE 17.0, by making use of the *plssem* package by Mehmetoglu and Venturini (2019).

The main purpose of PLS-SEM is to explain as much of the variance of the dependent variable as possible. In contrast to covariance-based structural equation modeling (CB-SEM), PLS-SEM is considered to be an explorative technique for predicting and explaining associations between independent and dependent latent and observed variables in complex models (Hair et al., 2017; Mehmetoglu and Venturini, 2021). Furthermore, in PLS-SEM the measurement error of indicators is ignored whereas theory-driven confirmatory CB-SEM takes error variances of indicators into account.

In the PLS-SEM model (Figure 2), we have assigned *Wellbeing* as the dependent or endogenous composite (latent construct of weighted sums of the assigned indicators), measured by three factor point manifest variables of *Identity Actualization*, *Mood and Coping*, and *Social Connectedness*. For the three WELLBEING factors, we applied factor score variables instead of factor sums as the WELLBEING inventory has not yet been validated. Computing factor score variables after an EFA and including these variables in a PLS-SEM model is furthermore a recommended practice, as factor score variables represent how all included inventory items load on each extracted factor in the analyzed data (Mehmetoglu and Venturini, 2021). In the PLS-SEM model, *Immersive Agency*, *Competitive Mastery*, *Social*, *Utility*, *Affective Engagement*, and *Wellbeing* are all assigned as reflective models whereas *Learning* and *Eudaimonia* are constructed as formative models. In contrast to reflective models which assume that the indicators are treated as factors that measure a common underlying latent construct, in formative models each manifest variable is taken to be a predictor of the construct they are associated with. Reflective models were applied in the above-mentioned cases of gaming motives as these constructs are validated in prior research by confirmatory factor analyses and CB-SEMs (Vahlo and Tuuri, submitted).

Table 8 summarizes standardized factor loadings for the constructs included in the PLS-SEM model. The loadings of all reflective models are high, which is also reflected in the corresponding scale reliability scores. The formative model of *Eudaimonia* indicates that all included self-attributed motives were clear precedents of the

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TABLE 8 Standardized loadings of the PLS-SEM measurement model.

	Reflective: Wellbeing	Reflective: ImmAgenc	Reflective: CompMast	Reflective: Social	Reflective: Utility	Formative: Eudaimonia	Reflective: Hedonia	Formative Learning
Identity actualization	0.93							
Social connect.	0.87							
Mood and coping	0.84							
Motive 1		0.82						
Motive 2		0.82						
Motive 3		0.77						
Motive 4		0.83						
Motive 5			0.82					
Motive 6			0.82					
Motive 7			0.83					
Motive 8			0.81					
Motive 9				0.88				
Motive 10				0.81				
Motive 11				0.89				
Motive 12				0.93				
Motive 13					0.88			
Motive 14					0.90			
Motive 15					0.87			
Motive 1						0.71		
Motive 2						0.74		
Motive 3						0.62		
Motive 4						0.71		
Motive 5						0.52		
Motive 6						0.52		
Motive 7						0.56		
Motive 8						0.56		
Motive 9						0.75		
Motive 10						0.61		
Motive 11						0.78		
Motive 12						0.78		
Motive 13						0.51		
Motive 14						0.57		
Motive 15						0.50		
Motive 16							0.81	
Motive 17							0.86	
Motive 18							0.84	
Motive 19							0.85	
Learning 1								−0.01
Learning 2								0.13
Learning 3								−0.07
Learning 4								0.32
Learning 5								0.83
Learning 6								0.02
Learning 7								0.33
Learning 8								0.28
Learning 9								0.01
Learning 10								0.04
Learning 11								0.05
Cronbach's alpha	0.85	0.83	0.84	0.90	0.86		0.86	
DG	0.91	0.89	0.89	0.93	0.92		0.91	
rho_A	0.85	0.83	0.84	0.91	0.87	1.00	0.87	1.00

Average $R^2 = 0.51$, Relative Goodness-of-Fit: 0.92. Weighting Scheme: Path. $N = 1{,}202$.

TABLE 9 Discriminant validity of the PLS-SEM model.

	Wellbeing	Immersive agency	Competitive mastery	Social	Utility	Formative: eudaimonia	Hedonia	Formative: learning
Wellbeing	1.00	0.47	0.28	0.44	0.22	0.64	0.27	0.09
Immersive agency	0.47	1.00	0.20	0.25	0.20	0.74	0.22	0.04
Competitive Mastery	0.28	0.20	1.00	0.26	0.28	0.44	0.09	0.02
Social	0.44	0.25	0.26	1.00	0.15	0.71	0.10	0.08
Utility	0.22	0.20	0.28	0.15	1.00	0.35	0.08	0.02
Eudaimonia	0.64	0.74	0.44	0.71	0.35	1.00	0.22	0.08
Hedonia	0.27	0.22	0.09	0.10	0.08	0.22	1.00	0.03
Learning	0.09	0.04	0.02	0.08	0.02	0.08	0.03	1.00
AVE	0.77	0.66	0.67	0.77	0.79		0.71	

Squared interfactor correlation vs. Average variance extracted (AVE).

TABLE 10 Structural model of the PLS-SEM model.

Variable	Wellbeing	Eudaimonia	Hedonia	Learning
Wellbeing		0.018**	0.517***	0.301***
Immersive agency		0.511***		
Competitive mastery		0.125***		
Social		0.468***		
Utility		0.113***		
Eudaimonia	0.693***			
Hedonia	0.178***			
Learning	0.075***			
Adjusted R^2	0.666	0.997	0.267	0.09

Standardized path coefficients (Bootstrap). *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

construct. Items that load on *Immersive Agency* and *Social* had a stronger effect on *Eudaimonia* than those that loaded on *Competitive Mastery* and *Utility*.

In the case of the *Learning* composite, the 11 learning categories had very different associations with the latent outcome of *Learning*. The learning category of *Interpersonal Skills* (Learning 5) had clearly the strongest effect on *Learning*. Also *Thinking Skills* (Learning 4), *Subject Matter* (Learning 7), and *Practical Skills* (Learning 8) had a notable association with *Learning*. It is important to emphasize that *Learning* of the PLS-SEM of this study is a summated composite, and that the 11 learning categories are assigned as potential predictors of it. This means that *Learning* is the diversity and versatility of informal learning, i.e., how multidimensional the learning from games is. In other words, the learning type of *Interpersonal Skills* is the strongest precedent for the versatility of game-based learning. In contrast to this, for instance, *Learning about Self* (Learning 3) and *Learning to Play* (Learning 1) were not associated with *Learning* which means that these types of learning do not predict that game-based learning would be multi-faceted.

Next, we continued to investigate discriminant validity of the PLS-SEM model by calculating the average variance extracted (AVE) for the reflective constructs *Wellbeing*, *Immersive Agency*, *Competitive Mastery*, *Social*, *Utility*, and *Hedonia* (*Affective Engagement*). To support discriminant validity for each composite, AVE for each reflective construct should be over 0.50 and higher than the square of the correlation between that construct and other reflective constructs included in the model (Fornell and Larcker, 1981; Farrell, 2009). The composites included in the study fulfilled these criteria. The average variance test results are reported in Table 9.

Tables 10, 11 report the structural model of the PLS-SEM (Figure 2). All effects with the exception of the effect of *Wellbeing* on *Eudaimonia* were found to be statistically significant on the level $p < 0.001$, while the effect of *Wellbeing* on *Eudaimonia* was statistically significant on the level of $p < 0.01$. The model explained 67 percent of the variance of *Wellbeing*, almost all of the variance of *Eudaimonia*, approximately 27 percent of the variance of *Hedonia*, and only 9% of *Learning*. Regarding *Wellbeing*, the model explained between moderate and substantial amounts of its variance (Hair et al., 2021).

Standardized (β) path coefficients revealed that *Eudaimonia* had a substantial direct effect on *Wellbeing*, and from Table 11 we can furthermore note that *Eudaimonia* also had an indirect effect on *Wellbeing* making the total effect strong ($\beta = 0.79$). *Hedonia* also had a significant effect ($\beta = 0.20$) on *Wellbeing*, although this effect was rather weak in comparison to that of *Eudaimonia*. In regard to wellbeing, these results give clear support to the H1. From the motive factors associated with *Eudaimonia*, the motive factor *Immersive Agency* had the strongest indirect effect on *Wellbeing* ($\beta = 0.41$). In addition to the *Eudaimonia* motive, also the *Social* motive had a moderate indirect effect on *Wellbeing* ($\beta = 0.37$). In terms of learning outcomes of gameplay, *Eudaimonia* had a moderate indirect effect on

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TABLE 11 Direct, indirect, and total effects of the manifest variables and latent constructs on endogenous constructs of Wellbeing, Learning, Eudaimonia, and Hedonia.

Direct, indirect, and total effects	Direct	Indirect	Total
Wellbeing - > Eudaimonia	0.018	0.003	0.021
Wellbeing - > Hedonia	0.517	0.075	0.592
Wellbeing - > Learning	0.301	0.044	0.345
Eudaimonia - > Wellbeing	0.693	0.101	0.794
Eudaimonia - > Hedonia		0.409	0.409
Eudaimonia - > Learning		0.239	0.239
Hedonia - > Wellbeing	0.178	0.026	0.204
Hedonia - > Eudaimonia		0.004	0.004
Hedonia - > Learning		0.061	0.061
Learning - > Wellbeing	0.075	0.011	0.085
Learning - > Eudaimonia		0.002	0.002
Learning - > Hedonia		0.044	0.044
Immersive agency - > Wellbeing		0.405	0.405
Immersive agency - > Eudaimonia	0.511	0.007	0.518
Immersive agency - > Hedonia		0.209	0.209
Immersive agency - > Learning		0.122	0.122
Competitive mastery - > Wellbeing		0.099	0.099
Competitive mastery - > Eudaimonia	0.125	0.002	0.127
Competitive mastery - > Hedonia		0.051	0.051
Competitive mastery - > Learning		0.030	0.030
Social - > Wellbeing		0.370	0.370
Social - > Eudaimonia	0.468	0.007	0.474
Social - > Hedonia		0.191	0.191
Social - > Learning		0.112	0.112
Utility - > Wellbeing		0.089	0.089
Utility - > Eudaimonia	0.113	0.002	0.114
Utility - > Hedonia		0.046	0.046
Utility - > Learning		0.027	0.027

Learning ($\beta = 0.24$), which however is much greater in comparison to the minor effect of *Hedonia* on *Learning* ($\beta = 0.06$). This further provides support to the H1 also in regard to informal learning outcomes. The effect of versatility of game-based informal *Learning* on *Wellbeing* was very weak ($\beta = 0.08$), albeit still statistically significant on the level of $p < 0.001$.

We furthermore included reversed investigations into whether *Wellbeing* outcomes from gaming were associated with the gaming motivations of *Eudaimonia* and *Hedonia*, and with informal game-based *Learning*. It was found that *Wellbeing* outcomes strongly predicted *Hedonia* ($\beta = 0.59$), thus the participants' higher score in wellbeing assessment clearly was a precedent for hedonic motivation to play digital games. However, this was not the case with *Eudaimonic* motivation to play digital games, which interestingly was not predicted by *Wellbeing* outcomes ($\beta = 0.02$). Finally, it was also revealed that *Wellbeing* was moderately associated with *Learning* ($\beta = 0.35$).

In all, our results provide support for the hypothesized imbalanced effects of *Eudaimonic* and *Hedonic* motives on *Wellbeing* and *Learning*. The oppositely imbalanced results of the reversed investigations of *Wellbeing* as a predictor for *Eudaimonia* and *Hedonia* give support to our second hypothesis (H2). Hence, based on the results, one may indeed argue that eudaimonia and hedonia serve different, but possibly complementary functions in the constitution of a person's wellbeing. This matter is further discussed in the following section.

5. Discussion

The outcomes of informal learning in this study are based on our analysis of players' own perceptions of learning from games. We identified 11 main categories of learning outcomes. To identify potential learner types, we conducted a cluster analysis. Together with comparisons between these three learner types (Learning perseverance, Learning practices and communalities, and Learning to perform) it was revealed that players do differ from each other in what they articulate they have learned by playing games of their choice. Each of the three clusters denoted different profiles of learning, respectively emphasizing the specific areas of self-development,

improving communal practices, and improving performative abilities in terms of both cognitive and behavioral skills. It is tempting to reflect on this result from the perspective of the SDT (Ryan and Deci, 2000), especially in terms of the three basic needs that constitute positive growth and motivation of individuals. Thus, it seems possible to make obvious linkages between the needs of Autonomy, Relatedness, and Competence, and the respective clusters of Learning perseverance (supporting autonomic self-development), Learning practices and communalities (supporting social relatedness), and Learning to perform (supporting the development of competence). This kind of interpretation would, however, require future studies focusing particularly on the prospect of this promising observation.

Secondly, the three learner types did have distinctive profiles, not only regarding the experienced learning outcomes but also player motives and preferred gameplay activity types. The main result of these comparisons was that the Learning perseverance (A) type of player-learners were notably less motivated to play games than the other two learner types, yet they enjoyed gameplay activities of coordination, caretaking, and management similarly to the Learning practices and communalities (B), and the Learning to perform (C) player-learners. The Learning practices and communalities player-learners differed from the Learning to perform player-learners in a much more subtle way, mostly regarding the Social motive and the Immersive Agency motive.

Our results indicated that playing because of social and immersive experiences (i.e., motives that were emphasized within the cluster B of player-learners), are associated with a high eudaimonic motivation to play games and, importantly, also with learning outcomes related to interpersonal and practical skills (e.g., language skills, teamwork, subject matter). Furthermore, we found that another, highly motivated player-learner type (i.e., the cluster C) that was not as motivated by social and immersive experiences reported learning outcomes that were closely associated with performance, competence, and honing skills by overcoming game challenges. The less motivated type of player-learners (i.e., the cluster A) perhaps considers games more as a method for self-development, self-enhancement, and coping, and thus has a more instrumental relationship with game experiences than the other two learner types.

On the level of gameplay activity types, it seems that game mechanics and dynamics that enable aggressive (e.g., shooting, killing) and explorative gameplay (e.g., character development, narrative progression) are attractive to players who (report to) have learned practical skills, interpersonal skills, thinking skills, and embodied behaviors by playing non-educational games (i.e., clusters B and C). For the player-learners of the cluster A, the aggressive and explorative gameplays are not similarly attractive, which means that this learner type has more balanced gameplay preferences. Perhaps this is another indicator of them being more focused on self-development, rather than the game and the social interactions it may enable. Related to this, it should be asked whether perceived learning and psychological need satisfaction, as argued in the SDT framework, are somehow related to each other. Our results seem to indicate that game-based learning might be closely associated with user gratification and satisfaction that players derive from games.

Given that all three learner types outlined stem from voluntary play of non-educational games, it is interesting to note how each cluster varies in terms of how dependent the learning outcomes are on gameplay (Figure 3). Most notably, the Learning to perform cluster

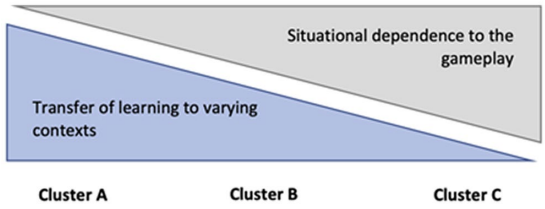

FIGURE 3
The two-way continuums of the transfer of learning and the dependence of learning in relation to the three clusters of learning outcomes.

(C) seems to incorporate the closest situational dependence to the engagement with gameplay activities and "doing well" in answering the game's challenges. This interpretation is underlined by the fact that this cluster included the largest amount of learning outcomes that were explicitly about learning to play. On the other end of the continuum, Learning perseverance cluster (A) seems to manifest skills that are most transferable to different contexts of everyday life, while also bearing the least number of skills with direct dependence to actual gameplay (e.g., strategizing, sensorimotor skills). The cluster B, Learning practices and communalities, is positioned between the other two, as it seems to both denote practical and interpersonal skills that are highly transferable while also associating with more gameplay-dependent similar skills as in the case of the third cluster.

In addition to analyzing the results from the perspective of the three player-learner clusters, we made a series of logistic regressions between gameplay preference factors, self-attributed motives, dimensions of wellbeing, and the outcome binary variables of the 11 types of informal learning. Multiple logistic regressions between gameplay preference factors, self-attributed gaming motives, and learning outcomes revealed that motives were more comprehensively and versatilely connected with learning than gameplay activity type preferences. A preference for *Exploration* clearly predicted Subject Matter type of learning outcome, and a preference for *Aggression* was related to Learning about Games. In comparison, all of the nine motive factors were associated with at least one learning outcome. For instance, the *Social* motive was a main precedent for Interpersonal Skills type of learning, the latter of which was the defining type of learning for the player-learner cluster B that was found to be the most highly motivated to play digital games.

The connections between gameplay activity type preferences and learning can perhaps be partly explained by considering what types of games emphasize *Exploration* and *Aggression* in their player-game interaction. *Exploration* covers player activities such as gameworld and story exploration, and character development and customization (Vahlo et al., 2018). These activities are frequent for role-playing games and action-adventure games, and both of these genres have many games that have rich story-driven and world-building qualities that can foster Subject Matter type of learning. Many games that have core gameplay loops based on *Aggression* are often also multiplayer online games of genres such as battle royale and MOBA (multiplayer online battle arena). In such genres, it is essential for players to understand game communities, and to have in-depth understanding about features of the game of their choice. Again, it is sensible that activities based on *Aggression* would be related to Learning about games.

Similarly to motives to play digital games, also all dimensions of wellbeing were found to be related with informal learning categories. Most noteworthy connections were found between the wellbeing factor of *Social Connectedness* and Interpersonal Skills type of learning, *Mood and Coping* factor and Subject Matter type of learning, and *Identity Actualization* and Learning about Self. The associations between *Social Connectedness* type of wellbeing and Interpersonal Skills type of learning as well as *Identity Actualization* and Learning about Self are rather self-explanatory, although it is noteworthy and interesting as a result that the connection between wellbeing and learning gained from playing is so clear. However, the relationship between *Mood and Coping* and Subject Matter type of learning is not as evident. How exactly do the optimal experiences of emotional self-regulation and coping with everyday issues function as a precedent for learning about Subject Matter? Further research is required for investigating this question.

A series of PLS-SEM analyses were done to study general questions about how eudaimonic and hedonic motives are related to the wellbeing outcomes of gaming and the versatility of game-based learning, and how learning and wellbeing furthermore are related to gaming motives. Importantly, these analyses showed that eudaimonic gaming motives (*Immersive Agency, Social, Competitive Mastery,* and *Utility*) were strong and important precedents for wellbeing effects of gaming, and also a significant precedent for game-based learning. Yet, the analyses also revealed that wellbeing from gaming was not a precedent for eudaimonic motivation to play digital games. Instead of that, wellbeing predicted the hedonic gaming motive (*Affective Engagement*) rather strongly.

These results raise two questions, both of which would be important to examine in further research. Firstly, we can consider that the etiology of eudaimonic motivation is probably not based on immediate gratification derived from an ongoing experience but rather, as the term indeed suggests, on the more profound values and virtues of the participating individual. According to the findings of Huta and Ryan (2010) there is a reason to believe that hedonia and eudaimonia co-constitute wellbeing at different time scales, the former relating to more immediate outcomes and the latter relating to longer and person-level outcomes of activities. Hence, immediate experiences are likely to have an effect on the hedonic motives to return or not to return to play a game, but the underlying eudaimonic motives would not be similarly affected by it. Secondly, the strong effect of eudaimonic self-attributed motives to play digital games makes us ask what factors outside the immediate gaming experience affect the eudaimonic motivation, and how game developers and other stakeholders could put forward services and solutions that are able to build eudaimonic motivation. Future research should focus on investigating to what extent this kind of effect could be achieved through game design practices that support social interaction and immersive agency, the two motives which had the most significant effect on both wellbeing and learning. Regarding the issue of supporting eudaimonic motives to play by design practices, it is furthermore important to consider in future research how prevalent game challenge types are associated with the identified 11 learning types and especially eudaimonic motives to play digital games (Vahlo and Karhulahti, 2020).

One of the prominent limitations of the present study relates to the nature of gathering all of the data with a single survey. Therefore, instead of adopting a longitudinal methodological approach, only a single point of measurement was used for investigating different phases of the process of motivational development and the outcomes of gameplay. Another limitation of this study is related to combining the 11 learning categories that were identified as a result of the qualitative content analysis to statistical analyses as binary variables. It is not clear how this procedure influenced the results as all of the other factor variables were constructed based on structured survey questions and psychometrically validated scales. In other words, although we were able to reveal several intriguing connections between wellbeing, gameplay preferences, motives to play, and the 11 learning types, these associations could have been different in their magnitude if the data considering the learning types would have been similarly structured as the factor variables included in the analyses. Related to this issue, future research could develop the 11 learning categories into a survey inventory and triangulate the analyses of the current study by making use of more structured data on the learning types. Finally, one should recognize that while learning outcome categories were identified using an open-ended approach, the learning categories were undoubtedly influenced by the researcher's existing conceptual understanding of learning. Because of this, future research on the learning types should not try to confirm the 11 types of learning with a confirmatory factor analysis without conducting first an extensive exploratory factor analysis with an extensive pool of possible modes of informal learning from games.

This study demonstrated that it is possible to identify distinct informal game-based learner types based on players' self-articulated learning outcomes. Furthermore, our analysis substantiated that these learner types are distinctive from each other also in relation to gameplay motives and preferences for particular gameplay activities as well as wellbeing outcomes, thus, strengthening their profiles. While we are not able to fully confirm Crawford, 1984 claim of learning being the most fundamental motive to play games, the present study indeed illustrated the intertwined nature of gameplay, learning and personal wellbeing from various different angles. The results also showed that learning is not just a spontaneous by-product of gameplay, but rather, it is entangled in a wide-ranging manner with the motivational development. Thus, while the learning gained through non-educational gameplay activity could appear as seemingly pointless or merely entertaining, the underlying purposes of this activity may well be guided by a self-determined eudaimonic desire to grow and learn. However, further research is needed to delve into the constitution and dynamics of the motivational basis of an informal player-learner.

Author's note

This article is partially based on a conference paper presented at ECGBL2022.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

JV, TV, and KT contributed to the conception and the design of the study and wrote sections of the manuscript. JV organized the data, performed, and reported the statistical analyses. TV performed and reported qualitative analyses. KT contributed to the conception of well-being in the analyses. All authors contributed to manuscript revision, and read and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1176773/full#supplementary-material

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Commercial exergames for rehabilitation of physical health and quality of life: a systematic review of randomized controlled trials with adults in unsupervised home environments

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Background: Commercial exergames are widely available tools that can support physical rehabilitation at home. However, the effects of the unsupervised use of commercial exergames in home environments are not yet clear. Hence, we provide a systematic review on the effects of unsupervised commercial exergaming at home on adults' physical health (RQ1) and quality of life (RQ2). We also scrutinize adults' experiences with exergaming at home regarding participant support, adherence, and adverse outcomes (RQ3).

Methods: We searched Web of Science, PsycINFO, PubMed, Embase, and CINAHL for peer-reviewed randomized controlled trials with adults in need of rehabilitation. Overall, 20 studies (1,558 participants, 1,368 analyzed) met our inclusion criteria. The quality of evidence was assessed with the Cochrane risk of bias tool.

Results: Effects of unsupervised commercial exergaming at home on physical health were higher in seven studies and similar in five studies regarding the respective comparison or control conditions; eight studies reported non-significant findings. Of the 15 studies that also examined effects on quality of life, improvements were higher in seven studies and similar in two studies regarding the respective comparison or control conditions; results were non-significant in six studies. Participant support consisted of setup of the exergaming system, instructions, training, and contact with participants. Adherence was high in eight studies, moderate in six studies, and low in one study. Adverse outcomes related to exergaming were found in four studies and were at most moderate. Concerning the quality of evidence, six studies were related to a high risk of bias due to outcome reporting bias or ceiling effects in the primary outcome. Additionally, 10 studies yielded some concerns, and four studies were related to a low risk of bias.

Discussion: This systematic review summarizes promising evidence that the unsupervised use of commercial exergames can support and complement rehabilitation measures in home environments. Still, future studies based on larger samples and using more recent commercial exergames are needed to obtain more

high-quality evidence on the effects of different exercise prescriptions. Overall, considering the necessary precautions, the unsupervised use of commercial exergames at home can improve the physical health and quality of life in adults with needs for physical rehabilitation.

Systematic review registration: https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42022341189, identifier: PROSPERO, Registration number: CRD42022341189.

KEYWORDS

commercial exergames, physical health, quality of life, rehabilitation, home-based exercise, unsupervised training, randomized controlled trials, systematic review

1. Introduction

Rehabilitation is an important cornerstone for people to restore and improve their physical health and quality of life (WHO, 2021). Rehabilitation encompasses "a set of interventions designed to optimize functioning and reduce disability in individuals with health conditions in interaction with their environment" (WHO, 2021, p. 1). Accordingly, physical health refers to the wellbeing and functioning of body parts that are relevant for physical interactions with the environment, such as limbs and muscles for grasping, walking, and other forms of physical activity. In addition, the term quality of life comprises the overall wellbeing and health of people (cf. Fayers and Machin, 2015), including health-related and psychological measures as well as rehabilitation benefits that go beyond physical health. It has been shown that an adequate amount of physical activity is key for people's health at every age, yet about 80% of adolescents and almost 30% of adults worldwide are not sufficiently physically active (Guthold et al., 2018, 2020; WHO, 2022). Relatedly, rehabilitation measures are not only important for *patients* with long-term or severe physical impairments but could support about every third *person* worldwide to improve their health condition (Cieza et al., 2020). In this regard, several studies have shown that exergaming can effectively support rehabilitation in terms of physical health and quality of life (e.g., Elena et al., 2021; Shida et al., 2021; Blasco-Peris et al., 2022; Gelineau et al., 2022). Exergaming refers to the use of video games that require players to be physically active, such as strength and balance exercises, and involves physical, cognitive, and psychological processes. Accordingly, exergaming has been related to several physical, psychological, and educational effects based on theories of motor learning, social cognitive theory, and self-determination theory (e.g., Peeters et al., 2013; Rüth and Kaspar, 2021). However, some exergames are customized to characteristics of people with specific symptoms or a certain pathology and are not widely available (Schättin et al., 2021). In contrast, commercial exergames are widely available tools that could support physical rehabilitation in terms of more general physical health and quality of life.

Commercial exergames refer to exergames that can be played on commercially available devices that can be purchased by the general public. Commercial exergames have been used in supervised contexts, such as rehabilitation centers (e.g., Prosperini et al., 2021) and schools (e.g., Rüth and Kaspar, 2020). However, supervised exergaming requires personal and financial resources such as rehabilitation professionals, which are particularly lacking in middle- and low-income countries (WHO, 2021). In addition, rehabilitation measures do not necessarily improve more in supervised vs. unsupervised settings (Lilios et al., 2021). In fact, meta-analytic findings indicate that improvements can be even higher in home environments than in supervised environments (Cugusi et al., 2021; Prosperini et al., 2021). Relatedly, meta-analytic findings indicate that self-rehabilitation programs can be as effective as conventional therapy regarding motor outcomes of adults who have had a stroke (Everard et al., 2021). Moreover, compared to center-based rehabilitation and telerehabilitation, exergaming at home can save healthcare expenses (Klompstra et al., 2022) as well as travel costs and time by allowing people to stay in their familiar home environment. Thus, the unsupervised use of commercial exergames at home could be a powerful tool to support rehabilitation, yet a systematic review on the effects on physical health and quality of life is still missing.

2. Using commercial exergames to improve physical health and quality of life

The use of commercial exergames has been related to several benefits for physical health and quality of life. For instance, a meta-analysis showed that the use of commercial exergames had a moderate positive effect on balance in adults with neurological pathologies (Prosperini et al., 2021). This effect was slightly higher in home environments (Hedge's $g = 0.52$) than in supervised environments ($g = 0.41$). Concerning arm, hand, and leg rehabilitation, meta-analytic findings indicate that playing commercial exergames at home has beneficial effects on adults with neurological diseases that are at least comparable with conventional therapy or usual care (Perrochon et al., 2019). Compared to conventional stroke rehabilitation, playing commercial exergames can alleviate motor impairment and improve motor function, according to meta-analytic results (Unibaso-Markaida and Iraurgi, 2021). Another meta-analysis on the effects of unsupervised exergaming at home and supervised exergaming in health facilities on adults with chronic diseases found that playing commercial exergames can have larger effects than conventional care on several facets of quality of life such as physical and social functioning (Cugusi et al., 2021). Irrespective of the pathology, the use of

commercial exergames at home can have several positive effects on physical, cognitive, and psychological outcomes (e.g., Bonnechère et al., 2016; Rüth and Kaspar, 2021). However, the effects of the unsupervised use of commercial exergames in home environments on physical health and quality of life across pathologies are not yet clear. Hence, we provide a systematic overview of available evidence on the effects of the unsupervised use of commercial exergames at home on adults' physical health (RQ1) and quality of life (RQ2). In addition, different methods can be used to ensure and measure compliance with exergaming interventions in home environments (Donoso Brown et al., 2020), and in few cases exergaming has been related to adverse outcomes, such as musculoskeletal disorders, accidental falls, increased spasticity, or dizziness (Prosperini et al., 2021). Hence, specifically concerning unsupervised exergaming, information is needed on adults' autonomy, compliance, and safety regarding the rehabilitation measures. Thus, we also scrutinize how adults experience the unsupervised use of commercial exergames at home in terms of participant support (RQ3a), adherence (RQ3b), and adverse outcomes (RQ3c).

3. Methods

This systematic review follows the Preferred Reporting Items of Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page et al., 2021) and has been registered with the International Prospective Register of Systematic Reviews (PROSPERO, Registration number: CRD42022341189).

3.1. Database search strategy

The databases Web of Science Core Collection, PsycINFO (via EBSCO), and PubMed, Embase, and CINAHL (via CENTRAL) were searched without time restrictions. Each database was searched first on July 12, 2022. In addition, we updated our search results from each database last on January 30, 2023. The search strings are provided in Supplementary Table S1. In addition, we checked reports included in related systematic reviews as well as all citing and cited references of eligible studies. Figure 1 provides an overview of the study selection process.

3.2. Eligibility criteria and study selection process

Following the PICOS (population, intervention, comparison, outcome, study) statement, the inclusion and exclusion criteria of our systematic review can be found in Table 1. We included peer-reviewed randomized controlled trials (RCTs) published in English language that evaluated the effects of the unsupervised use of commercial exergames at home on the physical health or quality of life in adults in need of rehabilitation. The comparison was anything but unsupervised exergaming at home (e.g., conventional rehabilitation, continuing usual activities, etc.). Physical health outcomes include, inter alia, results from questionnaires related to physical health as well as from tests related to physical activity, such as walking distance and gait. Outcomes related to quality of life include, inter alia, health-related quality of life, confidence in physical activities, fatigue, anxiety, and perceived pain.

Titles and abstracts of eligible studies were screened and coded independently by three reviewers (MR, MS, KB). For all included studies, we performed data extraction and synthesis, where possible. If necessary, the authors of the included articles were contacted to request missing or additional data. The quality of evidence was assessed using the revised tool to assess the risk of bias in randomized trials (RoB 2) (Sterne et al., 2019). Following this approach, studies are rated in five domains and may be related to a low risk of bias, some concerns, or a high risk of bias, whereas "the overall risk of bias generally corresponds to the worst risk of bias in any of the domains" (Sterne et al., 2019, p. 5). Risk of bias assessments are used to assess the robustness of the reported results and should not be misinterpreted as an evaluation of the overall quality of the studies. Three reviewers (MR, MS, KB) inspected the final study reports and study protocols when available. Disagreements were resolved via discussion until a consensus was reached. To assess outcome reporting bias, we compared statistical analysis plans and outcomes pre-specified in protocols and study registers with analyses and results in the final study reports. We also checked if the measures mentioned in the methods section were included in the results section. Finally, we addressed non-reporting bias by searching for study reports of study protocols that met our inclusion criteria.

3.3. Data extraction

Based on the PICOS statement and the template for intervention description and replication (TIDieR) checklist, three reviewers (MR, MS, KB) extracted essential information from eligible studies (cf. Hoffmann et al., 2014; Higgins et al., 2019). We provide information (1) on the report: author(s), year of publication, and study location(s); (2) on the study design: RCT type and characteristics, including blinding and randomization procedures; (3) on the participants: participant type (pathology, diagnostic criteria) as well as characteristics of the baseline and final/analyzed sample (recruitment, sample size, age, and gender); (4) on the intervention: background and aim, devices/exergames used, intended protocol, and participant support; (5) on the realization of the control/comparison group(s); (6) on the outcome definition and measurement: physical health, quality of life, and experiences with the intervention (adherence and adverse outcomes); and (7) on the main findings for physical health, quality of life, and experiences with the intervention (adherence and adverse outcomes). All items from the TIDieR checklist were considered as follows: why (background and aim), what (devices/exergames used, intended protocol, and participant support), who provided (participant support), how, where, when, how much, tailoring, modifications (intended protocol), and how well (intended protocol and adherence). Specifically, we extracted information on the following general exercise and training variables that are relevant to exercise prescription (cf. Burnet et al., 2019; Herold et al., 2019): frequency, intensity, time, type, density, duration, and enjoyment. Relatedly, we also

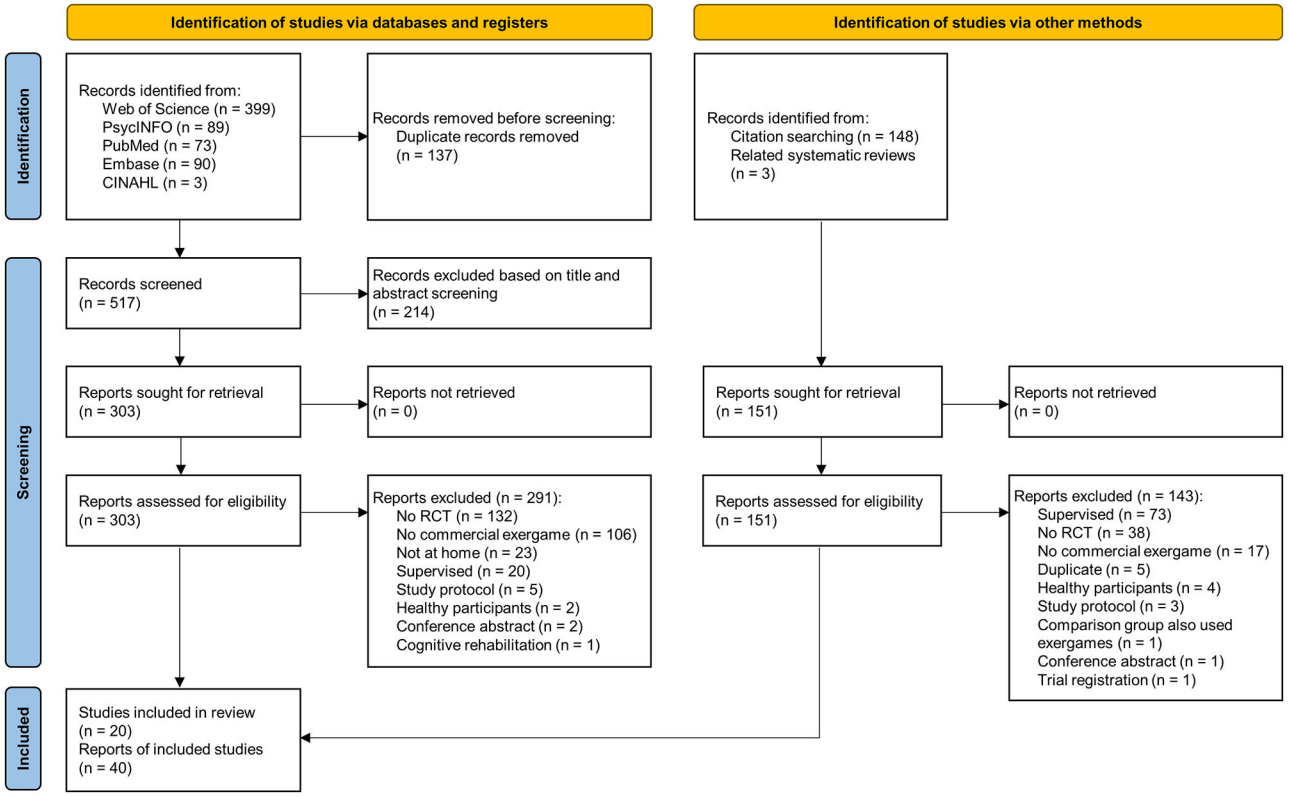

FIGURE 1
Study selection process based on the PRISMA 2020 statement.

examined whether the studies considered the following general training principles: variation, specificity, overload, progression, reversibility, and periodization and programming (Herold et al., 2019). In addition, we extracted information on financial support and financial conflicts of interest of study authors. A meta-analysis could not be undertaken due to the heterogeneity of sample characteristics, exergaming interventions, and outcome measures.

4. Results

4.1. Study selection

Database searching resulted in 654 records. After the removal of duplicates, 517 articles were independently screened. In addition, 151 records were identified through citation searching and screening of related systematic reviews. Overall, 20 studies and 40 reports were included in this systematic review, including final reports, trial protocols, trial registry records, and secondary analyses (see Figure 1).

4.2. Characteristics of included studies

In the following sections, we present key characteristics of the included studies, including (1) location, design, and participants, (2) background and aims of the studies, (3) exergaming interventions and control/comparison groups, (4) effects of exergaming on physical health, (5) effects of exergaming on quality of life, (6) experiences with the exergaming interventions, and (7) financial support and financial conflict of interest. More specific information about the exergaming interventions and control/comparison groups regarding exercise and training variables can be found in Table 2. Table 3 provides a concise overview of the effects of unsupervised exergaming on physical health (RQ1) and quality of life (RQ2) as well as on adults' experiences with unsupervised exergaming at home in terms of participant support (RQ3a), adherence (RQ3b), and adverse outcomes (RQ3c). Additionally, a comprehensive overview of the details of each study can be found in Supplementary Table S2.

4.2.1. Location, design, and participants

The included studies were conducted in different countries. Six studies were conducted in the United States (Sajid et al., 2016; Zondervan et al., 2016; Tefertiller et al., 2019; Yuen et al., 2019; Sanders et al., 2020, 2022), two in Canada (Imam et al., 2017; Tao et al., 2022), two in Italy (Prosperini et al., 2013; Ambrosino et al., 2020), two in the United Kingdom (Adie et al., 2017; Thomas et al., 2017), one in Australia (Zadro et al., 2019), one in Denmark (Villumsen et al., 2019), one in Germany (Golla et al., 2018), one in Iran (Zahedian-Nasab et al., 2021), one in Ireland (Meldrum et al., 2015), one in Israel (Yacoby et al., 2019), one in Switzerland (Punt et al., 2016), and one in multiple countries (Jaarsma et al., 2021a).

TABLE 1 Inclusion and exclusion criteria in terms of population, intervention, comparator, outcome, and study type (PICOS).

PICOS component	Selection criteria	
Population	Inclusion:	Adults (age ≥ 18 years) enrolled in physical rehabilitation programs and living in their own homes or home-like settings (retirement homes/communities, nursing homes, or assisted living homes).
	Exclusion:	Children and adolescents (age < 18 years); healthy adults; adults enrolled in cognitive rehabilitation; adults living in medical facilities and medical care units.
Intervention	Inclusion:	Fully unsupervised use of commercial exergames in terms of video games that require physical exertion and that can be played on commercially available devices that can be purchased by the general public; unsupervised use of commercial exergames after a phase of supervised use of commercial exergames.
	Exclusion:	Use of games that do not require physical exertion; fully supervised use of exergames; use of exergames that cannot be played on commercially available devices that can be purchased by the general public.
Comparison	Inclusion:	Anything but unsupervised exergaming at home (e.g., conventional rehabilitation, continuing usual activities, etc.).
Outcome	Inclusion:	Quantitative measures of physical health (e.g., limb function, disease activity), including physical activity (e.g., balance, walking). Quantitative measures of quality of life (e.g., confidence in physical activity, anxiety, and perceived pain). Quantitative and qualitative measures of experiences with the intervention (e.g., adherence, adverse outcomes, enjoyment/fun).
Study	Inclusion:	Randomized controlled trials including original research studies and pilot/feasibility studies.
	Exclusion:	Quasi-experimental studies, solely qualitative studies, case studies, study protocols, theoretical articles, reviews, and conference abstracts.
Date		No restrictions.
Language		English.

Sixteen studies used parallel RCT designs (Meldrum et al., 2015; Punt et al., 2016; Sajid et al., 2016; Adie et al., 2017; Imam et al., 2017; Thomas et al., 2017; Golla et al., 2018; Tefertiller et al., 2019; Villumsen et al., 2019; Yacoby et al., 2019; Yuen et al., 2019; Zadro et al., 2019; Ambrosino et al., 2020; Jaarsma et al., 2021a; Zahedian-Nasab et al., 2021; Tao et al., 2022) and four crossover RCT designs (Prosperini et al., 2013; Zondervan et al., 2016; Sanders et al., 2020, 2022). More specifically, seven of the included studies were pilot studies (Prosperini et al., 2013; Sajid et al., 2016; Thomas et al., 2017; Golla et al., 2018; Yacoby et al., 2019; Yuen et al., 2019; Ambrosino et al., 2020), four were feasibility studies (Zondervan et al., 2016; Imam et al., 2017; Sanders et al., 2020, 2022), and two were multicenter studies (Adie et al., 2017; Jaarsma et al., 2021a). Moreover, two studies included an additional comparison group (i.e., three groups) (Punt et al., 2016; Sajid et al., 2016).

Overall, data were collected from 1,558 participants (1,368 analyzed), with final/analyzed sample sizes ranging from 10 participants (Sanders et al., 2022) to 464 participants (Jaarsma et al., 2021a). More specifically, nine studies included 30 participants or less (Sajid et al., 2016; Zondervan et al., 2016; Imam et al., 2017; Thomas et al., 2017; Golla et al., 2018; Yacoby et al., 2019; Yuen et al., 2019; Sanders et al., 2020, 2022), and two studies included more than 100 participants (Adie et al., 2017; Jaarsma et al., 2021a). Most participants were older adults, since participants in 10 studies had a mean age of above 60 years, including those studies with the highest sample sizes (Sajid et al., 2016; Adie et al., 2017; Imam et al., 2017; Golla et al., 2018; Villumsen et al., 2019; Yuen et al., 2019; Zadro et al., 2019; Jaarsma et al., 2021a; Zahedian-Nasab et al., 2021; Tao et al., 2022). Based on the available information on gender (n = 1,532), the studies include more male (63.77%; n = 977) than female participants (36.23%; n = 555).

4.2.2. Background and aims of the studies

Regarding the background of the included studies, we noted that only four works contained explicit references to theoretical frameworks regarding their intervention (Imam et al., 2017; Thomas et al., 2017; Jaarsma et al., 2021b; Tao et al., 2022). Imam et al. (2017) and Tao et al. (2022) used a similar intervention that was based on social cognitive theory and aimed to address all four sources of self-efficacy. Jaarsma et al. (2021b) outlined a conceptual model on beneficial effects of exergaming on health behaviors, exercise capacity, and health via motivation, physical activity, and self-efficacy. Thomas et al. (2017) mentioned that their intervention considered social cognitive theory, cognitive behavioral theory, and self-determination theory. Notably, Sanders et al. (2022) did not mention that their intervention was based on a theory, but that participants could adjust the game for optimal challenges in line with motor learning theory. Most other studies were based on an empirical background in terms of previous meta-analytic results or empirical findings from individual studies (see Supplementary Table S2).

Concerning the aim of the exergaming interventions, commercial exergames were used for the rehabilitation of various pathologies. Stroke was addressed in five studies (Zondervan et al., 2016; Adie et al., 2017; Golla et al., 2018; Yacoby et al., 2019; Sanders et al., 2020), multiple sclerosis in two studies (Prosperini et al., 2013; Thomas et al., 2017), prostate cancer in two studies (Sajid et al., 2016; Villumsen et al., 2019), and lower limb amputation in two studies (Imam et al., 2017; Tao et al., 2022). One study each included participants with rheumatoid arthritis (Ambrosino et al., 2020), heart failure (Jaarsma et al., 2021a), unilateral peripheral vestibular loss (Meldrum et al., 2015), ankle sprain (Punt et al., 2016), spinal cord injury (Sanders et al., 2022), traumatic brain injury (Tefertiller et al., 2019), idiopathic pulmonary fibrosis (Yuen et al., 2019), chronic low back pain

(Zadro et al., 2019), and fall risk (Zahedian-Nasab et al., 2021). An overview of the games used in the case of each pathology can be found in Table 2.

4.2.3. Exergaming interventions and control/comparison groups

To facilitate comparisons between the procedures used in intervention and control/comparison groups, Table 2 provides a detailed overview of exercise variables relevant in an exercise session (type, intensity, and session duration) and training variables relevant in a training program (frequency, density, program duration, and enjoyment).

First, regarding the type of exercise, different exergames were used: 10 studies (50%) included only Wii Fit games (Prosperini et al., 2013; Meldrum et al., 2015; Punt et al., 2016; Sajid et al., 2016; Imam et al., 2017; Golla et al., 2018; Yuen et al., 2019; Zadro et al., 2019; Ambrosino et al., 2020; Tao et al., 2022), two studies (10%) only Wii Sports games (Adie et al., 2017; Jaarsma et al., 2021a), and one study (5%) used both Wii Fit and Wii Sports games (Thomas et al., 2017). Three studies (15%) used only Xbox Kinect games (Tefertiller et al., 2019; Villumsen et al., 2019; Zahedian-Nasab et al., 2021), and one study (5%) used Xbox Kinect games or PlayStation EyeToy games (Yacoby et al., 2019). Finally, three studies (15%) used a game that comes with the commercially available device MusicGlove (Zondervan et al., 2016; Sanders et al., 2020, 2022). Consequently, participants in these studies completed different types of activities, such as yoga (Wii Fit), baseball (Wii Sports), table tennis (Xbox), or gripping movements (MusicGlove). Moreover, participants in 13 studies (65%) could complete between four and seven activities using Wii Fit, Wii Sports, or Xbox games, participants in three studies (15%) played one game using the MusicGlove device, and the number of games was not specified in the remaining four studies (20%).

In the control/comparison groups, participants most frequently completed conventional exercises, which was the case in eight studies (40%) (Meldrum et al., 2015; Punt et al., 2016; Zondervan et al., 2016; Golla et al., 2018; Tefertiller et al., 2019; Yacoby et al., 2019; Sanders et al., 2020, 2022), followed by usual activities in four studies (20%) (Prosperini et al., 2013; Villumsen et al., 2019; Zadro et al., 2019; Ambrosino et al., 2020) and usual care in terms of conventional rehabilitation in two studies (10%) (Thomas et al., 2017; Zahedian-Nasab et al., 2021). In addition, three studies (15%) realized playing cognitive digital games (Imam et al., 2017; Yuen et al., 2019; Tao et al., 2022), two studies (10%) implemented tailored exercises (Sajid et al., 2016; Adie et al., 2017), and one study (5%) included physical activity advice as a comparison group (Jaarsma et al., 2021a).

Second, only three studies (15%) specified the intensity at which participants were exercising (Sajid et al., 2016; Yuen et al., 2019; Zadro et al., 2019). In the study of Sajid et al. (2016), the exergaming group and one comparison group engaged in exercises of similar low to moderate intensity. In contrast, participants in the study of Yuen et al. (2019) played exergames at a moderate to heavy intensity, whereas the control group played a cognitive digital game that was not physically taxing. Participants in the study of Zadro et al. (2019) played exergames at a moderate intensity or continued usual activities (control group). One study (5%) explicitly noted that intensity was at own convenience (Villumsen et al., 2019), and the other 16 (80%) studies did not provide information on exercise intensity.

Third, session duration varied between 15 and 60 min in the exergaming and control/comparison groups. Four studies (20%) reported information on session duration only in terms of minimum or maximum values, three of which only reported prescribed duration per week (session duration unknown). No information on session duration was provided for the exergaming group in overall five studies (25%), and six studies (30%) used control groups that were not instructed to exercise, so session duration was not applicable (see Table 2).

Fourth, the frequency in the studies ranged from two times per week (Punt et al., 2016; Zahedian-Nasab et al., 2021) up to seven days per week (Prosperini et al., 2013; Adie et al., 2017; Ambrosino et al., 2020). In between, participants also played exergames three times per week (Zondervan et al., 2016; Imam et al., 2017; Golla et al., 2018; Villumsen et al., 2019; Yuen et al., 2019; Zadro et al., 2019; Sanders et al., 2022), three to four times per week (Tefertiller et al., 2019), five times per week (Meldrum et al., 2015; Sajid et al., 2016; Jaarsma et al., 2021b), and six times per week (Yacoby et al., 2019). Participants in one study played at their own convenience (Tao et al., 2022), and there was no information about training frequency in one study (Sanders et al., 2020). Notably, one study used different frequency schedules in terms of two times per week in the exergaming group and nine sessions over six weeks in the comparison group (Punt et al., 2016).

Fifth, density of the training remained unclear in all but four studies (20%) (Prosperini et al., 2013; Imam et al., 2017; Zadro et al., 2019; Sanders et al., 2022). Participants had one rest day (Prosperini et al., 2013; Zadro et al., 2019) or one to two rest days in between exercise days (Imam et al., 2017). Another study mentioned that two sets of repetitions were completed in two sessions per day (Sanders et al., 2022).

Sixth, program duration ranged from three weeks (Zondervan et al., 2016; Sanders et al., 2020, 2022) to 12 months (Thomas et al., 2017). Other studies used training programs with a duration of four weeks (Imam et al., 2017; Tao et al., 2022), five weeks (Yacoby et al., 2019), six weeks (Meldrum et al., 2015; Punt et al., 2016; Sajid et al., 2016; Adie et al., 2017; Golla et al., 2018; Zahedian-Nasab et al., 2021), eight weeks (Zadro et al., 2019; Ambrosino et al., 2020), or 12 weeks (Prosperini et al., 2013; Tefertiller et al., 2019; Villumsen et al., 2019; Yuen et al., 2019; Jaarsma et al., 2021b).

Finally, enjoyment regarding the training was assessed in only three studies (15%) (Meldrum et al., 2015; Thomas et al., 2017; Yacoby et al., 2019). Participants who played balance exergames reported more enjoyment than participants in the control group who performed conventional balance exercises (Meldrum et al., 2015). Thomas et al. (2017) found that most participants enjoyed the exergaming intervention while there was no information on the control group (usual care). In the study of Yacoby et al. (2019), enjoyment of participants was high in the exergaming group, and slightly higher than in the comparison group who reported moderate to high enjoyment. Notably, Prosperini et al. (2013) did not report but consider enjoyment since participants could play

TABLE 2 Exercise and training variables in the intervention and control/comparison groups.

Study	Exercise variables (relevant in an exercise session)			Training variables (relevant in a training program)				Findings	
References and pathology	Type	Intensity	Session duration	Frequency	Density	Program duration	Enjoyment	Physical health	Quality of life
Adie et al. (2017) Arm weaknesses following a stroke	IG: 4 Wii Sports games (bowling, tennis, golf, baseball) CG: tailored arm exercises IG and CG: usual care and rehabilitation	NI	≤45 min (+15 min warm-up exercises)	7 days/week	NI	6 weeks	NI	= (arm function)	= (health state)
Ambrosino et al. (2020) Rheumatoid arthritis	IG: 5 Wii Fit games (running, skiing, balloons shooting, bike slalom, balls moving through labyrinth) CG: usual activities	IG: NI CG: N/A	IG: 50 min (10 min/game) CG: N/A	IG: 7 days/week CG: N/A	IG: NI CG: N/A	8 weeks	NI	= (global health)	+ (difficulty with activities) – (fatigue)
Golla et al. (2018) Stroke	IG: 4 Wii Fit Plus balance games (ski slalom, table tilt, penguin slide, balance bubble) CG: conventional balance exercises	NI	30 min	≥3 times/week	NI	6 weeks	NI	n.s. (balance, gait)	+ (balance confidence)
Imam et al. (2017) Lower limb amputation	IG: 4 Wii Fit games (yoga, balance games, strength training, aerobics) CG: Wii Big Brain Academy Degree program (cognitive tasks)	IG: NI CG: N/A	40 min	3 days/week	1–2 rest days[a]	4 weeks	NI	+ (walking capacity) n.s. (physical activity, steps per day, cognitive-motor interaction)	n.s. (balance confidence)
Jaarsma et al. (2021a) Heart failure	IG: 5 Wii Sports games (baseball, bowling, boxing, golf, tennis) CG: protocol-based physical activity advice (motivational support)	IG: NI CG: N/A	IG: 30 min CG: N/A	IG: 5 days/week CG: N/A	IG: NI CG: N/A	12 weeks	NI	+ (muscle function) n.s. (walking capacity, physical activity)	n.s. (exercise motivation, exercise self-efficacy)
Meldrum et al. (2015) Unilateral peripheral vestibular loss	IG: 5 Wii Fit Plus games representing balance exercises (yoga, leg exercises, balance games, aerobics, training plus games) CG: conventional balance exercises using a foam balance mat IG and CG: similar gaze stabilization exercises and a graded walking program	NI	15 min	5 days/week	NI	6 weeks	IG: more enjoyment than CG CG: NI	= (gait speed, standing balance)	= (balance confidence, anxiety, depression, rehabilitation benefits)
Prosperini et al. (2013) Multiple sclerosis	IG: 7 Wii Fit Plus balance games (zazen, table tilt, ski slalom, penguin slide, tightrope walk, soccer heading, balance bubble) CG: usual activities	IG: NI CG: N/A	IG: 30 min (10 min/game) CG: N/A	IG: 7 days/week CG: N/A	IG: 1 rest day/week was allowed CG: N/A	12 weeks	NI	+ (walking speed, static and dynamic balance)	+ (lower physical and psychological impact of multiple sclerosis)

(Continued)

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TABLE 2 (Continued)

Study	Exercise variables (relevant in an exercise session)			Training variables (relevant in a training program)				Findings	
References and pathology	Type	Intensity	Session duration	Frequency	Density	Program duration	Enjoyment	Physical health	Quality of life
Punt et al. (2016, 2017) Ankle sprain	IG: 4 Wii Fit balance games (ski slalom, table tilt, penguin slide, balance bubble) CG1: conventional physical therapy and advice to practice at home CG2: no exercise therapy	IG: preferred difficulty level CG1: difficulty level adjusted to progress CG2: N/A	IG: ≥30 min CG1: 30 min CG2: N/A	IG: 2 times/week CG2: 9 sessions over 6 weeks CG2: N/A	IG and CG1: NI CG2: N/A	6 weeks	NI	= (foot and ankle ability, gait speed, cadence, step length) + (single-support time)	+ (pain during rest) = (pain during walking)
Sajid et al. (2016) Prostate cancer	IG: Wii Fit games (exact games not specified) CG1: progressive home-based aerobic walking exercise program and therapeutic resistance band exercise program CG2: usual care	IG: similar intensity as in CG1 CG1: low to moderate[b] CG2: N/A	IG and CG1: similar (session duration unknown) CG2: N/A	IG and CG1: ≥5 days/week CG2: N/A	IG and CG1: NI CG2: N/A	6 weeks	NI	n.s.[c] (physical performance, steps per day, handgrip strength, lean muscle mass, chest press repetitions)	N/A
Sanders et al. (2020) Stroke affecting the hand	IG: hand exercises with MusicGlove CG: conventional hand therapy exercises depicted in a booklet	NI	≥3 h/week (session duration unknown)	NI	NI	3 weeks	NI	n.s. (gripping function)	N/A
Sanders et al. (2022) Spinal cord injury affecting hand function	IG: hand exercises with MusicGlove CG: 18 conventional hand therapy exercises	NI	IG: ≥3 h/week (session duration unknown) CG: ≥3 h/week (1 h/session)	≥3 times/week	IG: NI CG: 2 sets of repetitions, 2 times/day	3 weeks	NI	n.s. (gripping function, sensorimotor hand function)	N/A
Tao et al. (2022) Lower limb amputation	IG: 4 Wii Fit games (yoga, balance games, strength training, aerobics) CG: Wii Big Brain Academy Degree program (cognitive tasks)	NI	As much as participants liked (session duration unknown)	As much as participants liked (frequency unknown)	NI	4 weeks	NI	n.s. (walking capacity, lower limb, dynamic standing balance)	+ (balance confidence)
Tefertiller et al. (2019) Traumatic brain injury	IG: 6 Xbox Kinect Adventures and Xbox Kinect Sports games (20,000 leaks, soccer, table tennis, rallyball, beach volleyball, river rush)[d] CG: traditional home-based exercise program[d]	NI	30 min	3–4 times/week	NI	12 weeks	NI	= (balance)	n.s. (balance confidence, community participation)
Thomas et al. (2017) Multiple sclerosis	IG: Wii Sports games, Wii Sports Resort games, and Wii Fit Plus games (exact games not specified) CG: usual care	NI	NI	NI	NI	IG: 12 months CG: 6 months (delayed group) IG and CG (after delay): first 3 weeks were supervised	IG: most participants enjoyed the exergaming intervention CG: NI	n.s. (physical activity, self-efficacy, balance, gait)	n.s. (self-efficacy, hospital depression, hospital anxiety, psychological impact of multiple sclerosis on day-to-day life)

(Continued)

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TABLE 2 (Continued)

Study	Exercise variables (relevant in an exercise session)			Training variables (relevant in a training program)				Findings	
References and pathology	Type	Intensity	Session duration	Frequency	Density	Program duration	Enjoyment	Physical health	Quality of life
Villumsen et al. (2019) Prostate cancer	IG: 3 Xbox Kinect 360 games (Adventures, Sports, and Your Shape Fitness Evolved 2012) CG: continuation of normal daily activities	IG: at own convenience CG: N/A	IG: 60 min CG: N/A	IG: 3 times/week CG: N/A	IG: NI CG: N/A	12 weeks	NI	+ (walking capacity)	n.s. (global health)
Yacoby et al. (2019) Stroke	IG: 3–5 games, either using Xbox Kinect (standing), or PlayStation EyeToy (sitting) CG: self-administered Graded Repetitive Arm Supplementary Program (GRASP) and 3 lower extremity exercises (stretching, marching, and stepping)	IG: NI CG: 3 levels of exercises	60 min	6 times/week	NI	5 weeks (+4 optional weeks)	IG: high enjoyment, slightly higher than CG CG: moderate to high enjoyment	n.s. (upper extremity, perceived balance improvement)	N/A
Yuen et al. (2019) Idiopathic pulmonary fibrosis	IG: Wii Fit games (exact games not specified) with Wii U Balance Board CG: cognitive digital game on Wii U without Wii U Balance Board IG and CG: encouragement to engage in physical activity	IG: moderate to heavy[e] CG: not physically taxing	IG: 30 min exergaming + 30 min physical activity CG: 30 gaming + 30 min physical activity	3 times/week gaming + 3 times/week physical activity	NI	12 weeks	NI	n.s. (walking capacity)	n.s. (health-related quality of life)
Zadro et al. (2019) Chronic low back pain	IG: 4 Wii Fit U games (yoga, muscle/strength training, aerobics, balance games) CG: continuation of usual activities (including care-seeking behaviors)	IG: moderate[f] CG: N/A	IG: 60 min CG: N/A	IG: 3 times/week CG: N/A	IG: ≥1 day off CG: N/A	8 weeks	NI	+ (function[g], engagement in physical activity)	+ (pain self-efficacy, pain intensity)
Zahedian-Nasab et al. (2021) Fall risk	IG: 4 Xbox Kinect sports pack games (ski, penalty, goalkeeper, darts) CG: routine programs of the nursing homes (jogging in the nursing home, table tennis, some artistic activities)	NI	IG: 30–60 min CG: NI	IG: 2 times/week CG: NI	NI	6 weeks	NI	+ (balance)	+ (fear of falling)
Zondervan et al. (2016) Chronic stroke	IG: hand exercises with MusicGlove CG: conventional hand therapy exercises depicted in a booklet	NI	≥3 h/week (session duration unknown)	≥3 times/week	NI	3 weeks	NI	= (gripping function) + (motor activity)	N/A

CG, Control/Comparison group; IG, Intervention Group; N/A, Not Applicable; NI, No Information; PH, Physical Health; QoL, Quality of Life. For studies that include supervised and unsupervised uses of exergames, data only refer to the unsupervised phase.

+, Significantly higher increase in the exergaming/intervention group in relation to the control/comparison group(s).

=, Similar increase in the exergaming/intervention group and the control/comparison group(s).

n.s., No significant change in the exergaming/intervention group and the control/comparison group(s).

[a]Exercising was on Mondays, Wednesdays, and Fridays; rest days were Tuesdays, Thursdays, and the weekends.

[b]Low to moderate for resistance exercises (perceived exertion of 3–5 on the American College of Sports Medicine revised rating scale) or moderate for aerobic walking exercise program.

[c]Exergaming/intervention group in relation to the control group (three-group design).

[d]Focus of the games vs. exercises was based on the most impaired subscale of the Balance Evaluation Systems Test (BESTest).

[e]Based on perceived dyspnea level.

[f]Rating of 13 on the Borg rating scale.

[g]But not in case of family history of activity-limiting lower back pain (see Zadro et al., 2020).

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their favorite games in the last four weeks. Still, enjoyment was neglected in most studies.

An overview of general training principles considered in the studies can be found in Supplementary Table S3. Eight studies (40%) mentioned variation in the exercise and training variables by means of changing exercises or games, four of which (20%) used no systematic manipulation but provided free choice of games. Ten studies (50%) implemented some specificity in the exergaming groups by means of preselected games (Prosperini et al., 2013; Punt et al., 2016; Sajid et al., 2016; Imam et al., 2017; Golla et al., 2018; Tefertiller et al., 2019; Villumsen et al., 2019; Yacoby et al., 2019; Zadro et al., 2019; Zahedian-Nasab et al., 2021). Other studies offered choice of difficulty or adjusted the exercise variables on an individual level or the setting on the group level. Three studies (15%) provided no information on specificity regarding the exergaming group. In the control/comparison groups, specificity was realized in terms of exercise booklets on the group level and tailored exercises in terms of type, difficulty, and intensity on the individual level. Progression was mentioned in 13 studies (65%) and possible by means of change in game levels, game modes, or additional materials, such as resistance bands or free weights. Related to progression and variation, some forms of periodization and programming were realized. No information was provided regarding overload and reversibility (see Supplementary Table S3).

4.2.4. Effects of exergaming on physical health (RQ1)

An overview of effects of exergaming on physical health can be found in Table 3. Physical health improved more in the intervention groups in relation to the comparison groups in seven studies (35%) (Prosperini et al., 2013; Zondervan et al., 2016; Imam et al., 2017; Villumsen et al., 2019; Zadro et al., 2019; Jaarsma et al., 2021a; Zahedian-Nasab et al., 2021). Exergaming was more effective than playing cognitive digital games (Imam et al., 2017), receiving physical activity advice (Jaarsma et al., 2021a), continuing usual activities (Prosperini et al., 2013; Villumsen et al., 2019; Zadro et al., 2019), usual rehabilitation care (Zahedian-Nasab et al., 2021), and conventional exercises (Zondervan et al., 2016). Five studies (25%) reported similar improvement in the groups when compared to tailored exercises (Adie et al., 2017), usual activities (Ambrosino et al., 2020), or conventional exercises (Meldrum et al., 2015; Punt et al., 2016; Tefertiller et al., 2019). Eight studies (40%) reported no significant changes after exergaming and conventional exercises (Golla et al., 2018; Yacoby et al., 2019; Sanders et al., 2020, 2022), playing cognitive digital games (Yuen et al., 2019; Tao et al., 2022), or usual care (Sajid et al., 2016; Thomas et al., 2017). Notably, Sajid et al. (2016) reported no significant changes after exergaming and usual care, but a significant improvement in the comparison group that engaged in a progressive home-based aerobic walking exercise program and a therapeutic resistance band exercise program.

4.2.5. Effects of exergaming on quality of life (RQ2)

As also shown by Table 3, 15 studies reported indicators of quality of life. Seven studies (47%) found higher improvement in the intervention group compared to usual activities (Prosperini et al., 2013; Zadro et al., 2019; Ambrosino et al., 2020), conventional exercises (Punt et al., 2016; Golla et al., 2018), usual rehabilitation care (Zahedian-Nasab et al., 2021), and playing cognitive digital games (Tao et al., 2022). Two studies (13%) reported similar improvement in both groups when compared to tailored exercises (Adie et al., 2017) or conventional exercises (Meldrum et al., 2015). Finally, six studies (40%) reported no significant changes after exergaming and playing cognitive digital games (Imam et al., 2017; Yuen et al., 2019), receiving physical activity advice (Jaarsma et al., 2021a), conventional exercises (Tefertiller et al., 2019), usual care (Thomas et al., 2017), or usual activities (Villumsen et al., 2019).

4.2.6. Experiences with the exergaming interventions (RQ3)

Participant support (RQ3a) was realized in each study and included setting up the exergaming system, training with the exergaming system, and contact with participants (see Table 3). First, the exergaming system was set up by the research team in 10 studies (50%) (Prosperini et al., 2013; Punt et al., 2016; Adie et al., 2017; Golla et al., 2018; Tefertiller et al., 2019; Yacoby et al., 2019; Yuen et al., 2019; Zadro et al., 2019; Jaarsma et al., 2021a; Zahedian-Nasab et al., 2021). The other studies did not provide information on the setup. Hence, although commercial exergames are ready to use, care was taken of the correct setup in these rehabilitation settings. Second, participants received instructions in 10 studies (50%) (Meldrum et al., 2015; Punt et al., 2016; Sajid et al., 2016; Adie et al., 2017; Thomas et al., 2017; Golla et al., 2018; Villumsen et al., 2019; Zadro et al., 2019; Jaarsma et al., 2021a; Zahedian-Nasab et al., 2021). Instructions included written or personal instructions on the exercises and exergames and how to play them. Third, participants received some training before the start of the exergaming intervention in 16 studies (80%) (Prosperini et al., 2013; Meldrum et al., 2015; Punt et al., 2016; Sajid et al., 2016; Zondervan et al., 2016; Adie et al., 2017; Imam et al., 2017; Thomas et al., 2017; Golla et al., 2018; Tefertiller et al., 2019; Yacoby et al., 2019; Ambrosino et al., 2020; Sanders et al., 2020, 2022; Jaarsma et al., 2021a; Tao et al., 2022). Noteworthy, exergaming started in clinical settings and then transitioned to exergaming in home environments in five studies (25%) (Meldrum et al., 2015; Imam et al., 2017; Thomas et al., 2017; Ambrosino et al., 2020; Tao et al., 2022). Fourth, during the exergaming intervention, participants were contacted via phone in 11 studies (55%) (Sajid et al., 2016; Zondervan et al., 2016; Adie et al., 2017; Imam et al., 2017; Thomas et al., 2017; Golla et al., 2018; Villumsen et al., 2019; Yacoby et al., 2019; Yuen et al., 2019; Zadro et al., 2019; Jaarsma et al., 2021a). In one of these studies, participants had contact in multiple ways (face-to-face, phone, and email) (Thomas et al., 2017). In one study (5%), participants themselves could call the study coordinator in case of technical or health issues (Ambrosino et al., 2020). Moreover, participants had physiotherapist meetings in two studies (10%) (Prosperini et al., 2013; Meldrum et al., 2015). Further, participants in one study (5%) had several contact possibilities since they were living in a nursing home (Zahedian-Nasab et al., 2021). In five studies (25%), participants were not contacted by the research team during the unsupervised phase (Punt et al., 2016; Tefertiller et al., 2019; Sanders et al., 2020, 2022; Tao et al., 2022). Hence, participant

TABLE 3 Overview of the empirical outcomes of the included studies.

References	RQ1 (physical health)	RQ2 (quality of life)	RQ3a (participant support)	RQ3b (adherence)	RQ3c (adverse outcomes)
Adie et al. (2017)	=	=	Yes[1,2,3,4]	High	No
Ambrosino et al. (2020)	=	+[a]	Yes[3,4]	High	No
Golla et al. (2018)	n.s.	+	Yes[1,2,3,4]	High	No
Imam et al. (2017)	+[a]	n.s.	Yes[3,4]	High	No
Jaarsma et al. (2021a)	+[a]	n.s.	Yes[1,2,3,4]	Moderate	No
Meldrum et al. (2015)	=	=	Yes[2,3,4]	High	Yes
Prosperini et al. (2013)	+	+	Yes[1,3,4]	High	Yes
Punt et al. (2016, 2017)	=[b]	+	Yes[2,3]	N/A	N/A
Sajid et al. (2016)	n.s.[c]	N/A	Yes[2,3,4]	N/A	N/A
Sanders et al. (2020)	n.s.	N/A	Yes[1,3]	Moderate	N/A
Sanders et al. (2022)	n.s.	N/A	Yes[1,3]	Moderate	N/A
Tao et al. (2022)	n.s.	+	Yes[3]	Moderate	No
Tefertiller et al. (2019)	=	n.s.	Yes[1,3]	Moderate	No
Thomas et al. (2017)	n.s.	n.s.	Yes[2,3,4]	N/A	Yes
Villumsen et al. (2019)	+	n.s.	Yes[2,4]	High	Yes
Yacoby et al. (2019)	n.s.	N/A	Yes[1,3,4]	Moderate	No
Yuen et al. (2019)	n.s.	n.s.	Yes[4]	Low	No
Zadro et al. (2019)	+	+	Yes[1,2,4]	High	No
Zahedian-Nasab et al. (2021)	+	+	Yes[2,4]	N/A	N/A
Zondervan et al. (2016)	+[a]	N/A	Yes[1,3,4]	N/A	N/A

N/A, Not Applicable. Adherence was categorized as high (> 70% of the intended goal), moderate (30–50%), or low (<30%).
+, Significantly higher increase in the exergaming/intervention group in relation to the control/comparison group(s).
=, Similar increase in the exergaming/intervention group and the control/comparison group(s).
n.s., No significant change in the exergaming/intervention group and the control/comparison group(s).
[a]Based on one of several outcomes.
[b]Based on most outcomes.
[c]Exergaming/intervention group in relation to the control group (three-group design).
[1]Setup: participants were supported in setting up the exergaming system.
[2]Instructions: participants received exercise instructions.
[3]Training: participants received some training before the start of the unsupervised phase of the exergaming intervention.
[4]Contact: participants were contacted by professionals or could contact professionals during the unsupervised phase of the exergaming intervention.

support was common but also implemented differently in studies on unsupervised exergaming in home environments.

Adherence with the intervention (RQ3b) was reported in 15 studies (see Table 3). Adherence with the intervention was high (>70% of the intended goal) in eight studies (53%) (Prosperini et al., 2013; Meldrum et al., 2015; Adie et al., 2017; Imam et al., 2017; Golla et al., 2018; Villumsen et al., 2019; Zadro et al., 2019; Ambrosino et al., 2020). Adherence was found to be moderate in six studies (40%) (Tefertiller et al., 2019; Yacoby et al., 2019; Sanders et al., 2020, 2022; Jaarsma et al., 2021a; Tao et al., 2022) and low (<30%) in one study (7%) (Yuen et al., 2019). In two studies, adherence was not assessable since participants did not receive a specific goal, such as the frequency or duration of exergaming (Thomas et al., 2017), or since exact adherence metrics remained unknown (Zondervan et al., 2016). In sum, adherence to the unsupervised exergaming interventions was moderate to high in most studies.

Information on adverse outcomes (RQ3c) was provided in 14 studies (see Table 3). Adverse outcomes were found in four studies (29%) and included low back pain (Meldrum et al., 2015), mild to moderate low back pain or knee pain (Prosperini et al., 2013), leg and back pain or other non-serious outcomes (Thomas et al., 2017), and non-heart-related chest pain due to surgical clips in the thorax (Villumsen et al., 2019). By contrast, 10 studies (71%) found no adverse outcomes related to exergaming (Adie et al., 2017; Imam et al., 2017; Golla et al., 2018; Tefertiller et al., 2019; Yacoby et al., 2019; Yuen et al., 2019; Zadro et al., 2019; Ambrosino et al., 2020; Jaarsma et al., 2021a; Tao et al., 2022). Relatedly, it was found that exergaming resulted in low to moderate stress levels (Golla et al., 2018), satisfaction with the intervention (Punt et al., 2016; Golla et al., 2018; Yacoby et al., 2019), and higher enjoyment compared to conventional exercises (Meldrum et al., 2015). Overall, few studies have found mild to moderate adverse outcomes of unsupervised exergaming.

4.2.7. Financial support and financial conflicts of interest

In the context of commercial exergames, financial support of the studies and financial conflicts of interest of the study authors could be of relevance. Concerning financial support, one study (5%) indicated no funding yet received three exergaming devices from the manufacturer (Zadro et al., 2019), and two studies (10%) received no funding (Prosperini et al., 2013; Ambrosino et al., 2020). The remaining 17 studies (85%) received public funding from universities or other institutions (Meldrum et al., 2015; Punt et al., 2016; Sajid et al., 2016; Zondervan et al., 2016; Adie et al., 2017; Imam et al., 2017; Thomas et al., 2017; Golla et al., 2018; Tefertiller et al., 2019; Villumsen et al., 2019; Yacoby et al., 2019; Yuen et al., 2019; Sanders et al., 2020, 2022; Jaarsma et al., 2021a; Zahedian-Nasab et al., 2021; Tao et al., 2022). A financial conflict of interest was declared by authors of two studies (10%) regarding the manufacturers of the exergaming device (Zondervan et al., 2016; Sanders et al., 2022), and authors of one study (5%) declared a conflict of interest concerning healthcare and pharmaceutical companies (Prosperini et al., 2013). Three studies (15%) contained no information on competing interests (Punt et al., 2016; Yacoby et al., 2019; Yuen et al., 2019), and the remaining 14 studies (70%) declared no conflict of interest (Meldrum et al., 2015; Sajid et al., 2016; Adie et al., 2017; Imam et al., 2017; Thomas et al., 2017; Golla et al., 2018; Tefertiller et al., 2019; Villumsen et al., 2019; Zadro et al., 2019; Ambrosino et al., 2020; Sanders et al., 2020; Jaarsma et al., 2021a; Zahedian-Nasab et al., 2021; Tao et al., 2022). Overall, most studies received financial support in terms of public funding and most authors reported no competing interests.

4.3. Quality assessment of included studies

The quality assessment of the included studies was based on the revised tool to assess the risk of bias in randomized trials (RoB 2) (Sterne et al., 2019). An overview of the quality assessment for each of the five domains of the risk of bias tool is provided in Figure 2. As shown, the overall risk of bias was rated as low in four studies (20%) (Meldrum et al., 2015; Adie et al., 2017; Villumsen et al., 2019; Sanders et al., 2022), and as high in six studies (30%) (Imam et al., 2017; Golla et al., 2018; Yacoby et al., 2019; Zadro et al., 2019; Sanders et al., 2020; Jaarsma et al., 2021a). Reasons for high risk of bias covered ceiling effects for the primary outcome (Golla et al., 2018) and reporting bias in terms of omitting measures that were announced in the protocol related to the primary outcome (Imam et al., 2017; Yacoby et al., 2019; Zadro et al., 2019; Sanders et al., 2020; Jaarsma et al., 2021a). In addition, some concerns were found in 10 studies (50%) (Prosperini et al., 2013; Punt et al., 2016; Sajid et al., 2016; Zondervan et al., 2016; Thomas et al., 2017; Tefertiller et al., 2019; Yuen et al., 2019; Ambrosino et al., 2020; Zahedian-Nasab et al., 2021; Tao et al., 2022). Reasons for some concerns were a missing protocol (Prosperini et al., 2013; Punt et al., 2016; Tefertiller et al., 2019; Ambrosino et al., 2020), a missing analysis plan in the trial registration (Thomas et al., 2017; Yuen et al., 2019; Zahedian-Nasab et al., 2021), missing information on the randomization process (Sajid et al., 2016; Tefertiller et al., 2019), and reporting bias regarding a secondary outcome (Zondervan et al., 2016; Tao et al., 2022).

In addition to the overall frequency analysis presented in Figure 2, the results of the quality assessment for each included study are shown in Figure 3. In the following, we explain our ratings for each of the five domains of the risk of bias tool (Sterne et al., 2019): The first domain (D1) considers potential biases arising from the randomization process, which was low for all but four studies that were related to some concerns (Sajid et al., 2016; Tefertiller et al., 2019; Yacoby et al., 2019; Ambrosino et al., 2020). These concerns arose due to the use of block randomization with a fixed block size which can result in a predictable allocation process (Yacoby et al., 2019; Ambrosino et al., 2020), and due to missing exact information on the randomization process (Sajid et al., 2016; Tefertiller et al., 2019). The second domain (D2) is about biases due to deviations from intended interventions, and the third domain (D3) is about bias due to missing outcome data. Risk of bias regarding both domains was rated as low for all studies (see Figures 2, 3). The fourth domain (D4) addresses biases in the measurement of the outcome, which was rated as low for all but two studies that found ceiling effects in three outcome measures at baseline (Golla et al., 2018) or used retrospective self-ratings instead of validated scales to assess improvements in physical health (Yacoby et al., 2019), both resulting in a high risk of bias. The fifth domain (D5) is about risk of bias because of the selection of the reported results, which was rated as high in five studies (Imam et al., 2017; Yacoby et al., 2019; Zadro et al., 2019; Sanders et al., 2020; Jaarsma et al., 2021a). Four studies did not report primary outcomes in the final article that were announced in the trial protocol (Imam et al., 2017; Yacoby et al., 2019; Sanders et al., 2020; Jaarsma et al., 2021a). Zadro et al. (2019) omitted measures that were announced in the protocol and analyzed the data not as specified in the protocol. Moreover, some concerns regarding selection of the reported results were found in 10 studies: Two studies showed some reporting bias in terms of not reporting intended secondary outcomes based on the trial registration (Zondervan et al., 2016; Tao et al., 2022), and reporting measures that were missing in the trial registration (Zondervan et al., 2016). However, as this bias only affected secondary measures, the rating resulted in some concerns instead of high risk of bias. Protocols were missing for five studies (Prosperini et al., 2013; Punt et al., 2016; Sajid et al., 2016; Tefertiller et al., 2019; Ambrosino et al., 2020), and analysis plans were not predetermined in three studies (Thomas et al., 2017; Yuen et al., 2019; Zahedian-Nasab et al., 2021). More specifically, Thomas et al. (2017) stated in their protocol that they tested out data analysis procedures, but the article contains only descriptive statistics as suggested for pilot studies, yielding some concerns instead of high risk of bias. Notably, Meldrum et al. (2015) used linear regression instead of the intended analysis of variance, which yet is basically the same analysis; Sanders et al. (2022) were missing an analysis plan, yet the main results are only descriptive. So, the risk of bias was rated as low for both studies.

Taken together, following the risk of bias approach, we could identify several methodological aspects regarding the robustness of results of the included studies. Nevertheless, we found a low risk of bias for most aspects and most concerns are due to potentially unreported results. Thus, the reported results of the studies included in this review can be considered largely robust.

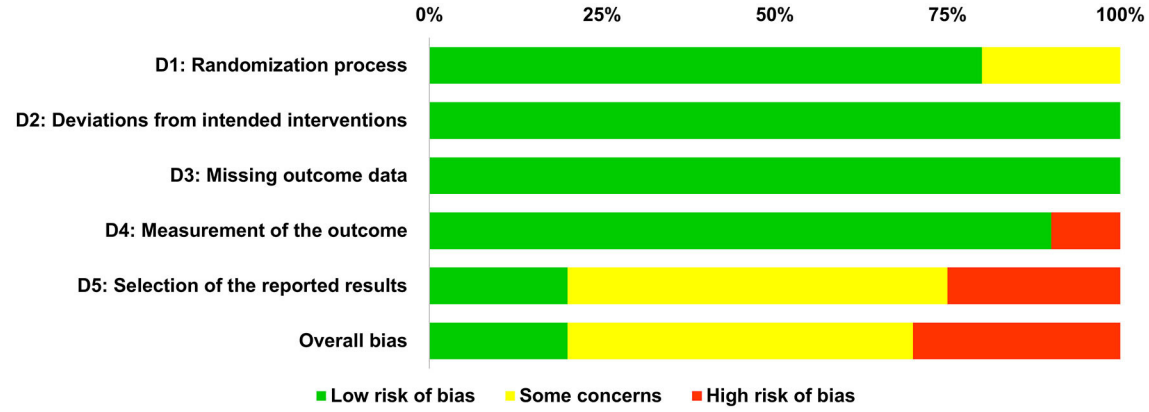

FIGURE 2
Overview of risk of bias regarding the randomization process, deviations from intended interventions, missing outcome data, measurement of the outcome, selection of the reported results, and overall risk of bias.

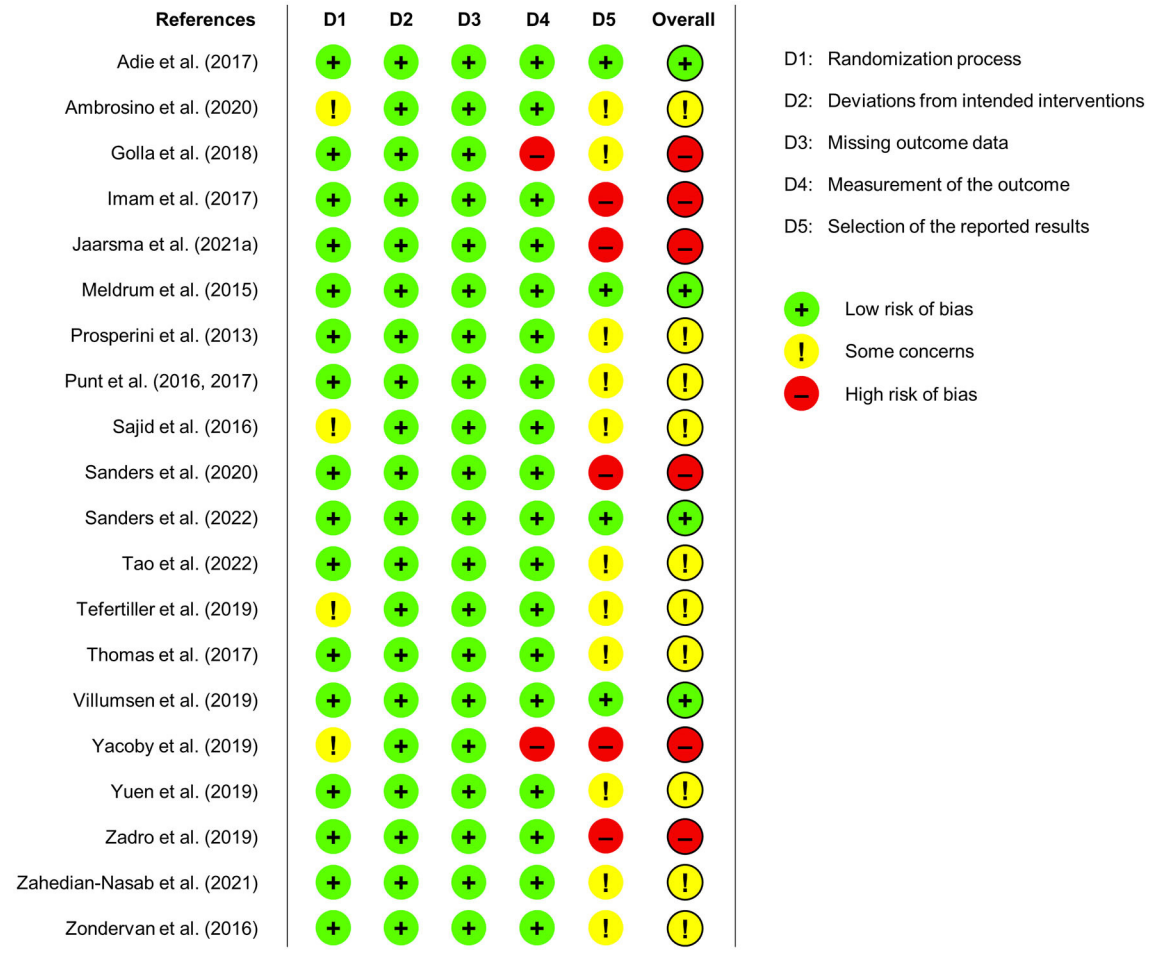

FIGURE 3
Risk of bias ratings for each of the included studies regarding the randomization process, deviations from intended interventions, missing outcome data, measurement of the outcome, selection of the reported results, and overall risk of bias.

5. Discussion

The delivery of rehabilitation measures will continue to play a key role in meeting the high global demand for rehabilitation services, which requires an increasing number of rehabilitation professionals (cf. Cieza et al., 2020). In this context, the unsupervised use of commercial exergames at home could be a complementary and effective rehabilitation approach to alleviate

the lack of professional workforce and reduce healthcare costs. To this end, we provided a systematic review of the available evidence on the effects of the unsupervised use of commercial exergames at home on physical health and quality of life and we will discuss its potential for home rehabilitation in the following.

5.1. Effects of unsupervised exergaming at home on physical health (RQ1) and quality of life (RQ2)

Regarding physical health (RQ1), seven of the 20 included studies (35%) found that exergaming was more effective than usual rehabilitation care, usual activities, conventional exercises, cognitive digital games, and physical activity advice. Still, three of these studies were related to a high risk of bias in terms of outcome reporting bias regarding the primary outcome. Moreover, four studies yielded some concerns due to missing protocol and analysis plans so that only one study was related to an overall low risk of bias. In addition, similar improvement was found in five studies (25%) that compared exergaming to tailored exercises, usual activities, or conventional exercises. Three of these studies were related to some concerns, and two were related to low risk of bias. Eight studies (40%) found no significant changes in both groups and ranged from low to high risk of bias. In sum, considering that effects on some primary outcomes remain unclear due to reporting bias, most studies reported similar or higher effects of unsupervised exergaming at home on physical health in relation to comparison interventions.

Concerning the 15 studies that evaluated the effects of exergaming on quality of life (RQ2), seven studies (47%) reported better outcomes for the exergaming groups compared to usual rehabilitation care, usual activities, conventional exercises, and cognitive digital games. Two of these studies had a high risk of bias in terms of ceiling effects or outcome reporting bias regarding the primary outcome. Quality of life was also found to increase similarly in two studies (13%) that compared exergaming to tailored or conventional exercises and had a low risk of bias. No significant changes were found in six studies (40%), which ranged from low to high risk of bias. Overall, most studies reported that the unsupervised use of commercial exergames in home environments had similar or higher beneficial effects on adults' quality of life in relation to comparison interventions.

5.2. Experiences with unsupervised exergaming at home (RQ3)

Concerning experiences with the exergaming interventions, we focused on participant support in relation to the intervention (RQ3a), adherence with the intervention (RQ3b), and adverse outcomes related to the intervention (RQ3c).

Participant support was realized in all studies and included setting up the exergaming system, training with the exergaming system, and contact with participants during the unsupervised phase of the intervention. Participant support regarding setting up the exergaming system was reported in 10 studies (50%), whereas the installation remains unknown in the other studies. Additional instructions were mentioned in 10 studies (50%), and training with the exergaming system was reported in 16 studies (80%). Contact with participants during the unsupervised phase of the intervention was most often realized via phone calls from professionals in 11 studies (55%), one of which also included contact via face-to-face and email. In two studies (10%), participants had regular physiotherapist meetings. In one study each (5%), participants were free to contact in case of technical or health issues, or were living in a nursing home. In the remaining five studies (25%), no contact with participants was mentioned regarding the unsupervised phase of the intervention. Overall, each study on unsupervised exergaming at home included some participant support mechanisms to ensure the fidelity of the intervention.

Adherence was reported in 15 studies and was high (>70% of the intended goal) in eight studies (53%), moderate in six studies (40%), and low (<30% of the intended goal) in one study (7%). Twelve of these 15 studies (80%) have made use of diaries and daily play logs to assess adherence, similar to previous research (e.g., Donoso Brown et al., 2020). Several studies included home visits or telephone support to check and ensure adherence, which are also strategies to increase adherence (Simek et al., 2012). In addition, reasons for adherence were examined in more detail for one study with moderate adherence (Jaarsma et al., 2021a). In this study, more adherent participants could motivate themselves to exercise alone, had fewer sleeping problems, and had a higher exercise capacity (Jaarsma et al., 2021b). Moreover, the effects of supervision on adherence seem to remain context-specific. For instance, the secondary analysis of one included study (Imam et al., 2017) emphasizes that supervision could increase the exergaming frequency and duration of adults who have had a lower limb amputation (Tao et al., 2020). However, adults who have had a stroke and engaged in self-directed exergaming were found to exercise twice as long and perform eight times more repetitions compared to standard care (Broderick et al., 2021). Overall, considering that effects of supervision remain context-specific, adherence to exergaming can be high even in unsupervised home environments.

Ten of the 14 studies (71%) that investigated adverse outcomes found no adverse outcomes related to exergaming. The remaining four studies (29%) reported mostly mild and some moderate adverse outcomes, such as back pain or knee pain. These findings are in line with previous work that reported mild to moderate adverse events in few studies on using exergames in supervised and home environments (Prosperini et al., 2021). Moreover, although hand lacerations are a common injury that has been associated with the use of Wii consoles (Sparks et al., 2009), such injuries were not reported by the three included studies that have used it in the context of home rehabilitation (Adie et al., 2017; Thomas et al., 2017; Jaarsma et al., 2021a). Thus, the unsupervised use of commercial exergames at home seems to be mostly safe when some precautions are considered (cf. Threapleton et al., 2016).

5.3. Exergaming at home for adults with different rehabilitation needs

In the following, we take a closer look at the pathologies investigated in the studies to discuss for which rehabilitation

needs exergaming may be an effective approach. Noteworthy, four pathologies were addressed in multiple studies, i.e., stroke, multiple sclerosis, prostate cancer, and lower limb amputation. Overall, the findings from the included studies suggest that the unsupervised use of commercial exergames in home environments can support the rehabilitation of the physical health and quality of life in adults with these pathologies.

First, adults who have had a stroke and played Wii Sports games were found to improve their physical health in terms of arm function like participants who engaged in tailored arm exercises (Adie et al., 2017). Playing a game that comes with the commercially available device MusicGlove improved gripping function and motor activity even more than conventional hand therapy exercises (Zondervan et al., 2016). However, three studies reported non-significant findings regarding balance and gait after using Wii Fit games (Golla et al., 2018), gripping function after using MusicGlove (Sanders et al., 2020), and upper extremity function and balance based on self-rated improvements after playing Xbox Kinect games or PlayStation EyeToy games (Yacoby et al., 2019). Additionally, playing Wii Sports games and completing tailored arm exercises resulted in a similar improvement in quality of life in terms of health state (Adie et al., 2017), and playing Wii Fit games in higher balance confidence than conventional balance exercises (Golla et al., 2018). Overall, our findings complement meta-analytic results on the effectiveness of exergames for people who have had a stroke (e.g., Unibaso-Markaida and Iraurgi, 2021; Chen et al., 2022; Gelineau et al., 2022; Truijen et al., 2022).

Second, adults with multiple sclerosis were found to significantly improve their physical health in terms of balance and gait measures (Prosperini et al., 2013; Thomas et al., 2017) as well as physical activity (Thomas et al., 2017) after playing Wii Sports games or Wii Fit games regularly for three or more months compared to usual activities or usual care. In these studies, quality of life was also found to improve in terms of less physical and psychological impact of multiple sclerosis (Prosperini et al., 2013; Thomas et al., 2017) as well as more self-efficacy, less self-reported depression, and less hospital anxiety (Thomas et al., 2017). In line with these findings, meta-analytic results highlight the positive effects of exergaming on multiple sclerosis (e.g., Calafiore et al., 2021; Truijen et al., 2022).

Third, one study found that adults with prostate cancer improved their physical health in terms of walking capacity after playing Xbox 360 Kinect games compared to usual activities for 12 weeks (Villumsen et al., 2019). Another study found no significant changes in the exergaming group that played Wii Fit games for six weeks, but a significant increase in physical performance and walking capacity in the comparison group that engaged in progressive exercising for six weeks (Sajid et al., 2016). Additionally, quality of life was numerically higher in terms of global health status (Villumsen et al., 2019), yet neither study provides evidence on significant changes in quality of life.

Fourth, adults who have had a lower limb amputation and played Wii Fit games regularly for four weeks significantly improved their physical health in terms of walking capacity and physical activity, while the validity of the quality of life measure was limited in terms of ceiling effects (Imam et al., 2017). By contrast, adults who have had a lower limb amputation and played Wii Fit games for overall eight weeks showed higher quality of life in terms of balance confidence compared to playing digital cognitive games, but no significant changes in physical health were found (Tao et al., 2022). Notably, the latter two studies refer to the same protocol, yet the study by Tao et al. (2022) started with a supervised phase of four weeks, followed by an unsupervised phase of four weeks during which participants could see other participants playing via tablet devices.

In the other nine studies, one pathology each was investigated, including rheumatoid arthritis, heart failure, unilateral peripheral vestibular loss, ankle sprain, spinal cord injury, traumatic brain injury, idiopathic pulmonary fibrosis, chronic low back pain, and fall risk. First, adults with rheumatoid arthritis played Wii Fit games for eight weeks, while home training after in-hospital training further improved their physical health in terms of global health and quality of life in terms of reduced difficulty with activities (Ambrosino et al., 2020). Second, a regular use of Wii Sports games for 12 weeks was found to increase physical health in terms of muscle function in adults with heart failure, yet no significant changes were found in other measures of physical health and quality of life (Jaarsma et al., 2021a). Third, after having played Wii Fit games for six weeks regularly, adults with unilateral peripheral vestibular loss had better physical health in terms of gait speed and standing balance, and higher quality of life in terms of higher balance confidence as well as lower anxiety and depression (Meldrum et al., 2015). Similar effects were found when participants engaged in conventional balance exercises. Fourth, playing Wii Fit games regularly for six weeks was also of similar or higher effectiveness compared to conventional physical therapy or exercise therapy for adults with an ankle sprain (Punt et al., 2016). In particular, participants showed similar or higher improvements in physical health in terms of foot and ankle ability and temporal-spatial gait parameters as well as similar or higher improvements in quality of life in terms of pain during walking and rest. Fifth, another study reported better physical health in terms of a numerically higher gripping function in adults with spinal cord injury after three weeks of regularly playing a game that comes with the commercially available device MusicGlove compared to conventional hand therapy exercises (Sanders et al., 2022). Sixth, playing Xbox Kinect games regularly for three months could increase physical health in terms of balance more than a traditional home-based exercise program in adults with traumatic brain injury, yet there were no significant changes in quality of life in terms of balance confidence and community participation (Tefertiller et al., 2019). Seventh, adults with idiopathic pulmonary fibrosis did not show a significant increase in physical health or quality of life after playing Wii Fit games at a moderate to high intensity and engaging in physical activity compared to engaging in physical activity for 12 weeks (Yuen et al., 2019). These findings may be due in part to the observed low adherence to the intervention, insufficient patient support, or the games, but these were not specified. Eighth, after playing Wii Fit U games regularly for eight weeks, adults with chronic low back pain showed better physical health in terms of higher physical function and engagement in physical activity (Zadro et al., 2019). Regarding quality of life, pain self-efficacy was higher and pain intensity over the last week was lower in the exergaming group compared to the group that continued usual activities. Finally, adults with fall risk were found to have better physical health in terms of balance and higher quality of life in

terms of lower fear of falling after they had played Xbox Kinect sports games regularly for 6 weeks (Zahedian-Nasab et al., 2021). Taken together, these findings are promising and show that the unsupervised use of exergames in home environments can support the rehabilitation of physical health and quality of life in adults with various pathologies.

5.4. The role of exercise prescriptions in exergaming at home

The exercise and training variables that we have considered allow discussing possible implications for exercise prescription and the different effects of exergaming on physical health in the included studies.

Regarding the exercise and training variables in the seven studies with more positive effects of exergaming on physical health, participants engaged in moderate intensity exercising in one study (Zadro et al., 2019) and in exercising at own convenience in another study (Villumsen et al., 2019). Participants in the control groups of both studies continued usual activities, while it remains unknown whether these activities included exercising. Information on intensity was missing in the other studies (Prosperini et al., 2013; Zondervan et al., 2016; Imam et al., 2017; Jaarsma et al., 2021a; Zahedian-Nasab et al., 2021). Session durations ranged between 30 min (Prosperini et al., 2013; Jaarsma et al., 2021a), 30–60 min (Zahedian-Nasab et al., 2021), 40 min (Imam et al., 2017), and 60 min (Villumsen et al., 2019; Zadro et al., 2019), whereas one study provided no exact information (Zondervan et al., 2016). The latter study was the only in which participants in the comparison group also engaged in exercising, and the minimum session duration between groups was similar (Zondervan et al., 2016). Exercise frequency ranged from two times to seven days per week, and program duration ranged from three to 12 weeks. Taken together, in most studies with more positive effects of exergaming, information on intensity was missing and session duration, exercise frequency, and program duration varied and cannot be compared between exergaming and control/comparison groups due to the study design.

Regarding the exercise and training variables in the five studies with similar improvements, four studies provided no information on intensity (Meldrum et al., 2015; Adie et al., 2017; Tefertiller et al., 2019; Ambrosino et al., 2020). Punt et al. (2016) implemented a preferred difficulty level in the exergaming group and adjusted the difficulty level to participants' progress in the comparison group. Session durations were similar between groups in three studies and ranged from 15 min (Meldrum et al., 2015), over 30 min (Punt et al., 2016; Tefertiller et al., 2019), to at most 45 min (Adie et al., 2017). In one study with usual activities as the control condition, participants completed a session of 50 min (10 min per game) in the exergaming group (Ambrosino et al., 2020). Exercise frequency ranged from two times to seven days per week, while program duration was most frequently six weeks and ranged up to 12 weeks. Enjoyment was assessed in one study and higher in the exergaming group compared to conventional exercises (Meldrum et al., 2015). In sum, in case of most studies with similar improvements, exercise intensity remains unclear while session duration, exercise frequency, and program duration were similar between exergaming and control/comparison groups that also completed exercises.

Regarding the eight studies with non-significant findings, five studies provided no information on intensity (Thomas et al., 2017; Golla et al., 2018; Sanders et al., 2020, 2022; Tao et al., 2022) and one study specified some information about intensity only in the control group (Yacoby et al., 2019). Sajid et al. (2016) reported that participants exercised at a low to moderate intensity in both groups. Another study stated that participants engaged in moderate to heavy exercising in the exergaming groups compared to digital gaming that was not physically taxing in the control group (Yuen et al., 2019). Session duration remained unknown in terms of at least 3 h a week (Sanders et al., 2020, 2022), as much as participants liked (Tao et al., 2022), or no information on session duration (Sajid et al., 2016; Thomas et al., 2017). In the remaining three studies, session durations were similar between groups and ranged from 30 min (Golla et al., 2018) to 60 min in both groups (Yacoby et al., 2019), also by means of combining 30 min of play and 30 min of additional physical activity (Yuen et al., 2019). Exercise frequency ranged from three to six times per week, and program duration ranged from three to 12 months. Enjoyment was assessed in two studies and most participants enjoyed the exergaming intervention in one study (Thomas et al., 2017), while enjoyment was slightly higher in the exergaming group compared to a conventional self-training program in another study (Yacoby et al., 2019). So, studies with non-significant findings included few information on intensity and session duration as well as different exercise frequencies and program durations, which complicates to understand the missing effectiveness in both groups.

Taken together, the included studies lack information regarding several exercise and training variables, which complicates to formulate exercise prescriptions for home-based exergaming. Still, studies that missed information on exercise prescriptions found positive effects on physical health and quality of life. It could therefore be that in these studies participants exercised at their own convenience, so that unsupervised home-based exergaming might be beneficial for adults' physical health and quality of life even in the absence of detailed exercise prescriptions. Overall, several exercise prescriptions may yield positive effects of exergaming in people with different pathologies.

5.5. Implications for research and practice

This systematic review of randomized controlled trials shows that playing commercial exergames in home environments can effectively support rehabilitation measures toward physical health and quality of life. Our findings extend evidence from previous systematic reviews regarding these outcomes and provide valuable information about the characteristics of the home-based interventions.

With regard to physical health as the primary target outcome of physical rehabilitation, other systematic reviews found that the use of commercial exergames can have beneficial effects compared to conventional care and other groups on balance in adults

with neurological pathologies (Prosperini et al., 2021; Unibaso-Markaida and Iraurgi, 2021) and on several physical health outcomes in older adults above the age of 65 living in long-term care homes (Chu et al., 2021). Potential improvements in motor functions have been reported in a previous systematic review on the use of commercial exergames in several physical rehabilitation settings; yet data have been lacking on potential adverse effects of exergaming (Bonnechère et al., 2016). Additionally, some of these systematic reviews contain findings based on various study designs in lack of a risk of bias assessment (Bonnechère et al., 2016) or findings related to a high risk of bias in most of the studies (Chu et al., 2021), limiting the possibility to draw practical implications. Other works provided evidence on adults with neurological pathologies who used exergames in different settings (Prosperini et al., 2021; Unibaso-Markaida and Iraurgi, 2021). In this context, our systematic review shows that the unsupervised use of commercial exergames at home can have similar or larger beneficial effects on the physical health of adults with different pathologies. These findings are based on experimental evidence with hardly high risk of bias and few adverse outcomes, indicating that home-based exergaming interventions can be considered effective, feasible, and mostly safe in the context of physical rehabilitation.

Regarding quality of life as a secondary outcome of physical rehabilitation, effects of exergaming on quality of life have been considered before. However, based on previous systematic reviews, quality of life outcomes were only considered in relatively few observational and experimental studies; quality of life was only higher after exergaming in few of these studies compared to conventional rehabilitation in adults who have had a stroke (Unibaso-Markaida and Iraurgi, 2021) and several comparison interventions for older adults above the age of 65 with various pathologies (Cacciata et al., 2019; Chu et al., 2021). A more recent meta-analysis found that the use of commercial exergames improved the health-related quality of life in adults with chronic diseases in home-based settings compared to conventional care (Cugusi et al., 2021). In comparison with these works, our systematic review provides experimental evidence that the unsupervised use of commercial exergames can have similar or larger beneficial effects on the quality of life in adults with different needs for physical rehabilitation.

Concerning the practical question which exergames may yield such beneficial effects, three groups of exergames were used in the studies included in our systematic review. First, 13 and thus most of the included studies (65%) used Wii hardware and software, 10 of which used Wii Fit games (50%). Relatedly, several therapists found the Wii Fit to be a motivating and effective tool to complement conventional therapy, for instance, regarding weight shift and balance training (Imam et al., 2018). Moreover, participants in one study also reported a high usability, exercise variety, and challenge concerning the Wii Fit games (Zadro et al., 2019). Still, perceived barriers include a lack of time and familiarity with games. In sum, playing Wii games resulted in similar or higher effects than comparison groups regarding physical health in all but five studies (Sajid et al., 2016; Thomas et al., 2017; Golla et al., 2018; Yuen et al., 2019; Tao et al., 2022). More specifically, playing Wii games was found to more effectively increase physical health than playing cognitive digital games, receiving physical activity advice, and continuing usual activities (Prosperini et al., 2013; Imam et al., 2017; Zadro et al., 2019; Jaarsma et al., 2021a). Improvements were similar when compared to tailored exercises, usual activities, or conventional exercises (Meldrum et al., 2015; Punt et al., 2016; Adie et al., 2017; Ambrosino et al., 2020). In addition, playing Wii games resulted in similar or higher effects than comparison groups regarding quality of life in all but two studies (Imam et al., 2017; Yuen et al., 2019). In particular, playing Wii games more effectively increased quality of life than usual activities, usual rehabilitation care, conventional exercises, and playing cognitive digital games (Prosperini et al., 2013; Punt et al., 2016; Golla et al., 2018; Ambrosino et al., 2020; Tao et al., 2022). Improvements were similar when compared to tailored exercises or conventional exercises (Meldrum et al., 2015; Adie et al., 2017). Second, Xbox Kinect games only were used in three studies (15%), which reported similar or higher effects regarding physical health compared to usual rehabilitation care, conventional exercises, and usual activities (Tefertiller et al., 2019; Villumsen et al., 2019; Zahedian-Nasab et al., 2021), and regarding quality of life compared to usual rehabilitation care (Zahedian-Nasab et al., 2021). One study (5%) used Xbox games when participants could play while standing or PlayStation EyeToy games when participants could play while sitting and reported non-significant results regarding physical health (Yacoby et al., 2019). Third, a game that comes with the commercially available device MusicGlove was used in the remaining three studies (15%), one of which found higher effects on physical health compared to conventional exercises (Zondervan et al., 2016), while effects on quality of life were not reported.

To turn the potential of using commercial exergames into actual positive effects on physical health and quality of life, some more practical aspects need to be considered. In all of the included studies, participants received support from researchers or therapists to some degree, including the setup of the exergaming system, instructions and training regarding exergaming, and possibilities to contact researchers or therapists. In five studies, exergaming started in a clinical setting and then transitioned to the home setting. Thus, it needs to be considered in practice how (independently) exergaming is initiated and adhered to, which also depends on whether the intervention is affordable. Concerning the largest study included in this systematic review (Jaarsma et al., 2021a), it was shown that the costs of using commercial exergames for rehabilitation were relatively low and that adults with a relatively high salary were willing to pay more than half of the intervention costs (Klompstra et al., 2022). In this regard, the financing and willingness to pay might be different in middle- and low-income countries (cf. WHO, 2021). Still, the costs for using commercial exergames for rehabilitation are much lower compared to center-based rehabilitation and telerehabilitation (Klompstra et al., 2022). Given that the necessary financial resources are available, exergaming at home can already be initiated when people are in health care and rehabilitation facilities, and contribute to monitoring and decision-making of adults' physical health and quality of life during rehabilitation and beyond (cf. Mura et al., 2022).

Throughout the intervention, adherence techniques that have proven successful in studies could also be considered and adapted to yield intended effects. Specifically, effective ways to increase adherence include appropriate instructions, adequate difficulty levels, regular exercise schedules, and individualization of the interventions (see, e.g., Donoso Brown et al., 2020; Ramos Muñoz et al., 2022). In addition, adherence could be improved if people receive social support and can choose between several suitable commercial exergames so that they are provided with variety and new experiences (cf. Rüth and Kaspar, 2021). Relatedly, social support could also complement and improve participant support that was provided in most of the studies to some degree. In sum, adequate adherence measures and support mechanisms should be considered concerning the unsupervised use of commercial exergames in home environments.

Depending on the pathology and individual needs, it should also be considered whether there are suitable customized exergames available. For instance, customized exergames were found to be more effective than commercial exergames concerning the quality of life in adults who have had a stroke (e.g., Chen et al., 2022). Moreover, exergaming at home could be tailored to people's needs and behavior to provide them with personalized user experiences (cf. Gómez-Portes et al., 2021). Notably, customization of exergames also includes taking precautions to avoid adverse events by using specialized mats or safety harnesses (Zahedian-Nasab et al., 2021; Subramaniam et al., 2022), adjusting exercise intensity by using free weights (Villumsen et al., 2019), or making use of other supportive equipment. Thus, commercial and customized exergames as well as customization of commercial exergames could be considered in practice. More generally, (more) effective exergames could be designed, for instance, by means of process models that consider the target behavior, motivational aspects, game mechanics, and mode of delivery (Robertson et al., 2021). In this regard, several research questions and future directions for the design of effective exergames have also been outlined (Baranowski et al., 2019; Rüth and Kaspar, 2021). Overall, our findings emphasize the effectiveness and feasibility of unsupervised uses of commercial exergames at home regarding physical health and quality of life, while context-specific characteristics should be considered.

5.6. Limitations and future research

This work comes with some limitations. First, this systematic review does not include studies on more recent commercial exergames that will be addressed in ongoing or future studies according to study protocols (e.g., Leonardo et al., 2021). Relatedly, the software and hardware for several of the commercial exergames used in the included studies may still be available, but has been discontinued and replaced by the manufacturer with newer products. Such developments are common in the market so that solutions such as software compatibility are needed to provide users a longer-term access to exergames. Moreover, three of the included studies did not provide information on the exact exergames used (Sajid et al., 2016; Thomas et al., 2017; Yuen et al., 2019). Future research should provide sufficient information on the exergames used to facilitate comparisons between interventions and studies, and to facilitate concrete recommendations. Hence, future studies and reviews will remain necessary to examine the effects of the unsupervised use of existing and future commercial exergames in home environments.

Second, while we highlight the overall importance of rehabilitation measures, this review focused on adults who had a diagnosed pathology and a need for physical rehabilitation. The same pathology (stroke) was investigated in at most four studies, nine pathologies were investigated by one study each, and there are other pathologies to take into account. So, the included studies can still be considered pilot work and indicate the need for further research. Moreover, it should be noted that exergaming was found to have positive effects on healthy adults, indicating the potential of exergaming for prevention of pathologies and maintenance of physical activity (Hai et al., 2022). Moreover, exergames can be used in the overlapping areas of rehabilitation, training, and wellness as shown by another systematic review on the use of exergames for older adults above the age of 50 (Kappen et al., 2019). While our systematic review focused on adults, other systematic reviews have reported beneficial effects of home-based exergaming on physical activity and body composition also in younger people (Gao et al., 2020; Oliveira et al., 2020). Thus, future research could take a holistic view on the use of exergames to support people of all ages from their stay in rehabilitation facilities to the transition home and beyond (cf. Mura et al., 2022).

Third, we focused on studies in home environments that evaluated the effects of unsupervised exergaming, including studies with supervised phases (e.g., exergaming started in a clinic and was continued at home). Hence, our review emphasizes that the integration of unsupervised exergaming phases can be an effective and cost-efficient way compared to conventional rehabilitation and supervised exergaming. Still, supervision and participant support were realized in different ways and contexts, for instance, in a clinic (Meldrum et al., 2015), in a nursing home (Zahedian-Nasab et al., 2021), or by means of telerehabilitation (Tao et al., 2022). In addition, the potential benefits of supervision and social support should not be neglected (e.g., Tao et al., 2020; Rüth and Kaspar, 2021). Hence, future research is needed on the appropriate timing and types of participant support to initiate and facilitate unsupervised exergaming at home.

Fourth, our systematic review provides an overview of the available evidence based on certain research approaches, contexts, and instruments. Depending on the pathology and rehabilitation need, specific health-related and exercise-related outcomes as well as moderation and mediation effects might be of interest for the delivery of an intervention. Regarding experiences with the intervention, the aspect of enjoyment was considered only in three studies (15%), although enjoyment and fun have been discussed as integral parts in exergaming and physical activity to elicit health benefits (Mellecker et al., 2013). Relatedly, future research could make use of available validated instruments, for instance, the motivation for exergame play inventory of Staiano et al. (2019). Overall, few studies reported psychological aspects of exergaming, which could receive stronger consideration in future research.

Finally and more generally, the term exergame or active video game was used in only six of the included studies (Villumsen et al., 2019; Yacoby et al., 2019; Yuen et al., 2019; Ambrosino et al., 2020; Jaarsma et al., 2021a; Zahedian-Nasab et al., 2021). Moreover, several of the included studies used the more general term virtual reality instead of more specific terms, such as exergames or active video games (Prosperini et al., 2013; Meldrum et al., 2015; Punt et al., 2016; Adie et al., 2017; Thomas et al., 2017; Tefertiller et al., 2019). In addition to these known terminological pitfalls that we had to anticipate with our search strategy, most of the included works did not refer to theoretical approaches for why exergames may support rehabilitation. Such a lack of terminological clarity and theoretical references has been a general issue in the field of exergames and digital technology (Rüth and Kaspar, 2017; Benzing and Schmidt, 2018). Hence, future research could benefit from more terminological clarity and consideration of other recommendations for research on exergames and beyond (e.g., Threapleton et al., 2016; Rüth and Kaspar, 2017, 2021; Benzing and Schmidt, 2018).

6. Conclusions

Commercial exergames can be valuable tools to address the need for physical rehabilitation of people with several pathologies. This work complements previous pathology-specific systematic reviews by providing an overview of the effects of the unsupervised use of commercial exergames on physical health and quality of life in the context of different pathologies. Most of the studies included in our systematic review reported more positive or similar effects of the unsupervised use of exergames in home environments on adults' physical health and quality of life compared to different comparison conditions, such as conventional exercises and usual activities. Some of these studies were related to a high risk of bias due to outcome reporting bias, yet the risk of bias was low or moderate for most studies. More research is needed to formulate clear recommendations regarding exercise prescriptions and to better understand psychological outcomes such as enjoyment of the intervention. To conclude, this systematic review suggests that the unsupervised use of commercial exergames in home environments can be a promising complementary way to address high rehabilitation needs and specifically to improve the physical health and quality of life in adults with different needs for physical rehabilitation.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

MR, MS, and KK conceptualized the study idea and protocol, which was part of a thesis of MS under the supervision of MR and KK. MR, MS, and KB performed the literature search and coded the included studies. MR wrote the original draft. MR and KB (lead) and MS and KK (supporting) revised the manuscript. All authors approved submission.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1155569/full#supplementary-material

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For the girls, gays, and theys: LGBTQ+ stakeholder communication and alignment of video game brands

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Queer identities have predominantly existed at the peripheries of media representation as well as communication research. Linking this research gap with the field of video games as a medium, this study examines video game companies and their strategic communication efforts toward LGBTQ+ stakeholders through critical discourse analysis with influences of queer theory. With this focus, we aim to identify how video game companies discursively construct queer identities and utilize them for strategic communication. Through the analysis of the social media and online discourses surrounding two games with queer inclusion, we show that queer branding has an influence on the way strategic communication efforts are employed throughout the year, as well as the type of content. Furthermore, we show that in our selected cases, organizations can successfully align themselves with their LGBTQ+ stakeholders by having queer inclusion at the core of their strategic communication efforts and authentic organizational practices.

KEYWORDS

strategic communication, LGBTQ+ stakeholder, LGBTQ+ representation, indie games, video game communication

1. Introduction

This study explores how video game companies employ strategic communication to foster LGBTQ+ stakeholder alignment and thereby partake in the creation of public culture and the construction of queer identities (Hallahan et al., 2007; Ciszek, 2018). To do so, we compare and analyze the communication of *Tell Me Why* (DONTNOD Entertainment, 2020) and *Bugsnax* (Young Horses, 2020) on social media, as well as their organizational practices. By analyzing the strategic communication efforts from the companies' social media, and then contrasting that to their corporate social responsibility practices targeting LGBTQ+ stakeholders, we attempt to analyze their perceived authenticity to stakeholders.

Until a few years ago, queer identities existed not only at the peripheries of media production and representation but also on the peripheries of communication researchers and practitioners (Edwards and L'Etang, 2013; Tindall, 2013; Thach, 2021). However, through the hard work of LGBTQ+ individuals, this is slowly changing (Ciszek, 2018). For example, video games have recently been acknowledged as a medium with worthwhile queer representation, with GLAAD[1] introducing the Outstanding Video Game award in 2019 (Harvey, 2019).

1 GLAAD is an acronym for Gay and Lesbian Alliance Against Defamation. GLAAD is an American non-governmental media monitoring organization.

Since discourse occurs as a form of social practice, an explanation of the concept of strategic communication, as well as relevant constructs, such as authenticity, public relations, corporate social responsibility, and LGBTQ+ stakeholders, is needed. We also provide an overview of the socioeconomic situation of the LGBTQ+ market and consumer identity to have the necessary basis to deconstruct these discursive practices. Finally, to better contextualize this for video games, the representation of LGBTQ+ identities in the medium is addressed.

2. Theoretical framework

The scholarship surrounding strategic communication has been expanding ever since the inception of the term in 2007. Still, the definition that Hallahan et al. (2007) put forward in their article remains one of the most influential and largely unchallenged. They summarize the essence of strategic communication as an "organization, defined in its broadest sense, communicating purposefully to advance its mission" (p. 4). Other scholars have offered expansions of this definition from 2007 but generally agree that strategic communication is deliberate, purposive, and persuasive by an organization enacted in the public sphere to reach set goals (Holtzhausen et al., 2021).

The term "organization" encompasses not only corporations and for-profit organizations but also non-profit organizations, activist groups, political parties, and (non)government organizations (Hallahan et al., 2007). Seeking to gain admiration, attention, alignment, affinity, and allegiance from their stakeholders (Hallahan et al., 2007), organizations use an array of communication channels for this purpose, including earned, paid, owned, and shared media (Zerfass et al., 2018). Strategic communication is always a two-way process of messaging and listening, meaning it does not only seek to influence but is also influenced by a variety of stakeholders, such as other organizations, consumers, and markets (Zerfass et al., 2018).

Public relations is, of course, one type of strategic communication, and fostering PR can be a balancing act for organizations having to oscillate between different stakeholder groups and their interests. Aligning with the LGBTQ+ community has been of increasing interest to companies (Champlin and Li, 2020). LGBTQ+ issues reflect changes in political, cultural, and economic landscapes; therefore, challenging the communication routine of organizations (Champlin and Li, 2020).

2.1. Public relations with LGBTQ+ stakeholders

In this research, we define public relations as a "flow of purposive communication produced on behalf of individuals, formally constituted and informally constituted groups, through their continuous trans-actions with other social entities" (Edwards, 2012, p. 21). Public relations as a cultural intermediary is "laced with ideological, political, and cultural values and hegemonic, heteronormative assumptions" (Edwards and L'Etang, 2013, p. 42). However, not only are practitioners affected by these values and assumptions but also academics (Tindall, 2013)—with LGBTQ+ perspectives having been "effectively written out of research on public relations" (Edwards and L'Etang, 2013, pp. 50–51).

2.1.1. Corporate social responsibility

Expanding since the mid-20th century, corporate responsibilities evolved beyond simply maximizing financial returns and providing services to consumers. Nowadays they also encompass catering to the expectations of a variety of different stakeholders (Carroll, 1999; Zhou, 2021). Companies include these expectations because perceived corporate social responsibility (CSR) influences the purchase intention and brand perception of consumers (Luo and Bhattacharya, 2006; Wagner et al., 2009).

Various and context-specific definitions of CSR are the result of including stakeholder expectations, though as several scholars highlight, they all built on the same groundwork (e.g., Carroll, 1999; Dahlsrud, 2008). All different definitions point to the same five dimensions: environmental, social, economic, stakeholder, and voluntariness (Dahlsrud, 2008). Hence, advocacy for, and alignment with the LGBTQ+ community, fall within the domain of CSR. LGBTQ+ issues are societal issues, and their solutions sometimes surpass legal obligations. To appeal to and retain LGBTQ+ stakeholders, organizations position themselves as socially responsible through initiatives that also need to be strategically communicated. If stakeholders perceive a divergence between CSR communication and organizational practice, meaning corporations failed to deliver on their promises, it is viewed as corporate hypocrisy (Wagner et al., 2009). Hence, CSR activities can only improve a corporate's image if those activities are perceived to be authentic or sincere (Yoon et al., 2006).

However, genuine commitment to social issues becomes increasingly difficult for corporations that operate transnationally. In an examination of the video game company Blizzard Entertainment, Venter (2021) found that the corporate strategy prioritized national cultural identities over their full commitment to supporting the LGBTQ+ community. These inconsistencies can lead to perceived corporate hypocrisy or inauthenticity, accentuating that "the line between pandering to consumers and social issues and practicing ethical and truly altruistic CSR can sometimes seem rather blurry" (Venter, 2021, p. 60). This is especially due to corporate communication on social media transgressing regional boundaries. Still, the existence of "truly altruistic" CSR can be contested since corporations in a capitalistic market are inherently motivated by financial gain.

2.1.2. Authenticity

When looking at CSR, it becomes clear that a key aspect of successful public relations, particularly with LGBTQ+ stakeholders, is authenticity. Scholars from a variety of disciplines have contributed to the understanding of this construct, highlighting its interdisciplinarity. However, there is no agreement on the definition of authenticity, resulting in a variety of research-specific ones (see Molleda, 2010).

Through strategic public relations, organizations highlight specific aspects to build their corporate personalities. This is in turn analyzed and judged by their stakeholders, with consistency between communication and action resulting in perceived

authenticity among stakeholders (Molleda, 2010). Accordingly, the context of authenticity becomes especially significant for relationships with marginalized stakeholder groups, like LGBTQ+ consumers (Ciszek and Pounders, 2020). Incorporating this aspect, Lim et al. conceptualized a scale of perceived organizational authenticity (POA):

> POA with historically marginalized publics [is] the extent to which stakeholders perceive an [organization] to be faithful toward itself (*continuity*), true to its stakeholders (*credibility*), motivated by caring and responsibility (*integrity*), and able to support stakeholders in being true to themselves (*symbolism*), and representing a diversity of stakeholders and their identities (*representativeness*). (2022, p. 192 emphasis in original)

They surveyed the effect POA has on stakeholder skepticism, brand attitude, and purchase intention. Results indicate that POA positively influences brand attitude and purchase intention. Most importantly, POA helps moderate stakeholders' skepticism toward LGBTQ+ communication, and, in turn, may strengthen the organization–stakeholder relationship. Their findings supported the assertion of Ciszek (2020) that LGBTQ+ stakeholders are highly skeptical of LGBTQ+ communication efforts.

Due to the increased importance of authenticity in LGBTQ+ stakeholder communication, the impact of inauthentic or inconsistent communication and CSR practices can be particularly detrimental to the organization–stakeholder relationship. The demand for authentic communication with LGBTQ+ stakeholders, and holistic support of their community, is not only voiced by queer consumers (e.g., Freitas et al., 1996; Gudelunas, 2011) but also recognized by (queer) strategic communication practitioners (Ciszek and Pounders, 2020; Ciszek and Lim, 2021).

In this research, authenticity means that strategic communication messages are in line with corporate practice. We utilize the POA framework to analyze online discourse surrounding the two video game companies to see if their corporate practices are consistent with their strategic communication efforts on social media. Through this process, we can observe how these companies appear authentic in their alignment with their LGBTQ+ stakeholders.

2.1.3. Rainbow washing

Organizations need to "walk the walk" by confirming their communication with philosophies and policies that are supportive of their LGBTQ+ stakeholders (Ciszek and Pounders, 2020). Marketing strategies that aim to take stances in sociopolitical movements but diverge from the actual organization's practice are summarized under the umbrella term "woke washing" (Vredenburg et al., 2020). When companies co-opt the LGBTQ+ movement for economic reasons, it is classified as rainbow washing (Ciszek, 2018; Champlin and Li, 2020). The term rainbow washing is understood as "any practice that vaguely or misleadingly portrays a company's stance and support for the LGBTQIA* community, leading to (financial) exploitation and deception of customers" (Wulf et al., 2022, p. 2). From this exploration of the term and its origin, it becomes clear that rainbow washing is a form of strategic communication (Ciszek and Pounders, 2020).

Due to the knowledge gap on rainbow washing and its effects (Ciszek, 2018; Johns et al., 2022), scholars build upon findings of other woke washing practices for their research. Johns et al. (2022) assumed that purchase intention would be affected by consumer attitudes toward rainbow washing. None of their hypotheses were supported, interestingly though, they noticed a moderately significant correlation between purchase intention and brand authenticity. If participants felt that the communicated goodwill/CSR of Skittles toward the LGBTQ+ community was genuine, they were more willing to purchase Skittles products (Johns et al., 2022). Wulf et al. (2022) conducted two studies on the effect of vague or concrete support claims on the perceived level of rainbow washing. They found that the perception of rainbow washing had negative effects on brand evaluation, meaning that LGBTQ+ stakeholders are highly skeptical of LGBTQ+ targeted campaigns since they are a historically marginalized public. They demand authentic and holistic organizational support, placing great emphasis on consistent organizational communication throughout the entire year, not just during Pride Month.

Pride Month celebrations in June began to commemorate the violent altercation between police and LGBTQ+ individuals that was known as the Stonewall riots (Library of Congress, 2021). Most organizations tend to "hop on the bandwagon" and release holiday ads with rainbows and queer symbolism, similar to other major holidays (Christmas and Easter). However, given its history and importance to queer culture, it is only natural that the LGBTQ+ community reacts negatively toward corporations commercializing Pride Month. This is truer when organizational practices throughout the year do not align with what they are communicating during Pride Month. Overall, it seems that engaging authentically and consistently with LGBTQ+ stakeholders may result in a mutually beneficial and long-term relationship. To further explore how organizations communicate with this stakeholder group, it is necessary to address the history of the LGBTQ+ community as a market and consumer segment.

2.2. The LGBTQ+ community as a market segment

Exactly when this LGBTQ+ market niche emerged is contested. Before the 1960s, scholars agree that, while queer-owned businesses were serving queer patrons, the concept of a gay market niche "was embryonic at most" (Sender, 2005, p. 25) and remained untargeted by businesses (e.g., Peñaloza, 1996; Branchik, 2002). Following the Stonewall riots in 1969 and the subsequent gay liberation movement, the LGBTQ+ market niche saw increasing visibility among the mainstream media and marketers (Gudelunas, 2013). However, in the beginning, advertisements in mainstream media did not show explicit queer representation and rather relied on gay iconography to covertly target queer consumers (Peñaloza, 1996; Sender, 2005). Importantly, as Sender (2005) notes, (gay) marketers did not only market products to the LGBTQ+ community but also constructed this niche through their marketing activities. Nölke (2018) demonstrates that, while there has been a shift toward more explicit LGBTQ+ representation in mainstream media advertisements, many queer identities remain invisible (e.g.,

trans identities). This bias is also visible in consumer and market research on the LGBTQ+ community (Coffin et al., 2019).

Recognizing the purchasing power of LGBTQ+ customers, companies seek to appeal to and retain these buyers through alignment with their values (Ginder and Sang-Eun, 2015). Research has shown that LGBTQ+ individuals are aware they are being courted for corporate profit, but nonetheless appreciate the gay-friendly attitude of corporations (Tuten, 2005; Gudelunas, 2011). Simultaneously, LGBTQ+ consumers criticize the perpetuated "affluent gay" stereotype and demand genuine support of their community from corporations (Ciszek, 2020; Place et al., 2021). While there are organizations that voice support for the LGBTQ+ movement and engage in supporting prosocial corporate practice, there is also inauthentic organizational communication that merely seeks to capitalize on the LGBTQ+ community and their "queer dollars" (see Ciszek, 2020).

2.3. (In)visibility: video games and LGBTQ+ representation

LGBTQ+ representations in media have changed significantly over the past decades, with new media genres and technologies introducing novel opportunities for LGBTQ+ (self-)representation (Gross, 2001; Sender, 2012). Scholars have largely neglected video games as cultural intermediaries, with Seiffert and Nothhaft (2015) stating that video games "should be considered the 'missing media' in public relations- and strategic communications-research" (p. 255).

Media and communication scholars have analyzed LGBTQ+ representation across various types of media, finding that the one-dimensionality of queer identities holds true across most media representations (Gross, 2001; Comeforo, 2013; Nölke, 2018). Despite this narrow visibility of identities, representation, in general, seems to be improving (GLAAD, 2021a,c, 2022). In 2019, the 30th GLAAD Media Awards inaugurated the category for Outstanding Video Game, acknowledging LGBTQ+ representation in this media form and hoping to incentivize a further increase of LGBTQ+ stories and characters (Harvey, 2019).

One important source, which charts and categorizes LGBTQ+ inclusion in video games, is the LGBTQ Video Game Archive (lgbtqgamearchive.com), the first scholarly database of queer content in video games. Using this archive created by Adrienne Shaw and her research assistants (Ruberg, 2017; Shaw, 2017), several scholars have analyzed LGBTQ+ representation in video games. Shaw and Friesem (2016) laid the groundwork for the archive by categorizing LGBTQ+ content in 351 games, concluding that this content takes many different forms. To address how LGBTQ+ character representation evolved through the years, Utsch et al. (2017) analyzed 861 video games listed in the archive. They noted an increase in the representation of LGBTQ+ characters over the years and a diversification in the portrayed identities (ibid). Providing contrasting findings, Shaw et al. (2019) emphasize that the diversification of most LGBTQ+ identities remains relatively low, despite an increase in released games.

In their research on transgender representation, Thach (2021) found that video game narratives seemed to reflect the real-life understandings of transness over the years, becoming less stigmatized and including less harmful stereotypes. In addition, they noted that only indie games had trans-centered perspectives in their narratives (ibid). Building on Sender's (2012) concentric circle model of media production, Thach (2021) argues that the production of video games operates similarly, with indie games offering more possibilities for queer representation than games produced or published by mid-size or major companies.

Including LGBTQ+ representation in any entertainment product can yield negative effects on general consumer segments. Media products with LGBTQ+ inclusion can alienate consumers that do not hold favorable LGBTQ+ attitudes (Cheng et al., 2023). However, the alienation of these consumers is not part of our research, because we utilize queer theory for our critical discourse analysis (CDA, see below).

3. Research questions

Hallahan et al. (2007) emphasize that studying strategic communication includes observing how an organization "presents itself in society as a social actor in the creation of public culture and in the discussion of public issues" (p. 27). For a successful organization–stakeholder relationship, it is important that organizations recognize the marginalization history of the LGBTQ+ public and employ authentic strategic communication, meaning communication should reflect sincere organizational practices.

Since LGBTQ+ alignment and support (communication) are part of CSR, when these messages are vague or misleading, they are considered rainbow washing. If authenticity is not achieved in the eyes of queer stakeholders, i.e., communication is not consistent with organizational practices, the relationship will be compromised. Research on CSR and rainbow washing has shown that only consistent and authentic support messages positively affect the organization–stakeholder relationship (Ciszek and Pounders, 2020; Lim et al., 2022). Hence, for our research, we have formulated the following research questions:

RQ1: How do video games with various queer branding differ in their strategic communication on social media during Pride Month?
RQ1.1: How does this communication compare to off-months?

Examining how Pride Month communication differs from off-months allows us to analyze whether video game companies use their games to solely position themselves as LGBTQ+ allies for corporate profit in June, hence, engaging in rainbow washing.

Also, the differentiation between video games that include various (or different) queer representations gives us another opportunity to analyze CSR strategies targeted at different queer stakeholders. We use queer branding to differentiate between how overtly games were positioned as queer. The queer representation in *Tell Me Why* is strongly intertwined with the narrative, as one of the main playable characters is a transgender man. Due to the game being narrative-driven, the experience of this character is heavily incorporated into the game world. On the other hand, the incorporation of queer representation in *Bugsnax* is not deeply embedded in the narrative. Queer (non-playable) characters exist

within the game, but their experiences as queer individuals are not the focus of the narrative at any point.

Authenticity is especially important for marginalized publics, such as LGBTQ+ stakeholders. So, to contextualize our findings from the previous research questions, we examine authenticity on an organizational level, by utilizing Lim et al. (2022) POA scale:

RQ2: To what extent is the LGBTQ+ stakeholder alignment on social media authentic?

To answer this research question, we contextualize the video game companies' social media communication within other online discourses (interviews, company websites, etc.). Using the POA scale, we then compare organizational practices to their social media communication to observe whether the brands' CSR is sincere.

4. Methodology

For this research, the video games *Tell Me Why* and *Bugsnax* were selected. Both feature queer representation, but with varying incorporation in their narratives, hence considered as variously queer branded. The social media accounts on Twitter (Bugsnax (YH Game) [@YoungHorses]., 2022; Tell Me Why [@TellMeWhyGame], 2022a), and Instagram (Tell Me Why [@tellmewhygame], 2022b; Young Horses [@younghorsesgames], 2022), as well as supporting organizational communication (e.g., websites and interviews) were analyzed to answer the RQs.

The sampling strategy for this research was non-probabilistic convenience sampling. *Bugsnax* and *Tell Me Why* were chosen because they were both released in the same year and nominated for the GLAAD Media Award for Outstanding Video Game (GLAAD, 2021b). While both games were nominated for outstanding queer representation, what also proves interesting for our research is that even if both games were developed by indie companies, which provide a safer space for queer individuals (Thach, 2021), *Tell Me Why* is still published by Microsoft. Being a major publisher, this could involve different organizational practices. Additionally, these two games were the only ones selected from the GLAAD nominees for 2021 because they were the only indie-developed games within the adventure game genre, even if they do provide completely different adventure experiences. However, the main reason for our selection of these games is their difference in queer branding or what we use to mean narrative incorporation, which we use to contrast our results.

Tell Me Why is a narrative adventure game developed by DONTNOD Entertainment and published by Xbox Game Studios (a Microsoft division). It follows the twins Alyson and Tyler Ronan as they relive their childhood. The game features two LGBTQ+ characters: the protagonist Tyler, a transgender man, and Michael, a queer Tlingit man. Tyler is the first playable trans protagonist from a major studio. Since the game is character-driven, the narrative centers around Tyler's trans experience. The queer aspect of the narrative is, therefore, central to the game experience and an integral part of the branding. The second game *Bugsnax* was developed and published by the independent game studio Young Horses. It is an adventure game that revolves around catching half-bug half-snack creatures while solving the disappearance of a missing explorer. The narrative does not center around queer narratives, but there are both a lesbian and a gay couple, as well as a non-binary character.

To analyze the organizational communication and practices and contextualize them fully, CDA[2] informed by queer theory is utilized. The focus of CDA lies in "the role of discourse in the (re)production and challenge of dominance" (Dijk, 1993, p. 249). The stereotypes and constructed images of queer consumers and the LGBTQ+ market directly influence the social cognition of LGBTQ+ individuals, furthering the reproduction of heteronormative dominance. The queer theory centers on the intersection of discourse and identity creation (Jagose, 1997). Therefore, we coded our data by focusing on LGBTQ+ stakeholder identity, as well as how LGBTQ+ issues were discussed by the organizations. Furthermore, it was of interest how direct the strategic communication was about LGBTQ+ identities and issues.

The data was collected between November and December 2022. Young Horses utilizes one Twitter account for all their communication and has posted 3.823 tweets; the first *Bugsnax* tweet was published in June 2020. On Instagram, they shared 4 posts. *Tell Me Why* has posted 540 tweets and 100 Instagram posts. While the final sample for *RQ1* and *RQ1.1* only includes posts that pertain to LGBTQ+ topics, all material was surveyed to provide adequate context. The final sample includes original posts from the main accounts as well as retweets by the accounts. Retweets were included as they also serve as SC to further LGBTQ+ stakeholder alignment. This resulted in a final sample of 15 *Bugsnax* tweets on the Young Horses Twitter account; all their Instagram posts were excluded. For *Tell Me Why*, 77 tweets on their Twitter account and 9 Instagram posts were included. This disparity in communication is also part of our findings, where one company chose to communicate much more concerning LGBTQ+ topics than the other. However, to provide context to tweets addressing LGBTQ+ stakeholders, the entire corpus of social media communication from both companies was analyzed. The final social media communication sample is used to understand how the video game branding of the companies influences the way they strategically communicate with their LGBTQ+ stakeholders.

To answer *RQ2*, the social media sample and further online discourses surrounding the companies, such as interviews, the company websites, news articles, and YouTube videos, were analyzed using the dimensions of POA (Lim et al., 2022)—23 sources for *Tell Me Why* and eight for *Bugsnax*. Here, the goal is to compare organizational practices with their strategic communication, to see if they are sincerely aligning with their LGBTQ+ stakeholders, engaging in real CSR, or participating in rainbow washing.

The final codebook used to analyze the data has two major codes dealing with *RQ1* (LGBTQ+ stakeholder identity and LGBTQ+ Discourse) and *RQ2* (Perception of Organizational Authenticity). Most codes were created deductively based on the

2 To comply with the principles of CDA, the bias of the researchers and by extent this research should be stated. This work is biased due to the method utilized and the circumstances under which it was written, which seeks to deconstruct the LGBTQ+ stakeholder identity and illuminate how organizations discursively reify these hierarchical constructs.

literature review. Subcodes were refined with inductive coding after the material was coded for the first time.

5. Results

5.1. Game production context

Looking at organizational practices, *Tell Me Why* was developed by DONTNOD Entertainment and published by Xbox Game Studios, which is a division of Microsoft. There are no conclusive numbers on how many queer individuals were part of the production process; however, there are a select few that communicated openly about their involvement. DONTNOD and Xbox Game Studios worked closely with two transgender GLAAD members, Nick Adams, Director of Transgender Representation; and Blair Durkee, Special Consultant for Gaming, ensuring an authentic trans narrative and character. Adams was consulted regarding the story, dialogue, character design, environmental design, and voice actor casting. Additionally, the voice actor for Tyler is August Black who is trans himself. Black was given the opportunity to influence dialogue and aspects of Tyler's character. With the availability of localized voiceovers for other languages, it was also revealed that they cast trans-voice actors for all languages.

While Young Horses is a smaller development team of nine people, there are also no conclusive numbers for the involved queer individuals. The Creative Director, Kevin Zuhn, is non-binary and they received additional writing support from Sage Coffey who is also non-binary. The queer representation in *Bugsnax* is strongly influenced by their lived experiences as non-binary individuals. The non-binary character Floofty Fizzlebean is voiced by Casey Mongillo, who is also non-binary. At least two other queer people were involved with the game, but it is unclear if they influenced the writing.

5.2. Communication strategy

Comparing the final analysis reveals that the games differ greatly in their strategic communication on social media. To assess these differences in communication about LGBTQ+ topics, all posts were first coded and categorized by their publishing date. While *RQ1* and *RQ1.1* only differentiate between Pride Month and off-months, it became clear that it was important to include other awareness and visibility days, such as Trans Day of Remembrance, since they also play a role in public relation efforts with these stakeholders.

Tell Me Why posted 77 tweets that pertained to LGBTQ+ topics, with less than half during off-months. Of these, 26 tweets were posted during Pride Month and 17 were on awareness and visibility dates. A similar distribution pattern can be observed for their Instagram posts. Instagram, in general, served more as a secondary posting platform, with the material centering around game content. Instagram posts mainly pertain to the trans representation within the game. So, *Tell Me Why* strategically posted about LGBTQ+ topics during Pride Month and other LGBTQ+-related days. Most of the content that was posted during these dates communicated stakeholder alignment through LGBTQ+ support, care, or advocacy. The account often urged their community to follow their example and stand up against discrimination and anti-trans sentiment. Furthermore, they urged their audience to financially support trans individuals and communities.

Tell Me Why platformed other queer games, individuals, and developers throughout the year, which positioned them further as an ally. When trans rights were at stake, like the revocation of gender-affirming healthcare for trans youth in Arkansas, they shared information on the situation and retweeted resources. During Pride Month 2020, the second queer character was revealed, and in 2021 and 2022, the game was made available for free for Pride Month. By making the game available for free, they were asking their community to spend their money on trans and queer charities instead. In the same blog post, they also recommended other games with queer representation. These are only some examples by *Tell Me Why*, where their organizational practices match their strategic communication alignment with LGBTQ+ stakeholders.

On the other hand, *Bugsnax* did not utilize Instagram as a communication channel for LGBTQ+ alignment at all. Of the four posts, none pertained to queer topics and were therefore excluded. Surprisingly, Twitter did not attempt to overtly align with LGBTQ+ stakeholders either. Since 12 June 2020, the account has only published 17 tweets that touch on LGBTQ+ topics. Of those tweets, only one was posted during Pride Month, the others were published during off-months.

This sole remaining Pride Month tweet is a retweet that strongly condemns the practice of rainbow capitalism (rainbow washing) and urges people to spend their money directly with queer artists. The remaining tweets highlight other queer individuals who were involved in the production of *Bugsnax* or spread information about various queer games and developers.

Young Horses generally refrained from overtly communicating LGBTQ+ stakeholder alignment and focused on platforming or supporting queer individuals in the video game industry instead. This communication strategy is in line with the opinions of both Kevin Zhun and Sage Coffey. They both stated that they aimed to normalize queer representation and inclusion in the game without othering anyone (King, 2021; Troughton, 2021a). Hence, social media communication focused more on the quirky half-bug, half-snack creatures, and fan creations rather than centering on their queer characters. Their communication strategy remained the same throughout the year. Pride Month and other LGBTQ+-centric days did not change how *Bugsnax* communicates about LGBTQ+ topics; they offer a platform to queer games and individuals all year long alongside their quirky creatures.

Queer branding and communication

Tell Me Why, in contrast to *Bugsnax*, is more directly branded as a queer game, through its integration of trans narratives, and this is reflected in their strategic communication efforts on social media. Even though *Bugsnax* amassed more tweets in roughly the same amount of time, only a marginal amount of them mentioned LGBTQ+ topics. The account only posted one tweet during Pride Month whereas *Tell Me Why* accumulated 26 tweets and six Instagram posts. While *Bugsnax's* strategic communication conveys the normalcy of queer identities, *Tell Me Why* conveys attempts to make them more visible. Consequently, this comparison shows that

the game with the more obvious queer branding focused extensively on communicating alignment with their LGBTQ+ stakeholders during Pride Month. Communication efforts include awareness and visibility days, with more than half of the *Tell Me Why* tweets occurring then. *Bugsnax* does post during these events but not with the intention of using them to overtly further stakeholder alignment. Hence, *Tell Me Why* deliberately engages in strategic communication during Pride Month and visibility or awareness days, with the intention of strengthening LGBTQ+ stakeholder alignment. They usually do so by voicing support, care, and advocacy for LGBTQ+ communities and their issues. In doing so, *Tell Me Why* positions itself as a socially responsible brand. Since they place great emphasis on trans visibility and awareness days, this consistent communication positions them as a trans-friendly brand as well.

On the other hand, *Bugsnax* seldomly engaged in such activities, with their sole Pride Month tweet condemning rainbow washing instead. Most of *Bugsnax's* tweets count as off-month communication, they are utilized to showcase queer individuals who worked on the game or to make a larger audience aware of other queer indie games and their creators. While not making overt alignment claims to stakeholders, this strategic communication normalizes queer identities and positions the company as a queer-supportive brand, accordingly aligning with LGBTQ+ stakeholder expectations. Their strategic communication also appears authentic to their stakeholders due to the sparse but consistent off-month communication.

Overall, both game companies engage in different methods of stakeholder alignment; *Tell Me Why* communicates more often and adamantly advocates for LGBTQ+ rights, while *Bugsnax* communicates sparingly, and therefore attempts to normalize the existence of queer identities within its games and the industry.

5.3. Authenticity compared

To explore how authentic the communicated LGBTQ+ stakeholder alignment is, the answers to RQ1 were contextualized with further organizational discourse, such as websites, blog posts, and interviews. The data was categorized along Lim et al. (2022) authenticity dimensions (continuity, credibility, representativeness, integrity, and symbolism) with the objective being to observe how organizational practices compare to the strategic communication of CSR initiatives by video game brands. Using the POA framework (Lim et al., 2022) to look at organizational practices allows us to assess the perceived authenticity of the brands for LGBTQ+ stakeholders. It is important to highlight that the following analysis only allows us to note the perceived authenticity of the video game brands and not whether they are authentic in their organizational practices.

5.3.1. Tell me why

Analyzing the perceived authenticity of *Tell Me Why* proved to be more complex due to the publisher and developer being separate organizations operating independently from one another. Additionally, Xbox Game Studio operates within the Microsoft corporation, which complicates matters further. One of the first perceived organizational authenticity dimensions to observe is *integrity*. The Human Rights Campaign Foundation's Corporate Equality Index provided great insight into Microsoft's LGBTQ+ company policies. For 17 years, Microsoft has received a score of 100, exemplifying its supportive policies (Capossela, 2022). Unfortunately, no such rating was available for DONTNOD, leaving only their website for further insight, where they highlight their inclusivity and diversity as key elements in their corporate practice.

For *continuity*, the Corporate Equality Index gave a great indication of Microsoft's continued commitment to its LGBTQ+ employees. DONTNOD has a history of LGBTQ+ character inclusion in their games, although some representation has been criticized in the past, arguing that it used the "Bury Your Gays" trope (Chan, 2017; Troughton, 2021b). The continued support of LGBTQ+ communities is also constantly voiced in the social media communication of *Tell Me Why*. In our sample, they supported trans and queer communities, also urging their audience to do the same.

Credibility was observed in the cooperation of Nick Adams, August Black, and Blair Durkee during the production process. These valuable trans perspectives helped DONTNOD and Xbox Game Studios in their endeavor to deliver an authentic character and narrative, one which does not rely on harmful tropes and stereotypes. They did not shy away from including negative experiences that can occur for trans people but dealt with them in an adequate way instead. Another demonstration of commitment to queer representation was the choice to only hire trans voice actors for the localized versions of the game. Tyler's depiction as a well-rounded character, who is not only defined by his trans identity, offers stakeholders the ability to connect with the character and provides a positive media representation, falling under the *symbolism* dimension of authenticity.

For *representativeness,* it should be emphasized that a continuous effort is made by *Tell Me Why* to platform not only queer individuals but also queer creators and their games. However, as of December 2022, one factor that negatively affects the perceived authenticity of *Tell Me Why* is that the game is not available to purchase in 13 countries, among which are China, Russia, and Turkey. Being unavailable in these countries, which have a more anti-LGBTQ+ sentiment, does not support the strategic communication made to align with LGBTQ+ stakeholders. Instead, it highlights national cultural values and identities, meaning that regional markets are prioritized over universal LGBTQ+ stakeholder support.

5.3.2. Bugsnax

Since Young Horses is a small independent developer and has only published two games, their perceived authenticity cannot be analyzed conclusively due to the lack of online discourse surrounding their organizational practices. Their website, in general, seems to imply an LGBTQ+ inclusive working environment, and the job listings strongly encourage queer people

to apply. Of the nine employees, Kevin Zuhn is the only non-binary person. Other queer people could not be publicly identified. The wording of their job listing adds to the *credibility* of Young Horses, with it being an equal-opportunity workplace with genuine LGBTQ+ affiliation. Furthermore, *credibility* is shown in the interviews with Kevin Zuhn and Sage Coffey when both elaborate on how they combat harmful stereotypes in the writing process and try to deliver seamless queer inclusion. Employing Casey Mongillo as the voice for the non-binary character also supports the commitment of *Bugsnax* to queer *representation*. Not including explanation scenes in writing further accentuates the normalcy of queer identities in the *Bugsnax* universe. Coffey states that the absence of these scenes is because the game was not written purely with a cisgender audience in mind. The *representation* of a lesbian and gay couple, in addition to a non-binary character, stresses *Bugsnax's* commitment to representing the diversity of queer individuals.

6. Discussion

Our research examined the strategic communication of the respective developers/publishers of the video games *Tell Me Why* and *Bugsnax* to assess their LGBTQ+ stakeholder alignment. We compared their strategic communication on social media and their corporate social responsibility practices (LGBTQ+), to assess their alignment and perceived authenticity from LGBTQ+ stakeholders. Comparing their strategic communication with organizational practices communicated in other online discourses, our findings indicate that perceived authenticity is usually achieved not only through fulfilling the criteria of the perceived organizational authenticity scale (Lim et al., 2022) but also when strategic communication with stakeholders is consistent with certain organizational practices. Our findings noted that this strategic communication is influenced by the queer branding of the video games, which we use in this research to mean how much LGBTQ+ themes are directly involved in the game narrative.

Bugsnax and Young Horses take a different approach in their communication with LGBTQ+ stakeholders. While *Tell Me Why* uses every opportunity to showcase its alignment with its LGBTQ+ audience, due to the direct involvement of trans characters in the game narrative, *Bugsnax* does not. The goal of *Bugsnax*'s strategic communication is not to foster LGBTQ+ stakeholder alignment with their consumers. They utilize their platform to integrate queer representation into the normalcy of everyday life, like how it is done within the game. Zuhn and Coffey both expressed that they want to combat the otherness of queer inclusion that is often dominant in other media. Neither their Twitter nor Instagram accounts engage in extensive Pride Month communication, just like how queer representation is never 'othered' within their games. However, their sincere alignment with LGBTQ+ stakeholders is made clear in other organizational communication.

For example, with *Bugsnax*, we noted no divergence between communicated CSR and corporate practice, so essentially, they appear to not engage in rainbow washing. The most notable aspect of their strategic communication is their refusal to treat queer and cisgender identities differently. They avoid othering queer identities and deconstruct the "us vs. them" narrative, both within their games and through their strategic communication patterns. *Bugsnax* does this by keeping overt LGBTQ+ stakeholder support to a minimum and instead using their account to give a platform to queer video games and their queer creators, not only during Pride Month but throughout the year. Overall, their organizational communication is in line with organizational practices found in other online discourses, indicating that Young Horses and *Bugsnax* are perceived to be authentically aligned with LGBTQ+ stakeholders.

On the other hand, DONTNOD uses *Tell Me Why*'s social media as a platform to overtly align with LGBTQ+ stakeholders. This is due to the game's branding, or how heavily LGBTQ+ themes are involved in the narrative. Dealing strongly with trans issues, the game is utilized as a vehicle to raise awareness and advocate for LGBTQ+ rights during Pride Month. As pointed out, since queer issues are within and central to their game, DONTNOD's strategic communication incorporates them as well. Still, the perceived authenticity of *Tell Me Why* in part resembles Venter's (2021) findings concerning *Overwatch* and Blizzard Entertainment, meaning that Xbox Game Studios (the publisher) support its LGBTQ+ stakeholders, but only to a certain extent.

With *Tell Me Why* being unavailable to purchase in several countries with anti-LGBTQ+ policies, this demonstrates how the publisher prioritizes potential market share over real CSR. *Bugsnax,* on the other hand, is available in every country, which again echoes their sentiment of not wanting to other queer identities. Inconsistent CSR and rainbow washing might be easier to avoid when operating as a smaller organization; nevertheless, it is still possible when most of the dimensions of authenticity (Lim et al., 2022) are met. Still, our research indicates that walking the walk can be done when queer inclusion is the core of the strategic communication effort.

7. Limitations and future work

The limitations of this research include not considering strategic communication outside of social media by both companies, as well as not deconstructing the queer identities within the games themselves, which would have greatly benefited the discourse analysis. Deconstructing the identities within the games while beneficial does not strictly fit under the umbrella of strategic communication, and hence was not included. However, it is still communication targeting stakeholders and can be considered important. Also, only the main account for the video games was analyzed. This was done to ensure that communication originated from sources (and content) of interest and to reduce the amount of filtering involved. Future research can incorporate additional associated accounts (publishers, developers, etc.) to contextualize the strategic communication efforts more adequately while incorporating more filtering to pinpoint relevant content.

Moreover, we understand that our work is only concerning two specific cases and that findings may differ for other video game developers and publishers. However, by creating a case definition based on queer branding, we selected typical, frequent, and theoretically relevant cases for our

research (Mayring, 2007). The next step to validate our findings and draw broader conclusions would be to broaden the range of cases. Case study researchers recommend working with three to ten single cases (Yin, 2005), which we can select with various ranges of queer representation and narratives.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical approval was not required for the study involving human data in accordance with the local legislation and institutional requirements. The social media data was accessed and analyzed in accordance with the platform's terms of use and all relevant institutional/national regulations.

Author contributions

IG performed the critical discourse analysis. Both authors contributed to the conception, design of the study, current manuscript, read, revised, and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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The light, the dark, and everything else: making sense of young people's digital gaming

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Whether gaming has a beneficial or detrimental effect on young people's lives is a defining feature in both the research and the public discussion of youth digital gaming. In this qualitative study, we draw from a thematic analysis of the experiences of 180 game players in Finland, aged 15–25 years. Utilizing the digital gaming relationship (DGR) theory, we explore how different aspects of gaming actualize in their lives, and how different features of gaming culture participation come together to form their experience. We contend that framing gaming as a balancing act between beneficial and detrimental obscures much of the complexity of young people's gaming, reinforces a partially false dichotomy, and overlooks young people's agency. Based on our results, we suggest alternative approaches that help reduce and avoid these problems.

KEYWORDS

digital gaming relationship, young people, digital gaming, social worlds, everyday life, transmedia, thematic analysis

1. Introduction

Young people actively participate in gaming cultures: in Finland, where this study took place, 76.2% of 10–19-year-olds play digital games weekly and 42.2% do so daily, while in the 20–29 years age bracket, the corresponding percentages are 66.7 and 24.4% (Kinnunen et al., 2022), respectively. As they live in a world where gaming is a part of everyday life, it is not surprising that for many young people, gaming is an important part of identity development (Granic et al., 2020) and social life (Bengtsson et al., 2021).

The impact of games and gaming cultures on young people's wellbeing and behavior has been a source of concern and interest from the early steps of modern digital gaming in the late 1970s and early 1980s to contemporary times (Rogers, 2013). However, research on young people's gaming has predominantly focused on their game play, typically through exploration of variables such as time spent playing and game play motives, and their connections to various outcomes regarding, for example, psychological wellbeing or learning, usually applying quantitative methods (e.g., Hamre et al., 2022). A minority of individual, usually qualitative, studies have focused on specific aspects of youth gaming, such as gaming as part of social life and friendships (e.g., De Grove, 2014; Eklund and Roman, 2019; Bengtsson et al., 2021), or youth views on problematic gaming (Nielsen, 2016), gaming-related parenting (Meriläinen, 2021), online gaming conduct (Kaye et al., 2022), or game content (Kutner et al., 2008). To our knowledge, only a few studies (Lenhart et al., 2008; Aarsand, 2012) have sought a more general understanding of young people's relationship with gaming.

Gaming is often seen as a dichotomous activity defined by the sometimes stark contrast between its "dark" and "light" sides (e.g., Greitemeyer, 2022), and issues such as violent content and problematic gaming are juxtaposed with aspects such as friendship, learning, and relaxation. However, many aspects of gaming sit outside the dichotomy of clearly beneficial or detrimental, light or dark, but are at the core of gaming nevertheless.

In this article, utilizing the digital gaming relationship (DGR) theory (Meriläinen, 2023; see also Sokka, 2021) as a lens, we draw on young people's views on gaming to broaden perspectives on youth gaming. Based on our analysis, we suggest alternative research perspectives to construct a more complete picture of young people's gaming. We wish to point out that our use of the word "gaming" in this article does not refer only to the act of playing games, covering instead a diverse constellation of gaming culture activities (Kahila et al., 2021). Gaming is participation in the social world of digital gaming, a socially constructed sphere of interest and involvement that individuals engage with varying intensity and attachment, and is influenced by social, personal, and cultural and societal factors (Unruh, 1979; Meriläinen, 2023). Contemporary games are often transmedia products (Koskimaa et al., 2021), and their fiction unfolds through multiple mediums, inviting varied forms of engagement.

2. Background

Much of previous research on youth gaming has focused on the impact of gaming, typically examined through variables such as gaming motives and spent time, on different aspects of wellbeing. While causality often remains unclear, gaming has been connected to a wide range of beneficial and adverse phenomena, from enhanced working memory and task-related brain activity (Moisala et al., 2017) and academic learning (Martinez et al., 2022) to depressive and musculoskeletal symptoms (Hellström et al., 2015).

Research focusing on youth gaming seen as problematic or disordered (e.g., Van Rooij et al., 2011; Männikkö et al., 2017; Su et al., 2018; Chang et al., 2022) has been prominent and increasing since the early 2010s, sparking considerable debate (see Aarseth et al., 2017 and responses) and making up a considerable part of contemporary research on young people's gaming. As a phenomenon, problematic gaming exemplifies the often blurred lines between genuine risk and moral panic that prominently feature in research on youth technology use and associated public discussion and policy decisions (see Rogers, 2013; Orben, 2020). The discussion of problematic gaming, coupled with the long-running academic and public debate regarding the potential impact of violent game content on aggressive behavior (see Mathur and VanderWeele, 2019) and contemporary worries over so-called screen time (Orben, 2020), has firmly grounded research and public discussion on youth gaming in risk perspectives, with the benefits of gaming offered as a counterbalance (e.g., Granic et al., 2014; see Behrenshausen, 2012).

While the risks of gaming have been widely documented, many studies (e.g., Männikkö et al., 2017; Hamre et al., 2022) on the impacts of gaming note that outcomes are contingent on a wide range of variables: they typically do not stem from gaming as such, but rather from an interplay of ways of engagement, motives, life situations, time spent, and games played, as well as factors such as gender, race, and age. As a result, discussing young players as a more or less homogenous group erases these fundamental differences. Our rationale for this study springs from this diversity; to better understand young people's gaming, we have to explore individual experiences and narratives to avoid collapsing vastly different experiences into generalized categories and stereotypes. To do this, we apply the DGR theory, discussed next.

The DGR theory examines individuals' engagement and relationship with the social world of digital gaming and was developed from the sport sociological theory of physical activity relationship (Koski, 2008) by Sokka (2021) and expanded by Meriläinen (2023). As a new theory, it has shown promise as a tool to understand gaming as a complex phenomenon (Meriläinen, 2023). The theory takes as its starting point that each individual has a different relationship with gaming, and an individual's relationship with gaming develops, and is actively constructed, over a long period of time and is influenced by a variety of factors. These factors are the personal meanings given to gaming, internal and external influences on gaming, different ways of engaging with gaming, and the level of engagement with gaming. The DGR theory acknowledges that there are as many individual formulations of young people's gaming as there are young people, and thus lends itself well to the qualitative exploration of individual experiences while also allowing the identification of wider phenomena.

3. Data and method

The data used in this study are a set of responses to a Finnish language qualitative online questionnaire (see Supplementary File 1) constructed by the first author and consisting of seven voluntary, open-ended questions and background questions (age, gender, cultural background, and living region), collected in Finland between May and June 2021. The questionnaire was targeted at 15–25-year-old Finnish speakers who played digital games. The questionnaire link was shared on social media (*Twitter*, *Facebook*, and *Discord*) through both professional and personal networks, with an emphasis on specific groups such as Discord gaming communities and Facebook groups for professionals, such as teachers, youth workers, and media educators, working with young people, requesting that they share the questionnaire to young people they work with. Several actors, both individuals and organizations, in the fields of gaming, academia, youth work, and media education also distributed the questionnaire through their public accounts. This resulted in a self-selected sample of 180 respondents.

The seven main questions were intentionally broad (e.g., "Does something limit your gaming?") to avoid constraining the responses. However, to assist participants, we provided several example subquestions (e.g., "Do your parents set limits on your gaming?" and "Do you avoid certain games or communities?"). It was explicitly stated in the questionnaire that these subquestions were examples to help respond to the broader questions and that respondents were not required or expected to address the subquestions. Most respondents ($N = 163$, 90.6%) answered all seven main questions. As all questions were voluntary, we also

included responses ($N = 17$, 9.4%) in which the respondent had answered some questions. Individual answers to the questions varied considerably in length: some consisted of a single word, while others ran for several paragraphs.

The whole age range of the target group (15–25) was represented in the data, with an average age of 20.6 and a median of 21 years. Out of the 180 respondents, 120 (66.7%) were men, 46 (25.6%) were women, and 11 (6.1%) were non-binary. Three respondents (1.6%) elected not to disclose gender information. While all ages in the 15–25 years range were present in the men's sample with an average age of 20.1 years, the youngest woman to respond was 17 years and the average age in the women's sample was 21.8 years. The small non-binary sample fell between these two, with an average age of 20.8 years.

Nearly all respondents ($N = 177$, 98.3%) were born in Finland, with 11.1% of the respondents ($N = 20$), reporting that one or both of their parents were born in another country. Very few respondents reported belonging to a cultural or language minority; five respondents (2.8%) were Swedish-speaking Finns and two respondents (1.1%) were Sámi.

We conducted a thematic analysis (see Braun and Clarke, 2021) on the responses, utilizing a combination of data and theory-driven approaches. We familiarized ourselves with the responses and, using the qualitative analysis software *Atlas.ti*, coded the responses, first individually and then together, going over the responses several times, coding and re-coding, combining notes, and discussing until we reached an agreement.

In the coding process, we identified different aspects that we considered relevant and interesting, to capture a detailed and diverse picture of young people's gaming. After removing redundancies and merging overlapping codes, the process resulted in 437 individual codes that ran from single mentions (e.g., "Worry over too much sitting") to broad topics mentioned by the majority of the respondents (e.g., "Gaming with friends"). Next, we grouped codes to make larger subthemes (e.g., "Gaming and gender" and "Public discussion of gaming"), experimenting with a variety of configurations. We then looked at these groupings through the lens of the DGR theory, as discussed next.

4. Results

We present our analysis organized by the four main themes derived from the DGR theory (Figure 1). We start with the *Level of engagement* to demonstrate the considerable differences in young people's engagement with game cultures, followed by the *Personal meanings of gaming*. We then explore the *Internal and external influences* that shape individuals' relationship with gaming and

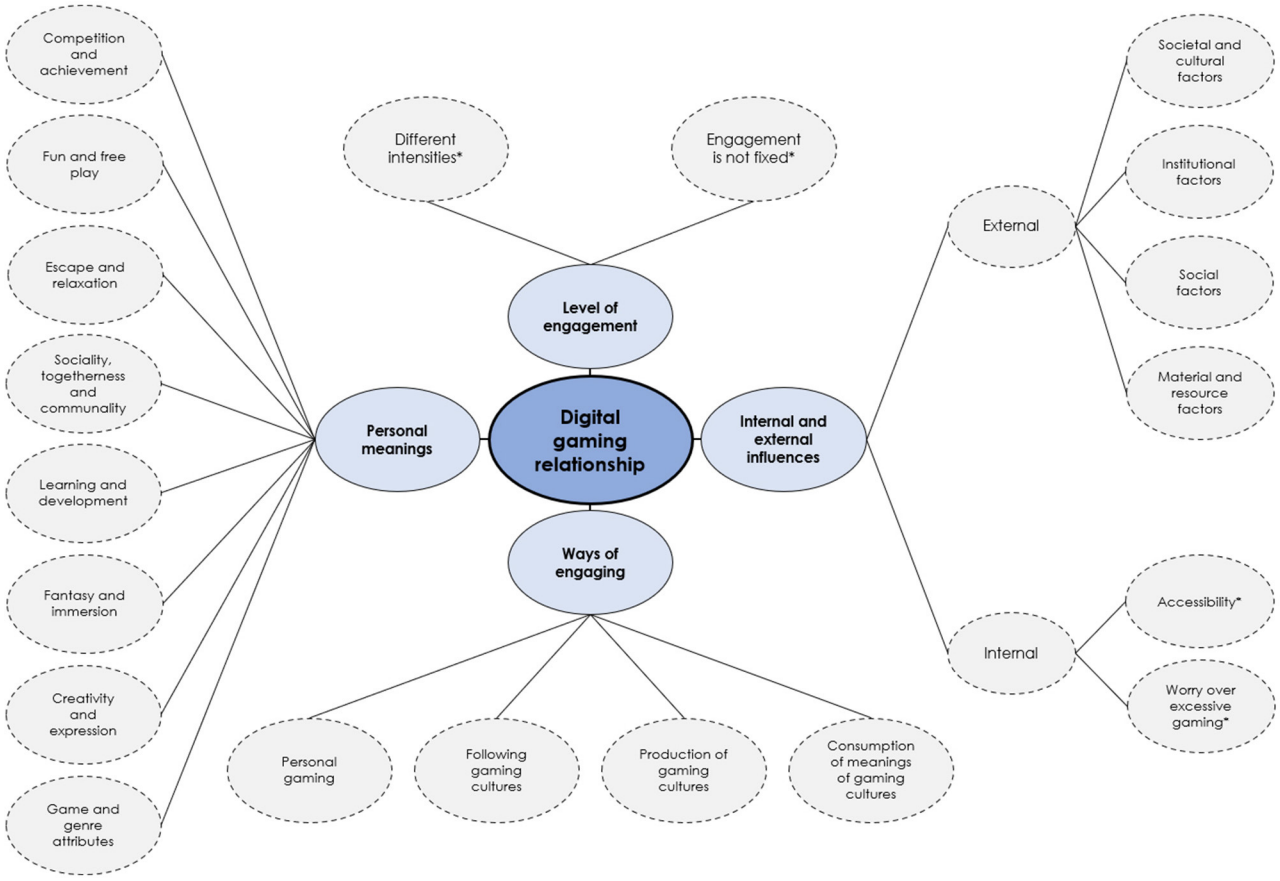

FIGURE 1
Thematic map of main themes and subthemes. Asterisk denotes a subtheme not derived from the DGR theory.

conclude with the different ways gaming takes place in the theme *Ways of engaging with gaming*.

We have illustrated our themes with quotes from the responses, translated from Finnish. For ease of reading, we have made minor grammar and punctuation changes to some of the quotes during the translation. Because of the contested nature of the word "gamer" (see Shaw, 2012; Paaßen et al., 2017), we have used the word "player" when referring to someone who plays games.

4.1. Level of engagement

This theme consisted of two subthemes: *Different intensities* and *Engagement is not fixed*. The first focused on the different levels of engagement based on Unruh's (1979) formulation of social world participation, whereas the second addressed the shifting nature of this participation.

4.1.1. Different intensities

In terms of the DGR theory and Unruh's four types of social world participants (*stranger*, *tourist*, *regular*, and *insider*), all types of participation could be identified. The vast majority of respondents could be classified as *regulars*: they routinely participated in gaming, displayed attachment to it, and had regular company to play games with.

> CS:GO [*Counter-Strike: Global Offensive*] has been extremely important for me ever since I ran into the game. It's been a tool to stay in contact with friends who live in other cities. Gaming is an important way for me to support social relations, that would be otherwise be almost impossible to sustain. Because the gaming itself is not the whole thing, but simple things like going through what's happened during the day is also a part of it. … Watching gaming streams and YouTube has replaced TV and other streaming services for me. Man, 20

In contrast to the teenagers interviewed a decade earlier by Aarsand (2012), these young people did not appear to strategically position themselves as "ordinary players" by distancing themselves from "casual" or "hardcore" players—possibly owing to the different research methods (anonymous online questionnaire vs. face-to-face interviews) and the further normalization of gaming since Aarsand's research (see also Vahlo and Karhulahti, 2022). Gaming appeared as a mundane part of their everyday life despite sometimes very intense gaming. However, when asked about negative gaming experiences or worries over gaming, some respondents specifically mentioned that gaming was not a problem for them if they were discussing intensive gaming, aware that it could be interpreted as such.

> Gaming has never been a problem for me. I've played for long periods in a row, but I can be without the computer and games too. Like driving around with friends. But I spend my free time home and at the computer, and quite often gaming. This doesn't have a big negative impact on my life. Woman, 22

A minority of respondents could be seen as *insiders*, expressing the importance of and their belonging to the social world of gaming in different ways. Below are two very different examples.

> In terms of players, I'm a so-called "hc" (hardcore) player which means that I game a lot using a purpose built computer. … Attitudes towards games are nowadays pretty open because almost everyone plays to some degree. In a way [this is also] a bad thing because many casual players don't have a clue about gaming culture in general and they don't care about the actions of game developers so they're easy to exploit to hammer out a profit. They're also often shocked about harsh language and demand game developers to address it, which just makes the whole culture/hobby even worse. Man, 22

> I encourage so-called noobs [new players] and offer advice whenever possible. I automatically block rude players and report inappropriate behaviour. … I run my own clan in *Warframe* and organize events and LAN parties. Woman, 25

The first comment echoes common discourses in gaming cultures. Although common in marketing and everyday language, the "gamer" or "hardcore gamer" identity is often seen as a negative one defined by exclusivity and hostility and is sometimes actively avoided (Shaw, 2012). The insider status partially differs from Unruh's (1979, p. 120–121) definition: although gaming appears to be an important part of the respondent's identity, the influx of new individuals into gaming appears more as a degradation of gaming culture, instead of a necessity to the social world's existence. Owing to the scale and dispersed nature of gaming, such insiders have few ways of policing access to the social world, which may further feed frustration. In the second quote, the respondent mentions several features pointed out by Unruh, namely the active creation and controlling of the social world through organizing events and reporting inappropriately behaving players and the recruitment of new members by both encouraging starting players and providing ways of entry through events.

At the other end of the engagement spectrum, a single respondent mentioned that they did not play games at all, their gaming culture participation limited to occasionally watching Let's Play videos (videos of commented game play) on *YouTube* (see Orme, 2021). This respondent can be seen as a *stranger* in the social world of gaming. Although engaging with gaming culture, their engagement is ephemeral and uninvested.

The fourth group of respondents were those classified as *tourists*, who enjoyed different aspects of gaming but were nevertheless not very invested in it, transiency and entertainment being common features of their gaming (Unruh, 1979, p. 119). They might regularly play different kinds of games on a variety of platforms and devices or have a history of very intense gaming yet did not view gaming as all that important. This observation shows the shifting nature of DGR and contests common notions of "casual gaming", stereotypically seen as occasional smartphone gaming limited to a few games (see Juul, 2010).

> I play FPS [first-person shooter] games with my friends, but also MMORPGs, as well as driving games and all sorts of roguelike [a subgenre of digital role-playing games] games. I

> also play single-player games or online games by myself. I play on the computer as well as on gaming consoles and sometimes on the phone. Gaming used to be a part of my everyday life, but nowadays I only play if there's a new trendy game or if I suddenly feel like it. … I also used to watch some gaming youtubers/streamers as my idols, so that's also influenced how I'm growing up/have grown up … If I need to choose between a hobby and gaming, I usually choose the hobby without the slightest thought. Man, 16

4.1.2. Engagement is not fixed

Participation in gaming can change for a variety of reasons. As Bergstrom's (2019; see also Wiik, 2023) exploration of the players of the massively multiplayer game *EVE Online* demonstrates, quitting or actively gaming is not a binary, but a spectrum. In our data, changing life priorities and responsibilities were a common source of change in participation. As demonstrated by the second quote below, a change in participation sometimes impacted only a part of the social world.

> Gaming is important to me, and I even consider it a hobby. My gaming fluctuates: there are periods when I don't play at all, at other times periods when I play even several hours per day. Woman, 19

> I don't play anything anymore because I see games as too addictive. They fill your mind even when you're not on the computer … I was definitely gaming too much, easily 5–8 h per day. That's far too much. … I watch a lot of streams, esports even though I don't play myself anymore. I like watching *CS:GO*. Man, 22

Changes in gaming did not always imply profound changes in an individual's relationship with gaming. Gaming activities might be stopped for long periods at a time, yet an individual could still view gaming as an important part of their life and participate in the social world. This said, few participants discussed long-term changes in their gaming participation.

4.2. Personal meanings of gaming

In this main theme, we examined the eight dimensions of personal meaning as defined by Meriläinen (2023): *Competition and achievement*; *Fun and free play*; *Escape and relaxation*; *Sociality, togetherness, and communality*; *Learning and development*; *Fantasy and immersion*; *Creativity and expression*; and *Game and genre attributes*. Although these dimensions overlap with gaming motives, they are broader wholes that represent respondents' self-positioning in relation to different gaming phenomena (Meriläinen, 2023). As different dimensions of a single broader whole, they intersect and overlap, and are not exclusive categories.

4.2.1. Competition and achievement

Competition is a key feature of many popular games and gaming culture phenomena from early arcades to contemporary esports. It is also a divisive topic that some respondents felt very strongly about. Discussion of this dimension was typically focused on game play mentalities and practices, although it also touched more broadly on competitive gaming culture. Many respondents mentioned playing popular competitive games such as *League of Legends*, *Overwatch,* or *CS:GO*, and competition and developing gaming skills were brought up by many respondents as an important part of their gaming. Competition was not only about victory over others but also about feelings of success and competence (see Ryan et al., 2006; Vahlo, 2018).

> The feeling of winning and success is important, the feeling that you can do this and you're good. Especially when playing against other people the feeling of being better than another person is amplified, not so much when playing against the computer and you're just happy about your own performance. Man, 19

Competition was a dimension where different goals and mentalities sometimes clashed. Respondents reported their annoyance over their fellow players being either too serious or too easy-going, depending on their preferences.

> I often play multiplayer games trying to do my best and I'm pretty competitive, sometimes it can be annoying if a friend/teammate is not trying to win and is playing "just for fun". Man, 21

Respondents discussed not only their preferences but also voiced their views on how they perceived competition as influencing gaming more broadly. Some respondents saw esports and the professionalization of gaming as a reason for gaming becoming too competitive (see Blamey, 2022). Echoing the different gaming mentalities mentioned above, these respondents saw a focus on competition as antithetical to relaxed fun and enjoyment (see Brock, 2017).

> Contemporary gaming culture has become remarkably competitive, even excessively so. I for example no longer play FPS game almost at all because good-natured fun has almost completely disappeared from them, and the game is approached like a high-level sport. Non-binary, 18

4.2.2. Fun and free play

Closely related to the previous dimension, *Fun and free play*[1] addresses gaming for fun and playful experiences. Experiences of fun can be difficult to pinpoint exactly (Vahlo, 2018), and respondents described a wide variety of things that contributed to the fun, from immersion in game narratives to fooling around with friends while gaming.

Although gaming is probably for the most part "fun", however individuals interpret the word, it is not always about playful leisure, but can, for example, be work (Bihari and Pattanaik, 2023), monotonous "grinding" of repetitive content or systematically

1 The word for free play in Finnish is *leikki*, *paidia* as opposed to *ludus* following Caillois (2001/1958; cf. Masek and Stenros, 2021) formulation.

working to hone gaming skills (Pargman and Jakobsson, 2008; Vahlo, 2018), or professionally creating video content (Törhönen, 2021). Gaming can also have instrumental functions. Here, the respondent makes a distinction between the instrumental use of gaming as coping, and playing "just for fun":

> I mostly play games for fun, as my hobby, but sometimes also to escape the tumult and stress of life. Man, 22

Having fun and approaching gaming from a playful point of view (see Masek and Stenros, 2021) was seen as normative by some respondents: gaming should be first and foremost fun. One respondent connected hostile behavior to taking gaming too seriously.

> I'm most worried about how angry players seem to be at each other nowadays. Or how some people take it [gaming] far too seriously. Man, 23

In some cases, playing for fun was related to the overall lower importance of gaming, echoing the idea of Unruh's (1979) tourist: visiting the world of gaming occasionally for entertainment, but not being very attached to it. As demonstrated by many of the respondents, gaming can hold great personal significance. However, for the majority of players, gaming is likely not a life- or identity-defining or otherwise profoundly important activity, but more about entertainment and killing time, even if they actively play and enjoy games.

> I play games because it's something fun to do—usually because of the story and characters. … I think gaming is fun but on no level does it rank over other casual hobbies. I do it when I feel like it, meaning irregularly. Woman, 23

> I play to kill time and mostly at home. I usually play because there's nothing better to do. I'm primarily a console player, and play regularly on the PS3, PS4, Switch and 3DS. Although I play a lot, it's not all that important to me, because I'm mainly looking to kill time because of my current life situation. Man, 18

The dimension also encompasses different types of playful behavior both during game play and in gaming culture more broadly, such as cosplay. Trolling in its different forms (Stenros, 2015; Cook et al., 2018) was an interesting example, as some participants did not frame their self-labeled trolling behavior as hostile, but as playful, prioritizing engagement over consequence (see Masek and Stenros, 2021). More hostile forms of trolling are discussed under the subtheme *Sociality, togetherness, and communality*.

> I mainly troll in ways that don't really cause harm to anyone. In *Valheim* I like to build treasure chests on the map in the middle of the forest and fill them with either useful or useless items for others to find. Together with another player we built a hut in secret, and filled it with signs with aphorisms written on them. Non-binary, 25

4.2.3. Escape and relaxation

Relaxation, stress relief, and psychological coping are common motives and outcomes for gaming (e.g., Ryan et al., 2006; Snodgrass et al., 2014; Caro and Popovac, 2020), and for many respondents, gaming was a way of supporting psychological wellbeing and served as a counterbalance to stress, for example through gaming as a comfortable routine, intense pleasant emotional experiences, or spending time with friends. The apparent instrumentality varied: some respondents mentioned that gaming was relaxing, whereas others explicitly reported using gaming to relax and relieve stress.

Several respondents formulated a distinction between gaming and other aspects of everyday life, and described this as an "escape." Despite this figure of speech, gaming appears very much positioned in the midst of everyday life with its associated problems and responsibilities: the figurative escape is, for example, comfort and time to oneself.

> For me, games are an opportunity to escape the rest of my life for a moment, and amidst an ending romantic relationship or health problems gaming has been a source of comfort and joy. Woman, 21

The opportunities for relaxation that gaming provided were also seen as a risk. Echoing previous research (Snodgrass et al., 2014; Shi et al., 2019), the easy escape that gaming provided was seen as problematic. Illuminating the problems of dichotomous approaches, both beneficial and detrimental qualities could appear simultaneously, and players were aware of this.

> I'd say that in terms of my quality of life it would be better for me to more often do something else than play games. Games often offer only short-term pleasure and filler for my life and they don't really result in long-term benefits like reading or just leaving the house in general might. Of course I think gaming with my friends is important, but I'm specifically talking about gaming I do by myself. Often gaming is an "easy" solution and deep in my comfort zone and I should try to leave it considerably more often. Man, 25

4.2.4. Sociality, togetherness, and communality

Gaming is a common part of many young people's social life (e.g., De Grove, 2014; Eklund and Roman, 2019; Bengtsson et al., 2021), and different aspects of social participation in gaming featured prominently in the data. Social interactions, or lack thereof, could considerably influence an individual's gaming experiences (see Kaye and Bryce, 2012) and relationship with gaming, for example through a sense of community and belonging, avoiding interaction with other players, experiences of discrimination, or conflict with friends and family members. None of the responses suggested that the respondent's gaming was completely asocial. Even those who preferred single-player games, or for whom gaming was very private, still participated in online communities related to their favorite games, visited events, or discussed games with their friends.

> Video games have been the source of my sociability since my youth. My friends at school were those who I gamed with and I could talk about things while gaming. I got to know my first girlfriend because she was wearing the shirt of a Youtuber I liked (Laeppavika [Finnish gaming Youtuber]). Man, 22

> I play games alone because I can't be bothered to deal with other people when I just want to relax with a game. Looking at [game] culture as a bystander, it feels like I've made the right choice and I wouldn't ever bother to try gaming especially with strangers. … Gaming is a part of interacting with many of my friends and at the very least they've been a part of building friendships or [friendships] have even been born from them. Non-binary, 23

Online conduct was often commented on, and online hostility (see Kowert, 2020) was a major problem discussed, and sometimes participated in, by the respondents. An important observation is that there was not a clear definition between a "toxic" and "non-toxic" player: respondents describing their online conduct as friendly and helpful could also lose their cool in the heat of a gaming situation. Respondents paid attention to their own conduct as well and sought to regulate it out of consideration for others.

> In general what annoys me in gaming culture is the amount of hate speech and harassment. I'm for example not at all surprised why women may find gaming communities repulsive. I try to make my own gaming environment a safe space for everyone. Man, 25

> Can I be polite? Yes, if I'm playing games like for example *VRChat*, in which there's no competitive value, so it's much nicer to get along than make yourself hated, especially in a game where there's nothing else than talking with others. *CS:GO* always crosses the line, in intense competitive games like that it's difficult to have fun otherwise. I've been in tears with laughter several times just because another player gets upset by my and many of my friends' shit talking. Shit talk is part of gaming, you can't eliminate it. The same applies to for example basketball or especially boxing/UFC. Man, 16

> I do my best to cheer on other players and keep up a positive gaming attitude. If I'm too agitated because of something (for example an opposing team's tricks or if the game is lagging) I keep quiet, because I don't want to say anything mean to anyone. I don't however feel like I lose my cool easily, instead there are usually some other factors behind it that lead to my annoyance. Non-binary, 19

4.2.5. Learning and development

As discussed in the background section of this article, learning is often mentioned as an important gaming benefit, and the learning dimension was brought up by many of the respondents. Many respondents, who typically spoke Finnish as a first language, assigned great importance to gaming as a way of learning English as a foreign language especially when they were younger. Respondents also mentioned more abstract development, such as new insight into their behavior.

> Games have also in some cases helped with school. E.g., I learned English very quickly because I constantly needed it with games. Woman, 22

> I've learned all sorts of things from games and gaming, but they've developed my emotional skills especially. Through games I've found sides to myself that outside gaming I haven't realized or revealed to others. For example when I was younger, aggressive behaviour after the emotional rush caused by gaming was something I never would have believed of myself in the outside world. Nowadays I can deal with the emotions caused by the game in a more "civilized" manner. Man, 25

While gaming was perceived as helping learn a variety of skills, many respondents also discussed the skill of playing games. When considering games and learning, this is a crucial point: rather than a stepping stone for learning something else, gaming can in itself be a skill with personal, social, and professional value, comparable to skills such as playing an instrument or a traditional sport (e.g., Huang et al., 2017; Karhulahti, 2020). Gaming skills and knowledge of different aspects of gaming culture could also be a source of game culture capital (Consalvo, 2007), helping navigate gaming culture and establish oneself in it.

> I'm not a skilled player, but I play using such difficulty levels that it's not a problem. On the other hand I know I've developed from when I started playing, and I'm happy for this development. Woman, 21

> I feel like I'm a skilled player, because gaming has after all been my hobby for my whole life and I'm also competitive, so I've always sought to be better than others in games. If I for example start a new game, the game's genre doesn't matter, but I learn the game mechanics really quickly and get good at it. Man, 22

> In PvE [player vs. environment] games you can learn so much and then you can be the smart one who knows everything and makes everyone else's experience much better because you're the dictionary for them. Man, 25

An interesting negative outcome of gaming skills for some respondents was that their high level ruled out potential people to game with. Skill- or rank-based multiplayer systems or large differences in skill between friends and spouses could make gaming together difficult or even impossible, limiting opportunities for shared gaming sessions. This is also an example of how the different dimensions overlap and influence each other, as in this case, the skill difference had an impact on the social aspects of playing.

> I would like to play more often with my live-in partner, but the difference in skill levels sometimes makes it difficult. Man, 24

> I have too high a rank to play competitive game modes with all of my friends. Man, 16

4.2.6. Fantasy and immersion

Closely related to the dimension of escape and relaxation, the elements of fantasy and immersion common in gaming were an important part of gaming for some respondents. The strong emotions elicited by games (see Lankoski, 2012), the ability to figuratively cross the borders of everyday life, and the different immersive qualities of games (Ermi and Mäyrä, 2005) were all brought up in the responses.

> I like gaming because I get to do things I couldn't do in the normie world. I like building houses and expressing myself in *The Sims* and *Minecraft*. I wouldn't necessarily get around to designing houses and interior decoration using a pen and paper at home, but in games it's easier. Woman, 20

Game fictions were an important part of the gaming experience, and while immersion can stem from different elements of game play (Ermi and Mäyrä, 2005), respondents mainly discussed imaginative immersion. Game fiction affords players opportunities to experience themselves and their everyday surroundings differently, and to toy with alternative ways and modes of being (Cremin, 2015). In addition to experiencing game stories in the games, some respondents engaged with them in other media (see Koskimaa et al., 2021) or expanded on the stories by writing their fanfiction, cosplaying as game characters, or drawing them (see *Creativity and expression*, below).

Several respondents compared their experiences with games to other media such as books and movies. Both similarities and differences were brought up in the responses. Echoing the notion of the *active audience* (see Behrenshausen, 2012), interactivity (see Christopher and Leuszler, 2023) was typically seen as the key difference.

> I like vicarious experiences, adventure, surprises, and exploration, and it's not possible to get similar experiences from, e.g., books or movies. Although they can also be emotional, a good game brings your emotions to the surface in a more personal way. Woman, 24

> These [story]games and moments in them are major memories for and will hopefully remain such even when I grow older. I think video games are the best form of art because they have one added layer of interactivity. Man, 16

4.2.7. Creativity and expression

Although games are often discussed from the perspective of consumption rather than production, gaming also provided an important outlet for creativity and self-expression. For some respondents, creativity was expressed through game play itself, whether as designs in games such as *Minecraft* or *The Sims* or as innovative tactics in competitive games. Others enjoyed recording and sharing videos of their gaming.

> I watch and make gaming streams. Sometimes gaming videos, but mostly I stream on *Twitch*. Man, 17

Activities such as cosplay, writing fanfiction, or drawing served as avenues for self-expression outside immediate game play contexts. They allowed participants to turn their interest and investment in games into a wider transmedia experience (see *Ways of engagement* below), expanding and re-interpreting characters and game stories, and, in the case of cosplay, rendering the digital into the tactile, allowing for new forms of engagement with the source material and constructing identity both as fans and as individuals (Lamerichs, 2011).

> I also do cosplay like many of my close friends and we have cossed and planned to coss game characters from our favourite games. I've also drawn some fan art and written fanfic of game characters, but that's fallen by the wayside a little recently; now I mostly do it when I want to give my friends for example a card with a picture of their favourite character. Instead I've focused on getting both fanmade and official merch[andise] of games that are important to me, such as stickers, jewelry, hoodies, and comics. Woman, 25

A different form of self-expression, game creation and modification as a hobby is an established part of gaming (Sotamaa, 2010; Lai et al., 2021). Some respondents modified ("modded") existing games, designed, and sometimes developed their own games as well. One respondent expressed his views on how gaming companies' control over their product was limiting players' sense of agency (see also Blom, 2022).

> I've even spun out a couple of shitty games that are inside jokes with friends. Man, 17

> Some developers also openly oppose modding which is also worrying. So the general trend is moving away from the player's decision making. Man, 22

4.2.8. Game and genre attributes

Connecting to many of the dimensions discussed above, individual games and game genres were unsurprisingly an important part of the respondents' gaming (e.g., Bergstrom, 2019). While many respondents reported playing a wide range of games and genres, others focused on a single game or two. This dimension demonstrates how players do not necessarily enjoy all kinds of games or gaming in general—something that may be overlooked in contexts such as gamification or game-based learning (see Deterding, 2014). This said, many respondents enjoyed a diversity of different games and genres.

> I play FPS games like *CS:GO*, *Apex Legends*, *Half-Life*, *Overwatch* and *Valorant* the most. After that I play simulation games like *The Sims* games, *Minecraft* and *Animal Crossing* the most. I tend to play a pretty diverse range of games, I also enjoy musical rhythm games, rally games and different story-driven games. Woman, 19

> I'm not interested in single-player games and I usually get bored of those after a few hours of playing. Non-binary, 25

Games and genres could also deter players, as respondents also reported avoiding individual games or game types, typically competitive games. Often this was because of the hostility of their communities or perception of the prevalent mentality in them. Much like gaming is not just the act of playing a game, in this context, a game was not just the game itself but also the culture, meanings, experiences, and assumptions attached to it.

> One category of games that I try to avoid is FPS games. I don't feel like I enjoy competition enough for games like *CS* [*Counter-Strike*] or *Overwatch*. Man, 22

> I don't play online games almost at all (and if I do, I don't open the chat) because I know that in some people's view it's part of gaming culture to harass everyone assumed to be a women and minority co-players. I don't feel like these kinds of games could make me happy or help me relax. Non-binary, 24

4.3. Internal and external influences

According to the DGR theory (Sokka, 2021; Meriläinen, 2023), there are different types of external and internal influences that influence people's relationship to digital games, encompassing personal, social, institutional, and societal and cultural factors. Following this classification, we next discuss the influences through the subthemes of *External influences* and *Internal influences*, both consisting of several subthemes. By external influences, we mean everything that the respondents position outside of themselves (i.e., social, material, institutional, and societal and cultural factors), while by internal influence, we refer to those influences that respondents see as stemming from themselves (e.g., their personality, preferences, and needs). Like the dimensions of meaning discussed in the previous theme, these influences are not neatly separated but overlap and interact.

4.3.1. External influences

External influences mentioned in the responses varied from those that increased or reduced the amount of engagement with video games to those that influenced the type of engagement respondents had with gaming. Similarly, they could be direct and forceful (i.e., parents forbidding certain games) or have a softer, more indirect influence (i.e., friends enjoying certain games).

Societal and cultural factors

Negative discourses about video games in public discussion both in Finland and globally, as well as the societal stigma around gaming that these discourses reinforce, were brought up by multiple respondents. Negative views on gaming did not typically influence the respondents' play activities, but rather how openly they would discuss their gaming. Earlier research has shown that people sometimes avoid talking about their gaming activities or identifying as a gamer due to gaming being perceived in a negative and stigmatized way (Shaw, 2012). Several respondents, however, also brought up that attitudes toward gaming had become more positive and accommodating.

> Older relatives also often think of games as "children's stuff" and adults who play are perhaps considered a bit childish. I think it's important to be aware of the negative effects of excessive gaming, but often still in public discussion gaming is seen more often as a negative thing. So I would also like more public discussion about the positive side of games, e.g., about what you can learn from games and that games would also be appreciated as an art form. Woman, 25

Another prominent societal discourse that influenced engagement with gaming was the perceived hostility of game communities and gaming culture in general. Overlapping with the previously discussed *Game and genre attributes*, this could lead to avoiding certain games or game types altogether.

> I don't avoid games, but I avoid game communities a lot. The communities of different games are often ungrateful towards the creators of the games and towards other players. Man, 17.

Respondents discussed avoiding certain game communities or regulating their engagement in these (for instance, by muting all communication channels) due to homophobic, transphobic, racist, and sexist comments and verbal abuse. With some of the women and non-binary respondents, this had a gendered dynamic. These respondents had experienced hostility due to their gender while playing and this had influenced the way they engaged with gaming (see Meriläinen and Ruotsalainen, 2022; Friman, 2022). Gaming cultures have long had issues with discrimination and hostility toward women and minorities (Kirkpatrick, 2017; Cote, 2018), yet our data also reveal a non-monolithic gaming culture: the majority of the respondents would not engage in or support hostile and sexist behavior, and many also actively resisted these behaviors and confronted those engaging in them (Meriläinen and Ruotsalainen, 2022; see also Nakamura, 2012).

> I have lots of bad experiences of gaming. Most often these experiences are related to my gender. There's a lot of verbal violence towards women in the gaming world. I don't like playing team-based games with strangers because as soon as the co-players hear I'm a woman, calling me a whore and other misogyny starts. Woman, 21

Institutional factors

The institutional factors affecting respondents' activities around video games varied from family to school, work, and hobbies. In the case of the family, the main influence was the parents. This would mainly manifest in the ways parents would set rules and limitations on the time spent playing, and the types of games played (see Kutner et al., 2008; Meriläinen, 2021).

> Well, I wasn't even allowed to play *Minecraft* until I was 12 years old, because my parents thought it was too violent as you can kill cows and pigs in it. Nowadays, when I no longer live

> with my parents, there are of course no restrictions. They have sometimes wondered that I play, say, *GTA V*, when they don't think it sounds like my kind of game at all. Woman, 20.

Hobbies, school, and work were mainly mentioned by respondents due to the time constraints they would introduce to playing video games. Related to this, some respondents mentioned that they would like to have some more time for playing video games or that they used to have more time to play video games. The changing rhythms of everyday life and engagements influenced how much the respondents spent time engaging with video games (see Apperley, 2010; Meriläinen, 2022).

> Nowadays the only thing limiting my gaming is myself. The time I spend on gaming has decreased because of studies and a relationship, but I still prioritize time for my gaming, especially on weekends. Sometimes I'd like more time off from my busy life for gaming. Man, 25

Social factors

Friends and social circles are an important part of young people's life, influencing the way they spend their time, form their identities, and construct their values (Youniss and Haynie, 1992; Oransky and Marecek, 2009). Friends also had a considerable influence on our respondents' gaming activities. Some respondents expressed a lack of friends playing some of the games they would like to play or a general lack of gaming friends.

> I'd like to find more people to game with. In one community there's always at least people to talk with, but people partially play other games than I do, so I don't get to play enough games that interest me with people I know. It would also be great to find women or others [likely referring to gender] to game with. Woman, 22

Other respondents mentioned how they would play certain games only with friends or because friends would want to play them, thus possibly even changing their usual gaming preferences to maintain their social circle. Multiple respondents would divide their preferred games into two different categories: games they played alone and the games they played with friends. As per Eklund (2015), who we play games with affects not only what is played but also how the games are played.

> I play alone and with my boyfriend. I play *Witcher 3* alone and *Redecor* home decoration game on my mobile phone. I play single-player games with my boyfriend and sometimes split screen co-op games. Woman, 25

Material and resource factors

Material and immaterial resources also influenced the way young people engaged with video games. Particularly common were financial limitations, manifesting in the state of gaming equipment: sometimes the respondents could not afford to buy new games or upgrade their gaming computer. Financial constraints also manifested as some respondents only bought games that were on sale or playing free games. While the questionnaire did not address the respondents' socioeconomic status, responses showed obvious differences in personal finances.

> As I'm an adult and live alone I have money for games and devices just fine. As a kid I couldn't get too many of them in a year, if I had to save from my fiver [5 euro] weekly allowance. I didn't buy even many cheap games because it was so expensive if they cost say 10€. At least I learned the value of money. Man, 25

> I don't have enough money for games and I'm constantly wondering if I can buy an interesting game or if I have to limit my food purchases. The games are constantly getting more expensive, even though it seems that, for example, the people who actually made the game in the game development team do not get enough compensation for the profits of all the games for the investors and those who have not made the game themselves. This seems unfair. I also don't think I have time to play enough because of my studies and running my everyday life. Non-binary, 21

This highlights how gaming can also be a constant negotiation of how one can participate with limited resources, whether these relate to material (the gaming hardware), personal finances, or available time (e.g., Apperley, 2010; Meriläinen, 2022). Gaming demands some expenditure of time and money by necessity, meaning that it competes for those limited resources with other activities.

4.3.2. Internal influences

In addition to external influences, respondents also mentioned internal influences that affected their engagement with video games. Alongside the personal meanings discussed previously, we identified two distinct subthemes, one related to game accessibility and the other to worries over excessive gaming.

Accessibility

The previously discussed skill requirements of game play can present an issue of accessibility, whether because of lacking experience with a particular kind of game, intentional game design, or disability (e.g., Baltzar et al., 2022). Players' perception of their skill could encourage or discourage them from playing games or influence game choices, while some respondents had physical limitations to their gaming.

> The obstacle with some games is their difficulty, which is often related to a lack of patience to grind the characters forward. I also feel that I own more games and devices than I have time to play. Often it is chosen by a familiar and safe game that you don't have to think too much about, instead of grabbing a more challenging game that is waiting for its turn to be advanced in. Woman, 23

> Console gaming is practically impossible due to chronic tendinitis. All controllers are from the same mold. Woman, 25

Worry over excessive gaming

Rather than gaming being limited by the constraints of other hobbies, work, and responsibilities, some respondents would actively self-regulate their gaming for wellbeing reasons. Some considered their own gaming habits excessive now or in the past and consciously wanted to game less. This was sometimes a source of distress and worry over one's mental health and the risk of addiction.[2]

Although the subject of problematic gaming was not very prominent in the data, mentions of occasional excessive gaming or unhealthy gaming habits featured in many responses. Problems and concerns related to excessive gaming are an everyday feature of gaming and something players are aware of, but our data also suggest that from the perspective of the topic's relevance to young people, research on problematic gaming appears dramatically overrepresented in the current literature.

> When I was younger I may have played too much, so that, e.g., I did less of other things in my free time and I was pretty addicted at times. In time it got better and with age my approach to gaming became more casual. Now I play a lot and enjoy it, but I understand that real life is more important. Man, 19

> [Gaming] is not important but I've been a bit of an addict for it for over a decade … Back in the day gaming sure was a problem as I couldn't concentrate properly on other things, e.g., looking for work or even eating. Man, 24

4.4. Ways of engaging with gaming

Young people continuously form relationships with video games that go beyond playing games. This is unsurprising, as video games today are often large transmedial products; either there is an element of transmedial storytelling to the product, the story is told through multiple mediums (Jenkins, 2006), or there is a shared world across multiple mediums (Tosca and Klastrup, 2019). Often this means that a product or franchise consists of multiple different artifacts, such as games, films, comics, and collectibles, rather than just a video game. Designing video games in a transmedial way has long been a part of gaming culture (see Koskimaa et al., 2021), and these design choices encourage multiple modes of participation.

These different modes of participation with video games, their transmedial content, and ultimately with gaming culture at large can be understood through four interconnected fields described in the DGR theory: *Personal gaming*, *Following gaming cultures*, *Production of gaming cultures*, and *Consumption of meanings of gaming cultures* (Meriläinen, 2023).

4.4.1. Personal gaming

Personal gaming can be seen as the activity of playing alone and solely engaging with the game rather than other mediums and meanings conveyed through them. Indeed, some of our respondents would explicitly mention that their gaming relationship consisted exclusively or almost exclusively of playing video games.

> I often discuss games with friends but otherwise the gaming hobby is largely limited to just playing. Men, 20

> Gaming is its own thing in my life and other things are their own. Man, 22.

4.4.2. Production of gaming cultures

Production of gaming cultures functions at multiple levels: institutional, social, and personal. Those creating video games are an obvious example of the production of gaming cultures, but as our data show, players also continuously participate in this production. Gaming culture production encompassed a wide variety of different activities and forms of engagement from writing game reviews to cosplaying game characters. These modes of engagement would allow challenging the normative production of gaming cultures, shifting the focus away from what is traditionally held important in Western gaming cultures (namely, skill and mechanics, see Kirkpatrick, 2017; Ruberg, 2018), to alternative themes. For instance, one of our respondents discussed her relationship with games and cosplaying by highlighting the importance of fantasy worlds and the possibility of momentarily existing within these worlds (see Lamerichs, 2011).

> What's important to me in games is their world, the opportunity to be someone else, and the sense of community. The fantasy worlds that are important to me in games are something to immerse yourself in for a while, sometimes to escape from reality and sometimes to experience adventures that you could never encounter in the real world. You can be someone else for a while, without changing yourself in any way. Same with cosplay; for a while we are part of another world, a story, a community, an adventure. Woman, 25

Different levels of production of gaming cultures are not separate categories, but a continuum that can be examined on the scales of professionalization and labor. Video game content creation can be seen as a form of labor, often discussed through the term *playbour* (Törhönen, 2021). Content creators are often not paid for this labor and it is quite common that they do not expect to be compensated either. However, there was also present an interesting continuum of ways of engaging and producing content for games or even full games for free as a hobby and simultaneously having a job related to games.

> I watch streams and game videos, make my own games in my free time and partly work with game education. I am also involved in the activities of the local board game association. Man, 25

4.4.3. Following gaming cultures

According to Koski (2008), the most common form of following sports is spectator sports. The closest analogue to this in gaming

2 We use the word "addiction" here as it was the word typically used by the respondents (cf. Nielsen, 2018).

cultures are esports which are becoming both increasingly popular and more institutionalized in the vein of traditional sports (Brock, 2017; Scholz, 2019; Törhönen, 2021; Ruotsalainen, 2022). One respondent described both following esports and having esports streams on as "background noise" rather than something fully engaged with.

> I have always followed sports extensively, and competitive games have also come into this palette over time. Nowadays, this especially includes *CS* [*Counter-Strike*, referencing streams], which is often just a background noise, and sometimes I watch games much more closely … I no longer play the games I follow the most (*CS*, *LoL*), so my following is specifically focused on the competitive side, but in the past, when I played those games, I also followed some side content. I occasionally listen to podcasts related to competitive games. Man, 25

Echoing earlier research on engaging with games beyond playing them (Koskimaa et al., 2021), watching videos and live streams were the most popular ways of following transmedial content about games. These different modalities (listening and watching) allowed respondents to engage with games differently than just playing games themselves, also changing where and how the game-related content could be followed. Sometimes the act of playing games was a side activity, for example, watching television. This problematizes the construction of players in general as an "active audience," in comparison to more "passive audiences" (see Behrenshausen, 2012), and highlights how there can be different intensities of engagement depending on context and activity.

Following gaming cultures sometimes also happened in relation to changes in playing routines, as previously discussed under the main theme of *Level of engagement*. With age, consuming content could become more common than playing video games in respondents' lives, presumably at least in part because of convenience.

4.4.4. Consumption of meanings of gaming cultures

Consumption of meanings of gaming cultures can happen through consumption of both material (games, gaming devices, and game merchandise) and immaterial (fanart, stories, and attitudes) things. What is central is that it broadens the meanings beyond individual artifacts and frame activities through participation in gaming culture. Echoing different levels of participation in gaming, consumption of meaning often has a level of intensity or engagement that following gaming culture does not necessarily have. One way to conceptualize the difference between consumption and following is comparing a sports fan and a sports spectator: a sports spectator is someone who merely watches the games, while a fan is invested in the game and usually its teams and players (Wann and James, 2018).

> My friends and I share experiences about the games we play. I have also bought books or small decorative items related to my favourite games. Woman, 23

Consuming meanings is also often a social activity and socializing was part of most of the gaming activities discussed by our respondents. Even when one is not directly socializing, they can be contributing to the co-construction and upkeep of the social world of gaming by, for instance, streaming game play, participating in a multiplayer game, or posting about games on social media.

When examining engaging with games and socializing from a transmedia perspective, certain mediums were mentioned for social interactions by our respondents. *Discord* was mentioned for communicating during playing video games, but also for maintaining and hosting communities around gaming. *Reddit* was mentioned as a place to both participate in and follow discussions about games on social media. *Twitch* was used for multiple purposes by our respondents: to create content by streaming, to consume content by watching streams, and also to host communities around particular streamers. Not all social interactions took place online, as LAN parties, gaming bars, and hobby associations also allowed respondents to socialize.

5. Discussion

In our discussion, we first highlight different continuums or spectra that can be used to explore youth gaming and address its diversity. We then discuss agency and the positioning of youth in relation to gaming in research.

5.1. Understanding young people's gaming

Although gaming can certainly have both beneficial and detrimental impacts on game players, these are not the be-all and end-all of young people's gaming culture participation, nor did the young people in our study usually frame gaming primarily as a balancing act between the two. The spectrum of beneficial–harmful is only a single, narrow perspective on young people's participation in the social world of gaming. Providing alternatives to the impact point of view is crucial to how we view games and gaming as culture, as media, and as a part of everyday life. The framing of gaming influences perceptions and attitudes (Kümpel and Haas, 2016), and whether gaming is primarily seen, for example, as a tool, a health risk, a form of art, or an everyday activity impacts how it is perceived, discussed, and studied. Furthermore, knowledge of the different potential impacts of gaming without a broader understanding and critical exploration of the phenomenon can cause its own problems, whether in the form of moral panics (Pasanen, 2017) or unrealistic optimism (Deterding, 2014).

As shown by our analysis, what is often referred to with the shorthand "youth gaming" is a hugely diverse and multi-faceted phenomenon. For each individual player, a multitude of factors come together to produce a personal, complex, and sometimes conflicted relationship with the social world of digital gaming. Based on our results and informed by the DGR theory approach, we suggest ten other intersecting and interacting continuums or dimensions that can be used instead or alongside explorations of beneficial vs. detrimental when making sense of young people's

gaming. Based on our results, we present the following key framings for conceptualizing and understanding youth gaming and its complex dynamics. Our listing is not an exhaustive list, nor a foundation for a categorical model (see Meriläinen, 2023). Instead, it is intended to summarize our results and suggest positioning and perspectives for future research.

5.1.1. Production–Consumption

While engaging with gaming culture, young people are constantly taking part in both its consumption and its production. These can take very concrete forms, as demonstrated by our respondents organizing events, making and watching gaming videos and streams, and purchasing games and merchandise. Production and consumption can also take more abstract forms, as youth participate in the co-construction of the social world of gaming in countless everyday game play exchanges, discussions, and social media posts, in a process of simultaneous production and consumption.

5.1.2. Leisure–Labor

The professionalization of different gaming activities such as streaming or competitive gaming blurs the lines between work and play (e.g., Brock, 2017; Törhönen, 2021), prompting and forcing youth to navigate and find their place in an intensely commercialized ecosystem and make decisions on potentially turning a hobby into work. However, the distinction between leisure and labor also relates to gaming more generally. Learning how to play games often requires considerable effort, and game play can in itself be laborious and repetitive (e.g., Orme, 2021). This framing also connects to fundamental societal discussions on the value of play and leisure, seen, for example, in some of our respondents' use of professionalization to justify gaming.

5.1.3. Stranger–Insider

The continuum from stranger to insider (see Unruh, 1979; Meriläinen, 2023) provides important insight into engagement with gaming cultures. While self-definitions such as "casual" and "hardcore" appeared in some individual responses, they capture only a part of participation (see Vahlo and Karhulahti, 2022). The continuum connects to existing discourses (e.g., Shaw, 2012; Paaßen et al., 2017) of gamer identity and gaming culture insiderness as well as fluctuations in an individual's relationship with gaming (Jiang, 2018; Bergstrom, 2019; Wiik, 2023). As the social world of gaming is massive, it is inevitable that an individual is a different kind of participant in regard to different aspects of gaming, and that this participation changes with time: no one starts as a regular or an insider.

5.1.4. Private–Public

The continuum from private to public relates to different aspects of youth gaming: the situating of gaming devices and parental mediation, game and gaming preferences, streaming, community participation, self-expression, and the role that gaming occupies in an individual's social life, to name a few. As shown in our results, keeping gaming private can stem from a personal preference for cozy solitary relaxation, but it can also be the result of a fear of ridicule or discrimination, or the lack of friends. Gaming also allows players to exist somewhere between private and public, such as when publicly participating in games and communities anonymously, allowing, for example, experimentation with different social roles and identities. Different popular platforms which facilitate gaming and activities around gaming, such as *Twitch* and *Discord*, also often create locations that are neither fully public nor fully private.

5.1.5. Allowed–Forbidden

Closely related to the continuum of private–public, there are important power dynamics that influence youth gaming. Direct parental control (e.g., Meriläinen, 2021), negative societal views, and stereotypes that relate to gaming (e.g., Kowert et al., 2014; Latinsky and Ueno, 2021), as well as struggles over who is allowed to exist or belong in game cultures, exemplified by different discriminatory behaviors (e.g., Paaßen et al., 2017; Ortiz, 2019; Friman, 2022), exert their influence on young game players by affording or removing gaming opportunities. As discussed in some of the responses, factors such as disability can also push individuals away from games if not accounted for when games and devices are designed (e.g., Baltzar et al., 2022).

5.1.6. Inclusion–Exclusion

In addition to different intersectional variables such as race, gender, disability, and class, there are different phenomena such as the meritocratic ideals especially prevalent in competitive gaming (Siutila and Havaste, 2019) or normative hostility (Hilvert-Bruce and Neill, 2020) that include some young people in gaming and exclude others. These structures and phenomena are present in everyday interactions; as key game culture participants, young people both construct and dismantle barriers to participation and are included and excluded by them. Problems of inclusion and exclusion can also come about through skill differences, as players' different levels of skill can make it difficult or even impossible to play certain games together. Exclusion can also stem from lacking resources (i.e., not affording to buy games and gaming devices), tying into larger societal issues of inequality (Apperley and Gray, 2020).

5.1.7. Casual–Intense

Games can be played with different mentalities and social goals (Juul, 2010; Kallio et al., 2011), and our respondents had diverse approaches to how they played games. Casual in this context does not refer to game types but to mindsets: a player can play a very simple game very intensely (see Deterding, 2019) or a complex game very casually. The mentalities do not necessarily reflect an individual's overall relationship with gaming, but instead fluctuating preferences and different contexts. The difference between casual and intense does not by default equate to a difference between having fun and gaming seriously—although some of our respondents also discussed this—as both our study and previous research (e.g., Ryan et al., 2006; Vahlo, 2018) show that for

many players, the experience of enjoyment stems from achievement and competition. The level of intensity does not only relate to gaming, as it is possible to participate very intensely in some aspects of gaming while taking a very casual approach to others (e.g., Orme, 2021).

5.1.8. Mundane–Special

Gaming is inevitably interwoven with other aspects of a player's life, and has to be negotiated in relation to mundane everyday commitments such as studies, sleep, social relations, and work, and takes place regulated by the constraints of resources such as time and money (e.g., Pargman and Jakobsson, 2008; Apperley, 2010; Meriläinen, 2022). As discussed by the youth in our study, gaming can be boring, but it can also provide exceptional experiences, whether through escapism and immersion in game stories or memorable moments with friends or family. Whether gaming is viewed as a mundane and domesticated part of everyday life or as distinct from, it also influences how it is approached in public discourse or contexts such as parenting.

5.1.9. Focused–Broad

Acknowledging diverse forms of gaming culture participation, such as cosplay (Lamerichs, 2011) or watching games instead of playing (Orme, 2021), recognizes that one can form a relationship with games in a multitude of ways and contests the narrow conception of "gamer" and defining gaming culture participation around it (see Consalvo, 2007). Perceiving gaming culture participation only or primarily as playing games privileges certain types of activities, and consequently can end up privileging those who have historically had access, both in terms of practice and identity, to video games and gaming cultures, typically white middle-class men (Kocurek, 2012; Shaw, 2012; Fletcher, 2020).

5.1.10. Local–Global

Although in this article we have discussed *gaming culture* for the sake of convenience, essentially gaming takes place in culture rather than being a separate entity (Shaw, 2010). It follows that young people's gaming is inevitably shaped by the same factors that shape their lives overall: societal structures, demands, and attitudes, cultural affordances, parents' and peers' views and attitudes, different intersectional positions, and as demonstrated by the COVID-19 pandemic (e.g., Bengtsson et al., 2021; Cote et al., 2023), global phenomena. Alongside the macro scale societal and cultural factors, it is equally important to pay attention to the micro-scale influence of individual and local factors. The generic young person exists only as an abstraction in research.

When we combine the diversity of young people, the diversity of games as transmedia, the diversity of gaming culture participation in terms of both intensity and ways of engagement, and the diversity of individual instances of gaming, the complexity of youth gaming becomes apparent. We must critically consider how accurate and truthful image results from reducing the phenomenon to a selection of variables. Qualitative approaches have repeatedly (e.g., Nielsen, 2016; Russell and Johnson, 2017; Bengtsson et al., 2021; Meriläinen, 2021; Zhao and Zhu, 2021) brought up underexplored facets of youth gaming crucial to understanding it, yet the field continues to be dominated by risk-focused quantitative studies. Research perspectives focused on the outcomes of gaming detached from its wider context provide limited help for understanding young people's gaming, or gaming in general. Philosophical questions of value also come into play: is a memorable experience from a game or a fun moment with friends valuable as such, or because it contributes to something else, such as wellbeing? The two are not mutually exclusive, but the focus has firmly been on the latter.

5.2. Young people are subjects, not objects

Attitudes toward gaming and gaming cultures appear to be slowly shifting, yet seeing games in a very polarized way has a long history that still influences contemporary discourses about gaming (Rogers, 2013). Shaw (2010) notes that in media, gaming has been largely depicted as an undesirable activity, and likewise those playing video games (see Kowert et al., 2014). This goes hand in hand with how videogames have long been targeted by moral panics and viewed as a source of aggression, moral decay, and addiction (Rogers, 2013; Pasanen, 2017).

Questions of young people's agency in relation to different media have long been a core topic in discussions of media literacy (e.g., Buckingham, 1998; Hobbs, 2011) and are central to the contemporary debate on the role of digital media in young people's lives (e.g., Granic et al., 2020; Vuorre et al., 2021). Acknowledging this agency is important not just in terms of understanding the phenomena but also to bridge disconnects among theory, measurement tools, and young people's experiences (see Nielsen, 2016): gaming does not happen to young people, but is something they choose to do. The approach taken in this article positions young people as active agents who engage with and participate in gaming, use (and sometimes abuse) games, and influence, create, and critically examine gaming cultures.

Obviously, we do not advocate against studying the impacts or outcomes of gaming, as the importance of detailed knowledge on them is apparent: it has been well-documented that games can cause and tie into health and wellbeing problems (e.g., Snodgrass et al., 2014; Männikkö et al., 2017; Shi et al., 2019; Hamre et al., 2022) and, for example, promote learning and cognitive development (e.g., Moisala et al., 2017; Martinez et al., 2022) and many of our respondents also discussed both negative and positive outcomes. However, whether intentionally or not, a focus solely on impact can end up ignoring much of what makes gaming meaningful and important for the young people themselves, and render gaming primarily a utilitarian issue, its value typically defined from the outside and its relevance derived from its measurable outcomes. This can end up erasing young people's agency: instead of exploring how young people *do* gaming and express, explore, and become themselves through and in gaming cultures, the focus turns to what gaming does to young people, rendering subjects into objects and active agents into victims or beneficiaries. Examining outcomes and meanings are luckily not mutually exclusive. On the contrary, combining different

approaches in terms of both research philosophy and research methods likely yields more holistic answers to complex questions of positive and negative outcomes.

Outside of academia, many parents and professionals encounter, celebrate, and worry over young people who enjoy gaming. In these different situations and contexts, an understanding of how gaming is intertwined with other aspects of young people's lives, from self-expression to time spent to structural oppression, can be immensely valuable. It can mean the difference between parents being emotionally supportive or dismissive (see Bax, 2016; Meriläinen, 2021) or between a professional focusing on causes or on symptoms (see Nielsen, 2016). The DGR theory can also help individuals, regardless of their gaming participation, critically examine their own relationship with digital gaming and the different factors that shape it (see e.g., Przybylski, 2014; Russell and Johnson, 2017; Hopia et al., 2018).

5.3. Limitations and strengths

Despite the rich data, it was apparent that some respondents had only answered the assisting example questions rather than going beyond them, limiting their responses. The assisting questions were added conscious of the possibility of this happening, as it was considered preferable to getting very short answers or the respondents misinterpreting the broad questions (see Braun et al., 2021). The cultural diversity of the respondents was limited, with ethnic and cultural minorities only marginally present. Because of our self-selected sample, our study is not representative of the diversity of young people who participate in gaming, although in our estimation, it likely reflects the experiences of typical, regular game players in Finland quite well. This said, people at opposing ends of the gaming spectrum, very intense, professional, or problematically gaming players as well as uninvested, occasional players are present in the data only to a limited extent.

As a qualitative study of young people's gaming through a reasonably large sample, our study is to our knowledge the first of its kind in Finland and provides important new insights into the subject. The responses suggest that many young people expressed themselves quite freely—something that might not have been possible in the social context of a face-to-face interview. By drawing on young people's own experiences instead of using standardized quantitative measures, we have highlighted aspects of gaming that are essentially not measurable but are nevertheless integral to understanding it.

6. Conclusion

Using the DGR theory, we illuminated the diversity of young people's gaming as a phenomenon influenced by a great number of variables, complicating the dichotomy of gaming being either beneficial or harmful. Based on our results, we suggested alternative and complementary perspectives for future explorations of youth gaming. Finally, we drew attention to the importance of acknowledging youth as individual active agents, capable of complex reflection on gaming culture phenomena when discussing and studying young people's gaming.

Data availability statement

The datasets presented in this article are not readily available because of privacy considerations, but will be made available through a public repository later for further research use once anonymized. Requests to access the datasets should be directed to MM, mikko.merilainen@tuni.fi.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent from the participants' legal guardian/next of kin was not required to participate in this study in accordance with the national legislation and the institutional requirements.

Author contributions

MM collected the data used in this study. MM and MR contributed equally to the analysis and writing. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1164992/full#supplementary-material

SUPPLEMENTARY FILE 1
Questionnaire.

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Literacy at play: an analysis of media literacy games used to foster media literacy competencies

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Media literacy is considered one of the key competencies to acquire in the 21st century. With games being recognized as having a large potential to train and educate, a wide range of games focusing on media literacy related topics such as fake news games, digital privacy, personal media habits, and practical media skills have sprung up over the years. All claim to foster media literacy skills and competencies. This begs the question how these games generally frame and understand media literacy, what competencies and skills they actually focus on, and through which game design choices. This paper thus asks: how media literacy games are designed to foster media literacy? Taking the Dutch Media Literacy Competencies Model as a departure point, we answer this question using a thematic analysis of 100 media literacy games and formal analysis of a smaller heterogeneous sample consisting of 12 games. We present a series of key findings involving the prominent presence of certain topics and competencies in the dataset, as well as prevalent design choices, allowing for a discussion of the current landscape of literacy games and underlying competencies and future potential for development.

KEYWORDS

digital games, media literacy, digital literacy, literacy competencies, educational games

Introduction

Media literacy, understood as "the knowledge, skills and competencies that are required in order to use and interpret media" (Buckingham, 2006, p. 36) is considered one of the key competencies to acquire in the 21st century. This especially concerns the type of media literacy that aims to increase information and digital media skills (cf. Vuorikari et al., 2022). With fake news on the rise in our digital media landscape [being consumed more than real news, nowadays (Gartner, 2017)], media literacy offers resilience against the potential harmful effects of consuming fake news by giving us the ability to think critically and make balanced judgements about all the information we find and use. Because of this, scholars, educators and policymakers have stressed the importance of innovative media literacy initiatives, especially those tailored to young people's news consumption habits and those offered via their preferred media channels (Mihailidis, 2018).

Given the popularity of digital games amongst adolescents (Lee et al., 2018), a wide range of fake news games, digital privacy games, and games on personal media habits have sprung up over the years, all of which claim to foster media literacy. However, this broad and diversified list of games also begs the question how these games generally frame and

understand the matter of media literacy, what literacy competencies and skills they focus on, and through which game design choices literacy is fostered. These are important questions to answer since a potential selective focus on or framing of media literacy education in games could at best impact the way that educators and parents think about the scope and depth of literacy competencies which can be trained through games and thereby their usefulness, and at worst undermine broader media literacy development amongst adolescents.

A literature review (De la Hera et al., 2023) done as part of this research project shows there is currently a lack of research providing these insights into the landscape of media literacy games. Firstly, the academic study of media literacy games is usually approached from a quantitative perspective, focusing on the possible effects of these games (e.g., Rowe et al., 2021), or a a research through design perspective, offering insights into the design process of a single literacy game and evaluating its use (Yamin et al., 2021). Secondly, of the papers that do explore the characteristics (topics, mechanics, literacy competencies) of the games more qualitatively, most focus on single cases, and the ones that do analyze a broader selection of games tend to focus on subtopics of media literacy such as fake news (e.g., Clever et al., 2020), cybersecurity (e.g., Hwang and Helser, 2022) or computational thinking (e.g., Sun et al., 2021). Thirdly and finally, the papers that do discuss a broader selection of games, consist of either a literature review combining and reporting on previous studies on singular or more selective media literacy games (Torres Toukoumidis et al., 2021), or instead focus on only one element (e.g., "operating media") of a, more common, broader understanding of media literacy (e.g., Škripcová, 2022).[1]

The purpose of this paper is to fill this research gap by conducting a qualitative analysis of a broad selection of (self-described or clearly identifiable) media literacy games (rather than games focused on a more narrow topic or popular entertainment games), while adopting a broad and multi-faceted understanding of media literacy. This will help to (1) provide an overview of which media competencies have been covered by these existing media literacy games and (2) generate insights into the strategies used to foster these competencies through game design.

This paper therefore answers the following research question: *how are media literacy games designed to foster media literacy?* For the purpose of this research, we define "media literacy games" as games which either explicitly present themselves as seriousgames focusing on media literacy (within the game, through its website, or on the platform where it is acquired), or serious games which through their design are explicitly geared toward one or more of the main topics, skills or competencies associated with media literacy.[2] The term "serious game" here is defined as a game that has been designed for a reason other than just to entertain (Ferdig, 2016, p. 319). By focusing only on serious games here, we connect to a larger research field focusing on the use of games and gamification in non-entertainment settings to educate or change behavior (cf. Egenfeldt-Nielsen et al., 2020).

Given that this research is part of a larger research project focusing on the potential of media literacy games funded by the Dutch Research Council (NWO), our understanding of media literacy departs from the purposefully broad and multi-faceted Dutch Media Literacy Competency Model 2021 (Netwerk Mediawijsheid, 2020). This model, discussed in more detail below, identifies a total of eight media literacy competencies and ten areas affected by a person's media use. In this paper, we report on how media literacy is fostered in a sample of games from an extensive database of 100 games which was created specifically for this project. The procedure of database creation, sampling, and thematic analysis of the game's topics, mechanics, and the inherent competencies they aim to train will be discussed in the method section below.

Ultimately, the analysis presented in this paper is focused on inventorying best practices in using digital games to support media literacy skills. This research clarifies if, and if so, how the eight competencies of the media literacy model as created by the Dutch Media Literacy Network are fostered through these games. Additionally, we also highlight and critically assess persuasive strategies used in these games to foster media literacy, particularly through ludonarrative and procedural rhetorical strategies (Bogost, 2007; Gómez-García and de la Hera, 2022).

The outcome of this research can thus be considered an overview of common practices in literacy games design. It does not look at the potential of using games in an educational setting in general (cf. Squire, 2011; Gee, 2013) but more specifically focuses on how developers up until now have dealt with media literacy in these games. As such, what our research presents is a comprehensive overview of existing media literacy games specifically showing which topics are more prevalent as well as which competencies are over- and underrepresented in the main goals of these games. The thematic analysis additionally provides insights into the specific ways games link literacy topics and goals to specific game design choices. All of this will eventually highlight focus and gaps in current development of literacy games which can be used to further our insights into the use and usefulness of games in fostering media literacy. Apart from academic relevance, this research also has relevance for more applied purposes, as it allows developers to focus on those media literacy competencies which are currently underrepresented in the literacy games landscape.[3]

Defining media literacy

As pointed out in the introduction, media literacy has become a key concern in our contemporary society, as it promises to educate our children to become and remain active and

1 As we'll discuss below, "operating media" is only one out of eight competencies of our much broader understanding of media literacy which we derive from the Dutch Media Literacy Competency Model 2021 (Netwerk Mediawijsheid, 2020).

2 See below for a thorough discussion of the different skills, topics and competencies associated with media literacy.

3 This paper is part of three research studies within the larger project titled "DIGITAL LITERACY GAMES: Digital games designed to support digital literacy skills acquisition" funded by the Dutch Nationaal Regieorgaan Praktijkgericht Onderzoek SIA, part of the Dutch Research Council (NWO). The results of the other two studies focus on a large-scale literature review on existing research on the effects of literacy games (De la Hera et al., 2023), and the evaluation and validation of the effects of actual classroom use of a literacy game on primary education students (Kneer et al., in prep).

critical members of our increasingly mediatized society thereby fostering civic engagement and overall socio-cultural well-being. However, underneath this broadly agreed-upon potential benefit of increasing media literacy lies a more disparate understanding of the term with different interpretations emphasizing different skills and competencies.

Traditionally media literacy has been understood as the ability to read, watch, listen and understand the media (principally press, radio and television). The evolution of the media landscape linked to the introduction of digital technologies have implied a change of paradigm. Nowadays, media literacy is considered the critical understanding and active participation in the media (Buckingham, 2006).

Roughly speaking, we can identify a spectrum of media literacy understandings with one end focusing on skills related to mastery and the other end focusing (more) on critical, reflective competencies. On the skills end of the spectrum, as Martin (2006) points out, ICT-related literacy was for a long time considered to be about technical and other applied skills like operating devices and digital tools. This emphasis is also found by Voogt et al. (2019, p. 60), in their literature review on definitions of digital literacies. On the competency end of the spectrum, people like Buckingham argue that, while students obviously need to begin with a basic understanding of how to use contemporary media, "to stop there is to confine digital literacy to a form of instrumental or functional literacy" (2006, p. 267). Instead, he argues:

> [Students] also need to be able to evaluate and use information critically if they are to transform it into knowledge. This means asking questions about the sources of that information, the interests of its producers, and the ways in which it represents the world; and understanding how these technological developments are related to broader social, political and economic forces (Buckingham, 2006, p. 267).

Over the years, several attempts have been made to tease out and bring together these different dimensions of media literacy in models that are able to further inform policy and education, such as the Digital Citizenship Education Handbook by the Council of Europe (Richardson and Milovidov, 2019) or The Digital Citizenship Handbook for School Leaders in the United States (Ribble and Park, 2022).

For the purposes of this research project, we similarly opt for a broad and multi-dimensional approach to media literacy which combines a more practical skills-based understanding of media literacy (e.g., operating or creating with media) with a more critical evaluative understanding (e.g., reflecting on and understanding media). Such a broad understanding does not only do justice to the complexity of dealing with media in our current times, it also allows us to explore its different dimensions in the media literacy games under investigation. As we'll explain and reason below, we draw our understanding of media literacy specifically from the Dutch Media Literacy Competency Model (2020).

Media literacy in the Netherlands

Given the context of our project, we specifically turn to the situation in the Netherlands, which has seen several attempts at unraveling and standardizing media literacy to increase its role within educational programs in national policy (cf. Wiegman and Berkhout, 2019; Agirdag et al., 2020; Opree et al., 2021). The foundations for much of the thinking behind the current model (Netwerk Mediawijsheid, 2020) were laid in an influential policy paper on the topic by the Dutch Council for Culture ("Raad voor Cultuur"). In this paper, media literacy ("mediawijsheid" in Dutch) was defined as "the sum of knowledge, skills, and attitudes citizens need to consciously, critically, and actively find their way within a complex, ever-changing and fundamentally mediatized world" (Raad voor Cultuur, 2005, translation by authors). Media literacy here is meant to combine both the "functional" (i.e., "skills") and the "critical" (i.e., "competencies").

This definition of and increased attention for media literacy was pushed by an observed lack of literacy amongst children and a drive to elucidate what it is that these children should be learning in their daily interactions with media. As previous research has shown, Dutch children are less literate than expected (Dirkx et al., 2013; Nieuwelink, 2020), with one study showing that only 50% of 10-12 year old were digital literate at a level that could be expected of them (Netwerk Mediawijsheid, 2018). As such, digital literacy has become a key part within the new Dutch national educational policy plans titled Curriculum.nu (cf. Agirdag et al., 2020).

Within this national setting, the ongoing attention for increasing media literacy among young people formed the starting point for the creation of a media literacies competencies model created by the Dutch Media Literacy Network (i.e., Netwerk Mediawijsheid) in 2012. This network was established in 2008 as a program initiative by the Ministry of Education, Culture and Science in order to connect the many hundreds of non-profit and commercial organizations dedicated to media literacy. The version of the competencies model used within this study is the revised edition published in 2020. As is pointed out in the documentation of the model, the goal was to give substance to the aforementioned media literacy definition by the Dutch Council for Culture and to serve as a point of departure for setting up new activities, projects, and services by the network partners as well as research projects to study and monitor media literacy among various target groups (Netwerk Mediawijsheid, 2020, p. 11). This is why the current research project has adopted this model as a point of departure.

The media literacy competency model

The initial 2012 model was based on a research report by a project group consisting of Dutch cultural, educational, and research institutes (EYE Film Instituut, 2011) which provided the groundwork for the initial ten competencies, each further specified on five competence levels (Netwerk Mediawijsheid, 2012a,b). The newer 2021 version reduced the model into eight core competencies

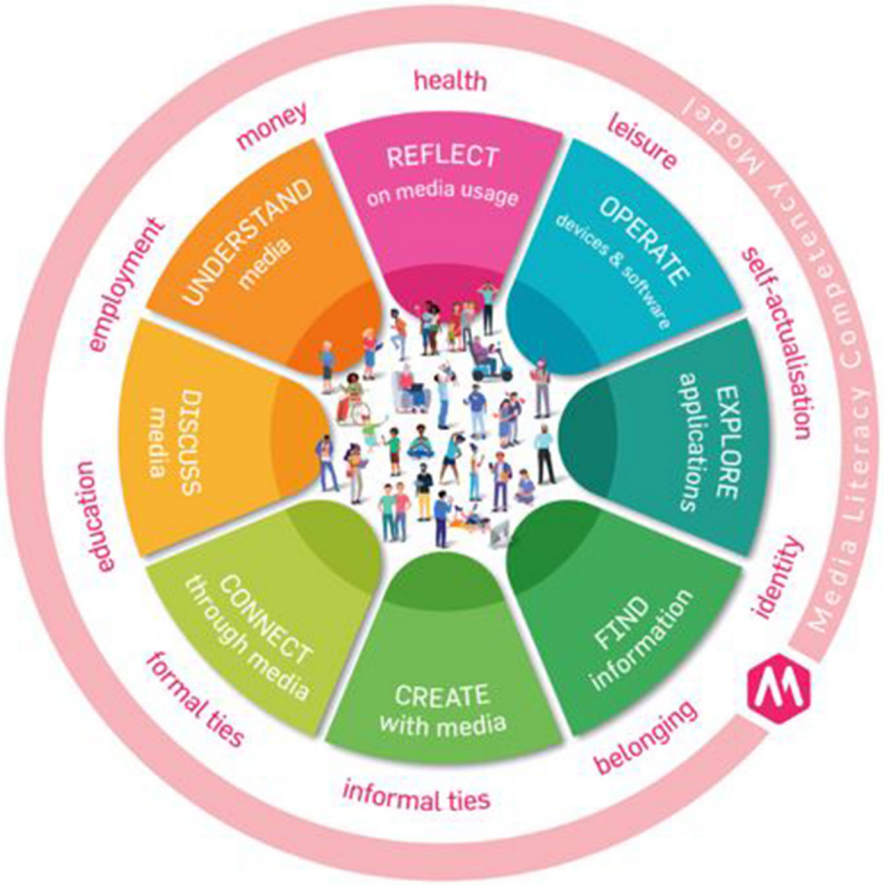

FIGURE 1
The Dutch media literacy competency model 2021 (English version, 2020).

explained through simple verbs: to operate, to explore, to find, to create, to connect, to discuss, to understand, and to reflect. In the substantive accountability for the model, it is made clear that two of these competencies (to explore and to discuss) are new to the model. Based on the work of Jenkins et al. (2005) and Coiro and Hobbs (2016), these additions focus on the more playful, experimental approach to media, as well as the fact that media literacy should not be seen as having one fixed outcome but rather should lead to the result of mutual and societal dialogue (Netwerk Mediawijsheid, 2021, p. 5). Whereas the 2012 model consisted of a more linear approach to media literacy (moving from the more passive to active and strategic competencies), the 2021 model is circular suggesting that competencies are of equal importance (see Figure 1).

The new version also includes an outer ring consisting of ten areas of media use, informed by Helsper et al. (2015) research on tangible outcomes of digital skills. The stated goal of the two rings is to present a dynamic model to help connect users (i.e., media literacy professionals) to connect media literacy competencies to achieving concrete goals in the economic, cultural, social or personal field (Netwerk Mediawijsheid, 2020). Given our focus on the games themselves and the way in which they foster media literacy, rather than the lived experience or potential impact of media literacy education through these games, we primarily focus on the competencies within the inner ring. We discuss these competencies in more detail below as part of the methodology section. First, we will connect media literacy to the potential of games to train literacy competencies.

Combining media literacy and ludoliteracy

Looking at games to educate young people about media literacy, and train them in its associated competencies is not far-fetched. Research on the use of games and play in educational settings in general has a long history starting well before Clark Abt coined the term "serious games" in his seminal 1970 book on the use of games for training and education (Abt, 1970). Here, however, we focus specifically on the use of games in relation to media literacy. Considering that the childhood process of learning takes place through playing, several studies for instance claim that the introduction of the use of technology at a young age can or even should be done through play (Andersen and Mirrels, 2014; Naranjo-Bock and Ito, 2017). More so, digital games are nowadays one of the preferred social leisure activities amongst children (Lee et al., 2018).

Gee theorized how the affordances and literacies of digital gameplay, the type of experiential learning provided by games, offer players a way to engage with topics and concepts that might not be easily accessible through conventional classroom approaches (2005). While traditional media use classical persuasion techniques based on verbal and visual rhetoric, the persuasive potential of digital games is unique due to their interactive nature (Deterding et al., 2011). Bogost has coined the unique persuasive potential of digital games as procedural rhetoric, this is, the reinforcement of argumentation through processes. Its advantage lies in the ability to show, in a practical way, how things work by playing with them rather than being told about them. Thus, thanks to user participation, more vivid experiences are raised than through traditional rhetorical formulas (Bogost, 2007, p. 45).

Previous studies have shown that media literacy games are effective in fostering media literacy skills such as multimodal literacy, critical literacy, digital literacy, information literacy, and game literacy, as well as interpersonal communication skills and experiential learning (Gambarato and Dabagian, 2016). Aside from teaching players about digital literacy through the content of game itself, research suggests that literacy games are also capable of stimulating the acquisition of literacy skills through the interaction with the game technology itself (Meyers et al., 2013; Romero et al., 2014; Gallardo-Echenique et al., 2015; Rakimahwati and Ardi, 2019). According to extensive meta-studies, games are successful at teaching skills through active engagement (Clark et al., 2016) and through inspiring and motivating affective connections to the content (Connolly et al., 2012).

It should not come as a surprise, however, that the effectiveness of the use of digital games for learning purposes depends on the way the game interacts with a learner's unique history and relationship to a domain, the game's own affordances, and the context of play (Squire and Jenkins, 2011). More so, from a media literacy perspective it should be noted that games are media themselves too. This means literacy *about* games, also known as *ludoliteracy* (Zagal, 2010), should play a part in this discussion. This becomes all the more relevant when taking into account the aforementioned pervasive nature of games in the lives of young people (Glas, 2017). In this research, we do not focus on serious games created to specifically enhance ludoliteracy. That does not mean understanding games and their design is not a useful skill seen from a larger media literacy perspective. Game scholar and designer Eric Zimmerman combines the approach of thinking about ludoliteracy and media literacy in general into what he calls "gaming literacy." For him gaming literacy is key in addressing the "new sorts of literacies that will become increasingly crucial for work, play, education, and citizenship in the coming century" (Zimmerman, 2009, p. 23–24). Games, he argues, present players with systems to experiment with, which helps to understand the underlying systems and structures of our contemporary society, and engage in social interaction (Zimmerman, 2009, 25–27). Finally, Zimmerman argues that through game design, games offer meaningful, interdisciplinary engagement with a certain topic, concluding that:

> Gaming literacy is certainly not the only way to understand the emerging literacy needs [...]. But games and game design are one promising approach, making use of a cultural form that is wildly popular and wildly varied, both incredibly ancient and strikingly contemporary (Zimmerman, 2009, 29).

The benefits of game design within an educational collaborative setting have been discussed elsewhere as well in relation to literacy-related skills (e.g., Kafai and Burke, 2015; Glas et al., 2021; Werning and van Vught, 2021). All the works mentioned above show the plurality of potential when using games and play to engage with media literacy within an educational setting. The question is, of course, to what degree this plurality is visible within the sample of media literacy games already published over the years. In the next sections, we will discuss the methodology used to investigate these games in relation to the Dutch Media Literacy Competencies Model.

Methodology

Research design

In order to analyze the use of digital games to foster media literacy, this study adopts a qualitative methodology. In concrete we have selected a deductive approach, choosing *thematic analysis* (Braun and Clarke, 2006) and *formal analysis* (Lankoski and Björk, 2015) as data analysis methods. The final database consisted of 100 media literacy games. As we discuss below, a subset of 56 games were played, with a selection of 12 titles receiving a more detailed analysis.

Sampling

A total of 100 media literacy games comprise the sample for this study, all published between 2008 and 2023 (see Annex I). The selection criteria were as follows: (1) a title should fit our working definition of a media literacy game, i.e., games explicitly presenting themselves as serious games focusing on media literacy, or serious games which through their design are explicitly geared toward one or more of the main topics, skills or competencies associated with media literacy; (2) a title should be published in English or Dutch or should be using no written or oral language; (3) while the dividing line between them can at times be difficult to assess, a title should be definable as a *game* rather than an example of gamification [i.e., where only certain game elements are added to an otherwise non-game environment (cf. Deterding et al., 2011; Egenfeldt-Nielsen et al., 2020)]; (4) a title should be (at least partially) digital. The above criteria led to the deliberate exclusion of games which focused on purely technical rather than reflective skills (like educational games about learning how to code) but also examples like quizzes, tests and other titles which could be considered gamified media rather than games. It also left out non-digital board and card games, as our main focus was on digital games.

The sampling strategy employed for this study was *comprehensive sampling* (Gray, 2004), this is, we examined each and every case we could find that matched the sampling criteria. With a lack of readily available databases to search through for these types of games, our database was created through a systematic online search for the use of media literacy associated terminology used by the game developers and/or publishers in the description of their games on the website where they are playable, or the platforms where they are to be downloaded (in the case of smartphone apps for instance). At first, general search terms were used: "literacy games"; "digital literacy games"; "media literacy games"; "games on media" as well as Dutch language varieties of these search terms. This mostly returned titles related to misinformation (more on which below in the findings). This meant that we adjusted and finetuned search terms in a dialectic between results and theory on media literacy (i.e., common topics, and terminology from the media competency model). Additionally we found a sizable amount of titles using a *snowball approach*. The use of often referenced literacy games as search terms would for instance lead to educational websites where such titles would be mentioned among other titles not in our database yet. Finally, welooked at the websites of developers or publishers already part of our database to see if they had produced other titles which would fit the criteria. We stopped our search as soon as these search approaches did not yield new titles anymore.

Data collection and data analysis

We used a combination of two data analysis methods for this study: *thematic analysis* (Braun and Clarke, 2006) and *formal analysis* (Lankoski and Björk, 2015). The first part of the study consisted of a *thematic analysis* (Braun and Clarke, 2006) of the 100 media literacy games that composed the sample. For this analysis we followed the four steps of thematic analysis as described by Braun and Clarke (2006) to report on the different media competencies that were mapped onto the games and how this was linked to the paratextual information provided by the designers.

The data collection process for this phase was done in four steps. **First**, we collected general information on the games composing the sample including: the game's title, the year it was published, the platforms it could be played on, the developer and publisher and the country of origin. Furthermore, we looked for basic information which was more specific to the educational context of the game (when we could find it), the potential presences of teacher guides, and/or other relevant information about the primary goal or context of games. **Second**, we tried to identify the general topicor topics of the games on the basis of the game's description and other paratextual information available (e.g., screenshots, videos, reviews). **Third**, we looked for trends and outliers in the information we had documented about the games (e.g., dominant topicsand/or genres, productive years, developers and/or countries). And **fourthly**, we collected extra data about how the different media literacy competencies were mapped onto the games through a *superficial play,* "where the analyst plays around with the game for a few minutes, merely to make a quick classification and get a "feel" for the game" (Aarseth, 2003, p. 6). Due to pragmatic reasons (high costs, lack of appropriate specialist hardware) and a desire to focus on games which would have the potential to reach a large and broad audience, this fourth step involved a decision to only focus on those games in our database which were freely and readily available either on the games' own websites or through app stores. This meant we played 56 out of 100 titles in the database.

A key part of the thematic analysis was the use of the terminology of the Dutch Media Competency Model 2021 (2020) as sensitizing concepts as part of step four. This meant that for the 56 titles we played as part of the analysis, we would look at if and how the eight competencies of this media literacy model are fostered through these games. Our reasoning for only doing this for the played games rather than the whole dataset is that we wanted to see if and how the competencies were actually conveyed through play beyond the promises made in the game descriptions. The eight competencies of the model are: *operate devices and software* (mostly related to practical skills), *explore applications* (having an open, investigative attitude toward soft- and hardware), *find information* (which also includes matters as storing, sharing, presenting information and being able to detect misinformation), *create with media* (which also includes being able to write elementary code), *connect through media* (related to meaningful, constructive social interaction with others), *discuss media* (related to the attitude to critically discuss media use in an open dialogue with others), *understand media* (which relates to understanding mediatization of society, the specific language of media, and the underlying business models), and *reflect on media usage* (related to attitude toward one's own and others' media use) (Netwerk Mediawijsheid, 2020, p. 3–5). For each title we played, we assessed which of the competencies were fostered, to create an overview of the most dominant media literacy competencies currently fostered through media literacy game design.

The second part of our analysis consisted of a close reading in the form of a *formal analysis* as described by Lankoski and Björk (2015) of a selection of 12 games. The purpose of this formal analysis was to conduct an in-depth analysis of this selection of games, to identifynarrative, stylistic and rule-based strategies used in the games to foster media literacy competencies. Using close reading was meant not to identify commonly employed design principles but instead to come to an understanding of exemplary *persuasive strategies* as described by De la Hera (2019), including ludo-narrative and *procedural rhetorical* (Bogost, 2007) strategies, employed to contextualize and teach media literacy competencies. Therefore, we aimed for a close reading of a heterogeneous selection of games which simultaneously mirrored the abundance in topicsof our database. The sampling strategy followed for the formal analysis was therefore purposeful sampling following the maximal variation approach (Flick, 2007). This means first grouped games with similarities in the topic covered and the competencies fostered, to later select the game that better represented each category in terms of quality and scope of fostered competencies.

A table with a full overview of all 56 game titles, the media literacy topic or topics as well as the associated media literacy competencies can be found in Figure 2. To provide an easier overview of topics and associated competencies, the table is ordered alphabetically by game topic rather than game title. The 12 case study games are highlighted in green. See Appendix 1 for a

	TITLE	Media literacy topics	Operrate devices & software	Explore applications	Find information	Create with media	Connect through media	Discuss media	Understand media	Reflect on media usage
1	Co-Co's AdverSmarts	Advertisement recognision, web literacy				V			V	V
2	Most Likely Machine	Algorithms				V			V	V
3	Bloxxgame	Blockchain	V	V						
4	Free Culture Game	Copyright							V	V
5	Media Literacy Escape Game	Digital vocabulary								
6	Galgje	Digital vocabulary								
7	Woordzoeker	Digital vocabulary								
8	Cyber Choices	Digital well-being							V	V
9	Eliza	Digital well-being							V	V
10	ACBC	Digital well-being							V	V
11	Digital Compass	Digital well-being					V			V
12	Media Matties	Digital well-being					V	V		
13	Gamer Girl	Digital well-being							V	V
14	Superbetter	Digital well-being								V
15	Mindlabs Energy Circuits	Energy circuits							V	
16	De Grootste Escaperoom	Environmentalism		V					V	
17	DigiKwis	Internet usage	V	V					V	
18	Cow Clicker	Microtransactions							V	V
19	Spot the Troll	Misinformation							V	V
20	ABC Fake News Game	Misinformation							V	V
21	Bad News	Misinformation							V	V
22	Bad News (Junior Edition)	Misinformation							V	V
23	Fake it to Make it	Misinformation							V	V
24	Fakey	Misinformation							V	V
25	Go Viral!	Misinformation							V	V
26	Harmony Square	Misinformation							V	V
27	Informable	Misinformation							V	V
28	Postfacto	Misinformation							V	V
29	The Fake News Game	Misinformation							V	V
30	The Republia Times	Misinformation							V	V
31	The Westport Independent	Misinformation							V	V
32	Troll Factory	Misinformation							V	V
33	BBC iReporter	Misinformation		V					V	V
34	Cranky Uncle	Misinformation			V				V	V
35	Facticious 2018	Misinformation			V				V	V
36	Facticious Pandemic	Misinformation			V				V	V
37	Newsfeed defenders	Misinformation			V				V	V
38	Escape Fake	Misinformation	V						V	V
39	Interland	Misinformation, Privacy, Digital well-being							V	V
40	MediaMasters	Misinformation, Privacy							V	
41	Mediamasters Themamissies	Misinformation, Privacy							V	
42	Datak	Privacy	V						V	V
43	Cyber X scape	Privacy							V	V
44	Beeld Kraken	Privacy		V	V				V	
45	Hack de Hacker	Privacy							V	V
46	Data Detox Game	Privacy							V	V
47	HackShield	Privacy							V	V
48	Help de FBI	Privacy							V	V
49	Click if You Agree	Privacy							V	V
50	Data Defenders	Privacy							V	V
51	Google Feud	Search engine		V	V				V	
52	A Google a day	Search engine		V	V				V	
53	Oculus Riftirement	Social acceptance		V						
54	Minecraft in later life	Technology acceptance		V						
55	ARe You Ready?	Virtual reality		V					V	V
56	The Wiki Game	Wikipedia		V	V					

FIGURE 2
All 56 games in the sample, organized by media literacy topic, each with their associated media literacy competencies.

ludography and short description of topic(s), goal(s), and main gameplay mechanics per game.

Findings

In this part of the article we want to explore key thematic findings of our analysis of the dataset as a whole, as well as the analysis of the sample games. We start with findings which sketch a broad sense of what media literacy games are about when looking at the results of the thematic analysis, to then move to observations which relate to the more specific gameplay mechanics we encountered in relation to media literacy competencies. Below, we grouped our findings into common topics and prevalent competencies, and finally discuss prominent related game design choices.

Distinguishing the most common topics

As said, we based our analysis of topics on how developers and publishers label games themselves. We did group games together if they would fall under the same larger socio-cultural phenomenon or issue. These could be considered umbrella topics, covering related topics under one header. When doing so, one of the first major finding was the large number of games we could label as misinformation games. As is visible within Figure 2, out of our entire sample, 20 games were dedicated fully to the topic of misinformation, with 3 containing misinformation as a key literacy topic next to other, often related topics as digital well-being and privacy.[4] No other topic was present in such numbers. The term "misinformation" describes a wide variety of related topics, ranging from fake news to the identification of reliable sources, and from dealing with arguments with strangers online to conspiracy theorists. In some games the player takes the role of the person responsible for the news (such as in *Data Defenders* or *Factitious*), in others, the player fights against fake news (such as in *Cranky Uncle* or *The Fake News Game*) and in some of them the player is the one spreading the fake news (like *Bad News*, *Harmony Square* or *Troll Factory*).

This abundance of misinformation games is perhaps not surprising. It appears that game developers are aware of current social and political upheaval about the influence of fake news and social media and incorporate these issues into their games as a way to appeal to players and attract attention (Quevedo-Redondo et al., 2022; Morejón Llamas, 2023). After analyzing the sample, it became clear that many game developers use terms such as "disinformation," "literacy" or "fake news" loosely, as a strategy to reach the desired audience. The large presence of these games in the dataset can be argued to say something about the societal need for such content, and the apparent reaction of developers and publishers to meet these needs.

It should be noted here, that the topicof these games does not necessarily say anything about the actual literacy *competencies* the games foster. Still, what we found is that the main gameplay mechanics of the games we labeled as misinformation games predominantly related to the competencies understand media and reflect on media usage. As can be seen in Figure 2, only four titles actually actively tried to engage players with the *find information* competency (such as *Newsfeed Defenders* and *Cranky Uncle*). One would expect games about misinformation to more proactively focus on information gathering, but only a handful of the group did so. We will further reflect on this below.

Beyond the games we could label as misinformation games, the most prominent other topics we found in the dataset were games we put under the umbrella topics of privacyand digital well-being. With these topics too, we saw such terms also being used in a broad sense to capture potential audiences of players. Privacy-related games for instance would aim to educate players about how to create better passwords (e.g., *Cyber x scape*); how to behave when talking to people online (e.g., *Interland*); what to do with sensitive information (e.g., *Data Defenders*); how to hack files or how to protect from file hacking (e.g., *Hackshield*); what cookies are and other autosave information is (e.g., *Click if You Agree*) and so on. No title would aim to cover all the aspects of digital privacy but rather focus on one such issue and, subsequently, also focus on only one or two associated competencies.

The same goes for the umbrella topic of digital well-being, under which we filed games focused on how to deal with cyberbullying (*ACBC*), how to respond to online sexism (*Gamer Girl*), how to overcome depression (*Superbetter*), and how to navigate the digital social world in high school (*Digital Compass*). Finally, games focusing on teaching players to use certain applications are worth mentioning here, as they share a common goal but often have very different topics. As operating or using applications or devices are already specific competencies (see competencies model) we did not group these under one overarching topic. This would create too much overlap between game topic and competency. Some of these games for instance focus on understanding how to work with certain soft- or hardware applications (as such strongly linked to the "explore applications" competency) by for instance helping players to use a search engine (*A Google a Day*, *Google Feud*) or a certain VR application (*Oculus Riftirement, ARe you ready?*).

Prevalent competencies

In this section, we explore our thematic findings related to the media literacy competencies the games aim to engage with or train. The prevalence with which certain competencies are incorporated in the media literacy games exemplifies which competencies the field of serious game development considers the most relevant, urgent or fashionable. Simultaneously, it can expose gaps in media literacy knowledge articulated in these games.

In our analysis of our data subset of 56 games, we mapped all competencies which the games explicitly or implicitly seemed to address, to all the titles. When organizing and visualizing those relationships in Figure 2, it becomes immediately clear that certain competencies (as described by the Dutch Media Literacy Competencies model) are covered by a significant amount of

4 Several games in our sample did not focus on just one topic but touched upon several. In our overview (see Appendix 2), the topic mentioned first was considered the dominant or most prevalent one.

games, while others were hardly present at all. Naturally, games can aim to cover several competencies.

The biggest thematic finding here was related to the competencies understand media (i.e., understanding mediatization of society, the specific language of media, and underlying business models), and reflect on media usage (i.e., attitude toward one's own and others' media use) (Netwerk Mediawijsheid, 2020, p. 3–5). In fact, as can be seen in Figure 2, in our sample of 56 games only 10 games did not incorporate the understand media competency, and only 16 did not incorporate reflect on media usage. In comparison, only 11 games incorporated the explore applications competency, and only 8 games incorporated the finding information competency. The other remaining competencies were represented even less within the sample games, with operate devices and software being incorporated in 4 games, create with media and connect through media both in merely 2 games, and the competency to discuss media in only 1 title.

This leads to some key observations. First, the majority of games thus focus on a reflective attitude. This attitude relates to how digital media work (*understand media*) and how one can or should see one's own role and actions within a media environment (*reflect on media usage*). The first can be considered a more passive attitude, the second adds a more strategic attitude focusing on media use and, potentially, changing such use. Some games in the sample add a more (inter)active dimension to these reflective attitudes by asking players to explore specific applications or by including active forms of information gathering (e.g., *Fake it to Make it, Go Viral, The Westport Independent*). As we will show in the game analysis below, many games however have a very specific argument they aim to make, and make this in a very specific way through the use of game design, leaving little room for additional player agency or creativity.

Interestingly enough, several games within the sample which highlighted the competencies of operating software and devices and explore applications did not include the more reflective competencies mentioned previously. They would mostly focus on explaining how certain technologies or applications work, and less so on what it would mean from a more critical or individual use perspective. An even smaller set of games in the sample did not incorporate any of the competencies as defined by the model in a meaningful enough manner. As can be seen in Figure 2, these games were grouped under the topic of digital vocabularies. The game Woordzoeker, for instance, is basically a simple word search puzzle using media terms. It is presented on its host website as a media literacy game, but provides no additional information about the meaning of the terms themselves. Especially these latter games can be considered good examples of titles only using media literacy as a selling point rather than engaging with literacy in a critical, reflective manner.

Another key observation can be made about the lack of games incorporating competencies related to the more participatorysocial literacy competencies connect through media and discuss media. One key reason for this, we argue, is that almost all of the games within the subset are single-player rather than multiplayer games.

It should be noted that many of the games in the sample were created to be used in an educational environment, where discussing and connecting through media can be achieved through social in-class interaction. Some games, like *Bad News* or *Digital Compass*, even include teacher guides for this very reason. As mentioned in the theoretical framework, the context of play matters for the effectiveness of educational games (Squire and Jenkins, 2011). As such, these competencies can be fostered by the game in an indirect fashion through the educational setting in which a game is played. If it was not an explicit part of the game itself, we did not take it into account in the analysis. What we can argue, however, is that games without the explicit inclusion of these competencies within their design will in all likelihood also not provide players with such competencies when they are not added in an educational social setting with teacher guidance.

A final, overarching observation about the competencies in the games is that the large majority of games focus on a single issue or topic, and connect this to a very particular competency or the aforementioned prevalent set of related competencies of *understand media* and *reflect on media usage*. As such, the large majority of games aims for specific purposes within the larger media literacy sphere, such as misinformation or digital safety, rather than media literacy in general. The perceived benefit is a clear and focused design and topic, but a drawback we envision is that most of the media literacy games we looked at fail to address the potential interdependence of media literacy competencies.

Recurrent game design choices in media literacy games

While the thematic analysis allowed us to make general observations about the competencies the games covered, without playing them, it was not possible to consider *how* these competencies were actually fostered through gameplay. As mentioned, as part of the final step of playing through the 56 games in the database we also paid attention to the ways in which literacy topics were connected to gameplay as well as aesthetic design choices.

As we explained in the methodology section, the games analyzed here are a heterogeneous (purposeful) sample of the larger set of games. The discussion of findings is exploratory rather than all-encompassing but nonetheless aimed at examining exemplary strategies we also witnessed in the larger set of media literacy games in the sample. The goal is to provide more detailed insights into what existing games are in terms of game design, which also allows for further reflection of what these types of games could be in terms of future development (which we will return to in the discussion).

What we found here is that games beyond the most simple applications of literacy into game form (like the word search puzzle game mentioned above) often use fictional game worlds as stand-ins for the real-world and its social-cultural issues. This is, of course, not uncommon, with educational games having mimicked entertainment games by offering fantastical setting to increase intrinsic motivations to play or to act as cultural models to interact with (cf. Egenfeldt-Nielsen et al., 2020, p. 258–261). The gameplay, i.e., the procedural model players follow to progress through a game, is embedded within such fictional worlds, but the design strategies for combining the two can differ significantly. As Bogost points out in his work, what he calls the "surface representation" of a game is not "mere dressing for the abstract rules" but ideally

	TITLE	Media literacy topics	Operrate devices & software	Explore applications	Find information	Create with media	Connect through media	Discuss media	Understand media	Reflect on media usage
1	ARe You Ready?	Virtual reality		V					V	V
2	Bad News	Misinformation							V	V
3	BBC iReporter	Misinformation		V					V	V
4	Cranky Uncle	Misinformation			V				V	V
5	De Grootste Escaperoom	Environmentalism		V					V	
6	Digital Compass	Digital well-being					V			V
7	Fake it to Make it	Misinformation							V	V
8	Gamer Girl	Digital well-being							V	V
9	Harmony Square	Misinformation							V	V
10	Interland	Misinformation, Privacy, Digital well-being							V	V
11	Newsfeed defenders	Misinformation			V				V	V
12	Troll Factory	Misinformation							V	V

FIGURE 3
The case study games, organized by media literacy topic, each with their associated media literacy competencies.

works together in unison with the rules (2007, 242). Games, he argues, can offer a medium-specific form of rhetoric he calls procedural rhetoric which mounts or expresses arguments through rules and procedures. Such "procedural representation," he points out, can be "deliberately chosen for its applicability to the games' respective topics" (2007). Gameplay, then can move from merely being associated with a literacy topicor competency, to actually demonstrating it in the process of play. In our formal analysis, we specifically looked for this interplay between rules and fiction in the 12 games we analyzed more in-depth. See Figure 3 for an overview of the specific titles, their topics, and associated competencies.

The game *Interland*, for instance, sells itself as a game about online safety and citizenship. The game presents itself as an adventure-like game with a fantasy world where players need to shield a castle from killer robots by building the castle walls higher and stronger. In order to do so, players need to select the strongest password out of a list, upgrading the castle walls every time the player selects the right choice (see Figure 4). Here, building strong castles in the fictional game world stands for creating good online safety measures for online spaces in the real world. It does, however, require an extra step of understanding the link between gameplay actions (choosing passwords to build walls) and real-life application of such actions (creating good passwords to protect oneself online). The game world's aesthetics and gameplay are geared toward creating and maintaining an engaging experience, with the real-life competencies fostered being addressed indirectly. From a procedural rhetoric perspective, the idea that the process of building stronger walls is akin to creating stronger passwords is nonetheless sufficiently clear.

We did, however, see games where the design choices to engage players through an engaging gameplay experience were not as easy to connect to the media literacy competency the games were aiming for. The browser-based *Free Culture Game* for instance aims to make players understand contemporary copyrights. The simple game is played using a mouse, where you have to keep certain balls from getting sucked up by a little machine on the side using the cursor. In terms of procedural rhetoric, this gameplay however has little to do with the copyright industry. Here, rules and fiction are not aligned in terms of meaningful interaction (see Figure 5). Instead, learning about copyright occurs almost entirely outside of the context of the actual gameplay. After starting the game it is explained that the balls are Intellectual Property created by individuals and the machine stands for the corporations which take credit for this IP. Without this contextual knowledge, the educational goals would remain unclear during actual gameplay. Consequently, recognizing IP and its various corporate appropriations would still be incredibly difficult after playing the game.

The notion of procedural rhetoric is a relevant starting point to understand how games aim to foster media literacy, but we did not consider it as the *only* way games can transfer meaning and engage with literacy competencies. As De la Hera points out: "procedural rhetoric should not be seen as [...] the unique persuasive domain available within digital games but as a strategic option that could be useful for some purposes, but not for others, and like other persuasive forms, it may hold a potential that is not always fully realized" (De la Hera, 2019, p. 196). Hence, we also focused on other design strategies involving different rhetorical strategies, such as specific forms of interactive storytelling.

When playing through and analyzing the games' core features from this perspective, what was immediately striking is that the

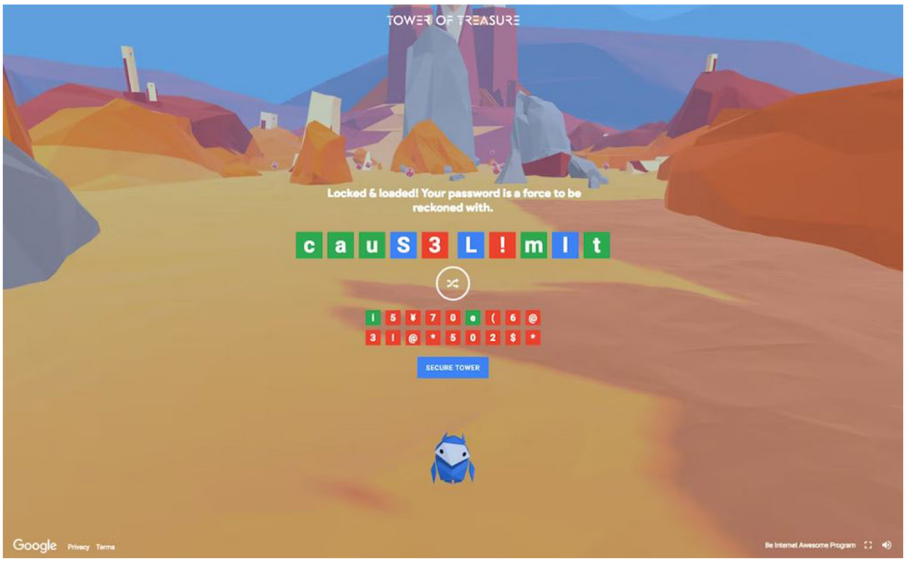

FIGURE 4
Playing with passwords in Interland.

specific topical focus was often aligned with a very linear narrative path, limiting agency for players to deviate or experiment with other options. The games are for instance divided into chapters, questions, or a timeline, which dictate the progression of the story, limiting the player's ability to alternate from the main narrative (see Figure 6 for example). This design allows for a focused educational experience but sacrifices the open-ended and non-linear characteristics associated with more experiential, discovery-based educational games.

With such a linear path to take, and recognizing that the large majority of games focus on a single-player experience, we started looking at how learning is linked to playing (and thus experimenting) with a certain identity which the game's fiction asks players to fulfill. The link between identity play and learning has long been described as a key intrinsic quality of games (cf. Gee, 2003), further underscoring the relevance of this analytical focus. Three recurrent player roles appear in the 12 games we analyzed: Fake content creator (e.g., *Harmony Square*, *Troll Factory*, *Fake it to Make it*, *Bad News*), fact-checkers or media professionals (e.g., *BBC iReporter*, *Newsfeed Defenders*), and citizens exposed to (or trying to resist) disinformation (e.g., *Interland*, *Cranky Uncle* or *Factitious*). Each role highlights different competencies from the Dutch Media Literacy Competencies Model, establishing different viewpoints and connecting up to different game mechanics.

Games where players assume the role of a creator of fake content portray the motivations of this activity that range from pure malice ("From fake news to chaos! How bad are you?," from *Bad News*) to more pragmatic motives ("You will be making money by creating news sites and profit from people viewing and clicking on ads on your site [...] We won't worry too much about sticking to the truth. Fake News takes less time to create, and it often spreads better than real news," from *Fake it to Make it*). In these games, credibility is a performance meter for the player, generally tied with followers (or another kind of popularity) or expenses (or another way to present economic benefit). Here, the game's scoring mechanics complement the narrative of these games, tying player success to the creation of more effective misinformation. Consequently, players do not only get to explore the consequences of spreading misinformation and how it can impact society and individuals, they also gain insights into the social, technical and economic mechanisms that help to afford the spread of this misinformation.

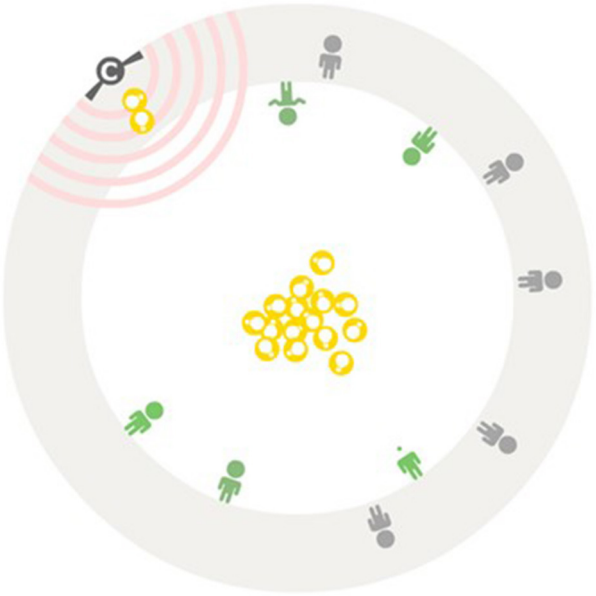

FIGURE 5
Gameplay free culture game.

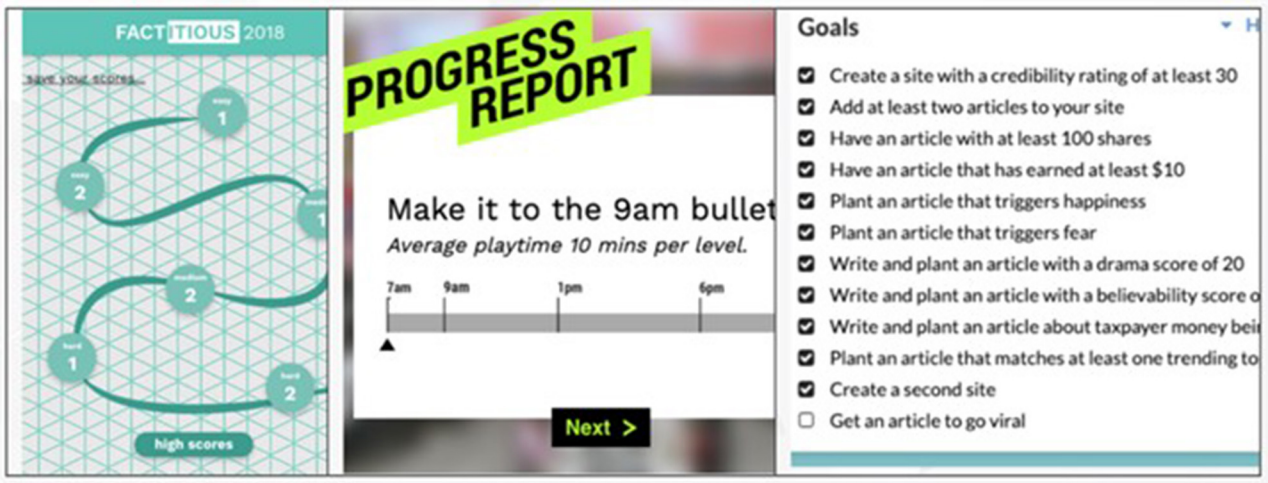

FIGURE 6
Game or goal structure on factitious **(left)**, iReporter **(middle)**, and fake it to make it **(right)**.

One relevant game in this sense is *Harmony Square* where tactics and manipulation techniques to mislead people are exposed in the player's role of "Chief Disinformation Officer" and play four chapters. Each one is dedicated to one polarization strategy: "trolling," "emotion," "amplification," and "escalation." other games use this content strategy as well. *Cranky Uncle, for example,* divides the game into techniques to deny science like fake experts, logical fallacies, impossible expectations, cherry picking and conspiracy theories. In these games, promoting digital literacy and critical thinking is thus done by reverse engineering disinformation processes. The use of these games raises ethical and deontological issues about the role of digital games as a form of discourse. As Amanda Warner, designer of *Fake it to Make it*, puts it when acknowledging the ethics around her game:

> "the process of creating fake news is already well documented online. If someone wants to make a fake news site, they already have access to the information they need. However, I acknowledge that there is a difference between information and inspiration. It's possible that this game could inspire someone to make fake news, but I'm willing to take the risk, because I think the potential for positive change in players is worth it" (Warner, 2017).

At the other end of the spectrum, games in which players must verify information are divided into two broad groups depending on the player's role. The first one, where the player is a fact-checker or journalist, advocates the *reflect on the media usage* and *understand media* competencies of the media literacy model. For example, the game *BBC iReporter* emphasizes the player's role as a BBC journalist, which is to cover a breaking news story and publish the story to a BBC live site. This purpose is integrated into the performance meters of the games, where the story must balance accuracy, impact and speed. Similarly, *Newsfeed Defenders* employs accuracy, transparency, trustworthiness, impartiality and focus as game meters (see Figure 7). They are relevant examples of how games can quantify some of the traits of the competency model. For example, players of *iReporter* have the chance to publish breaking news fast or verify some relevant issues about it. When the player chooses to publish fast without verification, the speed meter will rise, and the editor will be pleased as long as the information is right. Still, there is a greater risk of spreading misinformation which will make the accuracy and impact meters decrease. Sometimes, the editor scolds the player if the information is factually wrong. The additional content and teacher's guide of *iReporter* published on the BBC site[5] further elaborate on the perverse incentives at play in the mechanisms of the news publishing industry thereby offering further reflections on how to deal with sources in media usage and the process of verification by media outlets.

A different view is developed in games where the players are just citizens trying to distinguish correct from incorrect information. The most relevant game in this group is *Factitious* (in its different editions), in which the player must identify real articles and fake articles.

In trying to achieve this goal, players acquire skills that will help them identify fake news in the real world. While the game does not explain how scoring is going to be determined until the end (see Figure 8), the game's procedural rhetoric implicitly enforces a specific type of player behavior because not only are the correct answers rewarded, but finding the signals that identify fake news and the speed with which this is done are also encouraged. Thus, it can be seen that the design of the game or, more precisely, the way in which the player is rewarded or punished, shapes the literacy proposition in which players participate by accepting the rules.

In many of the games discussed above, various forms of rhetoric are in place. However, in games which engage the player in more long-term, strategic planning (as opposed to more short-term

5 Information available at: https://www.bbc.co.uk/teach/young-reporter/ireporter-guidance-for-teachers/zbb3hcw.

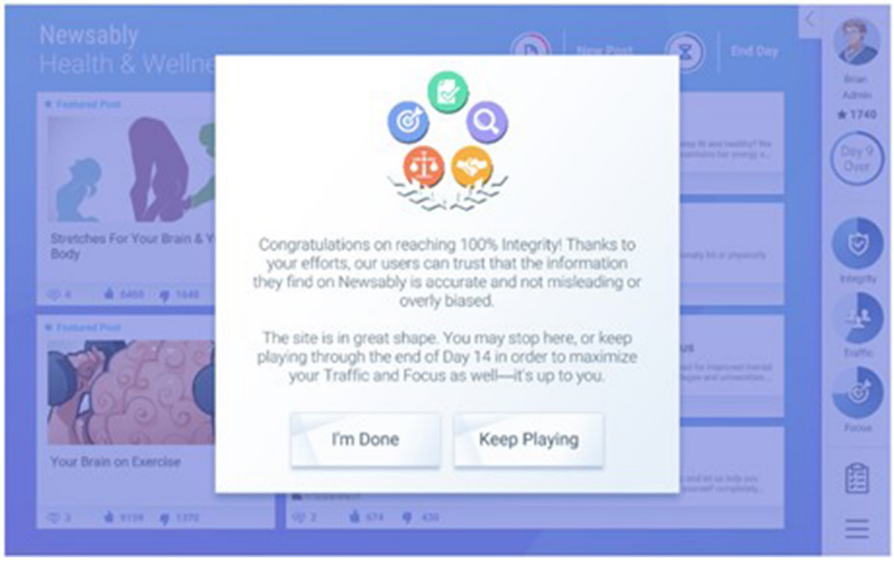

FIGURE 7
Newsfeed defender congratulates player for reaching 100% integrity.

Right reply: +40 points each
Wrong reply: -10 points each
Fast reply: up to 7 points
Slow play: down to -5 points
Show Source button: +2 points
Reading article: +1 point

FIGURE 8
How does factitious work? Source: factitious.

tactical decisions) we see that the potential for procedural rhetoric takes a backseat to more traditional forms of visual and verbal rhetoric. This makes sense because in these games, the positive and negative feedback loops are delayed which leaves the game to rely on other strategies to inform the player of appropriate play behavior. While this is not necessarily a problem in itself (visual and verbal rhetoric can be highly effective in games), we found that in some of our analyzed cases the lack of/limited procedural rhetoric was tied to a more obscure or even convoluted learning objective. For example, *Fake it to Make it* requires a greater combination and interpretation of elements to realize the consequences of the player's choices (strategic rather than tactical). The difficulty in determining the scope of the actions therefore affects the feedback the game offers in the long term and distinguishes it from the other games that propose it in a more immediate way. Therefore, the possible scope must be limited, because the effectiveness of serious games is based on the certainty that the player recognizes the game's intentions. In short, the feature that distinguishes and enhances these messages—their playful and interactive nature—sometimes becomes their main obstacle by obscuring the literacy purpose behind them.

Discussion and conclusion

Our research tries to offer an answer to the question *how media literacy games are designed to foster media literacy?* The results of our thematic and formal analysis show that media literacy games include a range of mechanics and narratives to foster different digital information literacy competencies as outlined by the Dutch Media Competency Model, 2021. However, as we've shown, the eight competencies of the model appear with different intensities. The prominent presence of specific topics and competencies in the dataset and the use of (seemingly more and less effective) prevalent design choices allow for a discussion about the current landscape of literacy games.

Firstly, when categorizing our dataset according to the topics or labels that the makers themselves have attributed to their games, we found a clear overrepresentation of so-called misinformation games. This suggests that socio-cultural concerns about fake news can be seen as a strong influence on media literacy development and publishing strategies. We can hypothesize here that specific societal concerns might be considered a key reason for developing games with specific literacy topics and directly related competencies, rather than developing literacy games about the more general need for increasing media literacy aiming to foster a broad set of competencies (development costs naturally play a role here too). Interestingly (and unexpectedly), this strong focus on misinformation does not translate to a focus on the media literacy competency of information gathering.

Here we identify a few clear gaps in the current landscape of media literacy games. The selective focus on misinformation has so far resulted in an underrepresentation of various other topics that also fall under the umbrella term of media literacy (e.g., cybersecurity, privacy, cyberbullying), thereby narrowing the understanding of media literacy and ignoring players the ability to acquire a broader set of media literacy skills and

competencies. Also, the mismatch between misinformation games and the competency of information gathering, seems problematic since it leaves players without an essential skill to deal with misinformation online.

Secondly, our findings suggest that the most dominant competencies in media literacy game design are those related to *understand media*, and *reflect on media use*. These highly reflective competencies were also most visible within the dominant topicof misinformation. While we have seen media literacy games focusing on practical skills (operating devices and software) and some even on having an open, investigative attitude toward software and hardware (exploring applications), we rarely identified a combination of the more practical and reflective competencies.

This separation of the development of more practical skills and the development of a reflective attitude clashes with the more holistic multi-dimensional understanding of media literacy that has now become widely accepted. As we noted above, while discussing the difference between an earlier version of the Dutch Media Competency Model and the current version, acquiring media literacy is not a linear process that runs from the more practical skills of operation to the more reflective understanding of the role of media in our society. Instead, all competencies in the model are created equal and work together in the development of media literacy. Consequently, games that only focus on a single (or a few) competencies fail to address how these competencies are more interdependent, potentially installing a highly selective type of media literacy in the player.

As highlighted in our analysis of competencies, what we also found missing were media literacy games focusing on the more participatory, creative or socially oriented competencies. We have related this to the fact that many games are single-player game experiences and offer highly linear forms of progression, leaving little agency to the player to deviate or experiment. Within a classroom setting, this means the games require an instructor to transcend the sometimes singular message or logic of the game and discuss the outcome as well as potential different interpretations among students. This could also help students understand and discuss the ethical dimensions behind reverse engineered forms of misinformation production as discussed above.

Thirdly and finally, our formal analysis yielded insights into best practices in the landscape of media literacy games. We found how the more compelling and informative games managed to translate the pursued media literacy competency and/or skill into a clearly connected game setting (while the less successful games leave a gap between the simulated competency and the real world competency). We also found how the more informative games made efficient use of procedural rhetorical strategies (next to other rhetorical strategies) to push the player toward appropriate in-game behavior, which suggests that especially games with a more immediate positive and negative feedback loop are suitable for the education of media literacy skills (as opposed to games that have the player make long term strategic decisions which rely more on other rhetorical strategies to educate the player). Finally, we found how designers used interesting narrative strategies to offer players different identities with different connections to the media literacy topic at hand. Here it seems that especially the medium of games allows players to step into the shoes of someone spreading misinformation online, providing interesting insights into the social, technical and economic motivations accompanying the initiation and spread of fake news.

Ultimately, this research reveals that media literacy games tend to focus on a limited set of media literacy topics and competencies (while being more varied in the design strategies employed to foster these competencies. While this focus on singular topics and specific competencies might make sense from a developer's perspective as it is directly related to socio-cultural concerns like misinformation or cybersecurity, it still fails to address the interdependence of media literacy competencies. In that regard, when looking at the Dutch Media Competency Model we see significant gaps in the overall media literacy topicsand competencies addressed through these games. This is important to recognize since the focus of media literacy games eventually impacts what and how players learn from them. As such, we argue that an inventory of media literacy games like the one we offer here, should always precede any studies into the experience and effects of these games since their characteristics strongly determine the possible efficacy of the games and thereby the outcome of these player studies. Finally, our findings also offer suggestions for game designers who, we hope, may now wish to address media literacy more generally instead of focusing on one of many individual phenomena usually associated with it.

Data availability statement

The original contributions presented in the study are included in the article, further inquiries can be directed to the corresponding author.

Author contributions

TF and SG-G performed the initial analysis of games and contributed with first versions of the analytical sections of the manuscript which were further edited by RG. The sections of the manuscript related to theory and method were written by RG, TD, and JV. All authors contributed to the conception and design of the study, contributed to the submitted and revised manuscript, read, and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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Is playing violent video games a risk factor for aggressive behaviour? Adding narcissism, self-esteem and PEGI ratings to the debate

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Introduction: Aggressive behaviour is a challenge for society. There continues to be considerable debate over whether the consumption of violent video games affects aggression, as violent video game content has become more accessible in recent years due to the growing use of online distribution platforms. Personality traits often linked to aggression, such as narcissism and self-esteem, have been considered in the context of violent video game play and their relationship with aggression.

Methods: We surveyed an international population of 166 game players on their personality traits and their three favourite video game choices, which were classified as violent or non-violent, using Pan European Game Information (PEGI) 16 and 18 ratings.

Results: We found that violent video game choice is a predictor of verbal aggression alongside narcissism, and hostility alongside self-esteem. A categorical regression highlighted the desire to impersonate society's undesirable role models (e.g., 'be a thief or a killer') as one of the motivations for aggression and violent video game choice.

Discussion: These findings show that video game violence should be considered a risk factor for aggression, as in other violent media, as it provides a social reinforcement of aggressive behaviour and observational learning of aggressive models, calling for the introduction of stricter online age verification procedures on online game platforms to safeguard children from violent video game content; and increased use of parental controls on content fruition. More granularity should be considered in the PEGI classifications.

KEYWORDS

aggressive behaviour, violent video games, narcissism, self-esteem, social psychology

1. Introduction

Aggressive behaviour has been most commonly defined in social psychology as any behaviour performed with the intention to harm another human being, who is motivated to avoid that harm (Bushman and Huesmann, 2010). Aggression can appear in many forms, "ranging from relatively minor acts (such as name calling or pushing) to more serious acts (such as hitting, kicking, or punching) to severe acts (such as stabbing, shooting, or killing)" (page 2, Sturmey et al., 2017). The general aggression model (GAM) (Allen et al., 2018) considers aggression as a compound of social, cognitive, personality, developmental and biological factors. It explains how appraisal and the decision process are influenced by the circumstances, as well

as one's cognition, feelings and arousal, which in turn influence aggressive or non-aggressive behavioural outcomes.

To date, experiments into the effects of video games on aggression have produced mixed results. In recent literature, a longitudinal study by Kühn et al. (2019) followed players of Grand Theft Auto V and The Sims 3 over the course of 2 months. Grand Theft Auto V is a vivid adventure game for a mature audience about the life of three criminals, a con artist, a drug lord, and a street hustler, described as containing intense violence, blood and strong language. The Sims 3 is a sandbox game where the players create and control the daily activities of a character's life within a muti-agent world. The game allows swearing and violence in a manner that is more similar to cartoon humour. The researchers found no effect of either game on aggression when compared to the baseline. Also, an investigation into Korean adolescents found that violent gameplay lowered physical aggression in more dedicated players (Lee et al., 2020). Virtual reality technology is now available for video gameplay, providing a more immersive experience, thus inducing a possible increase in physiological responses and arousal. Ferguson et al. (2022) studied the effect of violent and non-violent virtual reality games. The games were a first-person shooter game Rush of Blood, with several levels, and a racing game Driveclub with several difficulty settings. They randomised the effect of both violence and frustration and found no appreciable impact on aggressive affect or behaviour.

Dowsett and Jackson (2019) argued that competitiveness increased aggression rather than violent video game content. However, Dickmeis and Roe (2019) found those video game genres classified as both violent and competitive (e.g., first-person shooters) were related to self-reported physical aggression, with both factors having influenced aggression. An investigation into Chinese adolescents found that moral disengagement was a significant mediator of longitudinal violent video game exposure and aggression, suggesting it was desensitisation to violent content that enabled heightened aggression in the context of video games (Teng et al., 2019). This provides an external factor of desensitisation that results in heightened aggression rather than violent video games themselves causing aggression. In addition, Agustarika and Adam (2020) found a significant effect between violent behaviour and online game addiction in Indonesian high school students.

Devilly et al. (2021) investigated the effect of violent and non-violent video games on anger and behavioural aggression. They argued that the GAM considers personological factors, such as personality and behaviour, only a minor component in the aggression model, which focuses on the learning afforded with each new exposure to violent media. They found that anger-inducing video games influenced mood and that both behavioural impulsivity and frustration with media increased anger, while there was no correlation between video game usage and behavioural aggression. They concluded that personality and frustration were predictors of anger and aggression.

All literature findings above present a convoluted picture that still does not allow us to answer whether violent video games cause aggression easily. Previously, Elson and Ferguson (2014) sought to summarise the results of experiments on the relationship between video games and aggression over a 25-year period. The overarching conclusion was that there was insufficient evidence to make solid conclusions on this subject, suggesting that the field must engage in dialogue to uncover the real cause of the matter without making video games into a moral panic, as is often the case in the media. Indeed, they noted a court case concerning selling violent video games to children without parental supervision (Brown v. EMA, 2011). The American Psychological Association (APA, 2020) also cited the mixed results in the field, and the resulting inability to make stable conclusions. With the research presented here, we aim to add new findings to the debate. On the strength of Ferguson and Wang (2019) and Devilly et al. (2021), we considered both personality traits linked to aggression and the characteristic of video exposure.

The first public debate over violence in video games began in the United States in the early-1990s. In 1993 and 1994, the United States Congress held two successive hearings on violence in video games (Walsh, 1993; S. Rep. No. 104-27, 1995; Blackburn, 2011). These hearings were sparked by parental concern regarding flagship games that exploited new and powerful technology. Two titles cited for having sparked this concern were Night Trap for the Sega CD, which used full-motion video to present violence against women, and Mortal Kombat, which used realistic digitised actor sprites and adjustable blood content. Video game companies, like SEGA, foresaw potential issues with players accessing content unsuitable for their age and introduced their own age rating system to counteract this issue; however, the rating system was considered too vague to be industry-applicable (Caron and Cohen, 2013). Following the 1994 hearing, the Entertainment Software Rating Board (ESRB) was established. The board's primary goal was to rate video games on their content and age-appropriateness to safeguard children against violent and sexual content. Other regions followed suit, with the Pan European Game Information (PEGI) and Computer Entertainment Rating Organisation (CERO) (Computer Entertainment Rating Organisation, 2002) organisations created in Europe and Japan, respectively. Since then, younger players cannot purchase video games from retailers if they do not meet the age rating criterion, where rating systems are legally enforceable.

There have been considerable advances in the complexity, detail and distribution formats of violent video games since these regulations were introduced in the 1990s. In 2018, digital video game sales accounted for 83% of all video game sales (Clement, 2021). Digital content delivery makes it easier for players to buy games from the comfort of their homes, where it might be easier for a younger audience to access games developed for an older audience. For example, Steam, a computer storefront, asks for a simple confirmation of the date of birth without an identification check (Solorzano, 2018), whilst the Nintendo eShop for the Nintendo Switch does not check the player's date of birth at all. Instead, the Nintendo Switch Parental Controls App lets parents decide what age ratings the child can access. However, only 39% of parents report using parental controls (Anderson, 2016). Thus, it appears that the regulatory system has not kept pace with the games' use and distribution changes, giving rise to the question of whether it is still fit for purpose.

In short, the video games and aggression debate is controversial. New technologies have changed the level of immersion in video games and dramatically shifted the manner in which most users access the content. Yet, regulation appears not to have kept pace with this change. This study attempts to reintroduce the research question of whether violent video games cause aggression by considering personality variables previously unaccounted for, that are already considered in relation to aggression, such as narcissism and self-esteem, in the context of age-appropriate video game play.

Narcissism is characterised by excessive self-focus and self-interest. Narcissistic individuals are more likely to disregard others' feelings to focus on themselves. Although research has shown that narcissism is linked to aggression, there is a disagreement as to whether aggression occurs more widely or is specific to the narcissism type. Researchers like Miller et al. (2021) suggest that most narcissists should be recognised as aggressive, but recent findings found a unique link between grandiose narcissism and aggression. This might not be the case, however, as Du et al. (2021) found that the relationship between narcissism and aggression differed depending on the level of both variables.

On the contrary, Kjærvik and Bushman (2021) found that all dimensions of narcissism (grandiose, vulnerable and entitlement) were related to aggression. Moreover, they found that this pattern of results occurred across many types of samples. They suggested that provocation might be a key factor in the relationship between narcissism and aggression. Although this interpretation disagreed with past findings, for example, Reidy et al. (2010), who found that individuals with high narcissism scores were more likely to be aggressors, further reviews, such as Lambe et al. (2016), agreed with this stance. They found that in a student sample that the link between narcissism and aggression was associated with an ego threat. This suggests narcissists must be provoked – perhaps by having their ego threatened – to evoke aggressive behaviours in them. Although independent studies provide mixed results, and reviews seem to disagree with each other, there is an overarching pattern of results: narcissism is somewhat related to aggression.

Although the literature on the relationship between narcissism and aggression is broad, not many studies have considered this in relation to video games, or violent video games. Blinkhorn et al. (2021) investigated the influence of their experimental game on the narcissistic perception of social exclusion. They found that the explosiveness feature of narcissism was correlated with a higher acceptance of violence in the context of social exclusion. This interpretation agreed with modern reviews of narcissism and aggression (Lambe et al., 2016; Kjærvik and Bushman, 2021) on the basis that narcissists must be provoked to evoke aggression-related behaviours and elaborated on their findings by suggesting that it is specifically ostracising social cues that were responsible for aggression in narcissists. However, little is known whether the extent of violence in video games influences this relationship. According to a conference paper by Melzer (2019), violence in video games did not meet the needs of individuals showing narcissistic attributes of the Dark Triad. However, no other investigations have been undertaken on the topic to date.

Self-esteem is a person's positive or negative attitude towards oneself (Rosenberg, 1965a). Brummelman et al. (2016) suggested that narcissism and self-esteem were two distinct entities, only weakly correlated. Intuitively, they also suggested that narcissists saw themselves as superior but were unhappy with themselves, which might suggest low self-esteem. Therefore, our study will consider self-esteem as a variable separate from narcissism.

In the literature, there appears to be a lack of consensus amongst researchers studying the relationship between self-esteem and aggression, with modern studies distinguishing between different self-esteem types and obtaining significant results for the relationship between the two. Older studies, such as that of Bushman et al. (2009), showed that low self-esteem did not cause aggression, directly or indirectly. By contrast, when Descartes et al. (2019) administered self-esteem questionnaires to children and adolescents, they found that self-esteem was inversely related to aggression. However, Snowden et al. (2021) outlined the need to distinguish between types of self-esteem as the flagship instrument to measure self-esteem, the Rosenberg Self-esteem Questionnaire, which measured global self-esteem only. This sparked an investigation of the distinct effects of subcategories of self-esteem: agency and communion. Snowden et al. (2021) argued that different types of self-esteem displayed different associations with aggression. Namely, communion was negatively associated with aggression, whilst agency was related to aggression (but not reactive aggression, which is displayed in relation to threat). Further research by Amad et al. (2020) showed that low self-esteem was associated with reactive aggression.

There is also a lack of studies on the link between self-esteem, aggression and violent video games. As such, we broaden this literature review also to consider studies looking at the connection between general video game use, aggression and self-esteem. The most relevant study on this topic, Fling et al. (1992), is now three decades old. They found that the amount of video gameplay correlated with aggression but not self-esteem. However, some more recent studies have linked video games and self-esteem. For example, Cudo et al. (2019) investigated the predictors of problematic video gaming. They found that personal distress via the mediator of self-esteem was a significant predictor of problematic video gaming. This suggests that players who suffer from personal distress might engage with problematic video gaming more as a function of their self-esteem. This pattern of results could be accredited to escapism, defined as seeking refuge from reality through entertainment. Laconi et al. (2017) found that problematic players had higher scores of escape motivations and argued that playing video games might be a valid coping mechanism. It is not yet clear, however, whether video games are a coping mechanism for players with healthy levels of engagement with video games. Including self-esteem in investigating the link between violent video games and aggression might provide valuable insight into whether violent video games are a means of escapism in the wider population of gamers.

Our study also considers gaming motivation, as it might provide valuable insight into the relationship between video games and aggression. In broad terms, occasional players seem to be driven by extrinsic motivations (e.g., completing the game), whilst more dedicated players are driven by intrinsic motivations (e.g., satisfaction and enjoyment) (Reid, 2012). A commonality for both groups is deriving challenges from gaming (Reid, 2012; Kneer et al., 2018). Deeper investigations into dedicated players revealed a vast plethora of motivations. There are positive motivations for gameplay, such as socialisation or increased agency (Fuster et al., 2013; Kneer et al., 2018). However, there are also negative motivations for gameplay, such as griefing (causing inconvenience to another player) or virtual aggression (Kneer et al., 2018). In the space of video game addiction, the motivations for gameplay seem to be positive, for example socialisation and immersion (Zanetta Dauriat et al., 2011). However, some addicted players cite escapism as their motivation for gameplay (King and Delfabbro, 2009; Zanetta Dauriat et al., 2011). Belonging to a negative player class, such as an aggressive player, seem to put players at risk of developing a video game addiction (Hussain et al., 2015). It appears that virtual aggression is one of the motivations for video gameplay, but it is considered as a class of aggressive players, rather

than aggressive motivation, that puts players at risk of addiction. As such, we believe the relationship between aggressive motivations within the video game, aggression and violent video games should be studied further.

Based on the intrinsic motivations for video gameplay, Teoh et al. (2020) have proposed a gaming motivation questionnaire, surveying video game players on their motivation for playing specific video game genres, delivering promising results for using this scale to study gaming motivations. We posit, however, that it might be more accurate to look at specific video game titles, rather than genres. Video games evolved so much that they began transcending genres. For example, Minecraft can fit into genres of action, adventure, sandbox and survival. We will therefore use this proposed questionnaire to investigate gaming motivations, modifying it to ask participants about specific video game titles, rather than genres. This will allow us to better understand the relationship between video games and aggression.

Taken together, there is a noticeable literature gap in the study of violent video games and aggression in relation to the personality variables of narcissism and self-esteem. Narcissism literature, although broader in this field, has failed to answer the question of whether the relationship between narcissism and aggression is stronger in violent video game players. The self-esteem literature, on the other hand, has ignored the link between self-esteem and aggression in the context of video games, even though there is now a march towards the belief that self-esteem and aggression are somewhat linked. Therefore, it is paramount to investigate whether both narcissism and self-esteem and aggression could be mediated by the extent of engagement with violent video games.

Violent video games often involve a multiplayer aspect, replicating a social environment virtually. It is therefore not implausible to suggest that narcissists who are socially excluded (either in real life due to their self-centeredness or interest in video games, or virtually when playing competitively) will display heightened aggression, as per the findings of Kjærvik and Bushman (2021) and Lambe et al. (2016). Similarly, individuals with low self-esteem could pick up violent video games as a coping mechanism to relieve their aggression toward virtual entities, as per the findings of Laconi et al. (2017).

As such, the primary aim is to investigate whether the relationship between narcissism and aggression dimensions or self-esteem and aggression dimensions is enabled solely by violent video game choice when it is considered a mediator (Figures 1, 2).

> *H1a*: Violent video game choice will mediate the relationship between narcissism and aggression dimensions.

> *H1b*: Violent video game choice will mediate the relationship between self-esteem and aggression.

The secondary aim is to investigate whether there will be a relationship between the aggressive gaming motivations, aggression, and violent video game choice. Aggression will be considered as a composite due to the nature of the surveyed aggressive gaming motivations concerning factors within the game (Figures 3, 4).

> *H2a*: There will be a relationship between aggressive gaming motivations and aggression.

> *H2b*: There will be a relationship between aggressive gaming motivations and violent video game choice.

2. Materials and methods

2.1. Participants

One hundred and sixty-six participants took part in the study, 113 males and 53 females, with age statistics of $M = 25.2$, $SD = 8.05$. The average amount of time spent playing video games per week was coded in increments of 1, where 0–5 h was assigned a value of 0, and 41+ hours was assigned a value of 8. The coded data has descriptive statistics of $M = 3.65$, $SD = 2.07$, which suggests that the average time spent playing games was around 20 h per week.

Participants volunteered to take part in the study after seeing an advert on Reddit or Discord. The study was posted on the Reddit communities r/samplesize, r/narcissism and r/truegaming; and on the Discord servers Cluster B Circus, r/NPD Official and NPD Recovery 2.0. Permission to post the link to the study experiment was granted by community moderators. The inclusion criterion was that only those who actively play video games should participate.

The study was conducted in December 2021, as many countries, and especially those providing the biggest sample, had lifted their COVID-19 lockdown restrictions for the holiday season. Therefore, this study instigates the impact of video games post-lockdown. As seen in Figure 5, the United States was the most frequent country of origin in our sample (77 participants, 46.3% of sample). This was followed by the United Kingdom (34 participants, 20.4%), Canada (24 participants, 14.4%) and (22 participants, 13.2%) amongst the biggest countries in our sample. We can therefore assume that most of the sample came from Western cultures, and that at least some of the sample came from the region where PEGI is used (Figure 5).

2.2. Materials

The experiment was carried out on participants' computers, using an online link to a Gorilla Experiment Builder questionnaire.

2.2.1. Demographics questionnaire

This questionnaire collected data on age, gender, country of origin, three most played video games, and time spent playing video games per week.

2.2.2. The Buss-Perry aggression questionnaire (BPAQ)

BPAQ was used to measure the level of aggression in each participant. This questionnaire was chosen as it is the preferred method of investigating aggression levels in psychological research (Buss and Perry, 1992).

The scale comprised 29 items on four dimensions, physical aggression (9 items, range 9–45), verbal aggression (5 items, range 5–25), anger (7 items, range 7–35) and hostility (8 items, range 8–40). Responses were collected on a Likert scale, from 1 (extremely uncharacteristic of me) to 5 (extremely characteristic

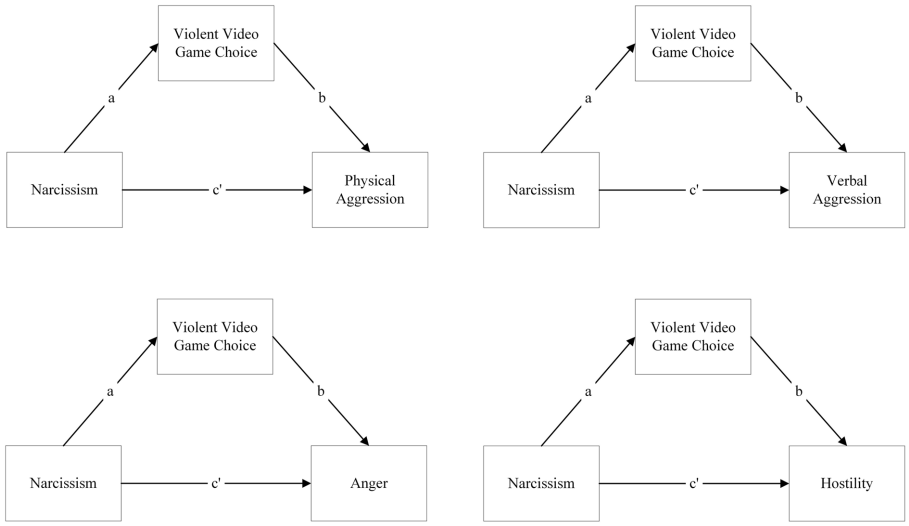

FIGURE 1
Models of simple mediations of violent video game choice on the relationship between narcissism and aggression dimensions: **(A)** physical aggression, **(B)** verbal aggression, **(C)** anger, and **(D)** hostility.

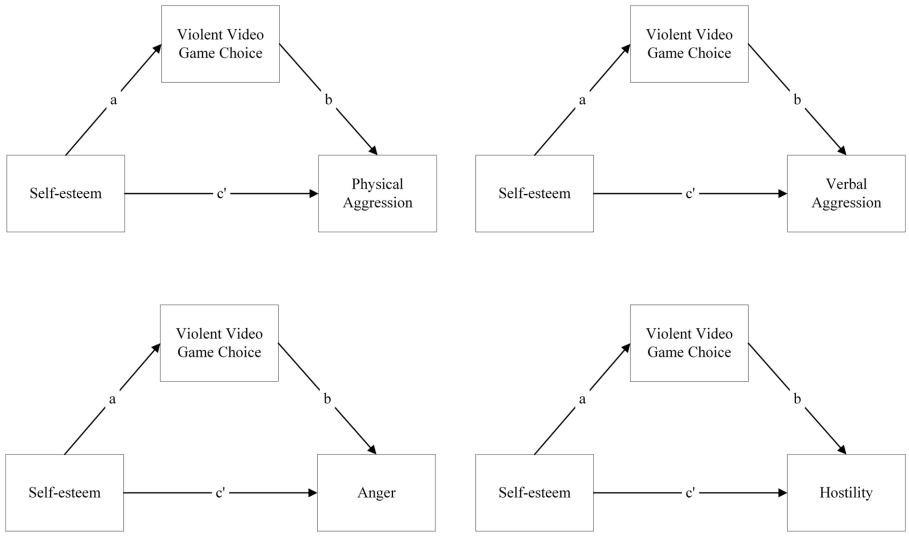

FIGURE 2
Models of simple mediations of violent video game choice on the relationship between self-esteem and aggression dimensions: **(A)** physical aggression, **(B)** verbal aggression, **(C)** anger, and **(D)** hostility.

of me). The composite range of this scale was 29–145. Two items (one from physical aggression and one from anger) were reverse scored. For H1a and H1b, this questionnaire will be analysed by splitting it into its dimensions. For H2a and H2b, this questionnaire will be analysed as a composite of all the dimensions. The internal validity of the BPAQ as a composite, measured by Cronbach's alpha, was excellent, $\alpha = 0.901$. The internal validity of the individual dimensions ranged between good and acceptable – good for anger, $\alpha = 0.819$, good for physical aggression, $\alpha = 0.852$, acceptable for hostility, $\alpha = 0.735$, and acceptable for verbal aggression, $\alpha = 0.767$.

2.2.3. Narcissistic personality inventory-16 (NPI-16)

NPI-16 was used to measure narcissism levels in each participant. This scale estimates both healthy and unhealthy narcissism, where higher scores lean toward pathological narcissism. NPI-16 was preferred over other narcissism questionnaires due to its good consistency scores relative to its short form. It also enabled us to conduct a quick test of the level of narcissism that would not exhaust the attention span of the volunteers (Ames et al., 2006).

The scale comprised 16 statement pairs, and the participant chose whichever statement reflected their thoughts. The range of this scale

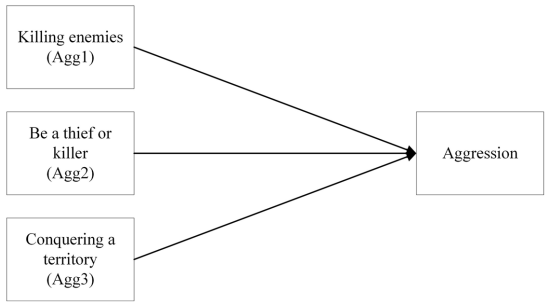

FIGURE 3
A model of the categorical regression of aggressive gaming motivations on aggression as a composite.

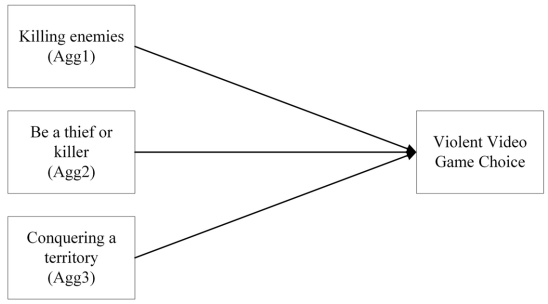

FIGURE 4
A model of the categorical regression of aggressive gaming motivations on violent video game choice.

was 0–1. The internal validity of the NPI-16, measured by Cronbach's alpha, was acceptable, $\alpha = 0.768$.

2.2.4. The Rosenberg self-esteem scale (RSES)

RSES was used to measure the self-esteem of each participant. This questionnaire was chosen as it is the preferred and the most standardised self-esteem measure in psychological research. This questionnaire allows us to examine the escapism theory, as argued by Laconi et al. (2017).

The scale comprised 10 items. Responses were collected on a Likert scale, from 0 (strongly disagree) to 3 (strongly agree). The range of this scale was 0–30. The internal validity of the RSES, measured by Cronbach's alpha, was excellent, $\alpha = 0.900$ (Rosenberg, 1965b).

2.2.5. The gaming instinctual motivational scale (GIMS)

GIMS was used to test for motivations behind video game engagement. Teoh et al. (2020) administered this questionnaire several times, asking for motivations based on video game genre. In our study, the scale was administered only once, and, in addition, participants were asked to provide motivation ratings for the game title of their preference.

The scale comprised 31 items split into 11 motivation types: survival, self-identification, collecting, greed, protection, aggressiveness, revenge, competition, communication, curiosity and colour appreciation. The responses were collected on a 5-point Likert scale, from 1 (never) to 5 (always). However, only the aggressiveness items were used in analyses. These were: "Killing enemies" (Agg1), "Be a thief or killer" (Agg2) and "Conquering a territory" (Agg3). These were analysed as ordinal variables, with range of 1–5. The internal validity of the GIMS as a composite, measured by Cronbach's alpha, was excellent, $\alpha = 0.907$. However, the internal validity of the aggressiveness dimension of GIMS was unacceptable, $\alpha = 0.316$, and is likely a result of analysing single items, rather than the scale as a whole.

2.2.6. Violent video game choice

We introduced a novel measure of violent video game choice. The researchers categorised the three most played video game titles provided by the participants as violent or non-violent based on the game's PEGI rating. PEGI is currently the video game rating system used in Europe, established after the ESRB. It replaced many national rating boards to provide a unitary rating system across all European Countries, including the UK, and it is legally binding. PEGI ratings were sourced from the online PEGI database (Pan European Game Information, 2022). PEGI ratings span from PEGI 3 (suitable for all age groups) to PEGI 18 (suitable only for adults) (Pan European Game Information, 2017). PEGI uses content descriptors similar to the ESRB system used in the US.

As only 36.5% of video games bearing the 'Violence' content descriptor have been rated as suitable for more mature audiences (16+) (Pan European Game Information, 2022), the 'Violence' content descriptor was deemed inappropriate. Instead, the PEGI age ratings were used, as the descriptions of PEGI ratings include specific information on the type of violence that can be found within a given age rating scale. PEGI 12 was considered as the cut-off point for reasonable violence, as games in this category portray violence toward non-human characters or non-realistic violence toward human-like characters. PEGI 16 rating, instead, is given to games that portray violence similarly to how it would look in real life (Pan European Game Information, 2017). Thus, games with PEGI 3, 7 and 12 were classified as non-violent, and games with PEGI 16 and 18 were classified as violent.

The ESRB ratings were also collected as a secondary measure of violence. Certain games, usually games not released in the European market, or mobile games, lack PEGI ratings but have ESRB ratings. In such instances, we classified games as violent if they both had the ESRB rating of M 17+ and had the content descriptors of Violence or Intense Violence. ESRB ratings were sourced from the online ESRB database (Entertainment Software Rating Board, 2022).

Finally, if both the PEGI and ESRB ratings were not available, the researchers screened the game for its gameplay and assessed the gameplay against PEGI/ESRB ratings and descriptors, assigning them with a probable violent/non-violent judgement.

Participants reported three of their favourite video games. These would then be assessed against the PEGI and ESRB databases. This provided three dichotomous variables, where a value of 0 was given for non-violent games (≤PEGI 12) or 1 for violent games (≥PEGI 16). The three scores would then be summed up to produce a violent video game choice score in the range from 0 (plays 0 violent video games) to 3 (plays 3 violent video games).

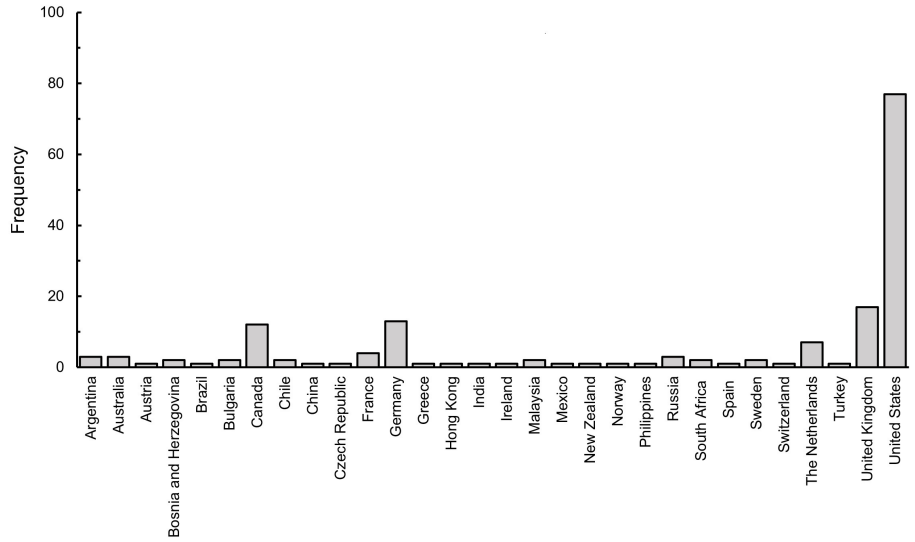

FIGURE 5
A frequency histogram of country of origin in the obtained sample.

2.3. Procedure

Participants volunteered to take part in the study after viewing a post on Reddit or Discord. They clicked on a link that sent them to the Gorilla experiment. They first read the Participant Information Sheet and provided informed consent. After, they were shown a screening question asking them whether they played video games. Participants were automatically rejected if they answered 'No' to this question. If they answered "Yes," they would proceed to the demographic questionnaire. Upon completion, the participants would enter the testing phase. It comprised four questionnaires administered in a counterbalanced order using Gorilla's Latin square Order node. These were: BPAQ, RSES, NPI-16 and GIMS. All questionnaires had to be completed to finish the testing phase. Participants had to click 'Next' to fully submit the data, after which the experiment was over.

2.4. Data analysis

Prior to data collection, the minimum sample size was calculated using G*Power (Faul et al., 2007). This was calculated for all the hypotheses to ensure the sample size was big enough to meet the statistical power assumptions of all tests. For all tests, the effect size was set at medium benchmark, $f^2 = 0.15$, the error probability was set at $\alpha = 0.05$ and the expected power was set at $power = 0.80$. For H1a and H1b, for both the a-path (1 tested predictor) and the b-path (2 tested predictors), the minimum sample size was 55. For H2a and H2b, for both the categorical regressions (3 predictors), the minimum sample size was 77. As such we have exceeded the minimum sample size requirements set out by *a priori* analyses, by recruiting 166 participants in total.

Participants who failed to complete all questionnaires were excluded from the dataset. The data was analysed with IBM SPSS 27. All mediation analyses were carried out using the PROCESS Macro package (Hayes, 2022) and checked for reliability with the standard SPSS Linear Regression tests using the method outlined in Speekenbrink (2021). We adopted the recommendation made by Baron and Kenny (1986): should any step of a mediation analysis return not significant results, the analysis will be stopped. All other analyses were carried out with the default SPSS 27 package.

Some data cleaning was performed. Firstly, the dataset was checked for outliers; none were flagged by the SPSS 27 package. Secondly, as noted earlier, some games given by participants (usually the case for mobile games) lacked PEGI ratings. A total of 57 data points out of 498 (11.4%) did not have associated PEGI ratings and were classified using the ESRB or direct observation of the gameplay. Thirdly, some participants reported playing fewer than three games. In such instances, the violent video game choice would be computed as though the missing games were non-violent (i.e., the missing values were assigned a value of 0). This method was employed as it was judged to be the most conservative.

3. Results

3.1. Descriptive statistics

As seen in Table 1, Anger and Physical Aggression were positively skewed, while Hostility and Verbal Aggression were normally distributed. Thus, the participants only demonstrated mild physical aggression and moderate anger. The narcissism scores were positively skewed and showed that most of the sample scored low on the narcissism scale, and therefore most of the sample displayed a 'healthy' level of narcissism. Self-esteem and Violent Video Game Choice (VVGC) were normally distributed. Players indicated playing 1.33 violent games if given an opportunity to report three of their favourite games.

3.2. Analyses

3.2.1. Correlation analysis

Firstly, we carried out a correlation analysis to ensure all aggression dimensions were fit for further mediation analyses. As seen in Table 2, not all the dimensions of aggression were correlated with Narcissism and Self-esteem. For Narcissism, only Anger, Physical Aggression and Verbal Aggression returned significant correlations. For Self-esteem, only Hostility returned a significant correlation. As such, mediations will only consider the above variable pairings.

Interestingly, VVGC returned a significant correlation for Hostility and Verbal Aggression. This would imply that violent video game choice influenced the hostility and verbal aggression scores.

3.2.2. VVGC As a mediator between narcissism and anger

In Step 1 of the model, the direct effect of Narcissism on Anger, ignoring the mediator, returned a significant coefficient for Narcissism, $t(164) = 5.64$, $p < 0.001$, $\beta = 0.403$. However, in Step 2, the regression of Narcissism onto VVGC returned a not significant coefficient of Narcissism, $t(164) = 0.299$, $p = 0.766$, $\beta = 0.123$. Further steps were not analysed. There was no mediation of VVGC on the relationship between Narcissism and Anger.

TABLE 1 Descriptive statistics of variables in the present study.

Variables	*M*	SD	Skewness		Kurtosis	
			Statistic	SE	Statistic	SE
Narcissism	0.208	0.190	1.393	0.188	2.209	0.375
Self-esteem	15.963	5.958	0.129	0.188	−0.206	0.375
VVGC	1.331	1.005	0.309	0.188	−0.956	0.375
Anger	15.813	5.813	0.591	0.188	−0.207	0.375
Hostility	22.427	6.110	−0.089	0.188	−0.426	0.375
Physical Aggression	18.325	7.175	0.997	0.188	0.766	0.375
Verbal Aggression	15.301	4.552	−0.065	0.188	−0.658	0.375

We followed up this analysis with a multiple linear regression, considering Narcissism and VVGC as predictors of Anger. The overall model was significant, $F(2,163) = 31.783$, $p < 0.001$, $R^2 = 16.2\%$. The coefficient for Narcissism was significant, $\beta = 0.400$, $t(164) = 5.63$, $p < 0.001$. In contrast, the coefficient for VVGC was not significant, $\beta = 0.139$, $t(164) = 1.97$, $p = 0.051$. This showed that Narcissism predicted Anger. VVGC did not predict Anger (Figure 6).

3.2.3. VVGC As a mediator between narcissism and physical aggression

In Step 1 of the model, the direct effect of Narcissism onto Physical Aggression, ignoring the mediator, returned a significant coefficient for Narcissism, $t(164) = 3.53$, $p < 001$, $\beta = 0.267$. However, in Step 2, the regression of Narcissism onto VVGC returned a not significant coefficient of Narcissism, $t(164) = 0.299$, $p = 0.766$, $\beta = 0.123$. Further steps were not analysed. There was no mediation of VVGC on the relationship between Narcissism and Physical Aggression.

We followed up this analysis with a multiple linear regression, considering Narcissism and VVGC as predictors of Physical Aggression. The overall model was significant, $F(2,163) = 7.76$, $p < 0.001$, $R^2 = 7.6\%$. The coefficient for Narcissism was significant, $\beta = 0.264$, $t(164) = 3.53$, $p < 0.001$. In contrast, the coefficient for VVGC was not significant, $\beta = 0.125$, $t(164) = 1.67$, $p = 0.097$. This showed that Narcissism predicted Physical Aggression. VVGC did not predict Physical Aggression (Figure 7).

3.2.4. VVGC As a mediator between narcissism and verbal aggression

In Step 1 of the model, direct effect of Narcissism on Verbal Aggression, ignoring the mediator, was significant, $t(164) = 7.14$, $p < 0.001$, $\beta = 0.487$. However, in Step 2, the regression of Narcissism onto VVGC returned a not significant coefficient of Narcissism, $t(164) = 0.299$, $p = 0.766$, $\beta = 0.123$. Further steps were not analysed. There was no mediation of VVGC on the relationship between Narcissism and Verbal Aggression.

We followed up this analysis with a multiple linear regression, considering Narcissism and VVGC as predictors of Verbal Aggression. The overall model was significant, $F(2,163) = 31.770$, $p < 0.001$, $R^2 = 28.0\%$. The coefficient for Narcissism was significant, $\beta = 0.482$, $t(164) = 7.257$, $p < 0.001$. The coefficient for VVGC was also significant,

TABLE 2 A correlation matrix of variables of interest.

r	Narcissism	Self-esteem	VVGC	Anger	Hostility	Physical Aggression	Verbal Aggression
Narcissism							
Self-esteem	0.284**						
VVGC	0.023	0.003					
Anger	0.403**	−0.084	0.149				
Hostility	0.119	−0.516**	0.164*	0.491**			
Physical Aggression	0.267**	−0.039	0.131	0.615**	0.397**		
Verbal Aggression	0.487**	0.042	0.219**	0.527**	0.276**	0.391**	

* $p < 0.05$, ** $p < 0.001$.

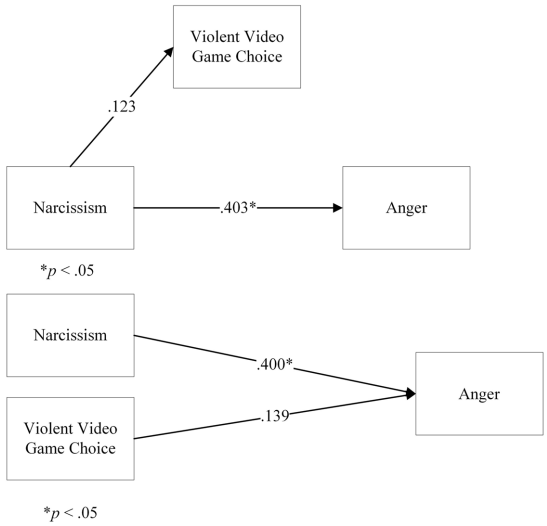

FIGURE 6
Analyses on Violent Video Game Choice, Narcissism, and Anger: **(A)** a mediation model of Violent Video Game Choice on Narcissism and Anger, **(B)** a multiple linear regression model of Narcissism and Violent Video Game Choice on Anger. Note: in the **(A)** panel, the b path is not shown, as the analysis was terminated.

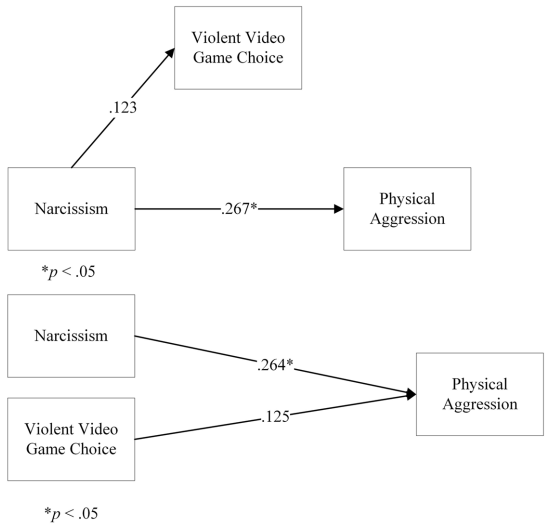

FIGURE 7
Analyses on Violent Video Game Choice, Narcissism and Physical Aggression: **(A)** a mediation model of Violent Video Game Choice on Narcissism and Physical Aggression, **(B)** a multiple linear regression model of Narcissism and Violent Video Game Choice on Physical Aggression. Note: in the **(A)** panel, the b path is not shown, as the analysis was terminated.

$\beta = 0.208$, $t(164) = 3.12$, $p = 0.002$. This showed that both Narcissism and VVGC predicted Verbal Aggression (Figure 8).

3.2.5. VVGC choice as a mediator between self-esteem and hostility

In Step 1 of the model, the direct effect of Self-esteem on Hostility, ignoring the mediator, was significant, $t(164) = -7.84$, $p < 0.001$, $\beta = -0.20$. However, in Step 2, the regression of Self-esteem onto VVGC returned a not significant coefficient for Self-esteem, $t(164) = 0.039$, $p = 0.97$, $\beta = 0.001$. Further steps were not analysed. There was no mediation of VVGC on the relationship between Self-esteem and Hostility.

We followed this up with a multiple linear regression, considering Self-esteem and VVGC as predictors of Hostility. The overall model was significant, $F(2,163) = 33.8$, $p < 0.001$, $R^2 = 29.4\%$. The coefficient for Self-esteem was significant, $\beta = -0.516$, $t = 7.84$, $p < 0.001$. The coefficient for VVGC was also significant, $\beta = 0.166$, $t = 2.52$, $p = 0.013$. This showed that both Self-esteem and VVGC predicted Hostility (Figure 9).

3.2.6. Relationship between aggressive gaming motivations and aggression as a composite

Categorical regressions were performed to investigate the relationship between aggressiveness motivations and aggression. Categorical regressions were suitable, as these convert ordinal variables (e.g., the GIMS motivations) into nominal variables that can be used to predict values of continuous variables (e.g., aggression scores/Violent Video Game Choice) via a linear regression.

The categorical regression of aggressive motivations on aggression total score returned a significant model, $F(7,158) = 6.37$, $p < 0.001$, $R^2 = 22\%$, However, upon the inspection of the coefficients, only Agg2 was significant, $\beta = 0.374$, $F(3) = 19.2$, $p < 0.001$. Agg1 and Agg3 were not significant, $\beta = -0.202$, $F(1) = 2.16$, $p = 0.14$, and $\beta = 0.166$, $F(3) = 1.16$, $p = 0.33$, respectively. This result suggested that only the 'Be a thief or killer' motivation was related to aggression (Figure 10).

3.2.7. Relationship between aggressive gaming motivations and VVGC

As VVGC could include a value of 0, the categorical regression was set up with Impute missing values as Extra category to include values of 0 in the analysis.

The categorical regression of aggressive motivations on VVGC returned a significant model, $F(6, 159) = 5.64$, $p < 0.001$, $R^2 = 14.4\%$. As with the regression on aggression, only Agg2 returned a significant coefficient, $F(3) = 6.14$, $p < 0.001$, $\beta = 0.364$, and Agg1 and Agg3 were not significant, $F(2) = 1.50$, $p = 0.23$, $\beta = 0.127$, and $F(1) = 0.241$, $p = 0.62$, $\beta = 0.065$, respectively. This result suggested that only the 'be a thief or killer' motivation predicted whether participants would be likely to play more violent video games (Figure 11).

4. Discussion

4.1. General discussion

Our study aimed to investigate whether video games classified as violent are related to aggression, considering personality traits often connected with aggression, such as self-esteem, narcissism, and gaming motivations.

We found that violent video game choice was not a mediator of the relationships between narcissism/self-esteem and aggression components. However, we found that violent video game choice predicted hostility and verbal aggression, self-esteem predicted only hostility, while narcissism predicted hostility, physical aggression, and anger (see Figure 12).

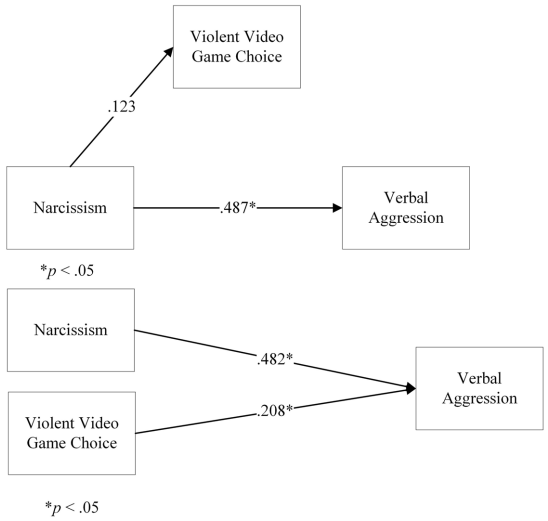

FIGURE 8
Analyses on Violent Video Game Choice, Narcissism and Verbal Aggression: **(A)** a mediation model of Violent Video Game Choice on Narcissism and Verbal Aggression, **(B)** a multiple linear regression model of Narcissism and Violent Video Game Choice on Anger. Note: in the **(A)** panel, the b path is not shown, as the analysis was terminated.

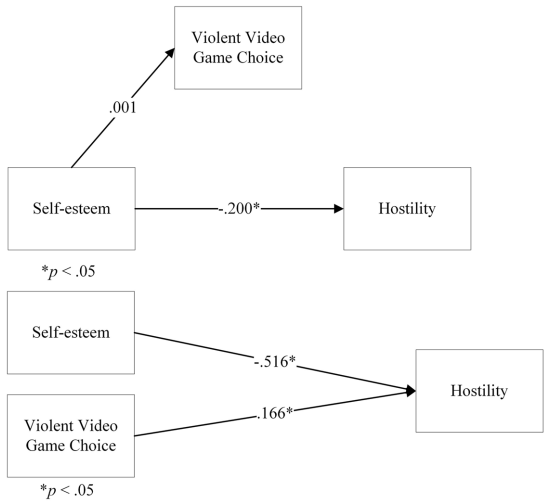

FIGURE 9
Analyses on Violent Video Game Choice, Self-esteem and Hostility: **(A)** a mediation model of Violent Video Game Choice on Self-esteem and Hostility, **(B)** a multiple linear regression model of Self-esteem and Violent Video Game Choice on Hostility. Note: in the **(A)** panel, the b path is not shown, as the analysis was terminated.

These results show that in the gaming population, narcissism, self-esteem and violent video game choice, are predictors of different components of aggression. These results are novel and in line with the literature on narcissism (Kjærvik and Bushman, 2021) and self-esteem (Descartes et al., 2019), although they shed further light on the aggression components in the context of gameplay.

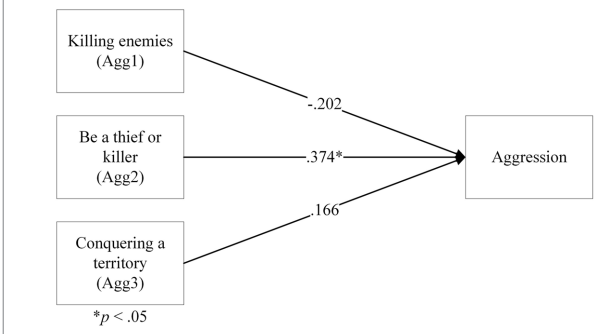

FIGURE 10
A categorical regression model of aggressiveness gaming motivations on composite aggression.

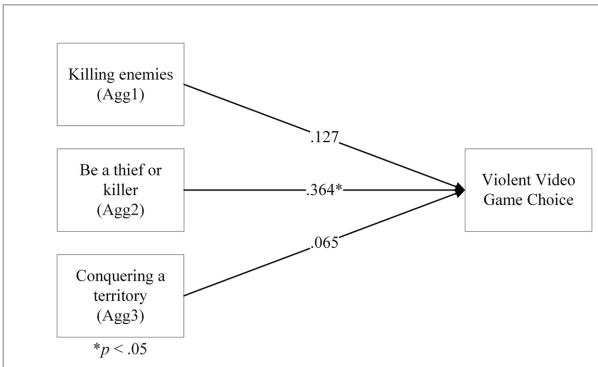

FIGURE 11
A categorical regression model of aggressiveness gaming motivations on violent video game choice.

Interestingly, we obtained these results by classifying, both games with a rating of PEGI 16 (approaching real-life violence) as well as PEGI 18 (gross violence) as violent. This is a novel result that can inform future investigations into the relationship between video games and aggression. The findings contradict past literature. Cabras et al. (2019) found no evidence of the influence of violent video game choices on self-esteem and aggression when using the same measures. However, their sample comprised solely of Italian participants, while our study considered an international sample, mostly Western. In addition, they only considered PEGI 18 as a classifier for violence, whilst our inclusion of PEGI 16 ratings yielded a significant relationship between violent video game choice and aggression. The inclusion of PEGI 16 was triggered by their suggestion that further research should consider including the PEGI 16 rating.

The analysis of aggressive motivations in terms of aggression returned significant results, but this was solely due to the 'Be a thief or killer' motivation. The same pattern of results emerged when the same regression analysis was carried out on violent video game choice. We can speculate that players engage with more violent video game content to immerse themselves in roles that are undesirable in society, and that they perhaps would never undertake in the real-world. Thus, the fun of playing video games could also be doing things which one would not normally do in the real-world.

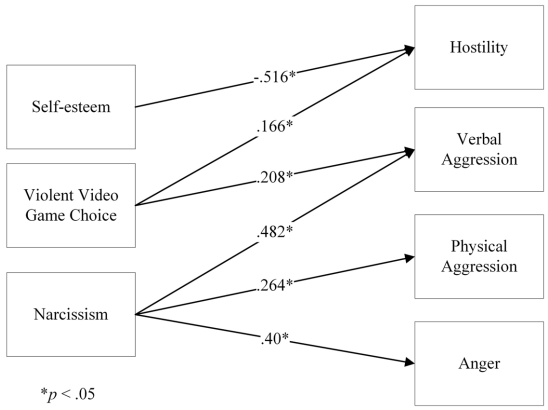

FIGURE 12
Overall results of significant analyses on the relationships between Self-esteem, Violent Video Game Choice, Narcissism and Aggression dimensions. The figure is not a structural equation model, but an aggregated result of all significant relationships for the variables of interest.

4.2. Theoretical implications

Our study opens a wider discussion about the possible impact of violent video game content on aggressive behaviour.

Online age verification is still widely underutilised in online media distribution and consumption. Cinemas enforce age restrictions for films that are not age-appropriate for children, and sometimes such films can be seen by young people only with adult supervision. This is still largely unaccounted for in Internet media. In fact, it is only recently that there has been a legislative drive to require age verification to view websites containing pornographic content in the United Kigdom (McCallum, 2022).

Many digital content distribution platforms, for both films and games, rely on parental guidance and discount age verification via identification (players are asked to input their date of birth at most). This can enable younger players to purchase games that are not age appropriate.

Considering the findings, the authors suggest digital content delivery platforms to consider revising their age verification procedures to prevent younger players from being exposed to inappropriate game material.

4.3. Limitations and future research

This study has a few limitations. The sample was largely composed of players from the United States. Although the diversity of the remaining part of the sample was broad, it is possible that our findings might only be applicable to the players from the United States.

Only one of the aggressiveness gaming motivations provided by GIMS returned significant results when assessed against the aggression scores. This might suggest that the aggressive motivations studied by GIMS might not have been relevant to aggression in our study. If this is true, this limits the conclusions that can be made regarding players' motivations or suggest that these motivations might not be relevant to studying aggression.

The measures of personality traits might not have been sensitive enough to detect the granularity needed to make viable comparisons. Looking at narcissism specifically, NPI-16 was chosen due to its short-form presentation. Additionally, RSES has been argued to only consider global self-esteem (Snowden et al., 2021), and as such, we could not have made distinctions between self-esteem domains. This questionnaire was chosen, as it was the flagship measurement instrument that was short enough to administer to volunteers, trading off granularity in self-esteem.

Finally, our study did not incorporate any qualitative/mixed research methods which would have allowed participants to explain their gaming motivations in more detail.

4.4. Conclusions and future research

This study investigated the link between personality traits (narcissism and self-esteem), and violent video game choice. The results show that participants scored higher on the aggression scale the more violent games they played. Playing violent video games predicted verbal aggression, alongside narcissism, and hostility, alongside self-esteem. Furthermore, we found that narcissism was a predictor of verbal aggression, physical aggression and anger, whilst self-esteem was a predictor of hostility. With further research, violent video game choice, assessed by the summation of PEGI ratings classified as violent, can become a factor in a toolbox of the psychology of aggression and violence.

Thus, the authors suggest that greater consideration should be given to the player's age and their frequent access to games displaying violence. In PEGI 12, which we considered as the cut-off for the non-violent games classification in this study, violence is committed against non-human characters. Future research might consider further lowering the cut-off point. Future research could seek to apply the current procedure to younger samples (age 17 and below) to see whether the results and implications of the present research still stand.

Furthermore, it is possible to sample narcissism and self-esteem binomially and analyse them in a between-subjects manner to observe significant results for the relationship between such variables, violent video game choice and aggression. As such, future studies should strive to collect binomial samples to investigate the disparity between the two extremes of the investigated variables. Moreover, future research should confirm whether violent video game choice is a superior method of analysing aggression in relation to video games than time spent playing per week.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by University College London Department of

Information Study Ethics Chair. The patients/participants provided their written informed consent to participate in this study.

Author contributions

The wider research question of violent video games and aggression was brought up by SO, who also reviewed the literature and prepared the online experiment. The experimental design and variables were chosen by SO and DR, who both carried out the data analysis and critically revised the manuscript prior to publication. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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A thematic analysis of bereaved adults' meaning-making experience of loss through playing video games

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Introduction: Recalling personal memories on the loss and deriving new meanings from them is deemed necessary for adapting to bereavement. Recent studies suggest that games can afford players meaningful experiences that can support players through stressful life events, but its potential on the meaning-making of loss has not been much explored. To address this gap, we investigated the bereaved players' experiences of playing commercial video games that elicited their personal memories of loss and what meanings they derived from those experiences.

Method: Twelve adult players with bereavement experiences (six male, six female, age range: 20-31) played two video games (Bear's Restaurant and Spiritfarer). Their experiences during and after gameplay were tracked via play diaries and in-depth interviews. Data was analyzed using thematic analysis method.

Results: We discovered seven themes on the meanings that players made from their gameplay experience: "Recalling memories", "Avoiding engagement with the pain", "Recognizing positive emotions", "Acknowledging the deceased's perspective", "Reviewing the meaning of loss", "Planning a better future", and "Fulfilling a wish". Our findings indicate that bereaved players recalled and related their autobiographical memories to their in-game experiences. Furthermore, they derived new meanings on both the loss and their post-loss life after playing video games.

Discussion: We discuss how video games can provide a unique meaning-making experience to bereaved players by affording them an agency to actively reconstruct their narrative of loss and facilitating the sharing of grief.

KEYWORDS

bereavement, video games, meaning-making, thematic analysis, reflection, autobiographical memory

1. Introduction

Life can be challenging—especially when the loved ones who made life worth living pass away. Although bereavement is an inevitable and universal event, losing loved ones to death remains one of the most stressful life events that can detriment both physical and mental health (Holmes and Rahe, 1967; Stroebe et al., 2007), cause intense psychological pain, and bring emotional turbulence (Zisook and Shear, 2009). Adapting to loss involves a complex task where the bereaved must make meaning of their losses and simultaneously manage the cognitive and emotional distress caused by the event (Stroebe et al., 2017). Our previous study Eum et al. (2021) found that grieving players derived new meanings of their loss while playing a video game *Spiritfarer*. Our findings also posed a question on the mechanism of meaning-making experience that playing video games can afford to the grieving players. How and why can playing video games be helpful for adapting to the death of loved ones?

1.1. The role of meaning-making in adaptation to loss

After losing their loved ones, bereaved individuals adapt to the loss in different trajectories. Most individuals successfully integrate the loss within 6–18 months and some even experience posttraumatic growth (Bonanno et al., 2002; Dutton and Zisook, 2005; Calhoun et al., 2010; Galatzer-Levy and Bonanno, 2012). However, about 10% of the population experience prolonged symptoms of grief that can harm physical and mental health (Prigerson et al., 2009; Shear et al., 2011; Szuhany et al., 2021).

Constructionist approach to bereavement argues that individual differences in the adaptation to loss depend on how successful the individuals are in their search for meaning in the loss. In this approach, the loss is understood as an event that challenges bereaved individuals' core beliefs about the world and threatens the coherency in their self-narrative. The meaning can be reconstructed through an iterative process of avoiding and confronting one's emotions, memories, and beliefs related to the loss; integrating the loss into his or her personal narrative through this work is deemed essential for adaptation to loss (Neimeyer, 2001). Through this process, individuals can make sense of the loss, find benefits in it, and even experience a change in self which is associated with adaptation to loss (Gillies and Neimeyer, 2006; Holland et al., 2006).

Recent research on fostering meaning-making in the context of loss has expanded to cover a wide range of topics. One significant area of focus is the sharing of grief, which can be an effective approach to reconstructing meaning and reducing grief levels. In fact, correctly assessing emotional reactions to autobiographical memories of loss is closely linked to grief reactions (Lobb et al., 2010; Mason et al., 2020), and remembering specific episodes and emotions in a self-focused and positive manner is associated with lower levels of grief (Eisma et al., 2015; Wolf and Pociunaite, 2018; Smith and Ehlers, 2020; Wolf et al., 2021). Constructivist grief therapies encourage bereaved individuals to confront their emotions and memories of the loss by retelling their bereavement experience, focusing on the metaphorical language, and engaging in evocative visualization of their emotions (Neimeyer et al., 2010; Neimeyer, 2019). Recent studies also highlight the importance of sharing grief within a community of close individuals who have experienced the loss together, such as family, for the co-construction of meaning during the adaptation process (i.e., Barboza et al., 2022). However, the cultural and relational context can often make disclosing grief challenging (Hooghe et al., 2018; Li et al., 2023). Interactive technologies like chatbots have shown promise as a novel way to assist the integration of the loss by providing a virtual presence for sharing grief experiences, resolving unfinished issues, and supporting identity reconstruction (Xygkou et al., 2023).

1.2. Players' experience of meaning-making of loss through video game play

Recent game studies focused on the potential of video games to provide meaningful experiences for players. In particular, players seem to derive meanings from video games by either players attributing personalized significance to in-game experiences or establishing direct links between in-game experiences and real-life challenges (Daneels et al., 2021). Empirical studies showed that video games can generate diverse meaningful experiences such as complex emotional and reflective experiences through relating in-game experiences and out-of-game experiences (Bopp et al., 2016; Mekler et al., 2018). Also, video games can provide a distant space where players can actively explore their emotions, reflect on their past and present life experiences that resonate with their in-game experiences, and find new meaning and values (Bopp et al., 2021; Spors and Kaufman, 2021).

The potential of using meaningful gaming experiences to facilitate bereaved players' meaning-making of loss has received little research attention. Empirical studies suggest that playing video games provided a lifeline for bereaved players overwhelmed by grief (Iacovides and Mekler, 2019; Bopp et al., 2021), and designing games has been explored as a medium for bereaved individuals to construct their own self-narrative on loss and share their grief experience (Harrer, 2018). However, only a few studies have explored how grieving players made new meanings of their loss through playing video games. They are mostly case studies on a single game, such as *Mandagon* and *Spiritfarer*, and their findings suggest that playing these games can help players reflect on their loss by making players engage with a gameplay experience similar to actual grieving experience (McGuire, 2020; Eum et al., 2021). Specifically, in our previous study, we discovered that playing the game *Spiritfarer* helped bereaved players reflect on the memories related to their lost loved ones and reappraise their loss in a more positive manner by engaging them with the simulated bereavement experience with the in-game characters (Eum et al., 2021). However, the specific trajectories for the meaning-making of loss through playing these games were not examined in detail, and it is unclear whether similar experiences can be obtained from other games with similar themes. Therefore, further research is needed to explore the mechanisms and potential benefits of gameplay in the context of meaning-making of loss.

1.3. Research question

Based on the findings from our previous study, we assumed that the bereaved players will encounter in-game scenes which would elicit autobiographical memories related to the loss (i.e., memories about the deceased or coping with the loss). We also presumed that by linking their in-game experiences to their personal memories, players will be able to engage in the meaning-making of their loss. In this study, we aimed to explore whether the above assumptions would hold true for the players with loss experiences who play two different commercial video games about death and bereavement. We set three research questions according to the steps players undergo to reflect on the in-game experiences and relate the out-of-game experiences to them:

1. What autobiographical memories did players recall as they played *Bear's Restaurant* and *Spiritfarer*?
2. How did players reflect on the autobiographical memories they recalled in two games?

3. What meanings did players make of their gameplay experience after playing two games?

The rest of the paper is as follows. We explain participant information, study procedure, characteristics of chosen games, and ethical considerations in the Methods section. We then present the seven themes that arose from the thematic analysis of the diaries and interview transcripts in the result section. The discussion section provides the interpretation of the results in relation to prior literature and presents our contributions to related fields of research.

2. Methods

2.1. Participants and recruitment

We recruited 12 participants (six male, six female, age range 20–35 years, mean age = 25.42) for this study. All participants were undergraduates or graduate students from the nearby campus area of the authors affiliation. They were recruited via flyers posted on school community websites. The recruitment criterion was that none of them played *Spiritfarer* or *Bear's Restaurant* before, and they have experienced the death of at least one family member, relative, friend, or a pet. In addition, we ensured to recruit participants who were not receiving medical treatment for depression, anxiety disorder, or prolonged grief disorder. Participants who scored above the clinical cutoff score on the depression (PHQ-9; Kroenke et al., 2001) and the anxiety self-report measures (GAD-7; Spitzer et al., 2006) in the recruitment survey were rejected. We also implemented the Inventory of Complicated Grief (ICG), a self-report scale for assessing complicated grief (Prigerson et al., 1995). Participants whose bereavement happened more than 12 months ago and scored over the cutoff score on the ICG were also informed of their results and rejected. This was to protect them from the potential mental health risks of this study. After participation, participants were compensated with 100,000 KRW.

Participants' bereavement contexts were collected using the 13 items in the Texas Revised Inventory of Grief that measure present grief (TRIG-Present; Faschingbauer et al., 1981, cited from An, 2006; Holm et al., 2018). Participants varied in their age, nationality, and bereavement context such as the number of losses they experienced in their life, their relationship with the deceased, time since loss, and perceived psychological closeness to the deceased differed across participants. We intentionally kept the diversity in nationality and bereavement context for two reasons. First, diversity was deemed necessary to capture recurring patterns in the different trajectories of in-game and post-game experiences. Second, the previous study (Eum et al., 2021) showed that the players with varying bereavement experiences reported different responses during gameplay. We also collected bereavement contexts such as the relationship to the deceased, the cause of death, time since loss, and the perceived psychological distance to the deceased which were known to influence adaptation to bereavement (Bonanno and Kaltman, 2001; Zisook and Shear, 2009; Lobb et al., 2010). Table 1 illustrates participants' demographics and bereavement contexts.

2.2. Game choice

For this study, we chose two games: *Bear's Restaurant* (Odencat, 2021; BR) and *Spiritfarer* (Thunder Lotus, 2020; SP). In both games, players have to progress the story by completing quests given by spirits in the afterlife. The two games support multiple platforms (PC, console, and mobile) and *Spiritfarer* affords local co-op play other than the default single-player mode. However, we asked participants to play the PC version in this study in order to reduce differences in players gameplay experiences that may occur from using different hardware or play modes.

We selected two games based on their ability to evoke autobiographical memories related to the loss. The games' themes and character stories are expected to provide numerous potential links to players' memories related to the loss, as both games' narratives explicitly focus on death and bereavement with diverse in-game characters that players can relate to people who have passed away. Our prior research and developers' commentaries support the idea that playing these games can help players recall memories of loved ones (Daigo, 2021; Escapist, 2021; Eum et al., 2021). Moreover, the main tasks in both games involve actions similar to the actual bereavement process, which can encourage players to relate their in-game experiences to their own memories. Players form relationships with the game characters in both games by completing quests that reveal their past, cause of death, and final wishes. However, once the player discovers the character's full story, they are required to send them away, leaving only a memento (i.e., the character's home in SP or memory shards in BR). Players are unable to interact with the character again, which mirrors the disconnection from the deceased experienced by bereaved individuals.

The selection of the two games was also based on their ability to provide players with the necessary time and space for reflection. Video games often present a challenging environment where players have limited time to analyze in-game experiences in relation to their real-life experiences (Juul, 2019; Atkinson and Parsayi, 2021). However, the two games we chose offer a different type of gameplay with relatively low demands. There are no time limits, win-or-lose conditions, or penalties in the games, and most in-game rewards are not tied to in-game progress. These conditions satisfy the requirements for the reflective mode of playing mentioned in Possler and Klimmt (2023) where players can interpret in-game experiences as symbolic representations of their memories of loss and reflect on their meanings. This reflective mode of play is particularly conducive to the interpretation and reappraisal of personal experiences, as it allows players to take their time and make connections between in-game events and their own lives.

Lastly, we selected the two games based on the assumption that, in reference to the notion of game affordance (Eden et al., 2018), the structural differences in the two games' environments (actions, tasks, and reward structure) would shape players' reflection experience in a different manner. BR affords players more time to contemplate the visual world and the narrative of the game, as most of the quests involve simple clicks to progress the story and the tasks given to players are less in quantity and complexity. The game also provides opportunities to more actively engage with the memories

TABLE 1 Participant demographics and bereavement contexts.

Name	Age range	Nationality	Time since the most recent loss	Perceived psychological closeness to the deceased	Relationship to the deceased	Nature of death (cause of death)
P1	24–27	South Korea	5–10 years ago	About as close as most of my relationships with other people	Uncle Pet	Sudden (illness)
P2	24–27	South Korea	5–10 years ago	Closer than most relationships I've had with other people	Grandparent Friend	Slow (illness), Sudden (accident)
P3	20–23	South Korea	5–10 years ago	Closer than most relationships I've had with other people	Grandparent Pet	Unexpected (illness)
P4	28–31	South Korea	6–9 months ago	Closer than most relationships I've had with other people	Grandparent	Unexpected (accident)
P5	28–31	South Korea	5–10 years ago	Closer than most relationships I've had with other people	Grandparent Friend	Unexpected, sudden (illness)
P6	20–23	South Korea	2–5 years ago	About as close as most of my relationships with other people	Grandparent Uncle	Slow (illness) Sudden (accident)
P7	24–27	Indonesia	6–9 months ago	Closer than most relationships I've had with other people	Grandparent Aunt	Unexpected, sudden (illness)
P8	20–23	India	3–6 months ago	Closer than most relationships I've had with other people	Friend	Unexpected, sudden (accident)
P9	20–23	US/German	10–20 years ago	Closer than any relationships I've had with other people	Parent	Unexpected, slow (illness)
P10	24–27	Ethiopia	3–6 months ago	Closer than any relationships I've had with other people	Uncle Aunt	Unexpected, sudden (accident) Unexpected, sudden (illness)
P11	28–31	Mexico	1–2 years ago	Closer than most relationships I've had with other people	Grandparent Pet	Slow (illness)
P12	24–27	Bolivia	9–12 months ago	Closer than most relationships I've had with other people	Grandparent	Slow (illness)

of in-game characters by letting players "dive" into characters' memories and interact with characters to complete the quest or see cutscenes of how they died. Since players can more directly engage with events related to characters' life and death in BR, we expected that players would more likely associate in-game events with real-life events and evoke stronger emotional engagement with the recalled memories. Meanwhile, SP provides players with more complex mechanics and a larger number of quests, requiring players to collect and craft diverse resources in between the journey of discovering the stories of in-game characters. Also, the backstories of in-game characters are implied in the dialogues. Therefore, players are presumed to report smaller frequencies of associating in-game events with their life events, resulting in less recalled memories and weaker emotional engagement with them. Figure 1 shows the title images of the two games; The game studios of the two games, Odencat and Thunder Lotus, have granted the permission to use the images. Table 2 illustrates the structural aspects of the two games.

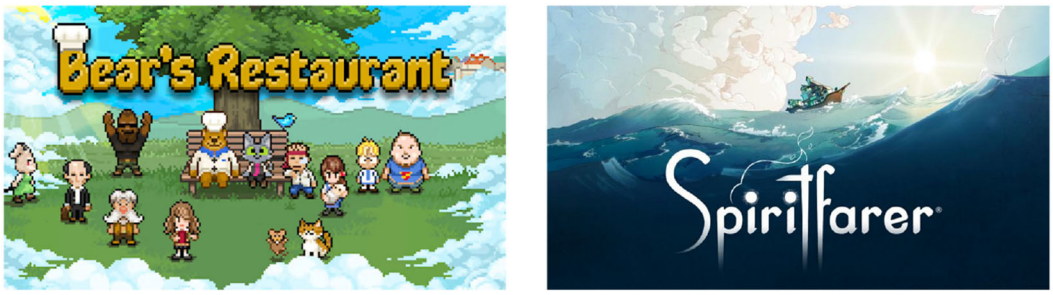

FIGURE 1
Title images of the two games, *Bear's Restaurant* by Odencat and *Spiritfarer* by Thunder Lotus. Images reproduced with permission of Odencat **(Left)** and Thunder Lotus **(Right)**.

TABLE 2 Comparison of *Bears' Restaurant* and *Spiritfarer*.

	Bears' Restaurant	*Spiritfarer*
Developer (country)	Odencat (Japan)	Thunder Lotus (Canada)
Genre	Indie, adventure, and interactive fiction	Indie, adventure, management, platformer, and farming simulation
Length	3–4 h	40–60 h
Main task	Discover and serve the meal that spirit wants before they leave	Fulfill spirits wishes and take them to Everdoor when they are ready
Actions and quests	Walk around Talk and hand food to characters Dive into characters memories via memory shards	Find new regions Care for spirits onboard (cook and give food, hug, fulfill their request) Gather resources in different regions (mine, fish, and collect) Craft materials out of resources Manage plants and animals in the farm Upgrade ships at the workshop
Narrative	Cat (player character; PC) works in a restaurant in the afterlife that is run by Bear. In hopes of finding her lost memories, she serves spirits the last meal they want to have before they go to heaven or hell. In the process, she finds out about spirits life before they died as well as her lost memories.	Stella (player character; PC) takes a new job as a Spiritfarer in the afterlife where she should find spirits who are not ready to leave the afterlife and take them to Everdoor when they are ready. In the process, she learns spirits memories of their life before death and discovers who she was before she arrived at the afterlife.
Reward structure	Completing quests lets the PC progress the main story and unlock Steam achievements.	PC can gather "glims" from completing quests and "Spirit Flowers" from spirits that left to Everdoor, and use them to upgrade ships in order to discover new regions and stories. Completing quests also unlock Steam achievements.

2.3. Procedure

2.3.1. Gameplay week: collecting players' diaries

After the researcher obtained written consent from all participants, players were asked to purchase the two games and start playing for 7 days. We did not limit the date and time they played in a given week in order to capture players' thoughts and emotions in the most natural setting possible. Considering the different playtime of the two games, we set the minimum condition that should be satisfied to participate in the interview: seeing the ending of BR, and sending at least two spirits to Everdoor in SP. The estimated playtime for satisfying the minimum condition was 10–12 hours.

During the given week, participants had to write diaries every day they played two games. In the diary, they attached screenshots of the game scenes that were particularly meaningful to them in relation to their life experience, and answered two open-ended questions. The questions asked why this scene was meaningful to them in relation to their life experience, and what they thought or felt when they encountered the scene. In order to encourage players to freely write their thoughts and feelings, we did not put any limits on the length and number of diaries. The diaries were written online using individual Google Docs documents, which were shared only between the participant and the researcher in order to keep the content private. The play diary examples given to the participants are attached as Supplementary material.

2.3.2. Post-gameplay interview

Participants who satisfied the minimum condition in a given week were interviewed individually. The in-depth interviews were conducted for approximately 1.5 hours via Zoom considering the COVID-19 restrictions. We provided the interview questions to participants prior to the interview. However, since the interviews were semi-structured, some questions were added or elaborated during the interview depending on the participants' answer.

The interview questions asked participants' gameplay history and motivations, their experiences with the two games, what they perceived differently in the two games' environments and their behaviors, and the change in their thoughts or feelings about their bereavement experience. During the interview, participants read their play diaries with the interviewer and discussed if there are memorable scenes that they want to add. Afterward, they chose the scene that was most meaningful to them and explained the reason for their choice. The interviewer also asked questions that asked deeper about the feelings and thoughts described in the play diary when deemed necessary. This was to compensate for the different depth of play diaries across participants and to collect additional data that can help the researchers better understand what they wrote in the diary. The full interview question list can be found in the Supplementary material.

2.3.3. Data analysis

The diaries and interviews were analyzed using Nvivo software. We deemed thematic analysis to be appropriate due to its capability to capture recurring patterns across players' subjective answers (Braun and Clarke, 2006). We used the inductive thematic analysis method in reference to Terry, Hayfield, Braun, and Clarke (Terry et al., 2017).

The analysis was conducted in the following fashion. First, all interviews were transcripted and play diaries were collected in a single Excel file with each sheet containing all diary entries of an individual player. The observational notes taken during the interviews were also reviewed in order to ensure no information was omitted during the transcription. The first author, who is a Native Korean speaker and a proficient English speaker, inductively coded the data using NVivo software. No new codes were generated after the coding of the 11th participant's interview, which was deemed as a sign that the saturation point was reached in reference to Saunders et al. (2018). Afterwards, the first author constructed candidate themes from the codes. To guarantee the credibility of the analysis, we employed the researcher triangulation approach (Nowell et al., 2017) when we reviewed the candidate themes. The candidate themes were subject to multiple triangulation sessions where they were reviewed by all authors and a fellow game researcher with expertise in Game Studies. Researchers reviewed the candidate themes and assessed whether they properly reflected players' experiences. Candidate themes underwent iterative reconstructions during the triangulation process. For instance, the initial candidate themes were differentiated according to the types of recalled memories (emotion-related memory and event-related memory), but they were reconstructed following the feedback that it is hard to

TABLE 3 Summary of the themes.

Theme	Category description	Conceptual link to the meaning-making of loss	Example quotes
Recalling memories	Participants recalled long-forgotten events, thoughts, and emotions related to the loss	Raising awareness on the presence of unresolved thought or emotion	(The game scene) reminded me of my friend's funeral...(P2)
Avoiding engagement with the pain	Participants sought to distance themselves from the memories after confronting the pain of loss	Part of the iterative process of avoiding and confronting emotions and thoughts on the loss	I don't want to even watch it or see (the game scene) again... It's quite scary. (P10)
Recognizing positive emotions	Participants became aware of the positive emotions in both pre- and post-loss lives	Part of the iterative process of avoiding and confronting emotions and thoughts on the loss	I remembered a lot of my grandmother. It's nice to remember the respect I have for her. (P11)
Acknowledging deceased's perspective	Participants witnessed the loss narrated from the deceased's perspective and reevaluated their loss	Incorporating a new perspective into one's own personal narrative of loss	I came to think about what it would have been from their point of view... (P3)
Reviewing the meaning of loss	Participants confronted the bitterness elicited by recalled memories and reassessed the loss with their current belief on life and death	Integrating the loss and reconstructing a coherent self-narrative	After being sad and nostalgic and bitter... it also makes me think, so what if it didn't happen? (...) a sense of telling myself everything has a reason. (P9)
Planning a better future	Participants shifted their focus from their regrets to cherishing the present and discovering future priorities in life	Restructuring priorities in life to create more coherent self-narrative	I will try to correct my mistakes and give my family appropriate time... (P8)
Fulfilling a wish	Participants resolved the unfinished business with the deceased and experienced peace	Continuing bonds as a resource to continue the meaning-making process	It's something I wish I could hear from my (late) grandma. It made me thankful and relieved. (P7)

distinguish between two memory types in participants' accounts. In the end, seven themes, 30 subthemes, and 135 codes were generated. The finalized themes and their descriptions can be found in Table 3.

2.4. Ethical considerations

The research process was approved by the institutional review board (IRB) of the authors affiliation. The study design included measures to protect participants from further distress. The registration survey included self-report measures for depression, anxiety disorder, and complicated grief. Applicants whose score for each self-report measure was above the clinical cutoff score were informed of the result and were rejected from participation in order to screen the applicants with high risk for mental health issues that may arise from participating in this study. In addition, the survey addressed the potential risks of participating in this study and the trigger elements in both games, such as the portrayal of suicide, murder, and illness, and asked if they agreed to proceed despite the warnings and agreed to share their experiences with the researcher. Participants were informed they can stop participating

TABLE 4 Quantitative percentages of the themes.

Themes and subthemes	Frequency	Percentage	Participants
Recalling memories	**14**	**10%**	**4**
Recalled related memories but no further meaning-making	14		
Avoiding engagement with the pain	**7**	**5%**	**2**
Recalled the unexpectedness of the loss	3		
Surprise	1		
Shock	3		
Remembering positive emotions	**24**	**18%**	**6**
Recalled fond memories with the deceased	4		
Recalled fond memories with the living close ones	10		
Nostalgia	5		
Gratitude	5		
Acknowledging the deceaseds perspective	**28**	**21%**	**4**
Recalled memories with the deceased	12		
Regret	7		
Relief	2		
Imagined how the deceased felt	4		
Found benefit in newly discovering the deceased	3		
Reviewing the meaning of loss	**35**	**24%**	**5**
Recalled memories of coping with the loss	13		
Bitter and longing	4		
Assessment of belief	9		
Reappraisal of the past	7		
Found benefit in sharing my interpretation with others	2		
Planning a better future	**22**	**16%**	**5**
Recalled memories of not spending time with the deceased	3		
Recalled memories of not spending time with living close ones	5		
Regret	4		
Not repeat the mistake and cherish the present	4		
Positive outlook on the present and the future	6		
Fulfilling a wish	**7**	**5%**	**2**
Recalled own wishes involving the deceased	3		
Relief	3		
Gratitude	1		

anytime if they experience too much emotional distress in the process. The interview process followed the guide on the interviews on sensitive topics, which contains instructions such as giving open-ended questions and creating a comfortable environment by allowing participants to choose the location and ensuring privacy (Elmir et al., 2011). In addition, in consideration of the potential emotional risk that researchers who study sensitive topics may face (Moncur, 2013; Waycott et al., 2015), several support mechanisms were installed in the study procedure. The corresponding author regularly met with the first author and monitored the study design and interview process. The first author received regular counseling during the study in order to monitor potential emotional difficulties that may arise from the emotional engagement with the topic.

3. Results

We found seven different themes from the participants experiences during and after playing two games. Each theme illustrates the types of recalled autobiographical memories, participants' emotional responses to recalled memories, the meanings participants made of in-game scenes, and the meanings participants made of the entire gameplay after they finished playing. While the first three themes showed players' reaction to confronting the memories related to loss, the latter ones showed players deriving new meanings of the loss. Korean participants quotes were translated into English. If participants mentioned an episode from a specific game, we wrote the game title in the parenthesis after the quote. If the participants mentioned their impressions on the two games in general, we did not write the game title to prevent confusion and wrote participant's name only.

This section also presents the screenshots of the in-game scenes that players mentioned in the quotes. We mostly used screenshots taken by the participants in the two games, but in case players forgot to or intentionally did not take in-game pictures, we substituted them with the screenshots taken by other players or the first author. The source of each image is mentioned in the caption. The developers of *Bear's Restaurant*, Odencat, and *Spiritfarer*, Thunder Lotus, have granted the permission to use the screenshots from their respective games.

Table 4 presents the frequency of the codes and their quantitative percentage in each theme, rounded to the nearest whole number. Themes with more subthemes may have a higher percentage even if they were reported by fewer participants, as the frequency is calculated as the sum of subtheme frequencies. To counter this bias, we also noted the number of participants represented in each theme.

3.1. Recalling memories

In the game, participants discovered various objects or scenes that they could associate with the people in their lives. These objects or scenes elicited the memories of the deceased they had long forgotten (i.e., distant friend). Participants recalled that these experiences brought these losses to their awareness. For instance, P2 remembered a childhood friend who died of an accident when he saw characters playing with a soccer ball in BR, a loss he had long been unaware of:

> When I saw that ball, I remembered my friend in elementary school. He chased the ball outside and never made it back. Usually, I dont recall him when I see a ball, but maybe the topic of this game (death) brought the memory back. (P2, BR)

P2 also identified a similarity between the scene from SP and a specific episode related to his loss. He described how the reactions of other characters to the departure of the character who was about to pass away greatly resembled his recollection of his peers' reactions at the funeral:

> (The scene) reminded me of my friends funeral. Because he liked the school very much, the bus carrying his coffin drove around the school one time after his funeral and all students paid respect to him. I remembered that moment because we were standing just like that. No change in expressions, just standing (...) I knew what he wanted at his last moments so I think I remembered the scene at the funeral more than who he was. (P2, SP)

Meanwhile, some participants mentioned that game scenes that elicited emotions similar to what they felt at the time of bereavement triggered the memories. P3 described that scenes from both games reminded her of how she felt when she heard about her grandfather's death:

> The two characters had a conversation after the reunion and then the game ended like this (a black and white drawing of an empty chair below a tree). I felt like I was really saying goodbye. I thought it was similar to how I felt when I realized the disconnection. (P3, BR)

> I was harvesting and planting something on the boat and building a new building. When you're ready to send your soul to Everdoor, the graphics turn into red rivers and trees (...) Somehow, I satisfied the condition to send Alice to Everdoor, so as soon as I woke up, the background color changed. I was really surprised because I didn't do anything. What did I do? (...) I wasn't ready and I was surprised that such events happened again in a row. Although she was a character, I wanted to tell her not to go. (...) I think it was more reminiscent of my experience of being confused when I got a call. (P3, SP)

While both participants recalled the memories of the related episodes and emotional reactions to loss, whether they engaged in further meaning-making of them differed. P2 explained that he did not reflect deeper about his friend's death because he did not have other significant memories associated with the deceased that he could relate to the game scenes. Meanwhile, P3 derived further meanings from his grandfather's death as she repeatedly encountered game scenes that elicited memories of him, as depicted in the theme "Acknowledging the deceased's perspective."

3.2. Avoiding engagement with the pain

Recalling memories related to the loss also confronted participants with the pain of losing their loved ones. Some participants reacted with shock and sought to distance themselves from those memories rather than dwelling on them. Two participants reported that they could relate the game scenes to their own experiences because they reminded them of the initial shock they felt upon their loss. The scenes were mostly death scenes that bore similarities to their loved ones cause of death. Those participants shared two bereavement contexts: they were emotionally close to the deceased, and their death was sudden and unexpected. The unexpected bereavement left them with great shock and regret that lasted until the time of the study. The scenes that participants mentioned in the quotes can be found in Figure 2.

> When I heard the gunshot I had goosebumps (...) I remembered that I raised a chick when I was young and that I felt very scared and guilty when it died, just like when I saw the bird die in the game. (P1, BR)

> I lost my uncle because of a car accident (tears). I don't want to even watch it or see it again. (...) I know how it feels for the parents or for any family (whose member) died in a car accident. It's quite scary. (P10, BR)

The intensity of participants' reactions varied according to the time passed since bereavement. For instance, P1, who lost her pet more than 10 years ago, was surprised but it did not last long. Meanwhile, P10, who lost her relative 2 years ago, was horrified and refused to record the scene in her diary. Despite their differences, both reported avoiding further reflection on their painful memories.

3.3. Recognizing positive emotions

Interestingly, the games did not only bring sad memories but also made participants aware of the positive memories in their pre- and post-loss lives. Participants remembered events that accompanied positive affect, such as the good times they spent with the deceased or the close ones who were still alive. Often, the characters lines that described their past life in a positive manner or the scenes that visually matched participants' memories became the cue for retrieval. In the recollection process, the memories were reconstructed focusing on how participants themselves helped the deceased or how joyful the moments they spent together were. Participants reported that they felt nostalgic after recalling memories with the deceased, but no further cognitive processes followed. For instance, P11 happily recalled his final days with his late grandmother when he took care of the character in SP:

> In that particular scene, I remembered a lot of my grandmother. It's nice to remember, like the respect I have for her (...) So every step with the hedgehog was like remembering the steps I went with her. It's pretty nice (...) I didn't consider that I was taking care of her. I just put myself to work to make her laugh every day or make her smile. (P11, SP)

Meanwhile, participants also recollected memories of times when living close ones such as family or friends supported them in the hard times. The depictions of characters helping one another or being surrounded by loved ones reminded participants that there were people who cared for them and supported them through dark times. Recognizing the presence of loved ones in their life led to realization that they were not alone and their life is full of positive memories. Participants such as P6 and P8 reported feeling gratitude and positivity from these recollections:

> In the game, one kind act of the cat turned a demon into something good. All he needed was a friend. I feel blessed to have some really nice friends in my life who will always be ready to help me whenever I need them. (P8, BR)

> Seeing this scene, I thought about what scenes would unfold in my afterlife. Rather than hateful and unhappy times, I only remembered happy and ordinary moments in my everyday life or the times I spent with my loved ones. So I thought I should make more happy memories in my life than (memories of) hate and anxiety. I felt positive and hopeful that making good memories alone can keep me busy. (P6, SP)

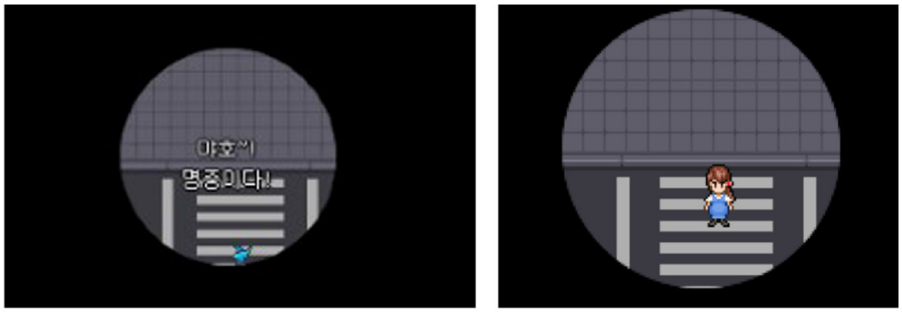

FIGURE 2
The Bear's Restaurant screenshots taken by participants in the theme "Avoiding engagement with the pain" [**(left)** P1, **(right)** P10]. The screenshot for P10 was substituted by the screenshot of the same scene taken by another participant because she did not capture the scene at the time of gameplay. Reproduced with permission of Odencat.

3.4. Acknowledging the deceased's perspective

Participants also recalled memories with the deceased when they were alive from the specific lines that game characters say or the features of characters stories that overlap with real-life figures. However, while the vantage point of the recalled autobiographical memory was themselves, the game scenes associated with the memories were narrated from the game characters point of view. This created an effect similar to witnessing the same real-life event being narrated from the deceased's perspective. Figure 3 shows the in-game scenes that participants (P5, P3) referred to their quotes.

Participants' reactions differed according to how the event was depicted in the game. For example, both P5 and P7 mentioned that they regretted their interactions with the deceased after encountering a situation in BR that resembled their conversation with the deceased. In the game, they witnessed that characters had regrets before they died, such as not being able to fulfill their last wish or express love to their close ones. Realizing that the past is irreversible, both participants regretted their past behaviors and shifted their focus toward contemplating what they should have said or done to the deceased:

> This is the scene where a friend visits the character who dies at the hospital at a young age. I remembered that when I went to see a friend who was years below me and had cancer. He said he wanted to perform on stage, but I discouraged him. I told him to get chemotherapy first, be discharged, and then we can perform together. Thinking back, it could have been his last wish. I was out of line. (P5, BR)

> I felt like I was not a good niece, I was not a good granddaughter. Because it seems like I should have done more for them. All this time I only wanted them to understand me. But I never really tried to understand them. Like, what they want, what they wish. I never really talk about those things. Sometimes I also feel like I don't really know them (...) what did I do all this time? (P7, BR)

However, not all participants experienced regret after realizing the perspective of the deceased. Some participants reevaluated memories that were initially associated with negative emotion in a more positive manner after seeing how game characters interpreted their death. This shift mostly occurred in participants who lost their loved ones to illness. For instance, both P5 and P3 lost their loved ones to cancer and related their loss to the negative emotions they felt while witnessing their loved one's health decline. However, as they associated game scenes with their past experiences, they began to interpret their death as salvation from pain, which brought them a sense of relief:

> Speaking of this character who died at an early age, my 22-year-old clubmate died of colorectal cancer in a painful way. It occurred to me that he would have been freed from the pain only after he died. (P5, BR)

> My grandfather who died of cancer also had some symptoms of dementia. It wasn't that serious, but he began to forget things and his family. I was more taken aback than feeling sad when I saw that. Seeing him confuse my name or mistake me for my younger brother scared me. (...) But even though Alice showed some symptoms (in the game), she looked calm. In that regard, instead of being scared or confused, I thought that it may not have been so painful for my grandfather. It somehow comforted me. (P3, SP)

Not all participants derived different meanings of their loss after gameplay. For instance, P5 commented that he decided to refrain from making judgments on his friend's situation because he deeply regretted how casually he spoke of his friend's last wish. However, other participants who had sufficient time to process grief since the time of bereavement started to realize that their memory of the deceased may not fully capture who the deceased really was. P3 and P7 acknowledged their lack of knowledge about the deceased's true character. They shifted their focus toward the benefits of uncovering and discovering the true nature of the deceased, rather than dwelling solely on the sorrow of their loss. This also involved less rumination and more motivation to share their thoughts and emotions with others who shared memories of the deceased, such as their family:

> It made me think more about the ones that passed away. For example, I wonder what kind of things they enjoy, they really do enjoy. Like what kind of things they like and what kind of things they don't like. (...) I want to know them more. (P7)

FIGURE 3
The scenes mentioned in the theme "Acknowledging the deceased's perspective". **(Left)** P5 from Bear's Restaurant; reproduced with permission of Odencat. **(Right)** P3 from Spiritfarer, reproduced with permission of Thunder Lotus.

> For too long, I felt that there would be no difference even if I thought about him, so I didn't try to remember him (...) but I came to think about what it would have been like from their point of view. (I thought) maybe it would be okay to think about him a little more. Maybe starting by asking my family what kind of person he was. (P3)

3.5. Reviewing the meaning of loss

Participants also recalled events that involved coping with the consequence of the absence of the deceased, such as events during or years after the funeral and what they felt at the time. The memories recreated the bitterness and yearning for the deceased but also acted as a catalyst for further reflections. Reviewing reconstructed memories offered participants an opportunity to reassess past memories with their current interpretation of the meaning of life. Whether participants found a new meaning of loss differed across participants, depending on the discrepancy between the perceived meaning of the game scene and their existing beliefs about life and death. Participants whose interpretation of the games message aligned with their prior beliefs noted that the games served as a time for reassessing their views on life. To quote P4, the games were the review session on how I should live and how I should remember [the deceased]. Figure 4 features the scenes that participants mentioned in their quotes.

Reassessment of ones belief arose during the process of coping with the stress from recalling bitter memories. For instance, P9 recalled the memories that revived strong bitter feelings of grief. However, this was compensated as he reevaluated his past experiences and found benefits in the present:

> When I see little kids being picked up by both their parents, or playing with their parents, I always imagined myself being with my deceased dad and how it would have been if he had not died. The memories we would have made together, be it getting picked up from school or just watching a movie together. (P9, BR)

> Its like that sad feeling of being like, I wish he wouldn't have to die. I wish I could have experienced life with him. I wish I could have played soccer with him (...) But then after being sad and nostalgic and bitter, it also makes me think, so what if it didn't happen? (...) I made the best of it and I'm happy where I am right now. Maybe all these (new events in life) wouldn't have happened if my dad didn't die. So it's like a sense of telling myself everything has a reason. (P9, BR)

Participants also reassessed their beliefs as they attempted to make meaning of the scenes that contrasted with their prior interpretation of the loss. For instance, P12 discovered a new meaning of her loss when she saw that the spirit characters gathered to help her in BR. While each character had different backstories, they all empathized with the main character's suffering because they shared the common experience of losing something or someone valuable in their life, such as the time with their family or loved ones who passed away. Reflecting on this scene, she realized that, in contrast to her prior belief that no one can understand her pain, grief is a normal reaction that everyone experienced at least once in their lives, including her close ones. The realization broadened her perspective:

> When you lose somebody or you feel sad about it, you say nobody can understand what I feel, or this is hard for me and I'm alone. But the reality is, everybody has been through that. Everybody has a kind of experience like that. And it's just nice that you can relate to somebody, to say maybe it's normal to feel like this or to have this process. (...) it liberates you. (P12, BR)

This experience also acted as a catalyst to disclose herself to her close ones. She found benefit in sharing her feelings and thoughts on the loss with others:

> As I felt comfortable with these games, like because I was pushed to think about these topics that you usually don't, it just made me think, What if I express myself about these topics more often? Would I feel more relieved or more comforted by the other people who listen to me? (...) Maybe it's a conversation I have to have more often with other people. (P12)

3.6. Planning a better future

Participants also reported that confronting their regret motivated them to plan a different future. Game characters' lines or situations elicited their regret for not cherishing the time with their loved ones. In contrast to the previous theme, the loved ones they

FIGURE 4
The Bear's Restaurant scenes participants mentioned in the theme "Reviewing the meaning of loss" [**(left)** P9; **(right)** P12]. Reproduced with permission of Odencat.

FIGURE 5
The Bear's Restaurant scenes participants mentioned in the theme "Planning a better future" [**(left)** P8; **(right)** P10]. Reproduced with permission of Odencat.

recalled were not only the deceased but also their living close ones. Participants became aware of the fact that they cannot undo their past mistakes with the deceased, but they realized that they could choose not to repeat the same mistakes with their living close ones. They began to shift their focus from the ones they lost to cherishing the present with their living loved ones so that they can prevent future regrets, as captured by the quotes from P8 and P10. The game scenes mentioned in their quotes can be found in Figure 5.

> Just like this man in the scene is regretting not liking food from his mothers' hand, I miss my family sometimes too now that I live in a different country far from them. I regret not spending more time with them, but at least I still have the chance to talk more to them. I will try to correct my mistakes and give my family appropriate time whenever I go back home on vacation. (P8, BR)

> This scene reminds me of my mother, she would always cook food for me. And she even knows which one I liked most. After coming to Korea, I regretted not appreciating her help more and I could have been much more affectionate (...) When I meet her in person, I promised to myself that I will be much more grateful and affectionate. (P10, BR)

Being reminded of their past mistakes and planning not to repeat them brought changes in some participants' daily lives after playing two games. More than half of participants spoke of how they began to appreciate small happiness in everyday life, connect more with their close ones, and express their love toward them. For instance, P8 described that playing two games made him more understanding of other people and realize how important family and friends are in his life. He began to make small changes:

> After playing these games, I did talk to some of my friends more, like not about the game but like, to connect more with them. (P8)

Even if the game did not greatly change their interpretation of their loss, participants were able to more clearly identify how they felt or thought about the loss. Moreover, it provided participants an opportunity to discover what they would value in their future lives and construct their own beliefs on life and death. To quote P11, playing two games was "not an inflection point (...) but a process" to move on from their loss. P10 suggested that playing two games let her feel more prepared for the future:

> I think it changed the fact about the future for me, because what's lost is lost, regret is not that good. (...) Try to remember what you had, happy moments in the past with those people you lost and try to do much better for those you already have. I wouldn't say it made me a different person. But maybe when a situation arises, the way I react to it might be different. It might be to recall those memories, like what I had, what I played, or what I did in these games. (P10)

3.7. Fulfilling a wish

Rarely, playing games provided an opportunity to fulfill a wish that involved the loved ones they lost. Their wish was left unresolved because their death was irreversible, but participants were able to fulfill them by interacting with the game characters that they strongly associated with the deceased. This phenomenon was observed in only two participants (P3, P7) because the condition for such a strong association was hard to achieve. First, participants had to encounter characters whose features greatly overlapped with their mental image of the deceased. Second, the interaction that the games afford had to match the interaction they wanted to have with the deceased. In BR, P3 was able to provide a decent meal to a mouse character who she associated with her late pet. In SP, P7 was able to hear the word of acknowledgment of her hard work from the character who shared many features of her late grandmother such as the voice tone, calling her by nickname, and being an old woman.

Both interactions elicited relief and a feeling of deep gratitude in players. Playing two games added a new layer of emotion and memory on the meaning of their loss and, more importantly, their life. The specific game scenes that participants mentioned in the quotes can be found in Figure 6.

> I raised panda mice as a pet a few years ago. I felt heavy from seeing how characters to whom I served meals died, but suddenly a mushroom-loving mouse appeared, which was cute. I couldnt raise my pet in a proper environment because I was

FIGURE 6
The game scenes participants mentioned in the theme "Fulfilling a wish" [**(left)** P3 from Bear's Restaurant, reproduced with permission of Odencat; **(right)** P7 from Spiritfarer, reproduced with permission of Thunder Lotus]. Since P7 did not take a screenshot of the exact moment, the image was replaced by another participants screenshot at the same scene, but with a different line.

> too young and it bothered me since, but giving the mouse its favorite food and sending it off to heaven was comforting. (P3, BR)

> Before (going to Everdoor) she said something like "Good job Stella." (...) It's something that I wish I could hear from my grandma. It made me feel thankful and relieved. Because it means that all the hard work, all the hardships that I've been through, my grandma acknowledged it. So I felt like, "Oh yeah I did it the right thing." (P7, SP)

4. Discussion

This study investigated how bereaved players made new meanings on their loss by deriving meanings from the in-game experiences that elicited personal memories of their loss. We discovered seven themes of the experiences related to the meaning-making of loss by analyzing the interviews with the twelve bereaved players and their diaries: Recalling memories, Avoiding engagement with the pain, Recognizing positive emotions, Acknowledging the deceased's perspective, Reviewing the meaning of loss, Planning a better future, and Fulfilling a wish. We will now discuss the implications of these findings.

4.1. Can video games facilitate the meaning-making of loss?

Our results showed that participants encountered various situations in games which elicited memories of loss. Although their reactions to the recalled thoughts and emotions on the loss varied (i.e., "Avoiding engagement with the pain" and "Recognizing positive emotions"), we discovered that participants were able to evaluate and construct their own meaning of loss (i.e., "Reviewing the meaning of loss"). Extending Daneels et al. (2021), participants found the meaning of loss from their in-game experience in two forms. First, as participants relived certain emotions and events in the game, they are able to create direct meanings by connecting them with emotions and thoughts they experienced during the bereavement process. Also, they were able to gain new perspectives on their loved one's death by interpreting in-game situations and attaching new meanings to them.

Interestingly, participants reported deriving generally positive meanings from the in-game experiences (i.e., finding benefit in discovering the deceased, positive outlook on the present and the future). Moreover, participants were able to focus on the meaning-making of their loss without dwelling on their memories too long. This appears to have occurred through multiple mechanisms. First, the games encouraged players to cope with challenges using autobiographical remembering, an act shown to be related to the positive meaning-making of loss (Wolf et al., 2021). Participants experienced emotional challenges in two games as they confronted negative emotions attached to their memories of loss (i.e., P9 from "Reviewing the meaning of loss"), which may have fostered participants to find ways to use recalled memories to cope with current problems and make positive meanings of their experience. Second, the games provided opportunities to recall positive emotions from their memories, which may have compensated for negative emotions from recalling the loss. Particularly, revisiting memories about the living close ones reminded players that they had people who supported them and that they still have time to compensate for their faults, shifting their focus to cherishing the present and finding benefits from the loss. Third, considering that the mood at the time of retrieval could have affected the valence of the retrieved autobiographical memories (Holland and Kensinger, 2010; Konrad et al., 2016), the playful atmosphere that the game medium possesses could have reinforced a positive meaning-making of recalled memories.

4.2. The unique meaning-making experience of loss from playing video games

The results of this study suggest that the unique meaning-making experience of video games may be attributed to the aesthetic distance they afford during the process. Aesthetic distance involves adopting the roles of both "cognitive observer (...) (and) affective actor" (Landy, 1994, as cited in Glass, 2006), which is important for the reflection on traumatic events and associated emotions necessary for meaning-making (Glass, 2006). Previous entertainment media studies that dealt with the theme of death and loss suggested that meaningful media can provide an anxiety-buffering function (Rieger and Hofer, 2017) and foster a sense of connectedness (Das and Peters, 2022). Moreover, reflecting

on tragedy has been found to be able to promote a deeper understanding of oneself (Khoo, 2016). However, they mostly feature reflective mode of media consumption. In contrast, the two video games seem to have afforded an active and immersive meaning-making experience to participants.

On one hand, the two games provided an environment where participants could make a cognitive evaluation of their loss from a safe distance. Participants were able to contemplate their evaluation of the past events ("Reviewing the meaning of loss") and restructure their values ("Planning a better future"). The video games' ability to provide a healthy escape where players can distance themselves away from reality (Kosa and Uysal, 2020; Spors and Kaufman, 2021) may have helped participants confront their thoughts and emotions on the loss without being overwhelmed by them or being disconnected from them. It is important to note that selecting games with low behavioral demands would be important to achieve such a reflective mode of playing, as suggested by Possler and Klimmt (2023).

At the same time, the two games also let participants interact with their memories as an active and affective agent. As explained in the Game Choice section, the two games mandated players to engage in a process similar to a bereavement in order to progress. In the lived verisimilitude afforded by two games (Atkinson and Parsayi, 2021), participants were able to relive their past and actively interact with game characters that partly embodied their mental image of the deceased, which provided grounds for constructing new meanings of loss. For instance, participants were able to see the loss from a new perspective (i.e., P3 and P5 from "Acknowledging deceased's perspective") and resolve unresolved relational issues they had with the deceased (i.e., P3 and P7 from "Fulfilling a wish"). This finding expands on the discussion of how the diverse forms of agency in games shape complex emotional experiences (Cole and Gillies, 2021) and suggests how the agency that games provide can foster bereaved individuals to take an active role in their bereavement journey.

Interestingly, participants appeared to have more easily disclose their emotions and receive social validation of their grief by sharing their in-game experiences to their close ones, which also fostered reconstruction of one's meaning (i.e., P12 from "Reviewing the meaning of loss"). This suggests that sharing loss-related memories and emotions through sharing gameplay experiences can serve as an avenue that bereaved players can use to obtain social support for meaning-making in a less demanding way. This opens venues for interesting future works. For instance, expanding the previous research that showed the bereaved individuals' prevalent use of online support groups to deal with grief (Baglione et al., 2018), future works can explore how video games can be used in support groups to aid the expression of grief or design novel forms of support system for the bereaved individuals.

4.3. What other factors may foster further meaning-making of loss through gameplay

It is important to note how the interaction between different game designs and participants' bereavement contexts shaped participants' meaning-making experience. We discovered that the game designs of the two games had a more profound effect on players' experiences than we anticipated. In BR, players directly linked in-game events to their past experiences as we assumed but their emotional responses were not predominantly negative. Rather, the game helped players acknowledge both their positive and negative emotions, leading them to derive positive meanings of appreciating their present lives and futures with their loved ones. On the other hand, we assumed that SP would produce a less frequent association with past memories since it provided more subtle reminders of loss. However, SP also allowed for more vivid reliving of emotional memories and a wide range of emotions from the process of forming relationships with characters and bidding them farewell, which fostered the meaning-making process. Our findings are consistent with a previous study that indicated individual differences in prior life experience affected how players responded to and interpreted their gaming experience (Eum et al., 2021). Specifically, the extent to which they had processed their emotional reaction to loss before gameplay appeared to play a crucial role in their successful reflection through cognitive distancing.

Additionally, players concurred that the task of writing a diary on their screenshots aided them in relating their in-game experiences to memories of actual events. Reviewing and writing on the meaningfulness of the screenshots helped them be more aware of the thoughts and emotions they did not notice during gameplay, which added depth to their meaning-making of past events. We extended the restorative potential of photographing daily moments in grief processing (Jiménez-Alonso and Bresco de Luna, 2022) by demonstrating that taking pictures of virtual experiences could also make participants more aware of the impact of their gaming experience on themselves, in line with the work of Hall et al. (2021). Pairing gameplay with activities that enable players to connect their gaming and real-life experiences may be essential for promoting the meaning-making of the loss in bereaved individuals.

4.4. Limitations, future works and contributions

This study comes with limitations. First, we would like to emphasize that this research does not guarantee any clinical implications for treating grief. In particular, how players who were diagnosed with Complicated Grief (CG) might experience target games is beyond our research scope. We cannot exclude the possibility that the games capability to afford vivid, emotional experiences can also provide triggers for negative rumination for players experiencing CG, which needs to be investigated in future works with caution. Furthermore, due to its explorative nature, this study covered a relatively small sample size, and bereavement contexts were not controlled in order to capture the most natural, diverse trajectories of players' experiences. Our findings do not provide the effect size of different patterns nor the correlation of the variables mentioned in each trajectory. Moreover, the saturation was verified by one additional interview, which indicates that a larger sample size may be needed to fully capture bereaved players' experience of two games. Future qualitative studies with a larger

sample, possibly with a more controlled bereavement context, may be needed to uncover potential areas that might not have been adequately addressed in this study.

The participants' diaries and interviews may also contain biases worth noting. Similar to studies on positive psychology interventions (Lee et al., 2021), the fact that participants were aware that this study was about adapting to bereavement could have resulted in participants noticing and reporting more changes. Therefore, results should be interpreted with caution. Also, the positive impact of playing games reported in this paper could change when longitudinally monitored. In fact, the long-term experience of playing games may differ from the short-term benefits of playing and return more negative results (Von der Heiden et al., 2019). In line with the increasing importance of longitudinal studies on player experience (Ballou, 2023), investigating the long-term benefits of playing video games for fostering the meaning-making of loss can be an interesting avenue for future research.

Notwithstanding the above limitations, we contribute to a better understanding of how video games can facilitate meaning-making of loss for the players who experienced the death of their loved ones. We found that bereaved players were able to engage with their thoughts and emotions on the loss and make new meanings of them by relating the in-game experiences to their autobiographical memories of loss, expanding the premise of the positive role of playing video games when adapting to stressful life events. Moreover, our findings showcase the unique meaning-making experience that players can experience from playing video games that can elicit memories related to the loss. Participants were able to draw new meanings of loss in the aesthetic distance afforded by the two games; they confronted their thoughts and emotions on the loss from a safe distance, but simultaneously they actively interacted with their reconstructed memories, which provided grounds for constructing new meanings of loss. The impact of bereavement context, game design, and the presence of a journaling activity on the meaning-making experience requires further investigation in future research.

Data availability statement

The datasets presented in this article are not readily available because participants did not agree to share their private data to the public. Requests to access the datasets should be directed to YYD, yydoh@kaist.ac.kr.

Ethics statement

The studies involving human participants were reviewed and approved by KAIST Institutional Review Board. The patients/participants provided their written informed consent to participate in this study.

Author contributions

KE collected, transcribed, and coded all data (in-depth interviews and play diaries) and wrote the manuscript. YYD guided and provided necessary supervision during the research process and reviewed the manuscript. All authors participated in the research design as well as the creation and triangulation of the themes. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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What we do not know about advergames: a literature review

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Introduction: This study presents the findings of a systematic literature review on the academic study of advergames. The evolution of the marketing paradigm has recently opened new avenues for the study of advergames, such as understanding how the brand narrative could be used within a game to achieve diverse marketing objectives, their value for brand engagement through games, or new applications of the specific characteristics of emerging platforms for advergaming. Therefore, this study aims to provide an overview of the state of the art in the academic study of advergames to identify necessary expansions of academic attention to advergames to encompass the full capabilities of branded entertainment and advergame design.

Methods: We conducted a systematic literature review of 122 studies on the topic of advergames published between 2005 and 2021, indexed in the Web of Science Core Collection.

Results: The results show that academic studies on advergames primarily focused on two key research areas: (1) investigating the impact of advergames on children's health through the promotion of food products (2) and examining the effects of advergames on purchase intention. However, there was a lack of emphasis on two other important themes: (3) brand narratives and innovative forms and (4) the effects on brand loyalty.

Discussion: The results of this study highlight the need for a more flexible analytical approach that considers the evolving marketing ecosystem and provides theoretical insights to explore the effectiveness of advergames from a different perspective while identifying gaps in the existing literature.

KEYWORDS

advergame, literature review, thematic analysis, marketing, persuasion, digital games

1. Introduction

This study presents the results of a systematic literature review of existing studies on advergaming. Since marketing communication techniques keep evolving, it is a necessity for brands to explore different communicative opportunities to reach and impact their audiences. Advergames, defined as digital games "specifically designed for a brand with the aim of conveying an advertising message" (de la Hera, 2019, p. 31), allow for the delivery of persuasive messages in an interactive and playful environment. These games emerged with the intention of reaching the audience from a different angle, becoming an alternative advertising channel to traditional media that are commonly saturated by advertising formats. However, the complexity and inherent characteristics of digital games present multiple variables to be taken into account to understand how advergames can be used to persuade consumers (de la Hera, 2019).

With the dominance of the videogame industry in the general entertainment domain, games with persuasive purposes receive greater attention (de la Hera, 2019). Over the last 20 years, the possibilities, pitfalls, and criticisms of games for advertising purposes have been discussed from a variety of perspectives and have become a topic of increasing academic attention (see Jami Pour et al., 2020; van Berlo et al., 2021). Furthermore, the evolution of the marketing paradigm opened new avenues for the study of advergames (Vashisht et al., 2019), such as understanding how the brand narrative could be used to achieve diverse marketing objectives (e.g., Villén Higueras, 2017), their value for brand engagement (e.g., Martí Parreño et al., 2015), or the specific characteristics of emerging platforms (e.g., Sanjuán Pérez et al., 2014). Therefore, it is relevant to understand what we know about advergames as a marketing strategy and what is still missing, considering the constant evolution of the marketing paradigm. Previous literature reviews on advergames have specifically focused on identifying the specifications and characteristics of advergames (e.g., Vashisht et al., 2019; Jami Pour et al., 2020; van Berlo et al., 2021). While these earlier reviews deftly discuss the ontological nature of advergames, a historiographical organization of the different approaches for the analysis of this topic remains absent. A more recent literature review has identified a shift in attention in more recent studies (van Berlo et al., 2021). However, a more recent quantitative analysis of the literature conducted by van Berlo and colleagues has identified a shift in attention in studies investigating advergames as a marketing strategy, and this shift seems to respond to recent changes in the marketing paradigm.

This study aims to critically analyze the evolution of the academic study of advergames from a qualitative perspective. The main purpose is to identify the research domains in which the academic study of advergames has been focused to point out gaps in the literature, taking into consideration the recent evolutions in the marketing paradigm. This study, therefore, aims to provide an overview of the state of the art in the academic study of advergames to identify necessary expansions of academic attention to advergames in order to encompass the full capabilities of branded entertainment and advergame design. Therefore, the purpose is to qualitatively complement the study conducted by van Berlo and colleagues (2021) and also complement it by identifying necessary expansions of academic attention to advergames in order to encompass the full capabilities of branded entertainment and advergame design. This study answers the following research question: *What has been the evolution of the academic study and advergames, and what are the gaps in the literature taking into consideration the recent evolutions in the marketing paradigm?*

As digital games improve in quality and persuasive games dealing with complex issues become more prevalent (Minár, 2016), understanding different approaches and their relationship with traditional approaches to advergames requires a generalized overview. Advergames can have diverse goals, ranging from simple brand recognition to providing opportunities for consumers to experience products (Martens et al., 2022). Consequently, acquiring a more structured comprehension of this phenomenon and identifying areas that require further exploration become socially relevant endeavors.

2. Evolution of the marketing paradigm

Advergames gained mainstream traction due to changes in the marketing paradigm. First, one of the main causes of the necessity to innovate in new marketing forms is the saturation of traditional media. Advertising strategies that follow a traditional perspective are usually linked to the repetition of a persuasive message that ends in a fatigue phase, where the recipient of the message is irritated and tired of receiving this kind of messages (Navarro Bailón, 2008). At this stage, persuasive messages are less believable and less effective (Duncan and Caywood, 1996). This realization of saturation coincided with the modification of habits and the use of different screens by the audience (Scolari, 2014). These two factors created new consumption modalities that forced brands to adapt their communication strategies to reach an empowered consumer that has more possibilities and different ways of consuming content (Rodríguez Fidalgo et al., 2017, p. 30). The search for an approach to reach the potential customer caused a forced evolution in marketing communication that paid attention to a different way of interaction with the audience. One of the changes brought by this change in the marketing ecosystem was the proliferation of narrative branded messages where the content that is shared is the main element of the message (Rodríguez Fidalgo et al., 2017), rather than repetition for brand recall.

The consideration of design and the creation of content as key elements in marketing campaigns opens interesting research areas for persuasive communication in organizations, such as transmedial campaigns that create a "discursive hybridity" (Marzal Felici and Casero Ripollés, 2017), where the audience turns into an active player that has to interact and follow the discourse created by the brand. The creation of marketing campaigns developed for an active and critical audience generated new marketing strategies that create a brand narrative designed to be told throughout multiple formats and media (Jenkins, 2006; Marzal Felici and Casero Ripollés, 2017; Rodríguez Fidalgo et al., 2017). Digital games, in this context, emerge as an opportunity to host persuasive messages that avoid traditional media by creating interaction with the audience.

As a result of these unavoidable changes in the communicative dynamics of society, the concept of marketing also underwent changes to accommodate and cater to these non-traditional strategies. This shift altered paradigms that had been in place since the industrial age and kept going throughout what Philip Kotler et al. call the information age and values-driven era (Kotler et al., 2010, p. 4). The evolution of these marketing paradigms is represented by three stages that Kotler et al. (2010) identify as Marketing 1.0 (product-centered), 2.0 (consumer-oriented), and 3.0 (values-driven). The main difference between these three perspectives is the perceived value of the customer as a key element in marketing strategies. During the industrial age, in which mass-produced products were marketed as commodities, the marketing paradigm shifted to a more communicative approach to respond to the demands of more active consumers. From that moment on, the marketing paradigm evolved into what we know as marketing 2.0, in which consumers became the center of the new marketing strategies. The rise of the internet brought a paradigm shift, marketing 3.0, in which the focus is no longer

on the product that caters to the needs of a consumer but instead on the communication of values that appeal to consumers through products. Although this last, values-driven stage, tends to romanticize media practices that enhance participation and interaction between companies and clients (Schäfer, 2008), these trends create new venues to design effective communicative elements focused on a dialogue (Aguilera Moyano and Baños, 2016) that needs to be effectively moderated and coordinated by following a planning process that integrates the different advertising and communicative strategies followed by the brand (Ang, 2014). It is in this latest era—the value-driven era—that the interactive nature of digital games holds the most promise.

The Integrated Marketing Communication (IMC) perspective is one of the processes that followed these different stages in marketing and whose tenets influenced several approaches to advergames. IMC follows a Marketing 3.0 perspective by creating a coherent message that is conveyed using multiple communication channels and benefiting from the unique characteristics of specific media channels and media formats to convey the message (Arens, 2000; Jiménez Castillo, 2006; Cauberghe and De Pelsmacker, 2010). IMC, as a communication strategy process, uses data and interaction to reach the audience according to their necessities. The analysis and understanding of the inherent characteristics of each communication channel and format help companies generate an integrated and consistent message that shares the brand identity based on congruent strategies (Duncan and Caywood, 1996; Madhavaram et al., 2005; Batra and Keller, 2016).

Taking into consideration the unique communicative characteristics of digital games, Terlutter and Capella (2013) proposed the possibility of using games as part of the Integrated Marketing Communication approach, not only taking into consideration the communicative strategy of the brand but also focusing on the social and individual factors of the player. This approach presented a broader point of view to identify and measure the variables, effects, and effectiveness of advergames. This inclusive perspective was followed by other authors who started studying advergames from a broader perspective (e.g., Vashisht et al., 2019; Stolley et al., 2021; van Berlo et al., 2023), while other studies were specifically focused on the specifications of advergames (e.g., Vashisht et al., 2019; Jami Pour et al., 2020; van Berlo et al., 2021). In this study, we contribute to the work advanced by these studies by taking into consideration the evolution of the marketing paradigm discussed in this section as a way to contextualize the evolution of the academic study of advergames, which also helped us identify gaps in the literature.

3. Methods

To give an answer to the research question of this study, we conducted a systematic literature review of 122 academic studies published between the years 2005 and 2021 on the topic of advergames and branded games.

The sampling procedure was divided into four steps (see Figure 1). In the first step, we ran a search in the Web of Science Core Collection (WoS) and further supported this search by consulting Scopus results. We based our search procedure on the PRISMA recommendations (Page et al., 2021). We looked for studies that analyze the phenomena of advergames or branded games as a main topic or as a comparison to other marketing techniques (such as in-game advertising, TV commercials, or print ads). We decided to use as few exclusions as possible in the terminology. For this reason, we included the term "branded game" in our search to avoid the exclusion of relevant papers that named the object of the study differently. We consequently used the following searching string: (TI = adverga*) OR (AB = adverga*) OR (AK = adverga*) OR (KP = adverga*) OR (TI = "branded game") OR (AB = "branded game") OR (AK = "branded game") OR (KP = "branded game"). The search was conducted by examining the title, abstract, and keywords (including author keywords and Keyword Plus) to retrieve items directly related to the object of study. In our search, we did not use year limitations. However, we excluded "Early Access" to focus on studies that were published until February 2022, when the search was conducted. This search produced 310 results.

Based on these results, in the second phase of the process, conference abstracts, book reviews, and letters were excluded. Books were also excluded because their content was already represented in the sample in the form of a book chapter. After applying the exclusion criteria related to the document type, 288 documents remained. In the third step, the titles and abstracts of these documents were scanned to assess to what extent they fit with the object of study. As part of the inclusion criteria, we selected documents that discussed the use of digital games designed or created by a specific brand for persuasive/marketing purposes. Moreover, we limited our selection to documents written in English or Spanish, considering the language proficiency of the researchers. After this step, 186 documents were selected for a deeper analysis of their content. The fourth step excluded some articles that we did not have full access to. Furthermore, we excluded those in which advergames or branded games were only mentioned as an example without discussing the concept further. This step yielded a final sample of 122 documents.

3.1. Data analysis

The analysis of the final sample, consisting of 122 articles, was conducted using the six-step thematic analysis approach proposed by Braun and Clarke (2006). This method is used to find patterns across a whole data set instead of separate data items, which fits the historiographic nature of the current study.

For the first and second steps of familiarizing ourselves with the data and generating the initial codes, we coded the data setup according to three main characteristics: (a) the object of analysis and variables analyzed; (b) the target involved in the analysis and concrete characteristics (e.g., age, country, or genre); and (c) the kind of methodology used in each study codified.

The third step of the thematic analysis, which consists of searching for themes, was supported by a quick bibliometric analysis of the metadata gathered from the WoS database. We decided to support this systematic review with bibliometric results because it is a recommended method for analyzing a considerable amount of data and helps to create distinctions between emerging areas in a field through network analysis (Donthu et al., 2021). The data were imported to the software VOSviewer for a visual

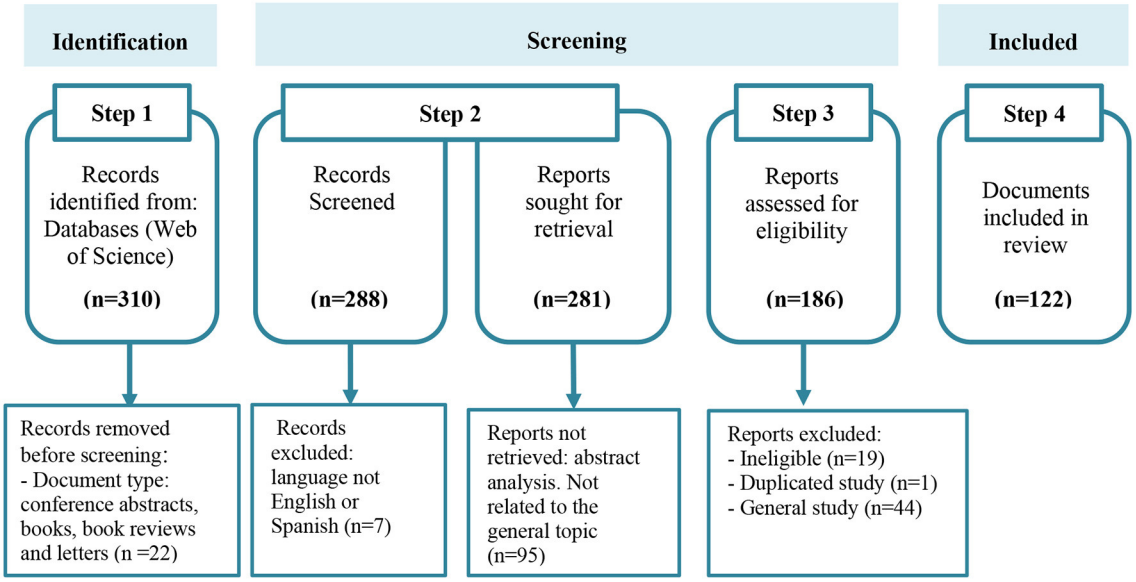

FIGURE 1
Steps sampling process.

representation of the co-occurrences between author keywords, as observed in Figure 2. VOSviewer was also used to visualize the related research areas as a way to identify specific clusters and purposes of the studies.

Consequently, the fourth and fifth steps consisted of the review of the visualized codification and the naming of clusters through an interpretation of the data with the idea of finding common themes identified in the data set.

3.2. Operationalization

The codification and further organization of codes into sub-themes and themes was performed following the theoretical framework of the shifting marketing paradigm discussed under Section 2. This is because we coded the studies taking into consideration their focus on their Marketing 1.0 (product-centered), 2.0 (consumer-oriented), or 3.0 (values-driven) approach. Furthermore, taking into consideration the purpose of this review, during the coding process we paid special attention to the identification of marketing practices that could fit into the missing gaps associated with the evolution of the marketing ecosystem (such as integrated marketing communication practices). Finally, we also took into consideration the characteristics of the game as a communicative tool (such as the marketing purposes of the game, specific characteristics of the brand, and effects on the audience).

4. Results

After the codification, we identified four main themes in the literature analyzed: (1) effects of advergames on children ($n = 54$), (2) effects of advergames on purchase intention ($n = 47$), (3) effects of advergames on brand narratives ($n = 28$), and (4) effects of advergames on brand loyalty ($n = 19$) (see Table 1). The analysis showed that 68% of the literature analyzed was represented by the first two themes. Among the studies analyzed, it was found that only 32% of the sample specifically addressed the utilization of advergames for promoting brand narratives or brand loyalty.

First, the first theme identified comprises studies that explore the effects of advergames on children's health, mainly to prevent obesity; the second theme consists of studies on the effectiveness of advergames on purchase intention. The third theme gathers studies on the effects of advergames on brand narratives and how advergames could work by linking them to other brand strategies. Finally, the fourth theme gathers the documents that explore the effects of advergames on brand loyalty through human-centric messages, where advergames host social causes that would turn into branding effects.

Figure 3 shows a visualization of the years when the studies were published. The first theme we identified has been commonly present throughout the years. A similar pattern was identified for theme 2, where studies on the effects of advergames on purchase intention have started gaining importance since 2013. The third theme started gaining presence in 2013 and kept a similar number of publications until 2021 (until the end of the study). Finally, the fourth theme gained more prominence in 2019. The temporary division of these themes aligns with the evolution of the marketing paradigm, moving from product-focused strategies to value-driven approaches, although there is striking continuity observed in the product-focused first theme. The different themes will be elaborated upon to show their content, limits, and possible gaps.

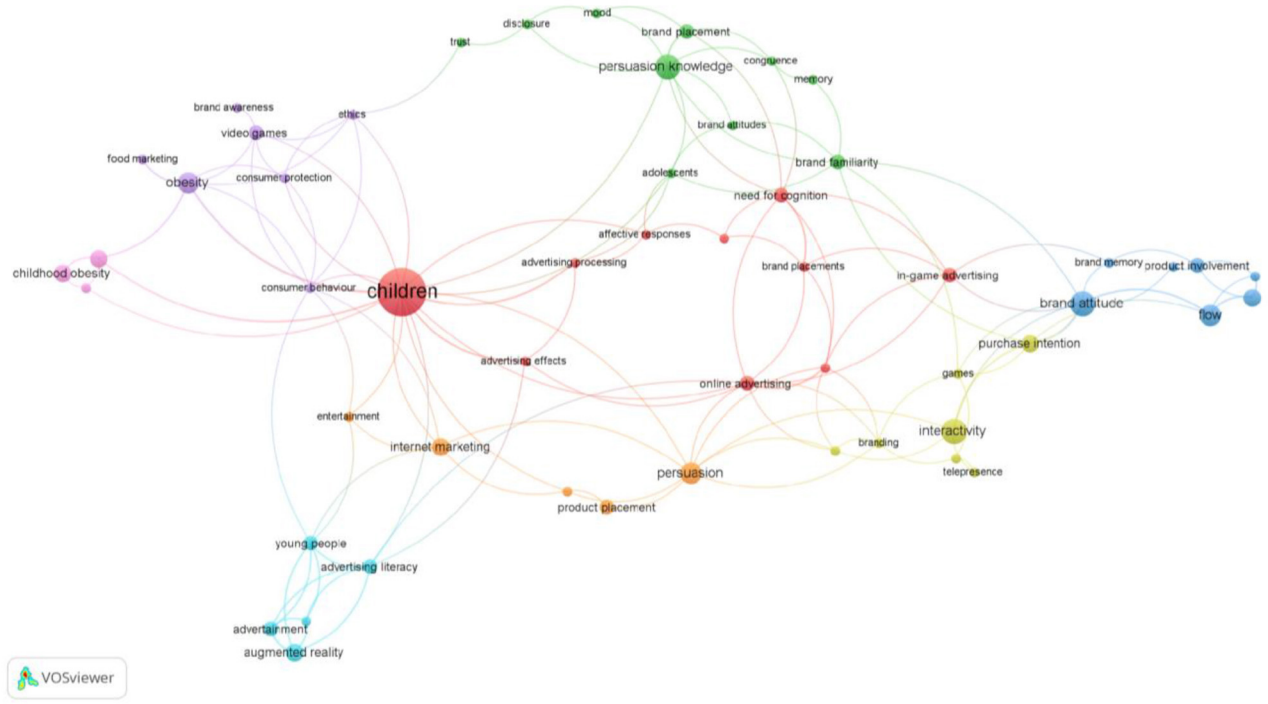

FIGURE 2
VOSviewer overview of co-occurrences from author keywords.

TABLE 1 Themes identified from the systematic literature review.

Categories	Number of documents and main codes	Example in literature
Group 1 Effects of advergames on children	($N = 54$) Quantitative (33) Qualitative (9) Case study (5) Theoretical analysis (9) Mixed Method (1) Literature review (3)	*Our findings indicate that a large number of foods with low nutritional value are being marketed to children via advergames.* ***A standardized system of food marketing guidance is needed to better inform the public about the healthfulness*** *of foods advertised to children* (Weatherspoon et al., 2013) *This study showed that exposure to food cues in advergames influences caloric intake and that these food cues hamper self-regulation when young children are rewarded to refrain from eating* (Folkvord et al., 2014)
Group 2 Effects of advergames on purchase intentions	($N = 47$) Quantitative (33) Qualitative (2) Theoretical analysis (1) Literature review (1)	*The findings of this study support the effect of brand interactivity on consumers' attitudes and purchase intentions. Importantly,* ***brand interactivity had a negative effect on attitudes toward the advergame****. However, this result can be explained by the interaction between brand interactivity and the type of game* (Lee et al., 2014)
Group 3 Effects of advergames on brand narratives	($N = 28$) Quantitative (17) Qualitative (5) Case study (5) Theoretical analysis (5) Literature review (2)	*By adopting an interdisciplinary approach, our findings have implications for practitioners regarding how* ***people from different cultures process information acquired in interactive environments*** (Hernandez and Minor, 2015) (…) *the parodic–ironic stance of these games* ***offers an affinity space to strengthen the shared sensibilities of the multifaceted taste culture of the brand's fans*** (Courbet et al., 2016)
Group 4 Effects of advergames on brand loyalty	($N = 19$) Quantitative (8) Qualitative (6) Case study (4) Theoretical analysis (5)	*The current study adds to this literature by showing that, contrary to previous findings,* ***prominent placement embedded in an advergame for public good actually led to positive evaluations of the company*** *as well as favorable attitudes and WOM intention toward the game* (Sung and Lee, 2020)

4.1. Effects on children's health

This theme encompasses studies that paid attention to concerns associated with the effects of advergames usage on children's health, which represent almost half of the analyzed articles ($N = 54$ studies out of 122). Among these documents, 35 of them were focused on the study of the effects of advergame usage to promote food products (e.g., Cicchirillo and Lin, 2011; Thomson, 2011; Folkvord et al., 2016; Bragg et al., 2018). Variables explored within this theme include repetition (Agante and Pascoal, 2019) or the effects of impulsivity and its influence on susceptibility to the food advertised (Folkvord et al., 2014). Within this theme, we identified

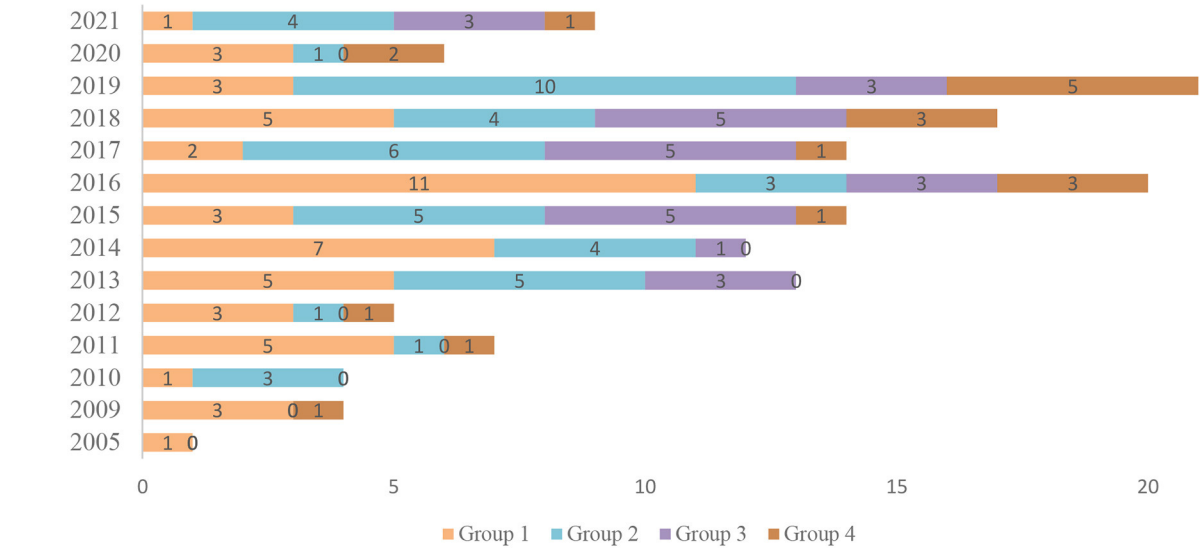

FIGURE 3
Studies on advergames throughout the years grouped per theme.

two sub-themes: (1) the study of the effects of the promotion of food products associated with childhood obesity; and (2) the study of children's capabilities to identify persuasive strategies within advergames promoting food products with associated health risks.

In concrete terms, we found a particular academic interest in exploring the effects of the use of advergames for the promotion of food products associated with childhood obesity ($n = 15$) (e.g., Weatherspoon et al., 2013; Folkvord et al., 2014; Bragg et al., 2018). For instance, the study by Paek and colleagues (2014) found that most of the food products that were promoted by brands through advergames were classified as unhealthy, and only half of the advergames analyzed by the authors had information about a healthy lifestyle.

Within this theme, there is also a representative number of articles ($n = 19$) discussing the necessity of better understanding the capacity of children to identify the persuasive strategies used within advergames to propose avenues to further regulate this practice (e.g., Folkvord et al., 2017). In concrete terms, eight of these articles refer to the need to foster "advertising literacy" in relation to advergames. In this respect, the results of the study conducted by Thomson (2011) suggest that, given the limited capabilities of children to recognize the persuasive purpose of commercial content, some tactics used within advergames to advertise unhealthy food could be dubious from an ethical perspective, suggesting the necessity of criticizing how these commercial messages were regulated. This same reflection was followed by the authors of other studies included in this theme (e.g., Grossman, 2005; Quilliam et al., 2011; Paek et al., 2014; Staiano and Calvert, 2014), which shows there has been a common academic concern about this problem. Among this sub-theme, we found an article with the most citations among the sample (193 citations by February 2022), the article written by Mallinckrodt and Mizerski (2007), which analyzes the effects of advergames on children by studying their preferences when playing an advergame that advertised cereals.

From this perspective, the analysis conducted by An et al. (2014) paid special attention to advertising literacy games and how they could help children perceive advergames as advertising. The results showed that playing educational games enhanced their advertising literacy and improved their critical attitudes toward persuasive content. In the same vein, the analysis by An and Kang (2013) delved into the way advergames on websites explicitly present information about the commercial intent. After studying 164 websites, the study found that 82 of them contained a total of 542 advergames targeting children. Only 20% of the websites, however, provided an explanation about the commercial purpose of the game (An and Kang, 2013).

Quantitative analysis ($n = 33$) was the most common methodological approach within this theme (e.g., Evans et al., 2013; Cicchirillo and Mabry, 2016; Esmaeilpour et al., 2018; Putnam et al., 2018; Cho and Riddle, 2021). In concrete terms, the most recurring research method is between-subject experimental studies ($n = 15$). For example, one of the experiments focused on the repetition effects of exposing children to unhealthy products through advergames (Agante and Pascoal, 2019). Another example was the study focused on the comparison of the effects of advergames and TV ads on children and how persuasion knowledge was identified by the player (Panic et al., 2013). The results of our study therefore coincide with the findings by Jami Pour and colleagues (2020), who found that most of the research published used a quantitative approach, while qualitative methods were barely used. These findings concurred with the characteristics of this cluster, which represents the majority of data units analyzed with quantitative results.

The second most recurring article format was theoretical analysis ($n = 9$) (e.g., Grossman, 2005; Thomson, 2011; Bragg et al., 2018). An example of this is the study by Staiano and Calvert (2012), who examined the problematic experiences of children in the digital world and the necessity of educating this specific target group on the persuasive character of these games, usually related to food with poor nutritional content (Staiano and Calvert, 2012, p. 71).

This theme deals with the effect of advergames on children, as they are often criticized for advocating poor health choices or discussing the ethical dimension of tricking children into making purchases. With a clear product focus and lack of attention to an active consumer, these studies mirror the marketing 1.0 trend, echoed further through the predominance of quantitative methods. It is worth noting that this theme maintains a critical perspective on the effects of advergames, whereas the marketing paradigm has largely shifted to value-driven approaches in the context of Marketing 1.0. The critical assessment of the efficacy of advergames on children seems to be a prevalent topic in the discourse.

4.2. Effects on purchase intention

The second category comprises studies that report on the effectiveness of advergames on purchase intentions ($n = 47$). In concrete terms, the purpose of the studies within this theme was to identify how specific variables could have an effect on brand recall ($n = 22$) and attitudes toward the brand ($n = 19$) after playing advergames.

Specific elements of the game, such as brand placement ($n = 11$), characteristics of game characters ($n = 4$), and interactivity with the brand ($n = 2$), were studied as variables in the experiments analyzed. To illustrate this, the experiment by Vashisht and Pillai (2016) examined how the specifications of the game (such as speed) and the congruence between the brand and the game identities had an impact on purchase intention. The main findings showed that slow-paced advergames with prominent brand placement had more effects on purchase intention. Another example is the study conducted by Sreejesh and Anusree (2017), which focused on how anthropomorphism and interaction interfered with the gamer's cognition demand to influence brand attention, brand recall, and brand recognition. The results showed that a high cognition demand was related to higher brand attention and memory.

The study of the effects of advergames on memory and brand recall was commonly found in this theme, linked to how players experienced the brand in this entertaining context and the impact of this on purchase intention (e.g., Ortega-Ruiz and Velandia-Morales, 2011; Yeu et al., 2013). Gross (2010), for example, studied the relationships between game-product congruity and implicit and explicit memory, and how these variables influenced the effectiveness of delivering persuasive messages through these games.

Finally, another relevant aspect explored within these studies in this theme is the relationship between the interactive characteristic of advergames and its relationship with brand recall (Sreejesh et al., 2021) and purchase intention (Goh and Ping, 2014; Lee et al., 2014). The experiment conducted by Bellman and colleagues (2014), for example, paid attention to the immersive nature of advergames and how this could create effective persuasive messages. The study compared advergames to traditional messages (television commercials) and interactive commercials and focused on the effects of telepresence in the three cases. The results confirmed that telepresence increased the effectiveness of persuasive messages as measured by attitudes toward the brand (Bellman et al., 2014, p. 280).

As in theme 1, the predominant method in this case is quantitative analysis ($n = 33$), and 19 of them were experiments. However, in contrast to theme 1, the qualitative, theoretical, and literature review studies are greatly outnumbered by quantitative measures. Although theme 1 also relied on the critical interpretation of the effects of advergames, theme 2 focuses on illustrating significant persuasive effects and purchasing goals.

This theme discusses the specific characteristics of advergames as advertising format. While this perspective also follows a Marketing 1.0 focus, through quantitative findings that are product-driven, a dawning Marketing 2.0 trend can also be identified that focuses more on ensuring consumer retention and instilling purchasing intention. Concretely, the games were analyzed in isolation, with a focus solely on the format itself, regardless of other communicative strategies of the brand. Although other advertising forms were also analyzed in specific cases, it was with the purpose of comparing their effectiveness in terms of brand recall or purchase intention. However, consumer necessities are not commonly present in these studies.

By following the marketing 2.0 perspective, emotional and functional values are also identified when analyzing these studies. While this appears to address a consumer, the focus on consumer necessities is mostly oriented to a product-centered and purchase perspective because some aspects, such as brand familiarity, are analyzed with the purpose of influencing choices after placing a brand element in a playful, entertaining context.

4.3. Effects on brand narratives

The third theme included studies that explore the effects of advergames as a tool that expands the brand narrative and creates a consistent message that is communicated throughout other formats. This theme comprises 28 studies in total, which is a number significantly smaller than the ones of the two previous themes, although this could be justified by the historical evolution of the marketing paradigm.

In concrete terms, these studies explore how the game and the context in which it is played have an impact on the brand narrative that is used in the marketing strategies of the brand beyond the advergame itself. Advergames are therefore studied as part of a broader integrated marketing communication strategy (Terlutter and Capella, 2013; Vashisht et al., 2019). Furthermore, aspects such as the cultural context in which they are used as a communication channel are taken into consideration when exploring their effects (Hernandez and Minor, 2015). For example, Gurney and Payne (2016) studied how the narrative of the

Adult Swim audiovisual products expanded their values through a specific type of advergames that the authors called "paracasual" advergames. In their study, the authors explore how parody is created within the advergame and used to create content that is later used outside of the game as part of an integrated marketing communication campaign.

The studies analyzed within this theme explore the effects and characteristics of advergames, taking into consideration the context in which these games are played as well as their players, such as prior experiences with the brand, actions from the player with friends, or links to other communicative actions performed by the brand (i.e., Hernandez and Minor, 2015; del Moral Pérez et al., 2016; Gurney and Payne, 2016; de la Hera, 2019; Vashisht et al., 2019; Martín Ramallal and Micaletto Belda, 2021).

In addition, it is pertinent to note the presence of studies that explore advergames that promote products other than food and beverages. As we mentioned in the first two themes identified, most of the articles scrutinized in this review were regarding food products ($n = 35$). The diversity of studies present within this theme shows an evolution toward a broader approach to the academic study of advergames. An example of this is the study conducted by Renard and Darpy (2017), who explored the virality and word-of-mouth aspects of advergames promoting holiday apartments.

In another study, de la Hera (2019) analyzed a game designed for a car company. This analysis dived into the persuasive dimensions used by the brand in the game and examined the role and use of the game in the brand's borader marketing campaign. The game was analyzed as a strategic part of a broader integrated marketing communication campaign, serving as a tool to build the brand narrative for the campaign.

Finally, two studies in this group analyzed specific advergames designed for audiovisual products (Kinard and Hartman, 2013; Gurney and Payne, 2016). In particular, the study by Kinard and Hartman paid special attention to the way the brand is integrated into the game and how prior experiences of players with the brand influenced the effects of these games on their players. In this case, the authors focused on advergames from entertainment brands. The results showed the relevance of marketers paying attention to the knowledge and relationships that exist between the brand and audiences before playing the game. The results showed, for example, that advergames with a high level of brand placement seemed to be more successful when the brand wanted to introduce new content (i.e., new plot or character).

Although quantitative methods were still predominant within this theme ($n = 17$), we could identify a broader number of studies using qualitative methods ($n = 5$) and theoretical analysis ($n = 4$) in comparison to the previous two themes. This presents a heterogeneous compilation of studies that presented a growing trend from 2015 until 2019 and emerged again in 2021(see Figure 3).

Returning to the marketing stages, this theme represents studies that follow the marketing 2.0 trend more fully than the second cluster. In this trend, consumers are seen as wellinformed and connected to information sources. Moreover, they also produce information, and the brand image is defined by the audience. In short, consumers are located at the center of activities, and brands listen to their necessities by creating valuable content. Although the consumer takes a more central position, the focus is still on supplying and creating a consumer need or purchase intention. This implies complexity in their campaigns and a bigger analysis of what they say and how consumers receive and react to those messages to ensure the creation of empathy and trust for the brand.

4.4. Effects on brand loyalty

Finally, the fourth theme identified in this analysis consists of studies that explore the long-term effects of advergames on brand loyalty ($n = 19$). Although this theme has some relations with the third one, in this case the documents gathered focused on the emotions and experiences related to the brand and the game rather than analyzing the external elements or context of the subject of analysis to understand the game as an element in a marketing campaign.

We identified two sub-themes within this theme: studies that explore the relationship between advergames and brand engagement ($n = 7$) and studies that explore the relationship between advergames and social interactions ($n = 10$). For instance, the study by Wanick et al. (2018) explored how cultural characteristics from two different countries (Brazil and the UK) had an impact on how familiarity and experience with the brand could affect engagement with the brand to promote a long-term relationship between consumers and brands. Another example is the study conducted by Bossetta (2019), who examined Political Campaigning Games as a contemporary digital campaign tool for elections. The author analyzed these games in a systematic way to study the content of these games and how context is necessary to create engagement with the brand and ideas.

Within this theme, some studies also paid attention to ethical aspects related to the use of advergames linked to social purposes to foster brand loyalty. For example, Neri (2019) addressed the ethical considerations of advergames and how they can be understood from a "strictly commercial point of view" (p. 121) and also be used to communicate the social values of the brand. Here, the author highlighted the importance of finding balance between the advertising objectives and the generation of a relationship of trust. Neri identified the possibility of promoting values that have a social impact owing to the possibility of interaction and the creation of spaces where audiences can discuss them. In the same vein, the reflections from Sung and Lee (2020) focused on the analysis of advergames with purposes beyond sales. In their study, they analyzed prosocial advergames and the impact of these narratives on brand loyalty. The experiment showed that the players who experienced a prosocial narrative responded more favorably not only toward the game but also toward the brand that was related to it. This positive result was also supported by Coombs and Holladay (2015). In this case, the authors focused on the use of an advergame to host a social cause related to fight hunger and how these games can communicate Corporate Social Responsibility actions and their link to social media.

This theme encompasses studies with diverse purposes. In terms of the research methods employed, the studies comprising this theme were almost equally divided among quantitative ($n =$

8), qualitative ($n = 6$), and theoretical analysis approaches ($n = 5$). Although this theme, compared to the former ones, is not widely mentioned in the literature, the use of this theme has been growing since 2016 and is included in different studies that represent the current marketing paradigm, focused on human and environmental necessities and the brand's responsibilities.

The studies that include this theme are a good reflection of the evolution of the marketing paradigm during the marketing 3.0 phase, where the consumer is identified as a human with values and necessities that companies can fulfill. A functional but also emotional value is present, as is the link to the audience through an appeal to values. Experiences, emotions, and interaction are values that are commonly identified in this theme, where persuasive purposes are achieved by understanding the consumer's needs with a goal to instill identification with what the brand stands for, more so than purchase intention.

5. Discussion

This study presented the results of a systematic literature review of 122 academic publications on the topic of advergames to answer how branded games have been studied from 2005 to 2021 and what main topics were found and discussed in academia. From this review, several gaps in the studies of advergames could be identified, which will be discussed below as suggestions for future research. The review showed that the academic study of advergames has been mostly focused on exploring the effects of advergames on vulnerable audiences and how these games could be designed as a persuasive product that is studied in isolation to test specific variables that could improve purchase intention or brand recall among audiences. Studies focused on the analysis of advergames as a communicative tool and their effects related to the integrated communication strategies of the brand, their effects on the context in which the game is played, and the incorporation of messages related to social values in advergames, although less prevalent in the sample, were identified as a growing trend in the literature.

Through a review of the 122 studies on advergames, we identified four main themes that were labeled as follows: effects of advergames on children's health, effects of advergames on purchase intention, effects of advergames on brand narrative, and effects of advergames on brand loyalty. The first theme includes studies on the use of advergames for the promotion of food products and their impact on children. The analysis showed that these studies take a protective perspective, focusing on criticisms of the efficacy of the advergames or scrutinizing attention to the product or the ethicality of the advergame as a possible successful marketing communication tool. Specifically, the capability of players to identify the persuasive purposes of the advergames and their effects on health (obesity) were recurring topics. Furthermore, the predominance of quantitative studies in this theme follows the marketing 1.0 approach, which neglects the agency of the customer. Despite the evolution of marketing from 1.0 to 3.0 and its associated shift from product-centered attention to value-driven approaches in recent years, the first theme comprised of studies on the effects of advergames on children's health has remained represented throughout the studied period. While updated with theoretical reflections (e.g., Bragg et al., 2018), this continued critical perspective highlights an ongoing concern regarding advergames. This echoes the incremental evolution of the marketing paradigm, never completely eclipsing earlier versions but always expanding the narrative.

The second theme is represented by studies that are focused on exploring the effects of advergames on purchase intentions. These texts analyzed under this theme are particularly focused on exploring traditional marketing purposes such as brand recall and product placement. Lacking the critical note from the first theme, these publications often focused on student population experiments. Interestingly enough, this particular target group is approached as a much more promising market segment in which the efficacy of the marketing, albeit through traditional strategies, is of greater importance than ethical considerations and persuasion knowledge. One particularly relevant gap in this theme is, however, the lack of consideration of the specific characteristics of digital games as a communication channel as a variable to take into consideration when assessing the effects of these games. Solely approaching advergames as a mere interactive communication channel for the brand disregards the persuasive potential of digital games and, consequently, the relevance of specific variables that should be taken into consideration when exploring the effects of these games.

The third theme is composed of papers that study the incorporation of brand narratives in advergames as part of broader marketing campaigns in which the same brand narratives are used and conveyed. In contrast to the studies that belong to the previous theme, studies within this theme pay attention to how specific characteristics of advergames and the context in which they are played, as well as the broader marketing campaign in which they are framed, should be taken into consideration when studying their effects. From a marketing perspective, advergames are considered within these studies as another communicative tool that is included in an integrated marketing communication campaign. With an increased consideration of digital games as a communication channel and the consideration of the role of an active audience, the studies in this theme seem to be the natural response to the changes in the marketing paradigm, from marketing 1.0 to marketing 2.0, in which a consumer-centric approach is taken. This shift in perspective is accompanied by a growing interest in connecting the studies of advergames with theories and frameworks from the field of game studies, opening avenues for further elaboration of the design specificities of advergames.

The studies that comprise the fourth theme are representative of the changes that marketing 3.0 brought to the marketing paradigm. Following the reflections from Neri (2019), the key to what advergames can or cannot do is related to ethics: the reflection on how to create "humanist advertisements," but also how brands could promote "responsible consumption or strengthen networks of values, both economic and social, in the context of a more participatory society" (Neri, 2019, p. 122). This also links to the concept of "goodvertising" (Minár, 2016), where brands take a step further and decide to be relevant to society as a result of the evolution of the necessities of the audience. This fourth theme encompasses studies that examine the values and benefits of creating a sense of belonging (Scandroglio et al., 2008), which

reinforces the relationship between the brand and the consumer (Solana, 2010, p. 51).

The results of this study allow us to claim that, although the study of advergame has evolved into a more diverse and interdisciplinary perspective since its inception in 2005, this study reveals that the study of the use of digital games in marketing is usually conducted by studying advergames without paying attention to the context in which they are played. As the authors Van Berlo et al. discussed in their systematic study of gamified advertising (van Berlo et al., 2023, p. 7), further research on the context of gaming needs to be addressed. Concretely, the social context is an area that could be interesting to analyze in depth due to the positive effects that word of mouth has in advergames (Roettl et al., 2016; Renard and Darpy, 2017; Zhao and Renard, 2018).

5.1. Gaps in the literature and suggestions for future research

This reflection leads us to pinpoint specific gaps in the literature that could be translated into future research opportunities and possible paths to explore advegames. First of all, theme 1 was heavily focused on specific sectors, in particular the food industry, and concrete approaches such as the impact of games on children's health. The overall predominance of attention given to this approach disregards the study of other relevant applications of advergames and limits the representativeness of the study of the effectiveness of this practice. A clear gap in the literature is therefore due to the exploration of the effects of advergames on other aspects that go beyond their impact on children's health or on customers' purchase intentions. For instance, it would be relevant to study the relevance of advergames to promote other audiovisual content, such as TV series. Gurney and Payne (2016, p. 178), who studied advergames to promote television programming blocks, helped to create content and redefine existing definitions and understandings of advergames until that moment.

Second, from our results, we can identify a lack of analysis regarding advergames from an integrated marketing communication perspective. This marketing approach has been useful in managing and coordinating various communicative efforts across multiple communication channels (Madhavaram et al., 2005). Furthermore, the analysis of the contextural effects of advergames on players represent another gap in the research. While there are some recent exploratory articles exploring this topic, further detailed should is needed to fully understand the potential impact of branded games on brands and how their connection to other communication formats could be beneficial for the effectiveness of advergames. Building on these last reflections, the use of advergames in transmedial campaigns is an approach that, although mentioned in some of the studies analyzed (i.e., Martín Ramallal and Micaletto Belda, 2021), deserves broader academic attention to understand its marketing potential. This gap highlights the continued study of advergames as isolated marketing strategies. We claim, therefore, that future studies should pay more attention.

Finally, although some studies are focused on advergames on specific devices, such as mobile advergames (i.e., Okazaki and Yagüe, 2012; Catalán et al., 2019), the evolution of new technologies presents a necessity to explore from an academic perspective how advergames are exploiting the potential of new platforms and technologies such as virtual reality or augmented reality. This evolution of advergames and technologies also asks for a revised typology and nomenclature of branded games to create a comprehensive and updated vision of the object of analysis.

To conclude, we identified some articles in which the study of advergames was conducted from a human-centered perspective (i.e., Sung and Lee, 2020). This is a significant evolution of the study of advergames that represents an adaptation of advergames and their study to the Marketing 3.0 perspective (Kotler et al., 2010). This perspective implies a strong contrast from the dominant theme presented in this review, and it could open new avenues to explore the effects of linking branded content to social issues through interactive content. These studies dive into the use of advergames as a tool to engage the audience and create immersive experiences that end up creating a long-term relationship.

The concept of corporate social responsibility is evident in these studies. From this perspective, advergames are considered a communicative tool that can communicate valuable messages, aiming to reestablish a sense of care and protection for the audience from an ethical standpoint. This inclusive perspective on advergames highlights their potential to be utilized in non-profit campaigns, expanding their role beyond purely promotional purposes.

Consequently, we believe that these gaps in the literature should be addressed in future research to create a proper understanding of advergames for academics and professionals in the game and marketing sectors. Concretely, game designers and advergame experts could take advantage of the specification of typologies and possibilities of games in the marketing ecosystem if the effectiveness of advergames is scrutinized from an interdisciplinary perspective, where game design plays an important role in communicating brand necessities. This exploration needs to be conducted using quantitative and qualitative methods to present a rich overview of the possibilities of branded games in the current marketing ecosystem by focusing on consumer requirements.

Based on this development, we expect a closer interaction between studies of advergames and game studies. The exploration of the design of the medium or further persuasive analyses in different, less apparent advertising contexts, such as those in branded content (e.g., Martens et al., 2022), offers new avenues for the academic study of advergames.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the authors.

Author contributions

LC performed the initial analysis of games and contributed with first version of the manuscript which was further edited by TD. All authors contributed to the conception and design of the study, submitted and revised manuscript, read, and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Comparing shades of darkness: trolling victims' experiences on social media vs. online gaming

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Although there is ample literature available on toxicity in games, as there is regarding trolling on social media, there are few to no cross-platform studies on toxicity and trolling. In other words, the extant literature focuses on one platform at a time instead of comparing and contrasting them. The present work aims to rectify this gap by analyzing interviews from a larger study of 22 self-proclaimed victims of in-game trolling to not only determine whether social media or gaming communities are considered more toxic but also to explore how definitions of the word 'trolling' change depending on the platform in question. We found that while definitions of in-game trolling behavior focused on behavioral styles of trolling (e.g., throwing one's avatar into enemy fire to disadvantage one's team, and blocking other players' avatars' movement), social media trolling is defined by more sinister actions such as misinformation spreading and 'canceling' other users. We also found that gaming is perceived as generally more toxic than social media, often due to company policies or lack thereof. Practical and theoretical implications for the study of toxicity in all online communities – gaming or social-media based – are discussed.

KEYWORDS

trolling, toxicity, online gaming, social media, victimization

Introduction

Since its inception, the internet has been used for social interactions both benign and malicious (e.g., Herring et al., 2002; Graham, 2019). At the outset, this took a largely textual form, with the earliest 'hate raids' – where users from one community invade another community's space to annoy or attack said community – taking place on Usenet (Graham, 2019) and later on modern internet fora (Herring et al., 2002), and with the first cases of trolling happening in text-based virtual worlds called multi-user dungeons or 'MUDs' (Dibbell, 1993). Back then, games and social media were not so different; these all consisted of people communicating with one another through text shared via cyberspace. Over time, however, social media and gaming began to differentiate themselves from one another and develop their own unique subcultures as they developed new affordances and mechanics (e.g., Baird, 2022; Mitchell-Church and Thambusamy, 2022). Today, few people would confuse Fortnite and Facebook, for instance, but both share the good and bad communication that their Usenet and AOL forebears once did (e.g., Hannan, 2018; Hilvert-Bruce and Neill, 2020). However, there are few studies that directly compare and contrast the kinds of communication that happen on these platforms.

Trolling – a form of negatively perceived communication that exploits fellow netizens using website, game, or chat mechanics online (Cook et al., 2021) – can take many forms: verbal,

non-verbal (often called behavioral in extant literature; see Cook et al., 2018), platform-specific, or more general. For example, while flaming (extensive use of profanity and/or personal insults) and spamming (repeatedly sending the same message non-stop) can occur on both social media platforms and in games using chat functionalities, stealing someone's kill bonus or blocking the movement of another person's avatar is only possible in certain types of games (see Kowert and Cook, 2022 for a more complete list of trolling behaviors in games). Trolling behavior has been found across most major platforms, including Twitter, Facebook, and YouTube (McCosker, 2014; Craker and March, 2016; Synnott et al., 2017), and nearly all forms of multiplayer gaming have some kind of trolling within them, though team-based multiplayer games such as League of Legends are notable for their extensive research on the topic (Coyne et al., 2009; de Seta, 2013; Blackburn and Kwak, 2014; Arjoranta and Siitonen, 2018; Kou, 2020). Research has also shown that the more severe forms of trolling – including but not limited to repeated harassment and identity-based insults – can lead to consequences comparable to those of cyberbullying, including heightened anxiety, depression, and withdrawal (Gray et al., 2016; Campbell, 2017; Fox and Tang, 2017). Essentially, we know that independent of one another, trolling occurs on both social media and gaming platforms. What we do not know is which is perceived as being more dangerous and/or toxic to its users.

The present study's aim is, therefore, to look at trolling on both gaming and social media platforms. More specifically, we spoke to people who have self-identified as victims of trolling in games and asked them (1) how their understanding of trolling differs between gaming and social media, (2) which behaviors constitute trolling on which platforms, and (3) how the perceived prevalence of trolling differs between social media and gaming platforms. From a theoretical point of view, this will add nuance to our understanding of what trolling is and how the platform shapes our understanding of the phenomenon. Practically, it will also enlighten policy-makers and platform owners and developers as to which kinds of behaviors they need to target and where best to protect their users.

Theoretical background

A recurring theme in trolling literature is the struggle to establish a single definition of trolling itself (Hardaker, 2010; Cook et al., 2021). While one definition might emphasize deviance (e.g., Fichman and Sanfilippo, 2014), another will focus on the idea of destruction or discord (e.g., Buckels et al., 2014). One idea that has been posited as an explanation for these different emphases is that these articles are all coming from different disciplines and different populations (Cook, 2021). This could explain, for instance, why Thacker and Griffiths (2012) – social psychologists working in a gaming psychology space – emphasized instrumentality in their definition as game players are often literally using game mechanics to achieve their trolling aims. Synnott et al. (2017), by contrast, emphasize the offensiveness of trolling as they focus on the targeted social media trolling of a single family and the criminality of this trolling and harassment. By looking at different people in different spaces, it seems natural that certain elements of trolling would become more or less prominent depending on the researcher's perspective.

It is important here to note that, within the realm of games research specifically, there is also considerable discussion about the overlap of the term "trolling" with other similar terms, such as grief play and toxicity. Each of these terms comes with its own distinct literature, and so, before we move on to trolling on social media, we will briefly cover each of these terms and how they relate to one another. Toxicity is specifically the behaviors that are intentionally malicious and hurt other players (e.g., Boudreau, 2019; Kordyaka et al., 2020; Beres et al., 2021). This is often the kind of trolling discussed in media covering trolling and is akin to harassment, abusive communication, and flaming (Beres et al., 2021). It is also important to note that marginalized game players are more often than not the targets of toxicity (Boudreau, 2022). All of these abusive behaviors have, at one time or another, also been listed as forms of trolling (see Herring et al., 2002; Kowert and Cook, 2022). In the present article, we therefore consider toxicity to be a subset of trolling more broadly: a kind of trolling that has caused harm (since we are talking to victims instead of trolls, we cannot confirm whether or not this harm was intentional). It should be noted that some of the behaviors that previous works have grouped into trolling are not universally agreed upon to constitute trolling (sexism, racism, and transphobia, etc.), and these often have their own rich literature. However, in the interest of avoiding the invalidation of targets' experiences of what they have determined to be trolling, we have included these as a part of our broader conceptualization of what trolling is in the present work.

Grief play is extremely similar to trolling, with Stenros (2015) describing it as "a collection of disruptive activities that are usually discussed as problematic, or something to be eliminated" (p. 176) and later as "an undesirable side effect of multiplayer games" (p. 177). These definitions also neatly correspond to existing definitions of trolling coming out of gaming spaces (see Thacker and Griffiths, 2012; Cook et al., 2021). Like the existing work on trolling (e.g., Cook et al., 2018), work on grief play is careful to emphasize that there is an element of playfulness, even if it is at the expense of others (Paul et al., 2015; Stenros, 2015). Grief play (also called "griefing") is also not limited to a specific set of "griefers" but is rather a type of play that many game players engage in from time to time (Stenros, 2015). Much of what is described as grief play has also been called either toxicity (see Beres et al., 2021) or trolling (see Thacker and Griffiths, 2012; Kowert and Cook, 2022) at some point, including scamming and ninja looting, which is the act of stealing in-game items from a defeated enemy that were not designated as belonging to the stealer in a group setting (Foo and Koivisto, 2004). Unlike toxicity, however, there is no specific implication that griefing is intentionally malicious; it is transgressive (Boudreau, 2022), but it may not necessitate the explicit intention to cause harm to others (Foo and Koivisto, 2004; Stenros, 2015). Therefore, when, in the present article, we examine "trolling" and "trolling victims," we are conceptualizing this as the kind of toxic trolling or grief play that causes harm to another gamer, be that harm minimal or more extreme.

However, just as Thacker and Griffiths (2012) do not provide the only gaming-based definition of trolling (e.g., Wright, 2019; Kowert, 2020), neither are Synnott et al. (2017) the only researchers to try and define the phenomenon in some way via social media (e.g., McCosker, 2014; March et al., 2017). Even within a single platform or context, trolling definitions vary considerably. For instance, while Thacker and Griffiths (2012) define trolling as "an act of intentionally provoking and/or antagonizing users in an online environment that creates an often desirable, sometimes predictable, outcome for the troll" (p. 18),

Wright (2019) defines it as "creating arguments by upsetting people either through talking about or posting provocative or off-topic messages in online communities" (p. 605). Both of these research groups studied games and game players and covered a variety of games, although Wright (2019) had a notable focus on console gaming that was not present in Thacker and Griffiths' (2012) work. Altogether, this would suggest that platform – even within the same category of users – plays a role in how we understand trolling and toxicity. In the interest of further narrowing down the definition debate, the present work will take a single population – thereby removing the inherent individual differences present when comparing studies using both different platforms and different samples per platform – and ask them about trolling on multiple platforms to see how, if at all, their understanding of trolling differs according to platform. More specifically, we aim to address the following research question:

> RQ1: How, if at all, does game players' understanding of trolling differ depending on the platform on which the trolling behavior occurs?

Trolling behaviors and prevalence

Another potential difference between trolling on gaming and social media platforms could be the trolls' chosen methodology. In games, research has shown that although trolls will engage in their fair share of verbal trolling (see Thacker and Griffiths, 2012; Wright, 2019), another major component is what the literature calls behavioral trolling (see Cook et al., 2018; Kowert and Cook, 2022), in which game players exploit the mechanics of the game itself to troll their targets without using a chat function. Examples of this could be purposely throwing one's avatar into the enemy to give the enemy the benefits of a kill (often called 'feeding') or using one's avatar to block the movement of a teammate (often called 'body-blocking'). Although this kind of exploitation does occur outside of the gaming sphere – one can think of Rickrolling, in which a person is bait and switched on YouTube when they expect one type of video and is treated instead to the music video of Rick Astley's 1987 hit "Never gonna give you up" (Baudry and Monperrus, 2022) – it appears less frequently in extant literature. Instead, literature focusing on social media tends to focus on the verbal elements of trolling: misinformation and the weaponization of information (Kargar and Rauchfleisch, 2019; Kirkwood et al., 2019), nasty comments on social media posts (Lopes and Yu, 2017; Masui, 2019), or making inflammatory posts to provoke others (Navarro-Carrillo et al., 2021). In academic literature, at least, behavioral trolling seems largely relegated to gaming, while verbal trolling – which receives more attention overall – seems more evenly spread across the two platform types (see Cook, 2021). Put in other words, the current state of research would suggest that those who troll in games take advantage of more affordances when engaging in trolling behavior than those who troll using social media.

That said, this could reflect a bias in research more than an actual difference between the platforms. For instance, Paul et al. (2015) point out that, at least in gaming, there is some degree of simple playfulness in trolling, particularly in terms of behavioral trolling (called "griefing" in that article). Some of this pleasure is sadistic, as is often considered the case for trolling outside of games (Buckels et al., 2014), but not all. Cook et al. (2018) also found that gamer trolls sometimes engage in trolling behavior exclusively to form friendships or start up banter within a team setting. However, there is far less research dedicated to this more "fun" type of trolling as from a funding and societal impact perspective, it is less urgent to "solve" playful trolling than it is to deal with the more malicious forms of trolling behavior. Consequently, behavioral trolling, which often falls into this more playful category, is an even less desirable a research topic for those outside of the gaming sphere. Given the limited understanding of trolling prevalence in either space (see Kowert and Cook, 2022), and the general lack of cross-platform studies in trolling research as a whole (see Cook, 2021), it is difficult to gauge what is an artifact of our own interests as researchers and what is representative of a genuine difference in platform. The present work aims to bridge that gap by asking game players about what they consider to be trolling on both social media and gaming platforms and also by inquiring about the prevalence of trolling on social media and in gaming. We will, more precisely, address the following research questions:

> RQ2: Which behaviors constitute trolling on social media platforms and gaming platforms, respectively?

> RQ3: What is the perceived prevalence of trolling on social media and gaming platforms?

Methods

Participants

The present study was part of a larger interview project with trolling victims involving 22 participants (17 men, 3 women, and 2 non-binary) between 18 and 36 years of age ($M = 23.64$, $SD = 4.33$). All but one (who selected Google Meets) participated via Discord. Please see Table 1 for a full demographic breakdown. On average, the participants engaged in 2.73 ($SD = 1.99$) hours of daily gaming, most of which took place in multiplayer games. The most popular genre was multiplayer battle arenas (MOBAs, 17), followed by first-person shooters (FPSs, 8), then massively multiplayer online roleplaying games (MMORPGs, 6); other genres mentioned included, in order of popularity, strategy games (5), mobile games (2), and console games (1). The participants used various social media platforms from 1.5 to 12 h a day ($M = 4.55$, $SD = 3.53$). In order of popularity, these platforms were Twitter (16), Instagram (15), Facebook (14), Discord (12), Reddit (7), TikTok (4), LinkedIn (3), WhatsApp (2), Twitch.tv (2), and Snapchat (2). These game players do not represent any specific strata of society and are as diverse a convenience sample as we were able to recruit via social media advertisements in English, the language of the interviewer. It is important to note that although several cultures are represented within the sample, we are not performing a culture-by-culture analysis due to the limited size of the sample.

Procedure and materials

After receiving their institutional review board's ethical approval, the authors recruited people who (1) had been trolled at least once before in a gaming context, (2) were at least 18 years of age, and (3)

TABLE 1 Participant demographics.

	Age	Gender	Residency	Citizenship	Ethnic Minority	LGBTQ+
Participant 1	26	Man	Europe	Europe	No	No
Participant 2	21	Man	South America	South America	No	No
Participant 3	21	Man	North America	North America	No	No
Participant 4	24	Man	Europe	Europe	Yes	No
Participant 5	23	Man	Asia	Asia	Yes	No
Participant 6	18	Man	Asia	Asia	Yes	No
Participant 7	25	Man	North America	North America	No	No
Participant 8	25	Woman	South America	South America	No	No
Participant 9	21	Man	North America	South America	No	No
Participant 10	19	NB*	North America	North America	No	Yes
Participant 11	20	Man	North America	North America	No	No
Participant 12	25	Man	North America	North America	No	No
Participant 13	32	Man	Europe	Asia	Yes	No
Participant 14	18	Man	Oceania	Asia	Yes	No
Participant 15	23	Man	Asia	Asia	Yes	No
Participant 16	20	Man	North America	North America	Yes	No
Participant 17	25	Man	Europe	Europe	No	No
Participant 18	22	Man	North America	North America	Yes	No
Participant 19	25	NB*	North America	Asia	Yes	Yes
Participant 20	36	Man	North America	North America	No	No
Participant 21	28	Woman	North America	North America	Yes	No
Participant 22	23	Woman	Asia	Asia	Yes	No

*= Non-binary.

were able to both receive payment and participate in an interview online. This recruitment took place via Twitter and Facebook posts, both of which were shareable by other users. It was a convenient sample. In order to avoid biases toward specific types of trolling, no definition was given to participants at any point in the recruitment or study phases. This also avoided the difficulty of selecting only one of the multiple definitions of trolling (Hardaker, 2010). Participants signed a digital consent form and then scheduled a time slot for the interview with the first author. All but one interview was recorded with the participants' permission using the Craig bot Discord program (see https://craig.chat/home/); the one participant using Google Meets was recorded with a Google Chrome extension (see https://fireflies.ai/).

As this was part of a larger study, the complete interview protocol will not be addressed here in full (see Appendix A in Supplementary material). Questions were generated *a priori* by the authors based partially on extant work interviewing trolls (Cook et al., 2018), to allow for comparison between how trolls view trolling versus how victims do, and partially on themes that were perceived to have gaps in the existing literature when it comes to our understanding of trolling victims. The questions that concerned the present work were those pertaining to comparisons between social media trolling and online gaming-based trolling. We asked participants to compare definitions of trolling, trolling behaviors, and frequency of trolling across platforms. We also asked the participants if any platforms were doing specifically well or poorly when it came to managing trolls and trolling. However, these interviews were semi-structured, meaning the interviewer was allowed to probe further should a new topic of interest arise naturally throughout the course of the interview. Interviews lasted between 36 and 95 min ($M = 63.64$, $SD = 15.25$). After a verbal debriefing and answering any questions participants had post-interview, they were paid the local equivalent of 15 euros via PayPal (with one exception who received it in cash).

Analytical strategy

At the beginning of our analyses, all recordings had already been transcribed via Temi.com and reviewed by the second author for quality control. The first author then highlighted all instances in each interview where social media and gaming-based trolling were compared and developed a codebook using a grounded theory approach (see Strauss and Corbin, 1990), meaning all categories were first found in the data proper as opposed to being made a-.

priori. The first two authors then independently coded each interview transcript using this codebook (see Appendix B in Supplementary material for codes) to allow for a systematic comparison of social media and gaming from the participants'

perspective. After coding for each of the three research questions, the two authors met to compare codes. They also discussed any discrepancies in the coding and decided on a final code for each participant response; the completed list of final codes was used to create our results.

Results

Comparing social media and gaming trolling definitions

When coding for the definitions of trolling on social media and online games, we found six categories of definitions: (1) intentional antagonism, (2) cancelation (social media only), (3) misrepresentation (social media only), (4) breaching privacy (social media only), (5) not trying to win (gaming only), and (6) playful "messing with". These are not, however, mutually exclusive; some participants' definitions included elements of two categories, while five participants failed to define trolling in social media, considering it a game-exclusive phenomenon.

Our first observation was that participants had a much firmer, more coherent understanding of trolling in the gaming context; there was a lot more variety in terms of understandings of what it meant to troll on social media or if it was even possible (see above). In the gaming context, only three of the six possibilities emerged: intentional antagonism, not trying to win, and playful 'messing with'. Of these, intentional antagonism was the most popular, with 17 of the 22 participants defining in-game trolling in this way for games and 11 defining social media trolling in this way. P6 defined trolling as follows: "I will classify trolling as annoying people … and harming other people … harming their experience … either verbally or using mechanics in the game to annoy other people for fun." This summarizes the category well; trolling, to these people, is the act of ruining someone's experience of a game or platform. This was the third most popular definitional category for social media as well. For gaming, however, the next most popular definitional category was "not trying to win the game" (12 out of 22 participants). In this category, the participants stressed actions such as "feeding" the other team by intentionally getting one's character killed (P14; P15), thereby assisting the other team to the detriment of one's own team. Finally, three participants (P19; P20; P21) included elements of playfulness in their trolling definitions for both games and social media. For them, trolling is not purely evil as those in the intentional antagonist camp seem to believe but rather "playful, like joking, like messing with others in game" (P19). P20 describes trolling as:

> behavior that kind of edges, the cusp of being downright toxic, uh, but is not necessarily toxic per se. It's, it's, it's that gray area that I would liken unto the kid in junior high that kind of wants to be your friend but doesn't want to be uncool. So, they pretend to be your friend and then laugh at you for thinking that you were friends with them.

In short, game players seem to believe that trolling in games is heavily tied to intentionality; whether that intention is malicious or playful, trolling is an action with a specific goal in mind, usually to capture a reaction from the target.

On social media, things are far murkier. In addition to the 11 participants who said that trolling was intentional antagonism, irrespective of platform, there were also some participants (P2; P12) for whom trolling is synonymous with cancel culture, which is the public removal of support from a person, usually due to an apparent moral failing (see Ng, 2020; Cook et al., 2021). It should be noted that cancel culture has its own literature and is not always grouped under the label of trolling. In the case of our participants who mentioned it, the key point that made it trolling for them was the intention to ruin someone's reputation *in the case where the person was not perceived as deserving of such a punishment.* This changed it from the canceling of a public figure to character assassination via online insults: an aggressive form of trolling. For instance, P2 describes social media trolling as "accusing people of stuff and maybe calling people for their preferences for no reason. Like, if I have an opinion, then you go out and say, ah, your opinion is bad." However, for others, trolling on social media is more about misrepresentation (5 out of 22 participants), either by spreading misinformation (e.g., P4) or by pretending to support a controversial cause in order to get a rise out of their target (e.g., P11). P17 describes this as "saying one thing and doing the other," a sort of bait-and-switch technique similar to Rickrolling in the early days of YouTube (see Cook et al., 2018). Finally, P5 equated social media trolling to doxing (i.e., revealing someone else's personal, private information online without their permission), saying that trolling on social media is "[breaching] someone's privacy, like they stalk your account and then like [post] your photo."

However, what is perhaps the most interesting aspect is that our participants seemed to find trolling on social media to be more playful than in gaming, with 9 of our 22 participants including an element of playfulness in their definition and 4 of those (P4, P6, P8, and P20) defining social media trolling as a purely playful behavior. P8 describes it as "making bad jokes," while P20 explains that on social media, "it's a bit more nuanced … because the rules of society are much more intricate and complicated than, than the rules of a video game," but concludes that trolling is "infuriating … [but] it [is] hilarious to the troll … and it [is] moderately amusing to some of us that [witness] it unfold." Essentially, it would appear that social media trolling is more varied in its intent than in-game trolling, or at the very least, this is how victims seem to perceive it.

Comparing social media and online game trolling behaviors

The summary of our results is presented in Table 2. We can see that what most users consider to be trolling differs significantly between social media and online games. On social media, trolling seems to take an especially personal and verbal dimension, with misinformation, teasing, and personal insults being the top three most common ways people seem to troll. In games, however, the dominant view is that trolling is something behavioral; common types of behavioral trolling mentioned include "inting" or "running it down", which refer to getting one's own character killed on purpose in order to disadvantage one's team and help the enemy team in games, and also selecting off-meta picks, which is when users decide to choose a character that is ill fitted to their role in team games, thereby disadvantaging their team. This is consistent with the extant literature

TABLE 2 Number of times each type of trolling behavior was mentioned per platform.

Trolling behavior	Explanation	Social media	Online games
Profanity/Flaming	Use of foul language or typing in all caps to simulate yelling.	7	6
Doxing	Stealing and spreading personal information from another user.	3	1
Verbal Harassment	Repeatedly attacking a person verbally.	5	2
Misinformation	Willfully spreading information the person knows to be false.	13	4
Provocation	Speaking with the sole goal of eliciting an overreaction from the target.	4	3
Behavioral Trolling	Inhibiting others' goal acquisition through using platform affordances.	0	20
Making fun of or Teasing	Playfully insulting or "messing with" others.	10	2
Spamming	Repeatedly typing the same thing into a chat box or saying the same thing verbally over voice chat.	3	1
Personal Insults	Attacking someone verbally based on an identity marker (LGBTQ status, religious affiliation, etc.).	9	9
Hacking	Using cheats or otherwise exploiting the programming of a platform in an illegal way.	1	4
Memes	Spreading gifs or images as a way to annoy or make others laugh.	2	1

Originally, misinformation and lying were separate categories, but they were merged at the final coding.

(e.g., Synnott et al., 2017; Kowert and Cook, 2022). That said, profanity/flaming and personal insults were also found to be popular in gaming.

What seems to separate social media trolling from gaming trolling, at least according to trolling victims, is its core motivation. If we look at the most popular types of in-game trolling, they are things that previous literature has rooted in frustration (e.g., Cook et al., 2018; Cook, 2019; Kowert and Cook, 2022). We can see the same thoughts expressed by P3, who describes trolling in League of Legends as follows:

> Well, I mean, there's a lot of times where trolling is just about, you know, someone, like, slightly annoyed you while you were playing a game, um, they took your kill or something like that. These used to be super common, um, like a few years back, especially in, in, uh, maybe lower levels of play and league. But, like, for example, if, uh, your support takes a kill, then you just start trolling, um, just out spite really. There's no, like, rhyme or reason to it.

Essentially, when things stop going one's way – when one's goals are frustrated by another player – this catalyzes a trolling response in games. Social media trolling, by contrast, does not seem to be borne primarily of frustration but rather out of boredom. P4, for instance, gives the example of "[joining] a flat Earth society as a joke and then [perpetuating] that idea ironically … that would be a troll." When considering personal insults, however, these motivations seem to overlap, with many participants mentioning racism and sexism in particular being prevalent on both gaming and social media platforms (e.g., P8-10) and participants from some regions stressing religious targeting (P5). We therefore have to be careful not to keep these two motivations as mutually exclusive and unique to each platform while recognizing that one motivation would seem to predominate over the other depending on the environment.

Comparing toxicity levels across games and social media platforms

To answer our final research question, we wanted to compare social media platforms and games to see which was perceived as more filled with trolls. Since so few of our participants defined trolling in a playful way (P19, P20, and P21 in games only), it would seem as though trolling is still largely seen as a toxic behavior to some degree, irrespective of platform (see Kowert and Cook, 2022, for a discussion of toxicity vs. trolling). It should be noted that eight of our participants did not specify that either social media as a whole or gaming as a whole was more toxic, though they did talk about reasons why individual platforms were more or less toxic. That said, of those who did specify one or the other as being the most toxic, ten (P2; P9; P11-12; P15-17; P19-20; P22) thought games were more toxic, and four (P1; P13; P18; P21) thought social media was more toxic. In terms of individual platforms, the game that was most frequently mentioned as having a toxic community was League of Legends, while the social media platform that was most frequently mentioned as being toxic was Twitter. Genshin Impact and Reddit, by contrast, were known for their friendliness and lack of trolls.

When probed further, the participants gave a variety of reasons for their choices. These reasons fell into three broad categories: features of the company (Company policies: 11, Content moderation style: 10, Moderation tools available: 13), features of the platform (Community norms: 10, Competition or lack thereof: 6, Anonymity: 8, Affordances: 9), and features of society (Racism/Sexism: 3). One participant was unable to give any reasons for their opinion regarding the toxicity of social media and gaming platforms (P9). Many participants brought up the company policies regarding punishment of trolls as a major source of grief; P18 had this to say about how companies deal with trolling in games:

> A lot of the times it's 1% of the people who contribute 50% of the trolling or whatever. I don't think that there is, like, it is to the point where if you were to remove all the trolls from the game or anyone who, who has trolled more than once you'd have no players. I think it's more so take these instances where it is blatantly obvious, where it's actively ruining more than just one game's worth of pain. And, like, you can sort of sniff out the, the real culprits of everything and maybe actually taking, making disciplinary action on them is something that can be take, taken into account.

Still, others focused on content moderation styles of certain platforms, with P20 praising Reddit's moderators for "[taking] care of [trolls] when they are too prevalent" and P12 asking that Riot Games "bring back a form of the tribunal," which was a player-based moderation system that existed in the past in League of Legends but has since been largely replaced with automatic tools such as chat filters. In essence, people often blame the companies that run the platforms and their poor decision-making when it comes to policies to punish trolls for toxicity levels today.

However, almost equally important were features of the platforms themselves and, especially, the community norms that develop on these platforms, particularly in light of anonymity. P1 explains that "a lack of physical presence … means that people disconnect the human being they are talking to from the interaction, which makes things very comfortable and … normalizes behavior that would not necessarily be normalized in a real-world setting." This is almost an exact definition of moral disengagement in the style of Bandura et al. (1996); the anonymity of the platform allows game players to 'other' other players and shut off their moral compass, so to speak. P10, by contrast, emphasizes how a good reporting system can neutralize trolling:

> Like, if somebody's been being toxic and chat, you can report them. And, usually, they will do something about, like, they actually are pretty good at doing something about it. If you report them for toxicity, uh, and, uh, stuff, kind of simple, like, if they, if they have a report system and actually look at reports, that's a good enough system for me.

In sum, platforms that are lower in anonymity, whose report functions are kept up to date and regularly addressed, and whose companies punish trolls for their actions are the platforms people want to use. Transparency here is key for both social media and gaming platforms alike. Platforms that fail to keep these things in mind not only turn away existing users but can develop a reputation that will ward off new clients.

Discussion

In the present study, our first aim was to compare how victims defined trolling on social media and how they defined it in the context of online gaming. Although there were elements that were the same across platforms, we did find differences in their understandings. The definitional categories provided for online gaming trolling – intentional antagonism, not trying to win, and playful 'messing with' – largely correspond to what has already been found in the extant literature on game-based trolling (see Cook et al., 2018), which is to be expected. However, the more varied results of trolling on social media better reflect the diversity of trolling literature as a whole. There is no one conception of trolling as malicious online behavior; rather, trolling can be as calculated as the act of 'canceling' associated with cancel culture (Ng, 2020; Cook et al., 2021) or as benign as gentle teasing of a friend. In other words, while the concept of trolling seems to be quite concrete and commonly understood within the gaming context, trolling on social media seems to be more fluid, albeit primarily verbal (spreading misinformation, flaming, etc.). Taken altogether, these results would suggest that part of the difficulty when it comes to unifying trolling research under a single definition is the issue of platform and how people understand trolling in different spaces.

Our second goal was to capture more fine-grained detail regarding which behaviors were considered to be trolling on social media and which were considered trolling in games. The complete findings are presented in Table 2; once more, though there was overlap, we did find distinguishing trolling types that were more prominent on either social media or in online games. The exploitation of programming and affordances for trolling purposes – called behavioral trolling here in accordance with the extant literature (see Cook et al., 2018) – seems to be something that people consider to be game specific, for instance, while misinformation seems to be mostly a social media problem. The latter stands in direct contrast to other trolling works that describe misinformation as one of the key ways veteran players troll newbies in games (Thacker and Griffiths, 2012; Cook et al., 2018). This could reflect several different aspects, all of which would require further research to confirm or deny.

Firstly, it could represent a shift in trolling trends. It has been several years now since Cook et al. (2018) and Thacker and Griffiths (2012) talked to gaming trolls, and it is possible that the more veteran players who employed these tactics have since 'aged out', so to speak, of trolling. Second, it could represent a shift in game players' collective understanding of trolling. Perhaps, the game players of today no longer consider the trickster archetype of the past (see Herring et al., 2002; Thacker and Griffiths, 2012) as the primary form of trolling, instead associating it with more malicious actions such as flaming and behavioral trolling, as indicated by our results. It could be an effect of the traditional media's current focus on misinformation and combatting misinformation on social media (Gross, 2023; World Health Organization, 2023). Although we did not specifically use the word misinformation in our questions (see Appendix A in Supplementary material), it is still possible that due to their following news on misinformation and disinformation, the participants automatically associate it with social media, simply not thinking of lying to a gamer about what level a monster is as a form of trolling. Finally, it could be an artifact of our limited sample. The majority of our game players are MOBA players, meaning they are making split-second decisions regularly about different plays to make as a team. This puts a lot of emphasis on game mechanics, while MMORPG players, for instance, have more time to talk to one another. Further research with a more varied sample could determine which explanation best suits the gaming population as a whole.

Finally, we wanted to see which platforms were perceived as being more toxic (i.e., included more malicious trolling) and why. On the whole, most participants found online games to be more toxic than social media, but this finding must be contextualized in terms of the

participant pool; most of our participants were relatively heavy game players, especially compared to their social media usage, so there could be an effect of time and usage creating this result in part. That said, most participants were able to give clear reasons for their opinions. A major factor in the participants' opinions regarding toxicity levels was content moderation practices. They were appreciative of automatic tools such as chat filters and automatic detection of profanity on voice chat but stressed that these are not a replacement for human content moderators. There was no clear winner in terms of whether paid or volunteer moderators were considered superior, but there was a definite cry for human moderation of some form. Gaming companies such as Riot Games and Valve were especially criticized for having too little human intervention. Social media companies were also generally perceived as being better at doling out punishments to toxic offenders, unlike most games, whose reporting functions were derided as useless by many of our participants. In other words, game players seem to have the impression that social media is a more controlled environment, while online games are more of a cyberspace Wild West.

However, our results have also highlighted the strong moral undercurrent that seems to apply to all forms of trolling. This concept of intentionality that is so critical to defining something as trolling, at least according to trolls (see Cook et al., 2018) and victims, fundamentally implies a moral choice and that trolling is a moral failing. One of our participants even explained trolling as a normalization of deviant behavior due to anonymity, essentially citing moral disengagement theory (Bandura et al., 1996) as the explanation for trolling online, irrespective of platform. Gaming research is no stranger to morality as single-player games often require players to make choices in the face of moral dilemmas (Joeckel et al., 2012). Joeckel et al. (2012), when examining this question, found that moral salience was an important factor in determining what kind of choice players would make when forced to make a choice: the more salient morality was in the environment/narrative, the less likely one was going to violate moral standards. Does the same thing happen when the moral choice is not forced but, rather, deals with real people and real interactions? On social media, when someone acts against the established social norms, people feel the need to process this negative emotion and behave accordingly, often with punishment for the violator, according to expectancy violation theory (Burgoon and Jones, 1976). Would increasing the moral salience have the same effects across these platforms? More cross-platform research involving moral theories needs to be conducted to find out.

It is also worth connecting the present work to the broader world of media studies. For instance, the concept of stickiness in platform economies could play a role in how platforms differ from one another trolling-wise. User stickiness refers to how often users return to a platform for use (Xu et al., 2018); it is also a key goal in modern platform economics (Laczko et al., 2019; Rong et al., 2019). The stickier a platform is, the more ads and/or products they can theoretically sell using that platform. In their study, Xu et al. (2018) suggest that platforms can enhance stickiness through improving content quality and system quality while encouraging user participation. However, studies such as that of Synnott et al. (2017) demonstrate that user stickiness can be achieved by quality conflict as much as by quality content, thus incentivizing platforms to increase trolling and toxicity rates to increase user stickiness. How much the upper management of different platforms adhere to this principle could theoretically affect perceived toxicity and/or trolling rates on said platforms.

Researchers have also documented how trolling has been used as a political tool to sway opinions and/or discredit ideologies or political figures (Phillips, 2011; Akhtar and Morrison, 2019; Kargar and Rauchfleisch, 2019). This also connects back to our participants who considered canceling as a form of trolling, particularly when done with solely malicious intent as opposed to the motivation of correcting an injustice. Trolling, in other words, can be used as a tool, and this could affect perceived trolling and toxicity rates on different platforms as well. Twitter is an example of a highly political space in which trolling is, according to our participants, rampant. At least a portion of this is due to politically backed actors and bots trolling with a particular ideology in mind (Kargar and Rauchfleisch, 2019; McCombie et al., 2020). A particularly terrifying version of this goes by the name of "chan cultures"; originating from sites such as 4chan and 8kun, these are internet subcultures in which "violence is both trivialized and glorified" (Crawford et al., 2021, p. 982). According to Crawford et al. (2021), this subculture has been connected to far-right groups and offline terrorism through their use of humorous trolling, particularly through spreading memes – a common theme in our own results. All of this goes to show that there is a big world of trolling out there, and our study only begins to uncover the full picture of trolling on both gaming and social media platforms. That being said, it still has some interesting theoretical and practical implications for the future study of trolls, be they political, playful, or otherwise.

Theoretical and practical implications

The first and most obvious theoretical implication of this work is the importance of the platform. As noted earlier, trolling is an inherently interdisciplinary topic with myriad available definitions for researchers to choose from (see Cook et al., 2021). To complicate this matter further, the media does not stick to a single understanding of what trolling is either, using it at times as a synonym for toxicity (see Conditt, 2020) and at times as a way to describe annoying but largely benign online behaviors akin to pranking in the offline world (see Piedra, 2018). The present work's findings would suggest that an important part of why we seem to have such difficulty agreeing on what exactly constitutes trolling is because people's understanding of the term is inherently linked to platforms, at least in part, which differ in many ways. Here, we divide the platform up by primary purpose: entertainment for online games and social networking for social media sites, though we investigated a particular subculture when we did so (game players). However, these are not the only distinctions that can be made between platforms. Gandolfi and Ferdig (2022) have already begun to look at the importance of specific affordances for toxicity; our findings would suggest that future work could take a similar approach, but instead of looking at affordances in a single game, multiple games or social media platforms could be categorized by affordances and their communities investigated to see how toxicity levels and trolling behaviors differ. Avatars, for instance, are a common difference between popular social media (e.g., Instagram) and games (e.g., World of Warcraft).

Another important distinction to make when reflecting upon differences between platforms is the communities that use said platforms. As previously mentioned, we specifically looked at game

players in the present work, but even this is a broad categorization. One could imagine that players of World of Warcraft, a fantasy MMORPG, may differ significantly in their usage of their platform than players of the Call of Duty franchise, an intensely competitive first-person shooter. Naturally, these platforms differ in terms of affordances – they are different genres of game – but they are also likely to differ in terms of the social norms of their communities (for a complete discussion of gaming communities, see Mäyrä, 2016). Like games, neither are social media platforms completely homogenous in terms of their communities' social norms and/or practices (see Paris et al., 2012; Freelon et al., 2018). In short, the present study's division of platforms is by no means the only option, and future work should explore differences between all kinds of communities across a variety of platforms to help determine the exact mechanisms behind the differences we have observed by talking to trolling targets. By continuing to investigate these fine-grained differences, we may be able to develop a series of individual understandings of trolling that are platform or community specific, better serving policy-makers and researchers alike.

A second important note is that this is not the first time that boredom and frustration have shown up as major motivators for trolling behavior (Thacker and Griffiths, 2012; Cook et al., 2018); it has been years since the original articles talking about these motivations emerged, and yet still today these are coming up in interviews as major trolling catalysts. It is, however, the first time that we have seen this distinction with social media trolling being primarily motivated by boredom and games by frustration. For games, theory would suggest that boredom has something to do with game mastery (see Cook, 2019); when the game no longer holds a challenge, people will find other ways to entertain themselves. Frustration, on the other hand, comes from the opposite end of the spectrum, with the game's difficulty level exceeding the player's skill level by too high a margin (Cook, 2019). However, similar theoretical work has yet to be done outside of games. Existing theoretical work on trolling on social media has heavily focused on personality theory to explain trolling behavior in these contexts (e.g., Buckels et al., 2014, 2019; March, 2019), while other studies provide more descriptive information (see Sanfilippo et al., 2018; Sun and Fichman, 2018). Given our findings suggesting that these motivations go beyond games and apply to trolling on social media as well, we need to begin looking at beyond-platform solutions to this issue, interventions that teach young adults to better manage emotions such as boredom and frustration, perhaps. Such interventions have already been designed and implemented with success in various workplaces (see Scott and Myers, 2005; Little et al., 2013); our findings would suggest that it may be worth adapting them for more general use and seeing how they impact trolling rates.

Finally, the present work has highlighted just how much behavioral trolling, or non-verbal trolling, is perceived as a problem in the current gaming landscape. A vast majority of our participants experienced some form of behavioral trolling or at the very least mentioned it as a type of trolling that they see frequently in-game. Participants also indirectly highlighted the perceived reason for behavioral trolling's prominence in games: an over-reliance on automated content moderation on gaming platforms. Chat filters and the like are, according to our participants, being used *instead* of human moderation teams as opposed to *a support for* human moderation teams. As previously mentioned, trolling is only truly limited by programming and human creativity, and it seems as though behavioral trolling is ingenuity's current bypass of automatic content moderation techniques. User-based moderation works for websites such as Reddit (2022) and was seemingly effective for a time in League of Legends during the days of the Tribunal (GameFAQs, 2015). Urban legends of games that created special servers for those who trolled excessively exist as well, although these rumors are not fully substantiated (Cook et al., 2018). It is also possible that companies are engaging in antisocial design practices (see Carmi, 2022), in other words, permitting trolling for the purpose of creating outrage, subsequently leading to further engagement (see Spring et al., 2018). However, if this is indeed the case, it would seem as though it only works up to a point as one of the most popular ways noted in the present work to deal with trolling was to stop playing the game, either temporarily or permanently. To avoid player dropout due to excessive behavioral trolling, new methods of moderation should be investigated by both academics and in-house researchers to determine the best balance between player freedom and player protection when it comes to non-verbal trolling.

Limitations and future directions

Though the present study highlights important differences between perceived trolling on social media and in online games, it is not without its limitations. As previously noted, because this is part of a larger study on game players, almost the entire population uses games more heavily than social media platforms; the study should therefore be replicated on more casual game players to see which trends hold and which are an artefact of our sample. This sampling also meant that our participants were mostly men, while this is not true of internet users taken as a whole. Future work should aim for a more even gender distribution to better capture a wider experience. In addition, several of our participants mentioned important cultural dimensions of trolling but not in enough detail or across enough participants to examine in more depth. Though there have been cross-cultural studies of trolling (see Cook et al., 2021), these have not been done qualitatively across two or more specific cultures. The present study suggests that there are indeed more cross-cultural differences to explore in depth. We were also restricted by our IRB review from asking more questions about gaming and demographic background as the interview protocol was already lengthy, and the reviewers wanted to keep participants as anonymous as possible. In addition, due to the need for coders to be both fluent English users and familiar with a wide variety of games, two of the authors had to be coders; in an ideal world, the coders would have been separate from the authorial team. Finally, the majority of our participants focused on team-based games. It is possible this is because team-based games have more trolling, but it could also be an artifact of our recruiting measures. Future work should aim for a more balanced distribution across gaming genres to potentially find new patterns.

There is still ample room for further work in this area. For instance, the present work did not focus on the emotional experience of victims, something that could be of particular interest to those designing interventions or counselling programs for trolling victims. This could be addressed in future qualitative work. With the categories of behaviors and definitions identified here, researchers could also ask a larger group of representative game players and social media users about their understanding of trolling in a larger-scale survey to determine which

results hold true and which are artifacts of the small sample size. The question of generational influence on trolling also remains (see Cook et al., 2018 for further discussion); this could be of interest for future studies to specifically target teenage or older adult trolls or targets to see how age impacts the understanding of this ever-changing phenomenon.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by the National Chengchi University Research Ethics Committee. The patients/participants provided their written informed consent to participate in this study.

Author contributions

CC designed the study, performed all data collection, analyzed all data, and wrote and revised the article. ST reviewed all interview transcripts for accuracy, analyzed all data, and reviewed the article. J-HL provided funding for the project and provided critical revisions prior to submission. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1163244/full#supplementary-material

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Representation of mental illness in video games beyond stigmatization

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The representation of mental illness is part of many video games; however, it is often accompanied by stigmatization of and discrimination against those who are affected. Recently, a more positive approach has been found, including a dimensional representation of mental disorders such as depression or anxiety, especially in games developed by independent developers. The study examined the most popular video games of 2018 and 2019 based on their representation of mental illness in a mixed-methods approach. A quantitative coding process examining general aspects of the games, the characters affected, and the illness representation is followed by a qualitative video game analysis of the games in the sample with a dimensional representation of mental illness. It was found that 16 of the 74 games examined included characters who were affected by mental illnesses. For the most part, mental illness is an essential aspect of the games analyzed in the sample represented by the main characters. However, the depiction of mental illness often lacks depth and dimensionality. Two examples in the study offer a dimensional representation that includes mental illness as characters, as part of the environment and atmosphere, and provides illness-related advice as part of the gameplay. These findings can be helpful for developing games with the potential to reduce discrimination and stigmatization of mental illness and those affected in the future by pointing out aspects leading to a more dimensional and empathetic portrayal of mental illness in existing games. Additionally, the category system used in this study is adaptable to future qualitative research on mental illness representation in video games.

KEYWORDS

video games, mental illness, representation, stigmatization, independent developers, depression, anxiety, dimensional representation

1. Introduction

Mental illness (MI) affects approximately every eighth person worldwide (World Health Organization, 2022). What distinguishes it from most physical disorders is that it is, in many cases, invisible. For instance, depression or anxiety are hardly recognizable based on a person's outward appearance (Lindsey, 2014). Therefore, those affected often experience a paucity of empathy, acceptance, or even discrimination from members of society. Comprehensive knowledge of MI is essential for identifying certain disorders, preventing risk factors and causes, and being informed about the available sources for professional help and mental health information (Jorm, 2000). The media is a highly significant source of illness-related knowledge. However, representations of MI and those affected are often negative and incorrect, which negatively affects the attitudes and beliefs of the general public (Edney, 2004). Negative depictions might cause prejudices against people who are

affected, resulting in social isolation and disadvantages within the job field or social life and negatively influencing the willingness for early detection and treatment regarding mental health problems (Scherr, 2019). With ∼3.2 billion people worldwide using video games (Newzoo, 2022), they belong to the most impactful types of digital media. The aspect of interactivity that allows players to actively participate and affect the content and the dynamic of its unfolding (Ryan, 2001; Neitzel, 2012) distinguishes video games from most other audiovisual media. Therefore, players are not merely passive spectators of what is happening to the characters in the game but instead take on their roles, interact with them, or even impact their fate. However, video games are not free from negative portrayals that misrepresent reality and contribute to the stereotypization, stigmatization, and discrimination of MI and those affected.

2. Current research

In plenty of games, characters affected by MI are depicted as violent, dangerous, and aggressive. Often, they are antagonists or side characters who harm protagonists (Morris and Forrest, 2013; Shapiro and Rotter, 2016; Ferrari et al., 2019). Many games do not depict them as individual human beings but as representatives of the illness within the game, considering them untrustworthy and their illness-related experience irrelevant (Lindsey, 2014). Another preconception often reproduced within games is the assumption that those affected are lonely and helpless, with little to no hope for recovery (Ferrari et al., 2019). Mental health institutions are frequently used as settings in horror games, evoking a dark, horrifying, and discomforting atmosphere. An abandoned asylum as the game environment is usually an indicator for players to be on guard. Psychiatric interventions, in general, are hardly ever part of games. The few exceptions, including medical treatment, portray them as expensive and ineffective (Morris and Forrest, 2013; Ferrari et al., 2019; Dunlap and Kowert, 2021b; Buday et al., 2022).

However, not all games dealing with MI reproduce stereotypes and stigmatization. Especially in recent years, an increasing number of games representing MI have taken a much more positive approach. One example is *Hellblade: Senua's Sacrifice* (2017), an action-adventure published in 2017. The game centers around a young woman in the eighth century suffering from psychosis. Aside from the negative and disturbing aspects of the illness, there is also a more positive perspective. Several times throughout the game, Senua's hallucinations are a gift, aiding the players in solving puzzles and making progress. Furthermore, at the very beginning of the game and on the website of the development studio, content warnings, as well as references to sources of illness-related information and aid organizations, can be found. In the development process of the game, people affected by psychosis and medical professionals were consulted (Fordham and Ball, 2019; Anderson, 2020).

Working with experts on mental health, such as medical professionals, scholars, and people affected, can be a valuable source for portraying MI in a realistic and empathetic way. Game designers might also use their own experience of suffering from mental disorders. Such expertise can provide accurate illness-related information, legitimize those portrayals, and initiate innovative games by cooperating with different fields (game industry, medicine, and academia) based on mutual interests (Schlote and Major, 2021). Games developed by independent studios often include progressive and more positive representations of MI. On the one hand, they are not affected by the pressure to design games for the mainstream market, leading to more creative freedom. Therefore, they are free to tackle serious and sensitive topics. On the other hand, they have considerably lower budgets than big studios and do not reach a broader audience in most cases. Hence, more elaborate productions are hardly possible, or they heavily rely on funding (Fordham and Ball, 2019; Runzheimer, 2020).

3. Dimensional model for MI representation in video games

Dunlap and Kowert developed a category system for representing mental illness in digital games. They identified three dimensions: First, the *decorative representation*, where MI is not essential to the characters, the story, or the game's environment. There are general references to the illness as having mere decorative aspects carrying little to no significance. In those cases, references to the illness do not contribute to the development of the story or the characters. Removing those references would not alter the overall story. For example, the name of a character indicates that they are "crazy "or "ill." The *defining representation* treats MI as essential to the game without exploring it beyond the surface. A psychiatric hospital becoming a horror game setting to create an unsettling atmosphere or an illness as the primary explanation of a character's backstory or motivations are examples of this lack of dimensionality. Lastly, the *dimensional representation* includes depth and dimensionality, examining MI from several perspectives. The experience of being affected by MI is recreated authentically, for example, using sound, visual effects, and game mechanics to simulate symptoms and create an empathetic link between the player and the character affected (Dunlap, 2018; Dunlap and Kowert, 2021a,b).

The current study evaluates the most popular video games of 2018 and 2019 according to the Internet Movie Database (IMDb) regarding the portrayal of MI. It discusses how MI can be represented not only through the characters affected but also as a part of the game environment, atmosphere, and gameplay, without any stigmatization. The questions focused on in this study are as follows:

Q1: How is MI represented in video games?

Q2: How is MI implemented in different elements of the game (character, environment, and gameplay)?

Q3: How might players benefit from the representation of MI in video games?

4. Method and sample

The sample consists of the most popular video games published in 2018 and 2019, according to the Internet Movie Database (IMDb). As the leading platform for user ratings on audiovisual media, IMDb is a relevant source of the popularity of games,

since an overview of the sales figures or the number of players was unavailable. The search was limited to games developed in 2018 and 2019, with a minimum of 250 user ratings on the platform. Therefore, lesser-known games with a high rating score were excluded. These search criteria led to 74 games that were examined based on whether they dealt with MI. For each game, a search of the title in combination with MI-related terms (e.g., "mental health," "addiction," "depression," and "madness") was performed. User-created game wikis, the websites of the games, and YouTube videos served as sources for further information on the representation of MI within those games. Games dealing with MI were analyzed based on the coding process by Prommer and Linke (2017). This method allows a comprehensible and verifiable thematic structuring of the content. A coding book is created beforehand, including categories (themes or thematic structures; e.g., the type of character) and codes (corresponding manifestations of the categories; e.g., protagonist, antagonist, and side character). For some codes, rules and textual examples are applied within the coding book to ensure coherent coding. There can also be open categories, where the corresponding codes are not defined beforehand but worked out in an inductive process based on the similarities of the findings. The coding in this contribution focuses on information on general details of the games, the characters affected by MI, and the mental illness in question (Table 1).

The following step includes a video game analysis, examining games dealing with MI in depth and from different perspectives. The sample of this qualitative examination depends on the dimensional model by Dunlap and Kowert: Only games including a *dimensional representation* of MI were considered in the analysis. Similar to the method of movie and television analyses, video game analysis includes the content's description, analysis, interpretation, and evaluation. There are five elements: *Simulation layer* (ludic layer; intervention of the player), *representation layer* (narrative layer; what is depicted/narrated and how), *characters and players*, *media design and aesthetic*, and *context*. The focussed elements and categories depend on the individual research questions (Eichner, 2017). Beyond the given categories, the analysis includes additional illness-related categories in the context of MI. Therefore, the category list (Table 2) is adaptable for future qualitative analysis of the representation of MI in video games.

5. Results

A total of 16 of the 74 games, hence every fourth game, dealt with MI. Within those games, there are 24 characters affected by MI. One character appears in two individual games, and one is a homogeneous group of characters. The majority of the characters affected by MI in the sample are playable. Of these characters, half assume central roles, one-third are protagonists, and three function as side characters and antagonists. Therefore, characters affected by MI in the games analyzed play an essential role in the game. However, they are not in the center of the story for the most part. Neurotic and stress disorders, such as anxiety ($n = 3$) and post-traumatic stress disorder ($n = 6$), as well as affective disorders, such as depression ($n = 7$), occur most frequently. However, almost one-third of the mental illnesses identified in the sample could not be categorized. Within the context of those games, those characters are affected by "madness." In every fourth game analyzed, not only the characters but also the environment and the gameplay represented the illness. Most games ($n = 19$) do not include any form of professional treatment. Three games occur in a mental hospital; two address medication, and one mentions a character in therapy. In the context of the category system of Dunlap and Kowert, most games ($n = 10$) include a defining representation of MI. Table 3 lists all games and characters affected by MI in the sample.

Two games include a dimensional representation of MI: *Celeste* (2018) and *Gris* (2018), both published by independent game developers. *Celeste* is a single-player platform game following a young woman called Madeline, who suffers from depression and anxiety. She is on a quest to climb a mountain called Celeste to overcome her struggles. In *Gris*, a single-player platform adventure game, the player takes on the role of a nameless female protagonist dealing with trauma and grief after losing a loved one, as well as with post-traumatic stress disorder or depression. The game does not include spoken or written words. Instead, the entire story unfolds through visuals and music. Hence, there is much space left for individual interpretations.

The following results are limited to the findings essential to MI representation. Each layer of the video game analysis is part of the results as follows: The section on characters includes the layers of *Character and Player*, focusing on the characters personifying the illness, and the *Representation* layer, dealing with the connection between the primary goal of both games and MI. The *Design and Aesthetic* layer is part of the section on environment and atmosphere, as the design of the game world and the atmosphere surrounding it symbolize the illness-related experience. The section on mechanics includes the *Context* layer, including illness-related knowledge and advice in *Celeste*, and also mentions the *Simulation* layer, as overcoming obstacles in Jump'n'Run games is related to illness-related experiences.

5.1. Mental illness in characters

Both games represent MI through the antagonists. In *Celeste*, Badeline, a doppelganger or shadow of hers, represents Madeline's depression and anxiety. Their outer appearances only differ in terms of hair and eye colors. Badeline appears several times throughout the game, trying to keep Madeline from reaching the mountaintop. She does so by attacking and discouraging her and leaving obstacles in her way. Madeline herself is aware of the fact that the illness is a part of her. She expresses her insecurities and self-doubts: "But I can't escape myself. I'm literally fighting myself the entire way. Maybe this is all pointless" (Thorson and Berry, 2018). Hence, fighting Badeline feels like fighting against herself, which is not the solution to her suffering. However, later on, both work together and become stronger by combining their abilities. Through their teamwork, they eventually reach the top of Celeste. This transformation from antagonism to cooperation reflects the primary goal of the game in the context of MI: To not defeat Badeline, hence the illness, but rather to learn how to accept and live with it, as both are a part of her.

In *Gris*, a shape-shifting shadow represents the MI in question. It appears as a bird, a serpent, and the protagonist herself. As a

TABLE 1 Coding process categories.

General details		Coding	
V1	Coding-number	Number	
V2	Game title	Title	
V3	Place within IMDb-list	Number	
V4	Number of votes on IMDb	Number	
V5	IMDb-rating	Number	
V6	Year of release	Date	
V7	Country	Abbreviation based on ISO 3166	
V8	Developer	Company/name	
V9	Publisher	Company/name	
V10	Genre (Narration)	List (multiple choices possible)	
V11	Genre (Gameplay)	List (multiple choices possible)	
V12	Space	2D = 1/3D = 2	
V13	Perspective	First-person = 1/third-person = 2/isometric = 3/side-view = 4	
V14	Game mode	Single player only = 1/multiplayer only = 2/single and multiplayer = 3	
V15	Online	Yes = 1/no = 2/asynchronous = 3	
V16	Platform	List (multiple choices possible)	
V17	Age rating	List	
V18	Virtual reality	VR = 1/mixed reality = 2/non = 3	
Characters		**Coding**	
V19	Type of representation	MI represented through character only = 1/MI represented through environment/gameplay only = 2/ MI represented through character and environment/gameplay = 3	
V20	Character affected	Name	
V21	Control	Player character = 1/non-player character = 2	
V22	Player type	Protagonist = 1	character in the center of the story
		Antagonist = 2	enemy/opponent of the protagonist
		Main character = 3	Reoccurring character important to the story
		Side character = 4	background character outside of the main story
V23	Gender	Women = 1/men = 2/other = 3/indefinable = 4	
V24	Age	List	
V25	Ethnic Background	List	
Mental illness		**Coding**	
V26	Illness	Open code (multiple choices possible)	
V27	Diagnosis	Unmistakably mentioned = 1	MI unmistakably mentioned/diagnosed
		Suggestions/symptoms = 2	MI is not unmistakably mentioned/diagnosed, but there are suggestive remarks or symptoms unequivocally referring to the MI
		Freedom for interpretation = 3	References to the MI are not unequivocal, so there is freedom for individual interpretation of the players
V28	Illness Category	List (multiple choices possible)	
V29	Dimension of Representation (Dunlap and Kowert, 2021a,b)	Decorative = 1/defining = 2/dimensional = 3	
V30	Stereotype	List	

(Continued)

TABLE 1 (Continued)

General details		Coding	
V31	Extent	Background story = 1	MI and symptoms are not visualized within the game itself but are revealed in the background story or other games within the same franchise
		Rarely = 2	MI briefly mentioned/symptoms hardly ever visualized
		Occasionally = 3	MI mentioned/symptoms visualized from time to time
		Entire game = 4	MI mentioned and symptoms visualized throughout a large proportion of the game
V32	Professional treatment	Open code (multiple choices possible)	
V33	Defining event related to MI	Open code	

TABLE 2 Video game analysis (Eichner, 2017) and additional MI-related categories.

Simulation	Rules and goals	Restrictions of interactions; tasks/quests and the ultimate goal of the game
	Actions	Possible interactions between players
	Interaction design and interface	Communication of possible interactions
Representation	Space	Design and restrictions of the game space; perspective
	Time	Narration time; narrated time
	Moral of the game	*The connection between the goal of the game and MI*
Character and player	Perspective and point-of-view	First-person perspective; third-person perspective
	Immersion and identification	Focus on sympathy/empathy for characters or the individual experience of the player
	Symptoms and side effects	*Impact of the illness mentioned or visualized*
	Dependents and support	*Actions, emotions, and support of people close to the person affected (e.g., family, friends, and partners) in the context of the illness*
	Medical and professional treatment	*Treatment and medication; interaction with medical professionals; medical institutions*
	Dealing with illness	*Actions and emotions of people affected in the context of the illness*
	Everyday actions and restrictions	*Effects of the illness on the everyday life*
Design and aesthetic	Audiovisual design	Sound, music, lighting, colors
	Graphic style	Art style
	Crossmedia elements	Film clips, textual elements, audio files, newspaper articles, etc.
	Metaphors	*Audiovisual elements symbolizing aspects of the illness*
Context	Genre and intertextuality	Genre expectations based on gameplay or narration; references to other media
	Game mode	Single-player; multiplayer
	Illness-related knowledge and advice	*Advice and knowledge on how to deal with MI, how to cope with symptoms, and how to aid someone affected by MI*

bird, the shadow appears harmless, simply getting in the player's way. It attempts to push the protagonist back to keep the player from making progress in the game. As a serpent, however, the shadow threatens the protagonist's life. It chases her and attempts to devour her. Instead of giving up, the protagonist is able to take advantage of those disruptions, using them for her own progress. For instance, the pushing back by the bird-shaped shadow can help her reach platforms further away. When taking over the shape of the protagonist, the shadow reveals that it is an ever-present part of her. However, even though it seems inescapable and undefeatable, in the end, she can leave it behind and move on with her life.

In both games, the antagonists representing MI turn out to be not entirely evil but rather a part of the protagonists themselves. Both examples are portrayed as shadows of the character affected. On the one hand, a shadow symbolizes darkness and negativity. The illness is taking over a person's mind and removing all light, hence the positive emotions, leaving them with negativity. On the other hand, a shadow constantly follows a person and would not be visible

TABLE 3 List of games including MI.

Game	Mental illness	Dimension (Dunlap and Kowert, 2021a,b)
God of War (SIE Santa Monica Studio, 2018)	PTSD (Kratos)	Decorative
Marvel's Spider-Man (Insomniac Games, 2018)	"Madness" (Otto Octavius)	Defining
Detroit: Become Human (Quantic Dream, 2018)	Depression, suicidal thoughts, alcoholism (Hank Anderson), drug addiction (Todd Williams)	Defining
Death Stranding (Kojima Productions, 2019)	Aphenphosmphobia (Samuel Porter Bridges)	Defining
Fire Emblem: Three Houses (Intelligent Systems and Koei Tecmo, 2019)	PTSD, survivor's guilt, schizophrenia (Dimitri); anxiety, social phobia, paranoia, and PTSD (Bernadetta)	Defining
Celeste (Thorson and Berry, 2018)	Anxiety and depression (Madeline)	Dimensional
Kingdom Hearts III (Square Enix Business Division 3, 2019)	Depression (Riku and Aqua)	Defining
Gris (Nomada Studio, 2018)	Depression and PTSD (Protagonist)	Dimensional
Lego DC Super-Villains (Traveller's Tales, 2018)	"Madness" (Joker, Harley Quinn, Mad Hatter and Mad Harriet)	Decorative
Call of Cthulhu (Cyanide Studios, 2018)	Alcoholism, PTSD, and Hallucinations (Edward Pierce)	Defining
Mortal Kombat 11 (NetherRealm Studios, 2019)	"Madness" (Joker); PTSD (Jackson Briggs)	Decorative
Apex Legends (Respawn Entertainment, 2019)	Hallucinations, Schizophrenia (Wraith); "Madness" (Caustic)	Defining
The Awesome Adventures of Captain Spirit (Dontnod Entertainment, 2018b)	Alcoholism, depression (Charles Eriksen)	Defining
Life is Strange (Dontnod Entertainment, 2018a)	Depression, insomnia (Lyla Park)	Defining
Blair Witch (Bloober Team, 2019)	PTSD, anxiety, and hallucinations (Ellis Lynch)	Defining
Rage 2 (Avalanche Studios & id Software, 2019)	"Madness" (Ghosts)	Decorative

if there was no light source. The shadow metaphor indicates that someone living with MI does not only experience negative feelings but can also have happiness in their lives as well.

5.2. Mental illness in the environment and atmosphere

Both games represent MI as part of the environment and atmosphere. In *Celeste*, Madeline's panic attacks become visual. The environment surrounding her and those immediately next to her disappears. The screen is overtaken by darkness, only disrupted by strands of Badeline's purple hair. An alteration of music and the controller vibrating evoke a feeling of discomfort. This intense sensation might give players a slight impression of the overwhelming and frightening feeling of a panic attack. In those moments, Madeline has the feeling of being transported to a place far away. Everything around her becomes blacked out as she can only focus on her panic attack. She expresses her discomfort to Theo, a friend she met on her journey, claiming she cannot breathe.

In *Gris*, this can be found throughout the game, as each level represents a stage of grief: denial, anger, bargaining, depression, and acceptance. With each level, there is a shift in the landscape and the addition of a new color. At the beginning of the game, the protagonist arrives in a gray landscape full of ruins, where she also loses her voice. This place, with its absence of color, represents denial. The following level represents anger, occurring within a desert and adding red. Bargaining is situated in a forest, hence associated with the color green. Depression takes place in a deep sea and adds blue to the color palette of the game. The last color, yellow, is added in the acceptance stage. The protagonist moves through a setting that resembles a starry sky, where she finally regains her voice and can leave the whole place behind. The shift of the environment from the blooming forest to the dark, deep ocean symbolizes that grief and dealing with MI are not linear processes. People affected do not get better with each step. There might always be a new low, even after a phase of improvement. However, the end of the game encourages players to hope for better days instead of losing faith after a stage of depression. Similarly, in *Celeste*, when Madeline is close to the mountain top for the first time, she falls down. However, instead of giving up, she continues climbing up once again and eventually achieves her goal.

5.3. Mental illness in mechanics

Celeste not only gives an impression of what a panic attack might feel like, but also offers advice on how to deal with one. This advice does not only address people affected but also players in general who might witness a panic attack. The former is part of the gameplay in the form of a mini-game. Her friend Theo tries to help her overcome the panic attack by introducing her to a breathing technique. He asks her to imagine a feather in front of her, which she has to keep floating in the air with steady breaths. This method is supposed to help her relax and calm down. The mini-game includes a feather that the players must keep within a small, selected area. Concentration is required to keep the

feather steady for a certain amount of time to complete this mini-game successfully. Players who suffer from panic attacks can adopt this method in real life. Besides that, the way Theo acts in this situation and supports Madeline is a positive example of how to aid somebody else experiencing a panic attack. Furthermore, it is essential to mention that the gameplay mechanics in both games focus on obstacles in the way and how to overcome them, which is a metaphor for dealing with MI.

6. Discussion and theoretical implication

The games in the qualitative analysis represent MI as the antagonist. At first glance, this reproduces existing negative portrayals of MI and those affected as dangerous and evil. However, in both games, the antagonists are revealed to be part of the protagonists themselves and end up supporting them to make progress in the game. In the end, both *Celeste* and *Gris* provide examples of MI representation where neither the characters affected nor the antagonists representing the illness are entirely evil or dangerous per se. Moreover, both protagonists can fight for themselves instead of being lonely, helpless, and needing rescue from others. This more positive perspective, similar to the example of the hallucinations in *Hellblade*, might contribute to overcoming stereotypical depictions in video games.

In contrast to abandoned psychological institutions as settings of horror games evoking negative attitudes toward professional medical treatment of MI, both games in the qualitative analysis offer a more positive approach, representing MI as part of the environment and atmosphere of the games. *Celeste* offers an immersive audiovisual experience of a panic attack's overbearing and terrifying sensation through the music, the interface, and the character's surroundings. *Gris* leads the player through the various stages of grief, each with a unique setting and atmosphere. This journey proves that grief and dealing with MI are not linear, with the person affected constantly improving. The examples in this study make illness-related experiences more understandable and empathically available for people unaffected by MI. Additionally, both games' outcomes disprove the common stereotypical notion that people affected by MI have little hope for recovery. Representing illness-related experiences through environmental and atmospheric elements might benefit the education of illness-related knowledge and lead to more empathy toward those affected.

The mini-game, including the feather as a breathing technique in *Celeste*, serves as a way to represent MI or, rather, cope with it as part of the gameplay. The game advises using this technique when experiencing a panic attack and demonstrates and manifests it due to the mini-game aspect. Implementing this advice in the gameplay might increase the chances of players remembering it when they experience a panic attack themselves in real life or witness someone else who could benefit from it. For future research, players affected by MI should be consulted to validate the effectiveness of the advice on mental health found in video games.

Both examples in this study are games developed by independent game studios; however, they have had substantial commercial success, reaching a broad audience of players. For example, no mental health professionals or similar experts were part of the development process in *Celeste*. However, the developer herself said in an interview that she is affected by anxiety and depression. Since MI is not supposed to be the game's main focus, the developers decided against consulting mental health professionals in the development process. Instead, they used their first-hand experience of being affected (Grayson, 2018). In *Gris*, however, the developers did consult a psychiatrist to discuss the topics of grief and depression within the game (Sanchez, 2019). Therefore, the dimensional representation of MI in both games lacking any stereotypization or stigmatization might be due to the expertise on the topic, whether through professional knowledge or first-hand experience.

Based on these findings, some significant aspects for the development of games including MI can be drawn that overcome stereotypical and stigmatizing representations and might be beneficial for those affected:

1. Representing MI through utterly evil characters with the ultimate goal of defeating them should be avoided. Characters affected learning how to accept their condition and not considering it their enemy should be portrayed instead.

2. Solely depicting negative effects and struggles deprived of MI should be resisted. Insights on positive symptoms (e.g., the beauty of some hallucinations in *Hellblade*) might lead to a more dimensional representation.

3. Representing illness-related experiences and emotions through the environment and atmosphere of the game might lead to more empathy for those affected.

4. Including advice for people affected by MI to adapt in real life (e.g., the feather mini-game as a breathing technique in *Celeste*) or positive examples of supporting those affected might be beneficial.

5. Expertise in MI (e.g., own experience, people affected, or mental health professionals) should be consulted during the development process.

7. Conclusion and limitations

In conclusion, MI can be a defining element in many video games dealing with such. However, their representation often lacks depth. For example, of the 24 affected game characters in this analysis, only two were represented beyond the surface and from multiple perspectives. Video games do have the potential to be beneficial for people affected by MI or those who are not. For those affected, it might provide opportunities to identify with game characters that have to deal with the same condition without being associated with negative stereotypes and stigmatization. Moreover, game elements such as the feather mini-game in *Celeste* offer advice that players might adapt to real life. In addition, representing MI not only through characters but also as part of the environment and gameplay might lead to people being more sympathetic about what it feels like to live with such disorders and how to interact respectfully with those affected. Experts in MI should be consulted in the development process to provide progressive and dimensional representations. This contribution provides aspects for consideration when representing MI in video games to provide more dimensional and empathetic portrayals beyond reproducing stigmatizing and stereotyping images of those affected. Additionally, the illness-related category system for this

study's qualitative video game analysis is adaptable for further research on MI representation in video games.

However, this study focuses on viral games within a limited period. More recent games should be considered for future research, as the video game market is ever-expanding and evolving. The sample is also limited in terms of popularity. There could be more progressive and destigmatizing representations from other independent developers that are lesser known. Hence, future research should focus more on examining less popular games. Nonetheless, the games analyzed in this study are significant examples of dimensional representations of MI suitable as models for the development of games in the future.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

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A game of persuasion: influencing persuasive game appraisals through presentation frames and recommendation sources

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Introduction: As games made with the explicit or implicit purpose of influencing players' attitudes, persuasive games afford a new way for individuals to reflect and elaborate on real-world issues or topics. While research points to effects of these games on their players, little is known about their practical impact. The current study focuses on the decision-making process that takes place between first hearing about a game and deciding to play it. Three elements in a game's presentation to potential players were explored: (1) the way it is framed as an entertaining experience, (2) the way it is framed as intending to persuade its players, and (3) whether it comes recommended by automated systems or through electronic word-of-mouth. These factors were chosen in line with theoretical arguments around framing, eudaimonia, and source credibility.

Methods: A two (entertainment frame: hedonic versus eudaimonic) by two (persuasive intent frame: obfuscated versus explicit) by two (source of recommendation: system- versus peer-based) between-subjects experimental design was performed across ($N = 310$) randomly distributed participants. Measures were adapted from previous research and included selection and play behavior, attitudes, and obtrusiveness of persuasive intent, among others.

Results and Discussion: Results show that frames need to be congruent to be effective, with the most effective stimuli being those where persuasive intent was clear and players could expect to engage meaningfully. Peer recommendations led to greater play intention than system-based varieties. While intention to play positively related to actual play behavior, this relationship was likely the result of avid game players displaying more interest in the game regardless of the study's manipulations. Implications are drawn from the advantages of being open about persuasive intent and the composition and drivers of a persuasive game's target audience.

KEYWORDS

persuasive games, media selection, framing, hedonic, eudaimonic, recommendations, electronic word-of-mouth

1. Introduction

Despite colloquial perceptions, not all games have the sole purpose to entertain players. The concept of persuasive games can be used to identify a subset of (digital) interactive experiences that are made with the explicit or implicit intent of influencing players' attitudes toward real-world issues and topics. In some cases, this influence is meant to nudge or steer behaviors without players' explicit awareness of any influence (Kaufman et al., 2021). In other instances,

it might be desirable to invite players to reflect and elaborate consciously on the topic at hand. One game that fits in the latter category is 'Why did the chicken cross the road?'(WDtCCtR, DatJuanDesigner, 2020). Published on Itch.io by a developer with the username DatJuanDesigner, WDtCCtR is part of an unexplored wave of persuasive games that are emerging on highly accessible game platforms. The game takes a classic set-up for a frivolous joke and uses it to immerse players in the discourse surrounding migrant workers who cross the Mexico-United States border. Even though it advertises itself as a 'poem/game' and couches its messaging in unassuming visuals and obfuscatory character dialog, this interactive experience clearly intends for its players to think more critically about this phenomenon. The current study investigates which of these different persuasive messaging styles makes the game most attractive to potential players.

Persuasive games have been studied mostly for the effects they have on players' attitudes. Some exceptions notwithstanding, this avenue of research generally points to small but robust persuasive influences on diverse social, political, and advertising topics (Jacobs and Jansz, 2021). Crucially, all effects research on persuasive games published so far has included study participants as captive audiences for these games. The tentative conclusion the aggregate of these studies has yielded is that persuasive games tend to persuade the people that play them. This conclusion on effects does not say much about persuasive games' real-world impact, though. Only a few persuasive games gain public attention. As technological advancements and platforms such as Itch.io are lowering the barriers for independent game developers like DatJuanDesigner to bring their creative ideas to fruition, this is not likely a question of supply. This leaves the processes of discovery, attraction, and selection as potential bottlenecks for the impact that persuasive games can have.

When placed alongside each other, persuasive games appear much the same as entertainment games. They can have colorful visuals, attractive gameplay elements, and interesting titles. However, research on serious games tends to center educational experiences and advergames, which are most often integrated either in a curriculum or an intervention, or they are hosted exclusively in places where their creators think they will be most effective. If research on adoption and acceptance of serious gaming in these formal settings is already rather scarce (see Bourgonjon et al., 2010 for a rare discussion), it is practically non-existent in an open setting where potential players have a bevy of choices on how to spend their time. At the time the current study was performed, one of the most prominent sources for these experiences is Itch.io. This is a platform with low barriers to entry for developers, and since developers can make their games available at multiple price points or even entirely for free, it has proven to be a refuge for independent persuasive game developers in a time when games running on Adobe Flash had been rendered inaccessible to most. The current study engages with the different ways developers can use platforms like Itch.io to draw attention toward their games. More specifically, we investigated how the game's presentation text and placement of persuasive games on independent gaming platforms relate to the chances they are selected and eventually played. Three elements in a game's presentation to potential players were explored: (1) the way it is framed as an entertaining experience, (2) the way it is framed as intending to persuade its players, and (3) whether it comes recommended by automated systems or through electronic word-of-mouth (eWOM).

The way we define persuasive games relies on intent on the developers' side. Of course, would-be players do not always have access to information about developer intent. On top of that, developers themselves might not consider their games as being persuasive, opting instead for seeing their games as 'starting a discussion' (Breuer and Bente, 2010), or refusing to classify the persuasive aspect altogether by referring to their work as poetry – as with WDtCCtR. We posit that the degree to which developers are forthcoming about their intentions might impact potential players' assessment of what the game is as well as the interest they would have in playing it. When writing a description of a persuasive game, one aims to positively influence attitudes and increase the chance of selection. Therefore, it might be worthwhile for the description to appeal to what players are looking for in a game.

In line with previous studies investigating individuals' reasons for entertainment media selection (Tsay-Vogel and Krakowiak, 2016), we distinguish between hedonic and eudaimonic frames that could both drive media consumption, albeit for different reasons. If the goal is to appeal to hedonic motivations, texts should emphasize fun, enjoyment, happiness, and positive experiences (Oliver and Raney, 2011). This is true for many kinds of gaming experiences, but it is not the only way to pique player interest. Though research on the topic is nascent and a recent overview (Daneels et al., 2021a) noted diverging perspectives and operationalizations, early evidence supports the assertion that games are also played because players appreciated a game's plot and experience relatedness for in-game characters or real people (Kümpel and Unkel, 2017). At least for pro-social works, it is easy to imagine persuasive games appealing to these types of motivations. Attract texts could appeal to eudaimonic motivations by emphasizing experiences that are meaningful, reflective, and engendering a deeper understanding of a real-world issue.

> *H1*: Compared to hedonic frames, eudaimonic frames make it more likely that a persuasive game is selected over an entertainment game.

Still, the eudaimonic rewards persuasive games might have for players are epiphenomenal to games' intent. Given the rise of entertainment games that include or focus on eudaimonic gratifications (Daneels et al., 2021b), persuasive games stand out from their peers by (typically) being very clear about persuasive intent. The real-world topic they are concerned with might initially be packaged in euphemisms to avoid aversive reactions (Crecente, 2014), but these games often wear the intended influence on their sleeve. Kaufman and Flanagan (2015) recommend a blend of explicit and 'embedded' design elements, the latter of which obfuscate the game's intent to avoid psychological reactance (Brehm and Brehm, 1981) in players who recognize the persuasive attempt. Reactance can cause frustration in players, resulting in rejection of the message as well as the game itself. Of course, reactance is not a given outcome of increased persuasion knowledge (Friestad and Wright, 1994). Some tentative conclusions on persuasion knowledge in persuasive games even posit it as a positive; persuasive games are liked more when their persuasive intent is clearer to players (Jacobs, 2017, 8). The question is still open whether these games should advertise their intent beforehand.

> *H2*: Compared to obfuscated persuasive intent, explicit persuasive intent makes it more likely that a persuasive game is selected over an entertainment game.

In the current study, the entertainment frame was manipulated independently from the persuasive intent frame. Of course, their effects might overlap. Eudaimonic motivations center on meaning, reflection, and growth, while explicit persuasive intent (of a pro-social game) simply highlight that the game is intended to have players reflect or take the perspectives of others. These elements might be congruent, potentially leading to additive or amplified effects (Malliet and Martens, 2010). As there has not been any evidence to build on in this regard, we formulated the following research question:

> *RQ1*: Do entertainment and persuasive frames interact in their effects on the likelihood that a persuasive game is selected over an entertainment game?

Selection behaviors are not the only measures that could provide insight into the process from discovery to play behaviors. The current study included an interest measure to give depth to the dichotomous selection variable. Participants were also asked about their attitudes toward the game, whether they intended to play the game and, in a one-week follow-up survey, whether they actually sought out the game. Hypotheses were drawn up for the first three of these measures, following the line of argument of H1 and H2 and RQ1.

> *H3*: Compared to hedonic frames, eudaimonic frames lead to (a) greater interest to play, (b) more positive attitudes toward, and (c) more intention to play a persuasive game.

> *H4*: Compared to obfuscated persuasive intent, explicit persuasive intent leads to (a) greater interest to play, (b) more positive attitudes toward, and (c) more intention to play a persuasive game.

> *RQ2*: Do entertainment and persuasive intent frames interact in their effects on (a) interest to play, (b) attitudes toward, and (c) intention to play a persuasive game?

Furthermore, the mechanism theorized for the influence of explicit persuasive intent leans on individuals' conscious awareness of this intent (Mallinckrodt and Mizerski, 2007). Persuasion knowledge would be the primary mechanism for any effects of this variable, leading to the following hypothesis:

> *H5*: Perceived obtrusiveness mediates the relationship between persuasive intent frame and (a) likelihood of selection of, (b) interest in, and (c) attitude toward a persuasive game.

Looking beyond the elements a developer can affect directly, the current study also observed the source of recommendation as a potentially strong influence on the discovery process. Given the tendency for contemporary persuasive game developers to publish their work on independent game platforms like Itch.io, two particular recommendation sources could be salient. Online recommendations can be categorized into system- or consumer-generated varieties (Ashraf et al., 2018). System-based recommendations are automated messages from the platform, typically involving personalized elements by using aggregated user data to support the recommendation. Consumer-generated recommendations could consist of reviews or testimonials by strangers (Lin, 2014), though they are seen as most effective when they come from a peer or familiar person (Kudeshia and Kumar, 2017). Because of the personal nature of a peer-based recommendation, we expected stronger intentions to play following this type of recommendation than a system-based version. The difference is expected to be the result of the peer-based recommendation being perceived as more credible than the system-based recommendation (Luo et al., 2013).

> *H6*: Compared to a system-based recommendation, a peer-based recommendation for a persuasive game results in higher intention to play this game.

> *H7*: Recommendation source credibility mediates the relationship between recommendation source and intention to play.

The present study was designed to also give insight into whether the proximal measurement of intention to play ultimately translated into (self-reported) play behavior. Extensive prior research and theorizing on the topic demonstrated a relatively robust link between intentions and behaviors (Ajzen, 1991).

> *H8*: Intention to play a persuasive game is positively related to subsequent play behavior.

The relationships investigated in this study are displayed in a conceptual model in Figure 1.

2. Materials and methods

2.1. Design

A two (hedonic or eudaimonic entertainment frame) by two (obfuscated or explicit persuasive intent) by two (system- or peer-based recommendation) between-subjects online experiment was performed. The game 'Why did the chicken cross the road' by DatJuanDesigner was selected as the target persuasive game. Participants were exposed to stimuli in two stages to guide them through a facsimile of the process from discovery to persuasive game selection. Stimuli were mock versions of game platform pages and social media application screens. Measurements were taken directly after exposure to a manipulated game presentation text and again after exposure to a manipulated recommendation. Additionally, a follow-up survey was sent to respondents after 1 week that included measures on interest in and experiences with the game. The study's design was reviewed by the University of Twente's BMS Ethical Review board and approved for data collection on April 22nd, 2022 (reference 220404).

2.2. Participants

The sample for the current study was recruited through convenience sampling among students at the University of Twente in the Netherlands and the principal investigator's social media reach. This sampling strategy was not expected to yield strong involvement with the game's topic (the US-Mexican border). A total of 370

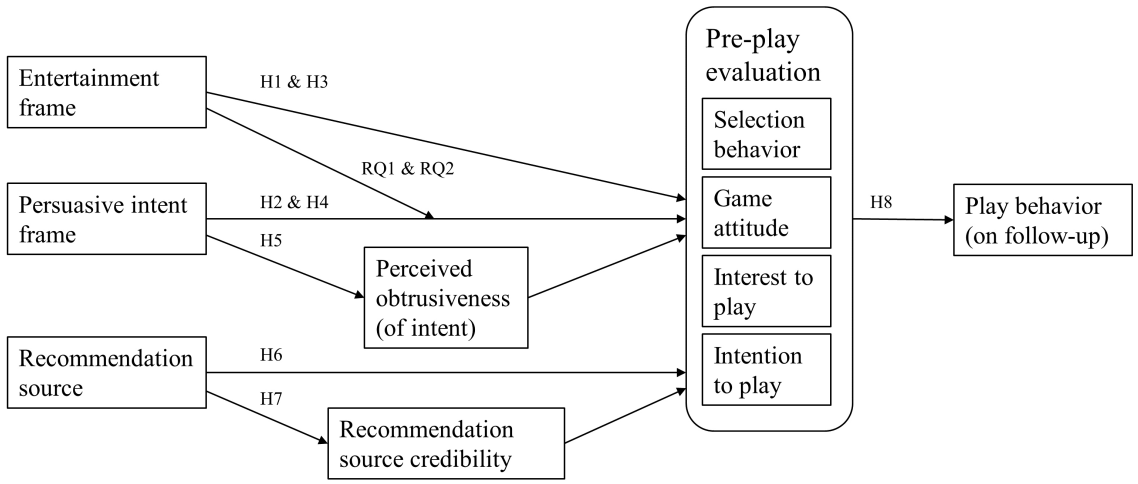

FIGURE 1
Conceptual model of the influences of presentation frames and recommendation sources on pre-play evaluations and subsequent play behavior. Pre-play evaluation variables are encapsulated to improve readability.

TABLE 1 Distribution of respondents across conditions.

	Entertainment frame: *Hedonic*		Entertainment frame: *Eudaimonic*	
	Persuasive intent frame: *obfuscated*	Persuasive intent frame: *explicit*	Persuasive intent frame: *obfuscated*	Persuasive intent frame: *explicit*
Source of recommendation: *System-based*	$N = 39$ 71.8% female	$N = 35$ 80.0% female	$N = 39$ 64.1% female	$N = 42$ 66.7% female
Source of recommendation: *Peer-based*	$N = 43$ 69.0% female	$N = 39$ 57.9% female	$N = 35$ 48.6% female	$N = 38$ 78.4% female

respondents met the inclusion criteria of being at least 18 years old. After removing incomplete responses (49) and respondents who did not stay on the stimulus pages for at least 20 s (11), a full sample of ($N = 310$) participants were included for data analysis. Of the full sample, 206 (66.5%) were women, and 101 (32.6%) were men. The average age was 36.20 years ($SD = 14.40$), with a mode of 25 ($N = 22$). Most respondents had either a considerable amount of experience playing games (129, 41.6%) or at least some (70, 22.6%), with 111 respondents (35.8%) claiming little to no experience with the medium. Finally, almost all respondents were European (266, 85.8%), but there were also respondents from the United States of America (37, 11.9%) that might have deviated from the rest of the sample in terms of their involvement with the issue. The distribution of the sample across conditions is shown in Table 1.

2.3. Stimuli

The game 'Why did the chicken cross the road?' (WDtCCtR) was chosen as the target persuasive game because of (among others): its free availability, online accessibility, and short play time which minimized barriers to play; its innocuous metaphor-based visual theming which forces potential players to rely on textual cues to get a sense of the game; its messaging as a pro-social persuasive game; and its relative obscurity helping to prevent familiarity among respondents. The game's messaging regards the motivations of migrant workers and refugees to cross the Mexico-US border without going through customs. The game demonstrates the hardships these groups of people face through colloquial phrases and anecdotes often voiced by these groups and opponents of this practice in the US. WDtCCtR encourages players to gather more information through charity organizations as well as to donate to help migrant workers and refugees.

2.3.1. Framing presentation text

Four different descriptions of WDtCCtR were composed, differentiated by their entertainment and persuasive intent frames. Table 2 shows the presentation texts with manipulated elements highlighted. The texts included a basic description that was constant across conditions. In line with common distinctions between hedonic and eudaimonic experiences, entertainment frames focus on presenting the game as either a distracting, enjoyable experience or as a meaningful, insightful experience that challenges players' worldviews. Independently, the game's persuasive intent was either obfuscated, by presenting it as an adventure game about work and life struggles that raises awareness (without referring to its topic concretely), or made explicit by describing it as a persuasive game that aims to increase sympathy for migrant workers and refugees. In keeping with their positioning as a blurb or attract text, the texts ranged in size from 59 to 69 words across the four versions. The texts were shown together with WDtCCtR's title screen, which displayed the titular question above a pixel drawing of a yellow chicken standing on a gray road with a yellow background.

TABLE 2 Game presentation text manipulations.

		Persuasive intent frame	
		Obfuscated	*Explicit*
Entertainment Frame	*Hedonic*	Escape daily life for a bit, playing *Why did the chicken cross the road?* You must talk to other animals to find the answer to that question. This five-minute **adventure game** offers an enjoyable experience about **work and life struggles**. It aims to **raise awareness** for these struggles. It has a storyline that makes you want to continue playing; you will have fun!	Escape daily life for a bit, playing *Why did the chicken cross the road?* You must talk to other animals to find the answer to that question. This five-minute **persuasive game** offers an enjoyable experience about **work and life struggles of migrant workers and refugees**. It aims to **increase your sympathy** for these struggles. It has a storyline that makes you want to continue playing; you will have fun!
	Eudaimonic	Gain some insight, playing *Why did the chicken cross the road?* You must talk to other animals to find the answer to that question. This five-minute **adventure game** offers a meaningful experience about **work and life struggles**. It aims to **raise awareness** for these struggles. It has a touching storyline; your way of viewing the world will be challenged!	Gain some insight, playing *Why did the chicken cross the road?* You must talk to other animals to find the answer to that question. This five-minute **persuasive game** offers a meaningful experience about **work and life struggles of migrant workers and refugees**. It aims to **increase your sympathy** for these struggles. It has a touching storyline; your way of viewing the world will be challenged!

Entertainment frame elements are underlined and persuasive intent frame elements are in bold.

2.3.2. Recommendations

Next, to the frames, the current study also investigated recommendation sources as a potential influence in the persuasive game discovery and selection process. Two types of recommendations were created; one representing the automatic recommender systems integrated into contemporary media and online shopping platforms, and one representing eWOM through a peer recommending the game via social media. Both stimuli (see Figure 2) were presented on a mock-up phone screen with a short introduction text to brief respondents. In the system-generated recommendation conditions, participants were asked to imagine encountering a recommendation after playing a few games on Itch.io. The recommendation was formatted to look like an Itch.io page and read "Based on the previous games you played, we think you might also like" followed by the WDtCCtR splash page and the text "A 5 min game with the answer!" (referring to the question in the game's title). The peer-based recommendation was preceded by a briefing message asking participants to imagine getting messaged by a friend on WhatsApp. The stimulus itself took the form of a screen from a conversation on this platform. The messages started with "Check this," followed by a link to WDtCCtR. The account holder is seen responding with "Whats that?." The friend's messages then read "A game. I liked it, you should try it too. Its only 5 min. And then you know the answer." Neither stimulus was interactive.

2.4. Procedure

Data collection took place online between May 19th, 2022 and June 12th, 2022. Participants accessed the Qualtrics survey via a direct link. The Qualtrics survey was optimized for computer and smartphone users. After informed consent, participants were asked for demographic information, including experience and affinity with gaming. Participants were then randomly assigned to one of four presentation text conditions. They were asked to evaluate three pairs of games and choose which game they would prefer to play within each pair. Each pair consisted of an identical background image with different presentation texts and titles per game. The first and last pair shown were distractors. The second pair showed WDtCCtR next to a fictitious game called "Back and Forth" (BaF), with both showing the same image of a chicken standing on a road. BaF's presentation text was identical across conditions: "Back and forth is a game made for your entertainment. You have to get to the other side of a dangerous road and back again as often as you can. With each crossing, you can gain points. But watch out! You have to do so without getting hit by one of the many cars and losing a valuable life. With easy controls, you can play for as long as you like." Participants rated their interest in playing each of the six games separately.

Following on from the pairs, participants were informed they would be asked specific questions about one of the games, which was invariably WDtCCtR. They then filled in scales of measures relating to attitudes toward the game and the perceived obtrusiveness of the game's persuasive intent. Directly afterwards, participants were again randomly assigned to one of the two recommendation conditions. They were shown a briefing and one of the mock-ups of the game (system-based) or social media (peer-based) platform. Finally, participants filled in scales relating to intention to play the game and recommendation source credibility and responded to manipulation check questions asking if the presentation made the game seem like 'simple fun' or to 'make me think' as well as asking if the text made the game seem like it was designed 'to influence me'. The recommendation source manipulation checks included asking who recommended the game and how realistic the recommendation was to respondents.

Since WDtCCtR is a freely available, real game, we decided to include a second stage in the study. Directly after finishing the survey, respondents were informed where and how to find the game. Around a day after participating, participants were sent a message reminding them of WDtCCtR. This message also included a link to the game. None of these messages included any more information on the game, nor did they encourage participants to try the game. One week after participation, participants were approached to fill in a short follow-up survey. This brief survey only included questions and scales about behaviors regarding the game and scales focusing on attitudes toward the topic of migrant workers and refugees.

2.5. Measurement

Responses were collected for seven scales, staggered across four stages during the study protocol. Before stimuli were shown,

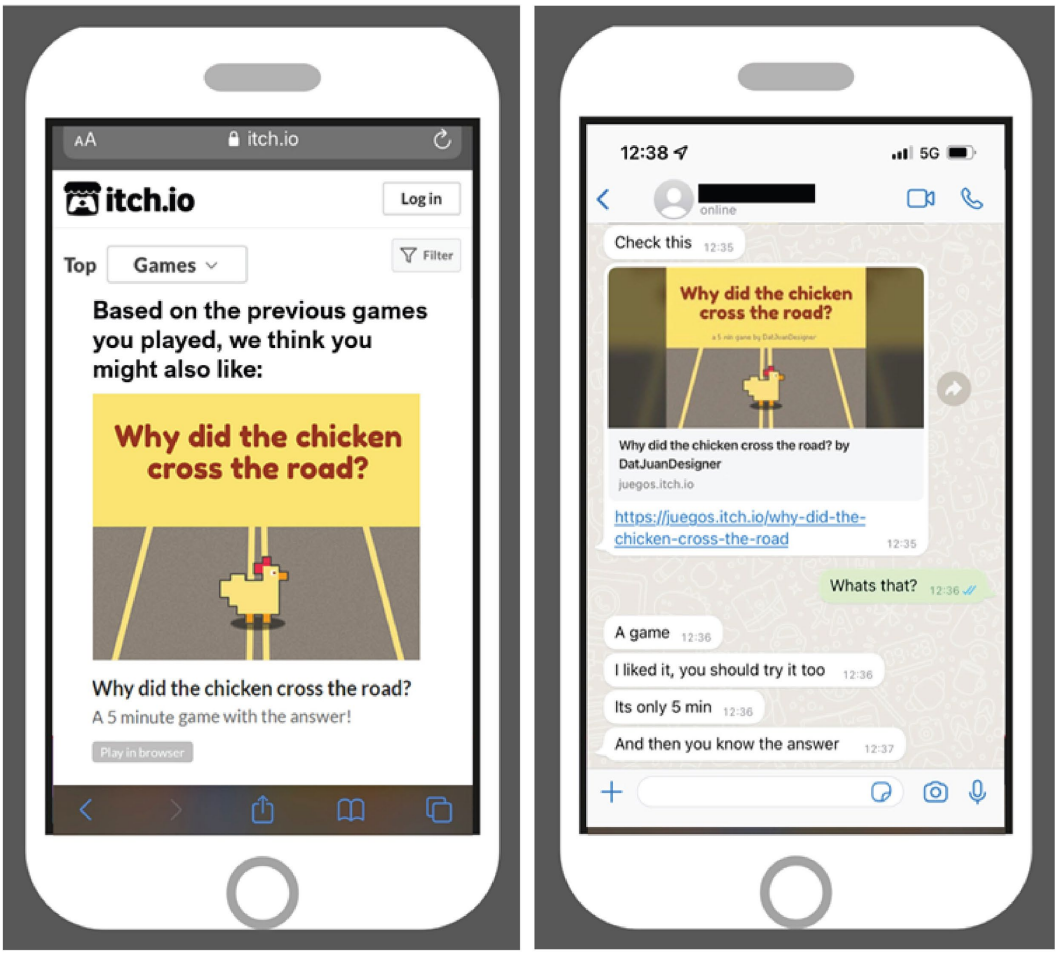

FIGURE 2
Recommendation source stimuli. Left: system-generated recommendation. Right: peer-based recommendation. Game images (DatJuanDesigner, 2020) and itch.io logo reproduced with permission of DatJuanDesigner and itch.io.

participants filled in a scale relating to attitudes toward gaming. Scales on attitude to WDtCCtR and perceived obtrusiveness of the game's messaging were shown directly after the presentation text stimuli. Following the recommendation stimuli, participants could respond to scales on intention to play and recommendation source credibility. In the follow-up survey, scales revolved around attitudes toward migrant workers and refugees and willingness to help this group. All scales were designed in English but were also available in Dutch. After data collection, all scales were included in one confirmatory factor analysis and subjected to individual reliability analyses. The measures below are the result of these analyses. Unless otherwise specified, scale response options were 7-point Likert scales.

2.5.1. Attitude toward gaming

Five polar items were used to have players indicate whether they found playing games to be undesirable/desirable, not enjoyable/enjoyable, negative/positive, boring/interesting, and harmful/beneficial. These items were adapted from Wang and Hollett's (2022) scale on physical activity. The scale's scores demonstrated high internal consistency (Cronbach's $\alpha = 0.94$).

2.5.2. Attitude toward the persuasive game

The attitude toward the persuasive game included after exposure to the game pairs was measured using a scale adapted from Vanwesenbeeck et al. (2017). Participants were asked to indicate on a seven-point semantic differential scale how they felt about the game, based on the description they had read. The adjectives used were unappealing/appealing, unpleasant/pleasant, dull/dynamic, unattractive/attractive and not enjoyable/enjoyable. This scale's scores demonstrated high internal consistency (Cronbach's $\alpha = 0.94$).

2.5.3. Perceived obtrusiveness

Perceived obtrusiveness was a five-item scale adapted from Jacobs (2017) and from Tutaj and Van Reijmersdal (2012). Changes were made to account for the prospective nature of the assessment. An example item is "The aim of the game [WDtCCtR] is to influence my opinion." This scale's scores were internally consistent (Cronbach's $\alpha = 0.82$).

2.5.4. Intention to play

Four items from Spears and Singh (2004) were adapted to the current context. This polar item scale asked participants whether they probably would not play/probably would play, have low/high interest

in playing, definitely do not intend to play/definitely do intend to play and would definitely not play/would definitely play. This scale's scores demonstrated high internal consistency (Cronbach's $\alpha = 0.97$).

2.5.5. Recommendation source credibility

This five-item polar scale included four items from Amelina and Zhy (2016) and one item from Filieri et al. (2015). Participants were asked to indicate to what extent they thought the source giving them the recommendation was not at all trustworthy/very trustworthy, not at all reliable/very reliable, not at all sincere/very sincere, not at all honest/very honest, and not at all credible/very credible. This scale's scores demonstrated high internal consistency (Cronbach's $\alpha = 0.97$).

2.5.6. Attitudes toward migrant workers and refugees

One week after being exposed to the manipulated messaging about the game, a scale focusing on attitudes toward migrant workers and refugees was shown to participants. Four items were adapted from Igartua et al. (2019) and McConahay et al. (1981) with some changes to fit the current context. An example item from this scale was "Migrant workers and refugees are getting too demanding in their push for better treatment." The scale's scores showed sufficient internal consistency (Cronbach's $\alpha = 0.79$).

2.5.7. Willingness to help

The final scale was a three-item willingness-to-help scale. Following van't Riet et al. (2018) participants could indicate how likely they were to perform three specific behaviors. These behaviors were (1) to donate money to a charity helping refugees and migrant workers, (2) to discuss the situation of refugees and migrant workers with their friends or family, and (3) to do volunteer work involving refugees and migrant workers. This scale's scores showed sufficient internal consistency (Cronbach's $\alpha = 0.77$).

2.5.8. Other measures

Directly below each pair of games, participants were asked which of the two games they would prefer to play. This single binary item was only analyzed for the second pair, which included the manipulated texts. Within the sample, 141 participants (45.5%) indicated wanting to play WDtCCtR over the fictitious entertainment game. Interest to play was measured separately with a single item for each of the six games. Responses were given on a scale from 0 (not at all interested) to 100 (very interested). Across all conditions, respondents were not very interested in playing the persuasive game ($M = 36.20$, $SD = 27.04$).

In the follow-up survey, participants were asked three consecutive questions about their behavior with WDtCCtR with yes/no response options. The first was whether they tried to access the game after the study ended. A total of 52 participants (16.8%) had done so. Of those, 40 (12.9% of the full sample) had started playing, and 26 (8.4%) had finished the game entirely.

2.6. Data analysis

All analyses were performed with IBM SPSS Statistics v26 and, where applicable, the PROCESS procedure for SPSS v4.2 (Hayes, 2018). Hypothesis and research question testing involved binary logistic regressions (H1, H2, H8, RQ1) Multivariate ANOVAs (H3, H4, RQ2), model 4 of the PROCESS macro (H5, H7), and a univariate ANOVA (H6). Additional analyses employed the same procedures, though linear regression analyses and independent-samples *t*-tests were also performed. The dataset and syntax used for the full set of analyses are available online.[1]

3. Results

3.1. Hypothesis testing

3.1.1. Framing entertainment and persuasive intent

A logistic regression was performed to test the first and second hypotheses, which stated that eudaimonic entertainment and explicit persuasive intent frames would lead to greater likelihood that a persuasive game is selected over an entertainment game, as well as the first research question, which involved an interaction between both independent variables. Across all conditions, 45.5% of participants selected WDtCCtR. In the condition where a eudaimonic and an explicit persuasive intent frame were combined, 54.8% of participants chose the persuasive game. A model that included both manipulated frame variables and an interaction term as predictors and selection likelihood as the dependent variable was not significant [X^2 (3, $N = 310$) = 3.36, $p = 0.340$]. Neither entertainment frame nor persuasive intent helped to predict when respondents would choose WDtCCtR over its entertainment counterpart. Hypotheses 1 and 2 are both rejected following this outcome. The answer to RQ1 is that there is no evidence for an interaction between both types of frame on the likelihood that the persuasive game is selected.

Hypotheses 3 and 4 and research question 2 centered on the influences that entertainment and persuasive intent frames have on the interest in, attitude toward, and intention to play a persuasive game. A multivariate analysis of variance (MANOVA) was performed with these outcome variables and both main effects and the interaction term of the two manipulated variables. Across all three dependent variables, both main effects were not significant [Entertainment frame: $F(3, 304) = 0.37$, $p = 0.772$, Wilk's $\Lambda = 1.00$, Persuasive intent frame: $F(3, 304) = 0.90$, $p = 0.442$, Wilk's $\Lambda = 0.99$]. The interaction term was also not significant over all dependent variables [$F(3, 304) = 2.39$, $p = 0.069$, Wilk's $\Lambda = 0.98$]. None of the dependent variables were significantly affected by the two main effects, but the interaction effect was significant for all three dependent variables individually (Interest: $F(1, 306) = 6.29$, $p = 0.020$, $\eta^2_p = 0.02$, Attitude: $F(1, 306) = 4.08$, $p = 0.013$, $\eta^2_p = 0.01$, Intention: $F(1, 306) = 4.50$, $p = 0.014$, $\eta^2_p = 0.01$], though effects were very small. Figure 3 shows the direction of the interaction effect. Within hedonic entertainment frame conditions, there are no substantial differences between obfuscated and explicit intent on interest in ($M_{obf} = 37.39$, $SD_{obf} = 22.67$, $M_{exp} = 33.96$, $SD_{exp} = 28.70$), attitude toward ($M_{obf} = 3.73$, $SD_{obf} = 1.26$, $M_{exp} = 3.66$, $SD_{exp} = 1.52$), or intention to play WDtCCtR ($M_{obf} = 3.60$, $SD_{obf} = 1.55$, $M_{exp} = 3.39$, $SD_{exp} = 1.79$). However, for those who saw the game presented with a eudaimonic frame, differences

1 https://doi.org/10.17605/OSF.IO/J7Y56

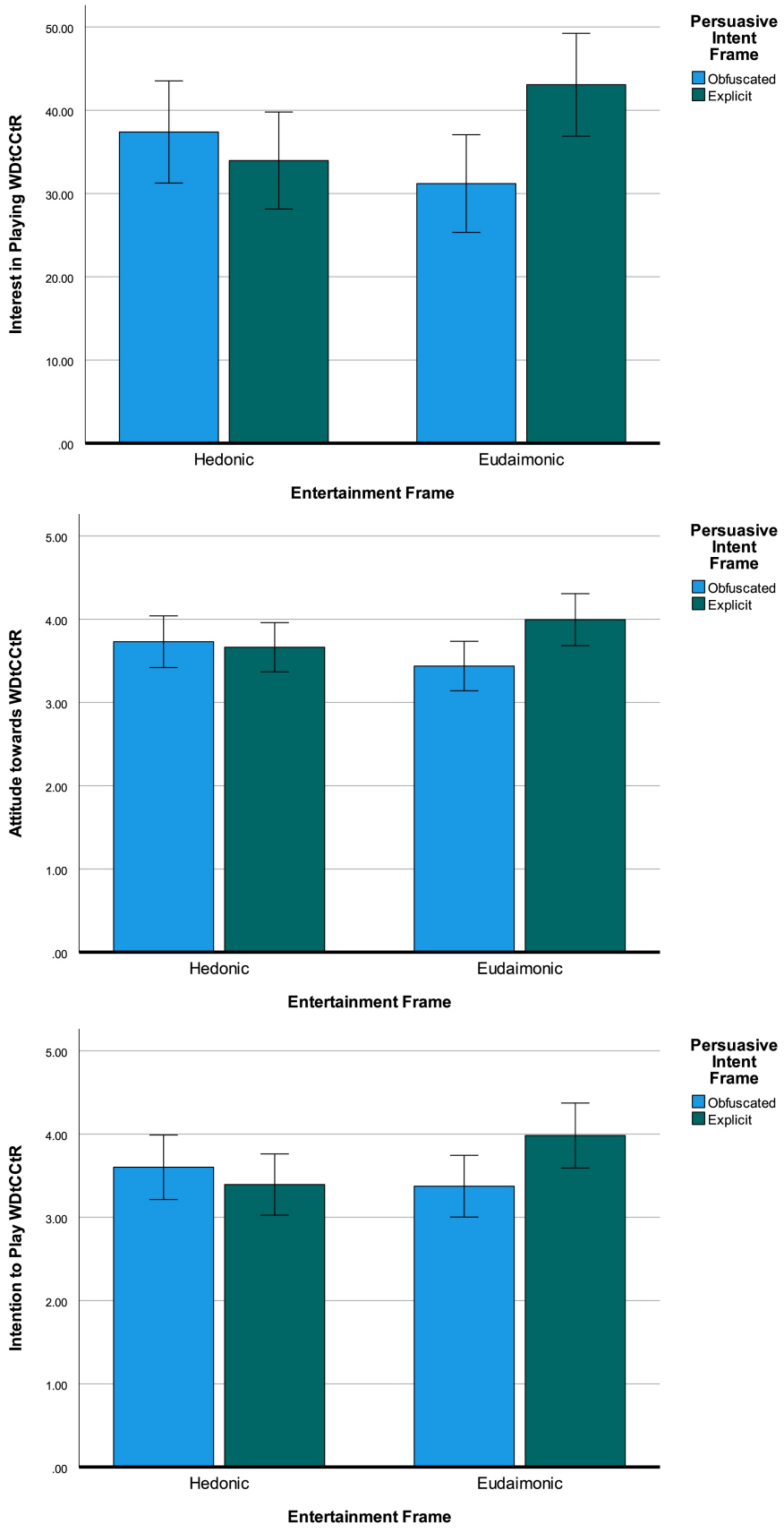

FIGURE 3
Graphs showing the interaction effect of entertainment and persuasive intent frames on interest in playing the game (top), attitude toward the game (middle), and intention to play the game (bottom). Error bars note 95% confidence intervals.

between obfuscated and explicit persuasive intent were more pronounced. Combined with a eudaimonic frame, explicit persuasive intent led to higher interest in (M_{obf} = 31.20, SD_{obf} = 26.38, M_{exp} = 43.07, SD_{exp} = 28.88), attitude toward (M_{obf} = 3.44, SD_{obf} = 1.36, M_{exp} = 3.99, SD_{exp} = 1.25), and intention to play the persuasive game (M_{obf} = 3.37, SD_{obf} = 1.77, M_{exp} = 3.98, SD_{exp} = 1.64) than obfuscated persuasive intent did. Hypotheses 3 and 4 are rejected. The answer to RQ2 is that explicit persuasive intent only led to more positive assessments of the game when combined with a eudaimonic frame.

The fifth hypothesis, which held that the effects of persuasive intent frame on (a) likelihood that the persuasive game is selected, (b) interest in playing this game, and (c) attitudes toward the game are mediated by perceived obtrusiveness, cannot be confirmed given the outcomes for hypotheses 2 and 4. The mediation analyses were still performed to determine whether an indirect effect could be established. Mediation analyses were performed with model 4 of the SPSS PROCESS (Hayes, 2018). An overview of results is shown in Figure 4. Firstly, persuasive intent frame had a significant effect on perceived obtrusiveness [β = 0.31, t(1, 308) = 5.63, p < 0.001]. An obfuscated persuasive intent frame was perceived as less obtrusive (M = 3.88, SD = 1.13) compared to explicit persuasive intent frame (M = 4.60, SD = 1.10).

Starting with H5a, a negative relationship between perceived obtrusiveness and selection behavior (a dichotomous variable) was found to be significant [b = −0.37, SE b = 0.11, Z (2) = −3.40, p = 0.007]. To illustrate: participants who chose *WDtCCtR* tended to find this game's persuasive intent significantly more obtrusive (M = 4.50, SD = 1.11) compared to those who chose the entertainment game (M = 4.02, SD = 1.18). The model as a whole explained between 4.2% (Cox and Snell R-square) and 5.6% of the variance in selection behavior. The indirect effect of persuasive intent frame on selection behavior was significant (*indirect effect* = −0.27, SE = 0.09, 95% CI [−0.47, −0.12]). As the direct effect of persuasive intent frame on selection behavior was insignificant (*direct effect* = 0.02 SE = 0.24, 95% CI [−0.45, 0.50]), there was no evidence to say perceived obtrusiveness mediated this (non-significant) relationship.

Second, we investigated if perceived obtrusiveness mediated the effect of persuasive intent frame on interest to play. Perceived obtrusiveness yielded a moderate, positive, significant relationship with interest to play [β = 0.38, t(309) = 6.76, p < 0.001]. The indirect effect of persuasive intent frame on interest to play was significant (*partially standardized indirect effect* = 0.23, SE = 0.05, 95% CI [0.13, 0.34]). Yet both the total effect [β = 0.15, t(309) = 1.33, p = 0.183] and the direct effect [β = −0.08, t(309) = −0.70, p = 0.483] were insignificant, meaning that there was no evidence for mediation occurring. Looking finally at H5c, perceived obtrusiveness was moderately, positively, and significantly related to attitude [β = 0.41, t(309) = 7.47, p < 0.001]. When looking at the total effect of the persuasive intent frame on attitude toward the persuasive game, this was not significant [β = 0.18, t(309) = 1.57, p = 0.118]. Also, the direct effect of persuasive intent frame on attitude was insignificant [β = −0.07, t(309) = −0.66, p = 0.511]. Although the indirect effect of persuasive intent frame on attitude was significant (*partially standardized indirect effect* = 0.25, SE = 0.06, 95% CI [0.15, 0.37]), though obtrusiveness was not found to mediate the relationship between persuasive intent frame and attitude toward the game.

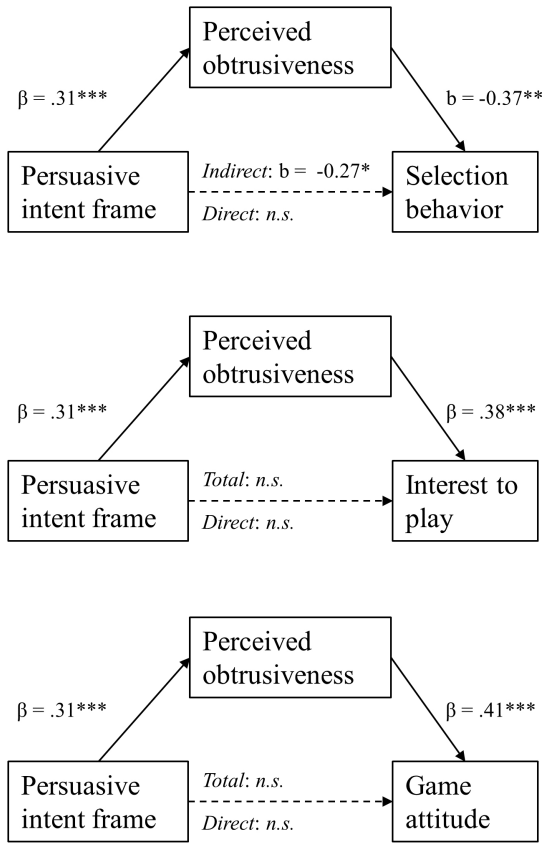

FIGURE 4
Empirical pathway models on the mediating relationship of perceived obtrusiveness on the effect of persuasive intent frame on selection behavior (top), interest to play the game (middle), and attitude toward the game (bottom).

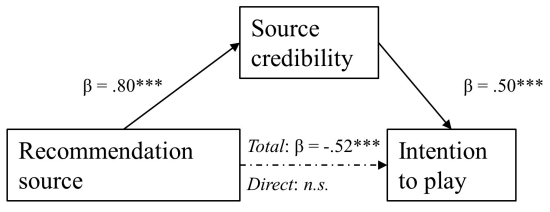

FIGURE 5
Empirical pathway models on the mediating relationship of source credibility on the effect of recommendation source on intention to play.

3.1.2. Recommendation source

Hypothesis 6 assumed that a peer-based recommendation would lead to higher intention to play compared to a system-generated recommendation. An ANOVA was performed with recommendation source as the independent variable and intention to play as the dependent variable. The model was significant [F(1, 308) = 22.30, p < 0.001, η^2_p = 0.07], with a moderate effect size. Peer-based recommendations led to significantly higher intention to play (M = 4.04, SD = 1.73) than system-based ones (M = 3.15, SD = 1.57). As a result, hypothesis 6 is retained.

To test hypothesis 7, which was concerned with the effect of source of recommendation on playing intentions being mediated by perceived source credibility, Model 4 of PROCESS by Hayes was once more adopted. An overview of results is shown in Figure 5. Source of

recommendation had a significant effect on perceived source credibility [$\beta = 0.80$, $t(309) = 9.36$, $p < 0.001$]. Peer recommendations led to higher perceived source credibility ($M = 4.76$, $SD = 1.34$) than a system-generated recommendation ($M = 3.55$, $SD = 1.46$). Source credibility in turn was positively and significantly related to intention to play [$\beta = 0.50$, $t(309) = 9.36$, $p < 0.001$]. When looking at the total effect of source of recommendation on intention to play the persuasive game, this was significant [$\beta = -0.52$, $t(309) = -4.72$, $p < 0.001$]. Meanwhile, the direct effect of source of recommendation on intention to play was insignificant [$\beta = -0.12$, $t(309) = -1.17$, $p = 0.244$]. As the indirect effect of source of recommendation on intention to play was significant (*partially standardized indirect effect* = −0.40, $SE = 0.07$, 95% CI [−0.55, −0.27]) there was enough evidence to assume that this relationship was fully mediated by perceived source credibility. Therefore, hypothesis 7 is retained.

3.1.3. Follow-up survey

Closing off the hypothesized relationships, we tested H8, which predicted a positive relationship of intention to play with subsequent play behavior. The variable indicating whether or not people reported trying to find WDtCCtR online was taken as the dependent variable. A logistic regression analysis was performed with intention to play the game as the predictor. This resulted in a significant full model [X^2 (1, $N = 287$) = 11.41, $p < 0.001$] that explained between 3.9% (Cox and Snell R Square) and 6.4% (Nagelkerke R Square) of the variance in playing behavior. It correctly classified 81.9% of the cases. Each point increase in intention to play (on a scale from one to seven) led to a 38% increase in odds that one attempted to access *WDtCCtR* ($b = 0.32$, $SE = 0.10$, $p = 0.001$, Exp (b) = 1.38, 95% CI [1.14, 1.67]). Therefore, it can be concluded that intention to play is positively related to subsequent playing behavior and hypothesis 8 is retained.

3.2. Additional analyses

In addition to hypothesis tests, four additional avenues were explored within the current study's dataset. These four avenues were (1) the exploration of how much of the variance in playing intention (measured at the end of the main survey) could be predicted from the manipulated and measured variables included in the study; (2) the exploration of potential relationships between the manipulated variables and source credibility; (3) confirming any connection of the manipulated variables with self-reported play behavior in the follow-up survey; and (4) a tentative exploration of how the study's variables relate to individuals' attitudes toward the game's topic (also measured in the follow-up survey).

A linear regression analysis was performed to determine how well the independent variables entertainment frame, persuasive intent frame, perceived obtrusiveness, attitude, interest to play, source of recommendation, and source credibility were able to predict intention to play a persuasive game. The results showed that a model which included these variables explained 52.2% of the variance in intention to play the persuasive game [$F(7, 302) = 47.11$, $p < 0.001$, Adjusted $R^2 = 0.51$]. Recommendation source, interest to play, attitude, and source credibility were significant predictors in the model. The strongest contribution was made by source credibility ($\beta = 0.37$, $p < 0.001$), which was a moderate positive predictor of intention to play when controlling for the other included independent variables. Interest to play ($\beta = 0.29$, $p < 0.001$), attitude ($\beta = 0.22$, $p < 0.001$), and source of recommendation ($\beta = 0.12$, $p = 0.009$) were weak positive predictors of intention to play. This final result is surprising, as the mediation analysis performed to find support for H7 pointed to full mediation. As the only difference between this significant relationship and the insignificant direct effect found in that analysis is the inclusion of more independent variables in this last linear regression, explanations need to be sought among the other predictors of intention to play.

Next, as recommendation source credibility was measured after all manipulated variables had been shown to respondents, there might have been influences on this variable from the two framing manipulations included before. In an ANOVA where both frames and recommendation source were taken into account as main effects and the interaction terms between either frame manipulation and recommendation source were included yielded a significant outcome for recommendation source credibility. While the main effects of both framing variables were not significant [Entertainment: $F(1, 304) = 2.88$, $p = 0.091$, Persuasive intent: $F(1, 304) = 0.05$, $p = 0.830$] and the interaction between entertainment frame and recommendation source was also insignificant [$F(1, 304) < 0.01$, $p = 0.983$], the interaction term between persuasive intent frame and recommendation source was significant [$F(1, 304) = 5.39$, $p = 0.021$, $\eta^2_p = 0.02$]. This interaction effect is shown in Figure 6. Inspection of mean differences reveals that for both an obfuscated ($M = 4.60$, $SD = 1.32$) and an explicit persuasive intent frame ($M = 4.92$, $SD = 1.34$), a peer-based recommendation led to significant increases in source credibility compared to a system-generated recommendation ($M_{obf} = 3.75$, $SD_{obf} = 1.41$, $M_{exp} = 3.33$, $SD_{exp} = 1.48$). The effect of the source of recommendation was amplified when the persuasive intent frame was explicit; the difference between the two types of sources was larger for explicit frames than it was for obfuscated frames. It is important to note that the size of this effect was quite small.

Third, a hierarchical logistic regression was performed to first test for any potential influence of the study's experimental manipulations on self-reported play behavior. Entertainment and persuasive intent frames as well as recommendation source were included in the first step, with interest to play, attitude toward, and intention to play included together with perceived obtrusiveness, recommendation source credibility, and general attitude toward gaming included in the second step. The first step did not yield a significant model [$X^2(3, N = 287) = 0.37$, $p = 0.947$], meaning that none of the experimental manipulations caused respondents to be more or less likely to have sought out the game within a week after exposure. At step 2, the results showed that the full model was significant [$X^2(9, N = 287) = 35.33$, $p < 0.001$] and thus was able to distinguish between those who did try to access the game and those who did not. As a whole, the model explained between 11.6% (Cox and Snell R Square) and 18.9% (Nagelkerke R Square) of the variance in playing behavior and correctly classified 82.9% of the cases. Attitude toward gaming in general was the only significant predictor of self-reported play behavior ($b = 0.36$, $SE = 0.14$, $p = 0.008$), with an odds-ratio of 1.44 indicating that for every one point (out of 7) one would be more interested in gaming, their likelihood to have sought to play the game would be predicted to have risen by 43.9%. Interest in WDtCCtR itself was not a significant predictor ($b = 0.02$, $SE = 0.01$, $p = 0.057$), though it was closer to the threshold of $p = 0.05$ than any of the other variables. A simple linear regression confirmed that general attitude toward

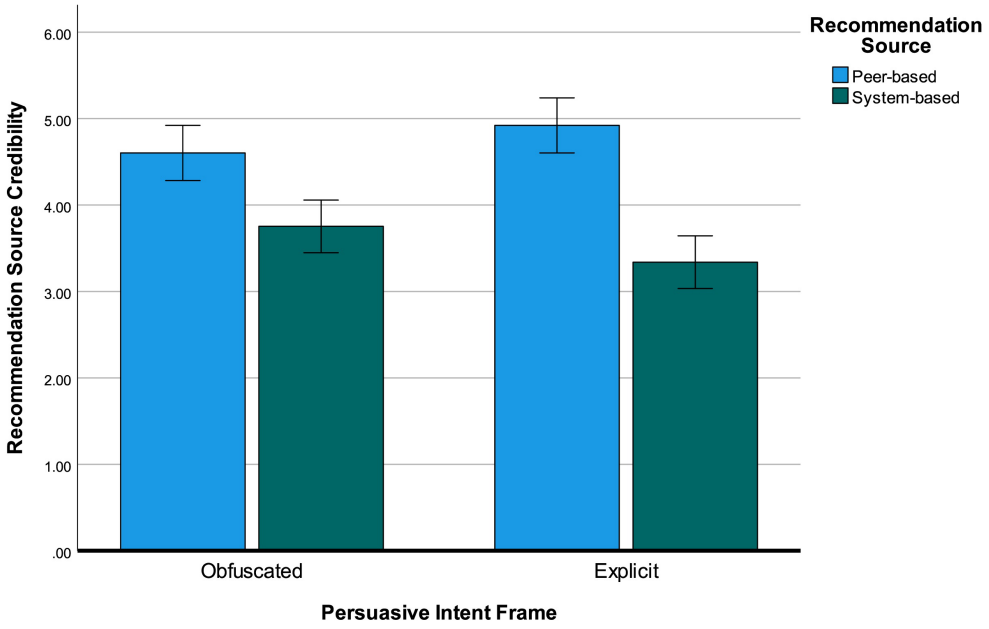

FIGURE 6
Graph showing the interaction effect of persuasive intent frame and recommendation source on source credibility. Error bars note 95% confidence intervals.

gaming was a moderate predictor of interest in playing WDtCCtR [$F(1, 308) = 71.88$, $p < 0.001$, $\beta = 0.44$] and intention to play this game [$F(1, 308) = 28.98$, $p < 0.001$, $\beta = 0.29$]. More avid gamers were more interested in the game.

The final additional analyses engaged with the attitudes people reported holding toward the issue WDtCCtR focuses on. An overall linear regression with the manipulated variables as well as interest to play, attitude toward, intention to play, perceived obtrusiveness, recommendation source credibility and individuals' attitudes toward gaming in general indicated that these variables could not significantly predict attitudes toward migrant workers and refugees [$F(9, 277) = 1.23$, $p = 0.277$], though it did serve to predict willingness to help [$F(9, 277) = 2.01$, $p = 0.038$]. The only significant predictors in this model were general attitude toward gaming ($\beta = -0.17$, $p = 0.012$) and interest to play WDtCCtR ($\beta = 0.19$, $p = 0.034$). General attitude toward gaming was a weakly negative predictor, while interest in the game was a weakly positive predictor of willingness to help migrant workers and refugees. Independent samples t-tests showed that there were no significant differences between those participants who did and those who did not seek out the game in terms of attitudes [$t(285) = 0.71$, $p = 0.480$] or willingness to help [$t(285) = -0.08$, $p = 0.940$].

4. Discussion

4.1. Discussion of results

The current study investigated the influences of entertainment and persuasive intent frames together with system- and peer-based recommendations on interest in and intention to play a persuasive game. It was clear from the results of this study that entertainment and persuasive intent frames by themselves do not directly affect assessments of this persuasive game. Looking beyond this, frames also do not make it more or less likely that the game is eventually sought out. The pattern of findings beyond this initial result was more intricate, however.

We did find an effect when two specific frames were combined. Being more or less open about the game's persuasive intent did not seem to matter for participants who were exposed to a hedonic entertainment frame. However, when the text that presented the game emphasized that it would make players think about this topic, interest, attitudes, and intent decreased when persuasive intent was implicit and increased when it was explicit. This effect did not cause participants to select the persuasive game over a similar entertainment game on first exposure, though. These findings could be indicative of a congruence effect (Malliet and Martens, 2010), where texts were seen as consistent if they presented the game as being fun or if they presented the game as eudaimonically gratifying. In the latter case, this would clearly serve to position its persuasive intent as benign; players are invited to reflect on a real-world issue, rather than feeling threatened and pushed to act (conform Staunton et al., 2022). Persuasive intent frames themselves were only indirectly related to selection behaviors and assessments, through obtrusiveness. Explicit persuasive intent frames had an effect on obtrusiveness, which was in turn predictive of interest in the game. The absence of any direct effects in spite of this sizeable indirect link can be interpreted in different ways. While it could be possible that only those who perceived the text as obtrusive (regardless of frame condition) were made to recognize the description as being congruent with a game that aims to persuade as a result of obtrusiveness, the current dataset offers no way to confirm or deny this explanation.

One outcome that was expected was the influence of getting the game personally recommended by a peer compared to a

system-generated recommendation. Even within the artifice of the experiment, participants who viewed a peer-based recommendation reported higher play intentions. As current knowledge on the mechanisms of effect of online recommendation systems would suggest (Cheung et al., 2009; Ashraf et al., 2018), this influence was fully mediated by source credibility – at least when no other variables were considered. A small effect from recommendation source on intention to play was found even when source credibility was included only when interest to play and attitude toward the game were also included. These variables preceded exposure to the recommendation stimulus, so including them in the additional linear regression might have made an additive positive effect of the peer recommendation visible next to its mediator, source credibility. Again, since just recommendation source was manipulated and the final effect was quite small, this finding throws up more questions than the current study can answer. What is clear is that for the low-involved participants of the current study, system-generated recommendations are not very persuasive.

The interaction effect between source of recommendation and persuasive intent frames found in the additional analyses provides further evidence for the position that participants were looking for information about WDtCCtR to make their decision whether or not to play it. Having a peer recommend a game that was previously explicitly advertised as persuasive feeds into perceptions of recommendation source credibility. In this and previous findings, entertainment and persuasive intent frames seem to act as cues; they are not necessarily sufficient by themselves to shift attitudes, but are taken into account together with other cues offered simultaneously or subsequently. When these cues are congruent, their aggregate effects give would-be players more certainty in their decisions.

There is a complex set of relationships between individual variables like attitude toward gaming in general and evaluations of the game as well as with self-reported play behavior in the one-week follow-up. Intention to play is likely to be the result of a combination of cues about the game and assessments where those cues are coming from. Looking beyond intention to play, complexity grows even further. When tested separately, intention to play WDtCCtR was positively related to one's efforts in subsequently putting in effort to play the game. When the full range of variables that was measured during this study were taken into account, it turned out that it was actually the attitudes someone holds toward gaming in general, rather than interest in or intention to play, that predicted the likelihood that someone tried to play this game. A potential explanation for this could be that participants 'played along' with the study's artificial texts and phony recommendations, but that only those participants who already had a prior interest in gaming held onto that interest after the study was over and real life resumed. Support for this explanation comes from attitudes toward gaming positively predicting interest and intention within the study as well. Frequent players were more interested in the game regardless of cues, and it was that contingent of participants who demonstrated affinity with the medium that was more likely to actually try WDtCCtR.

Finally, we found that none of the variables included here could predict players' attitudes toward migrant workers or refugees. As this was not a study that exposed players to the actual game as part of its manipulations, this finding cannot be taken to mean WDtCCtR is not effective in changing players' attitudes. It does mean that the cues that were tested here did not evoke more interest among potential players who were already invested in this issue beforehand. The two remarkable findings were that attitudes toward gaming in general and interest in the game itself both predicted willingness to help migrant workers and refugees. The two had opposite effects, though; those with more positive attitudes toward gaming displayed less willingness to help – even though they were more likely to have tried out the game – while interest in the game itself correlated positively with this same variable. Considering the complexity of these relationships and (again) the small effect sizes noted, it is not prudent to connect the negative relationship to a broader pattern of socio-political disengagement among frequent gamers (Bacovsky, 2021), but this finding does highlight that persuasive games' target audiences and actual player bases still tend to exist in the overlap between those who might be interested in the game itself or the topic, and those who are interested in the medium of gaming regardless of what messages they might hold.

4.2. Implications

4.2.1. Theoretical implications

The current study provides tentative evidence in favor of a link between eudaimonic play motivations – a largely unexplored set of motivations favoring meaningful and reflection-inviting content over more straightforward entertainment fare (Daneels et al., 2021a) – and interest in persuasive games. While the strategy to hide persuasive intent through clever design features (Kaufman and Flanagan, 2015) is clearly valid in some respects, the current study suggest that it is not the only viable strategy to get players to engage with persuasive games. Indeed, explicit communication about persuasive intent can make the game more interesting because of this, as players might try to satisfy their curiosity about what the game could be saying about a specific topic. It is an open question whether this is due to the sight of a game (of all things) broaching sensitive socio-political issues representing a novelty for audiences whose prior contact with persuasive gaming was limited to Dumb Ways to Die (Metro Trains Melbourne, 2016), or whether it represents an ongoing shift in the culture and image of gaming whereby players are learning to expect more meaningfulness from their games (Similar to the shift in attitudes toward gaming described by Kneer et al., 2018). The finding that people who have more affinity with gaming also display less willingness to help does not necessarily refute the latter possibility.

Looking more closely at the findings surrounding the game descriptions, it is likely that congruence in messaging plays an important role in players' ideas about and attitudes toward persuasive games. Congruence is implicated in framing messages causing positive assessments of a persuasive game, as well as with eWOM when it comes to perceptions of obtrusiveness. This makes it somewhat more difficult to advise on further experimentation with frames, as the current study's messages seem to have been judged holistically. Inconsistent framing elements could dampen effects from manipulations that would be viable in a fully controlled setting.

Finally, the interest that people have in gaming as a hobby is related in complex ways to how people engage with persuasive games. While identities of game players might be broader than ever before across the history of the medium (Howe et al., 2019), they are often still directly tied to being a consumer of the entertainment gaming industry (De Grove et al., 2015). If an experience strays too far from

the fuzzy boundaries of 'core gaming', players might face rejection from peers in highly normative (and fiercely gatekept) online spaces (Chess and Paul, 2019). Current findings speak to this culture in one form and deviate from them in another. Yes, players expressed more of an interest in WDtCCtR than non-players, but they were also more likely to be apathetic to the topic the game centered on. This points at a discrepancy between the use of gaming to promote pro-social attitudes and behaviors. A deeper understanding is needed on the differences between the audience a game targets and the audience a game attracts in practice.

4.2.2. Practical implications

Extrapolating from this study's findings, we would advise that developers are more forthcoming about their games' intent. There is a growing group of people who are interested in playing games that pertain to real-world topics and issues, or who at least are not shying away from games that advertise these issues outright. There is some leeway for those looking to market persuasive game experiences; texts can either emphasize their persuasive intent or present the game as any other entertainment game. However, aside from any ethical misgivings one might have about the latter tactic, the optimal outcome the current study points to is one in which games are presented in a congruous way as offering a deeper experience with ties to real-world issues.

In this study, we focused on games published on the independent gaming platform Itch.io. Though we did not look to include Itch.io's regulars in the current sample, findings relating to attitudes toward gaming in general do tentatively point out that developers cannot rely on the tools these platforms offer alone when it comes to lending their project visibility to its target audience. First of all, it might be that the target audience diverges from gamers in the traditional sense. Itch.io's player base clearly enjoys more diverse gaming experiences, but that does not mean they will be open toward persuasive games. Second, hosting a game on Itch.io places it among a fluid catalog of games that compete for attention of those browsing the platform. Unless people are specifically looking for keywords relating to the topic, there is little that separates "poem/game" experiences like WDtCCtR from thousands of entertainment games. Shifting focus from developers to platform holders, we would recommend focusing efforts to improve visibility of games by improving affordances for eWOM. Peer recommender systems are seen as more impactful than automated messages with personalized recommendations.

4.3. Limitations and recommendations

One of the major roadblocks to understanding the real-world impact persuasive games have is the tendency for validation research to center on captive audiences (Jacobs, 2021). Even though the current study did focus on the period between seeing a game and wanting to play it, it still employed a captive audience of study participants. Less than half of those players would select the persuasive game over a similar entertainment game, and less than a fifth of study participants ultimately sought out the game after the study ended without being asked to do so. If research into this aspect of persuasive gaming is continued, an ideal situation would be to perform online A/B-style testing directly on platforms. Different textual frames and other potential attractors could be explored for new visitors to a game's page. Including more than just a simple log of what attractors make it more likely a game is actually played is challenging (on ethical and practical levels), but there is no doubt this would lead to more externally valid insights.

The approach of the current study centered the potential agency of developers and platform holders, rather than the experiences and motivations of players. The article can therefore only speak on how persuasive games might appeal to individuals who are already browsing the catalog of games on Itch.io and similar platforms. Judging from the finding that players who liked games in general were also more likely to play WDtCCtR, one could argue that more frequent users of these platforms would more readily select a persuasive game over an entertainment-centered one. However, evidence for this is not conclusive. To fill this gap, future research could involve more of the player's journey. This includes understanding how gaming motivations (Holl et al., 2021) might relate to the selection process, but also to delve deeper into the seemingly growing sense players have that games gratify eudaimonic needs (Daneels et al., 2021a).

The current study's effect sizes were small. While these might be indicative of a small real-world effect, the manipulations used here might have been a factor as well. To stay close to the short descriptions found on game pages on Itch.io, attraction texts were written succinctly, with just a few words and phrases differing between conditions. Moreover, only the texts were manipulated, with identical visuals being used for the entertainment and persuasive game. Stronger manipulations could be embedded in, for instance, video trailers for a game. An audiovisual presentation might hold viewers' attention for longer, though of course care must be taken to avoid introducing new confounds.

Next, the stimuli were constructed around one specific persuasive game. The choice for WDtCCtR was made for various reasons (some of which are listed in the Materials and Methods section). Of course, the focus on a very specific example of one type of persuasive game limits generalizability in some respects. Further research should explore which topics do not suffer from reactance as a result of obtrusiveness and explicit persuasive intent, and which do. As an example of the latter, advergames' emphasis on sales and brand attitudes might unilaterally benefit from obfuscation of persuasive intent.

Even though the current study is situated in the landscape of persuasive game validation research, it does not put us in a position to speak to the effects of WDtCCtR on players. Some of the complex findings relating player's prior attitudes to interest and self-reported play behavior might translate to a validation setting. However, that in itself is not proof. These variables are clearly (at least partially) influenced by other factors that were not measured here. We would advise a qualitative investigation into the experiences people have when browsing for games on platforms like Itch.io. This would help us identify which factors might also play a role in this complex decision-making process.

Finally, the current study made use of a convenience sample. While the stimuli and measures were chosen and constructed around the population this study sampled from, the sample is not representative of this population. More research on representative subsets of the population is needed to understand the appeal of persuasive games for a wide audience of natural players, as well as to understand whether the mechanisms of frames and recommendations translate to the population as a whole. The influence of persuasive

intent frames, specifically, might be highly dependent on digital skills and media literacy, factors which vary widely across groups of people. It is important to note, though, that persuasive games also tend to have defined target populations. Any follow-up research should find a balance between games' intended players, issue relevance, and those populations who might benefit the most from engaging with this kind of persuasive communication.

5. Conclusion

The objective of this study was to chart the decision process potential players go through before they start playing a persuasive game called 'Why did the chicken cross the road?' that is available for free on gaming platforms. Two elements commonly found on these platforms were manipulated; the way a text can draw attention to the intent of the game to provide hedonic or eudaimonic gratifications or to persuade its players, and how such a game can come recommended by an automated system or by electronic word-of-mouth. Attitudes and behaviors were assessed at three points: interest was measured after reading attract texts and choosing for the game or an entertainment-focused alternative, intention to play was gaged after receiving a recommendation for the same game, and a final measurement asked respondents whether they played the game 1 week on from exposure.

The outcomes speak to different effects of frames and recommendations; frames seem to function as cues that are necessary but not sufficient in isolation, while game recommendations coming from a peer elicit greater play intention than automated versions. Interest and play intentions were strongest when frames and recommendations combined in a way that made the persuasive game's intent explicit. One week after exposure, the manipulated variables no longer had an impact on whether or not respondents would seek out the game to actually play it, though a small minority of respondents still did so after their interest was piqued during the study. Respondents who had stronger affinity with games were more likely to try playing the game but were also more likely to be less willing to help in the real world.

One of the ways in which persuasive games could attract players is by earnestly stating their goals upfront. Respondents in conditions where intent was clearest did not react negatively to these stimuli and in fact were more likely to select the persuasive game over a comparable entertainment game. At the same time, the results speak to a discrepancy between the target audiences of persuasive games and avid players who might be roaming gaming platforms looking for content that entertains but that does not necessarily have to have a deeper meaning. Focusing on what happens before a play session is vital to understand the impact a persuasive game can have, and the current study allows for cautious optimism about the roles entertainment delivery platforms can have in bringing these games the audiences they are made for.

Data availability statement

The raw data supporting the conclusions of this article are made available by the authors, without undue reservation. The dataset, syntax, and survey materials are available on OSF: https://doi.org/10.17605/OSF.IO/J7Y56.

Ethics statement

The studies involving humans were approved by University of Twente Ethics Committee BMS, Domain Humanities & Social Sciences (request number 220404). The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

MG conceptualized, designed, performed, reported on, and finalized this study as part a master's thesis. RJ was MG's supervisor the throughout the process, and had overseen all aspects in a supporting role. MG defended the thesis. RJ wrote the current manuscript with elements from MG's writing. RJ performed a new round of data analysis and replaced most of the results reporting in line with revised hypotheses. All authors contributed to the article and approved the submitted version.

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This research was first reported on as part of a Master's thesis (Groen, 2022). The current version of the manuscript includes re-analyses of the data. Hypotheses were rephrased for clarity but not altered in meaning or prediction from their intent in the thesis research.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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Explaining the formation of eudaimonic gaming experiences: a theoretical overview and systemization based on interactivity and game elements

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Over the past years, scholars have explored eudaimonic video game experiences—profound entertainment responses that include meaningfulness, reflection, and others. In a comparatively short time, a plethora of explanations for the formation of such eudaimonic gaming experiences has been developed across multiple disciplines, making it difficult to keep track of the state of theory development. Hence, we present a theoretical overview of these explanations. We first provide a working definition of eudaimonic gaming experiences (i.e., experiences that reflect human virtues and encourage players to develop their potential as human beings fully) and outline four layers of video games—agency, narrative, sociality, and aesthetics—that form the basis for theorizing. Subsequently, we provide an overview of the theoretical approaches, categorizing them based on which of the four game layers their explanation mainly rests upon. Finally, we suggest the contingency of the different theoretical approaches for explaining eudaimonic experiences by describing how their usefulness varies as a function of interactivity. As different types of games offer players various levels of interactivity, our overview suggests which theories and which game layers should be considered when examining eudaimonic experiences for specific game types.

KEYWORDS

video games, interactivity, eudaimonia, theory, game layers

1. Introduction

Like media entertainment in general (Bosshart and Macconi, 1998), video game entertainment has traditionally been conceptualized as a *hedonic* experience—enjoyment (Sherry, 2004; Mekler et al., 2014). However, studies have demonstrated that contemporary games may also elicit more profound entertainment responses such as meaningfulness related to "contemplating, introspecting, and experiencing greater understanding of essential values, fundamental beliefs, and important life lessons" (Oliver et al., 2016, p. 396). These profound responses have been defined as *eudaimonic* experiences (Daneels et al., 2021a).

Over the past decade, research on eudaimonia has become a prosperous area of game scholarship (Daneels et al., 2023). Initially, scholars examined the multifaceted nature of these profound states to clarify what eudaimonic gaming experiences are (for a conceptual review see Daneels et al., 2021a). More recently, substantial progress has been made in theorizing how eudaimonic gaming experiences emerge—either by drawing on established theories (e.g., *Self-Determination Theory*; Oliver et al., 2016), or by (further) developing new perspectives (e.g., *Poetic Gameplay*; Chew and Mitchell, 2020).

Despite this encouraging progress, we observe three limitations in current theorizing. Firstly, keeping track of the theoretical approaches can be challenging, given the rapid growth of related literature and its spread across multiple disciplines (e.g., communication, psychology, computer science: Daneels et al., 2023). As a result, theory development may suffer as scholars may be less likely to take note of and advance existing explanations from other areas of scholarship. Secondly, game characteristics (e.g., story, graphics) have often been regarded as antecedents of eudaimonic gaming experiences (Daneels et al., 2023). Yet, scholars lack a comprehensive overview of which theoretical approaches attribute the formation of eudaimonic gaming experiences to which characteristic. Without such an overview, it is difficult to identify which explanations complement, contradict, or interact with each other because they rely on (dis)similar game characteristics. Thirdly, games differ largely in their characteristics (Klimmt and Possler, 2021) and thus, the usefulness of each theoretical approach likely varies by game/situation.

In a first attempt to address these limitations, a recent systematic review (Daneels et al., 2023) provided a list of the theoretical frameworks applied and antecedents of eudaimonic experiences discussed in gaming research on eudaimonia. However, the review falls short of explaining how each approach explicates the formation of eudaimonic experiences, what specific game characteristics are pertinent in each approach, and for which games/situations each explanation seems most useful. The present paper builds on the systematic review by Daneels et al. (2023) but extends it considerably by addressing all three above-mentioned limitations. First, we provide a *theoretical overview* (DeAndrea and Holbert, 2017) that illustrates how the formation of eudaimonic gaming experiences is explained by each theoretical approach. Second, we categorize the approaches based on the game characteristics they argue are crucial for the formation of eudaimonic experiences, drawing on a framework of game layers [Agency, Narrative, Sociality and Aesthetics (ANSA) model, Klimmt and Possler, 2021]. Third, we illustrate the *contingency* of the approaches (DeAndrea and Holbert, 2017) by discussing how the explanatory power of the approaches varies depending on a game's degree of interactivity as a key defining feature of video games (e.g., Grodal, 2000; Juul, 2005; Weber et al., 2014).

2. Cornerstones of theorizing the formation of eudaimonic gaming experiences

In their systematic review, Daneels et al. (2023) showed that game characteristics are the most frequently considered antecedents of eudaimonic gaming experiences. Thus, explanations for the formation of these experiences predominantly focus on *active play* as a form of engagement with the medium. Conversely, other ways of engaging with games and gaming culture are mostly overlooked—for example, watching gaming live streams or talking about games (for an overview of such additional ways of engagement see Meriläinen, 2023). Rather, most approaches to studying eudaimonic gaming experiences seem to analyze game characteristics and link them to players' eudaimonic experiences via some explanatory mechanism—a common logic of theory development in game entertainment research (Klimmt and Possler, 2019). The cornerstones of such theorizing are (1) the phenomenon to be explained (i.e., eudaimonic gaming experiences) and (2) the preconditions on which the mechanisms operate (i.e., characteristics of gaming; see Figure 1).

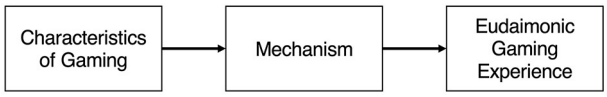

FIGURE 1
Key elements of explanations for the formation of eudaimonic gaming experiences.

2.1. Defining eudaimonic gaming experiences

A frequently applied basic first step for defining eudaimonic gaming experiences is to contrast them with hedonic gaming responses (e.g., Oliver et al., 2016), as the latter have long been the main focus of game entertainment research (Klimmt and Possler, 2019). *Hedonic gaming experiences* have often been described as enjoyment (Mekler et al., 2014)—a "'pleasant' experiential state [...] which includes physiological, cognitive, or affective components" (Vorderer et al., 2004, p. 393). Enjoyment seems to manifest in various ways (Vorderer et al., 2004). For example, emotions such as fun or pride or flow states have been considered "enjoyable" (Mekler et al., 2014). In contrast, *eudaimonic gaming experiences* are thought to reach beyond enjoyment (Possler et al., 2020) and are characterized as "more complex, fundamental" (Daneels et al., 2021a, p. 179), "meaningful and reflective" (Oliver et al., 2016, p. 391), or "serious" (Bowman et al., 2016, p. 84).

Beyond such metaphors, we identified four broad patterns in a recent scoping review of conceptualizations of eudaimonic gaming experiences (Daneels et al., 2021a): First, scholars used the overarching term appreciation (introduced by Oliver and Bartsch, 2010) to characterize eudaimonic outcomes of gaming (e.g., Wulf and Baldwin, 2020). Second, eudaimonic gaming responses have been characterized by three states that often seem to covary: meaningfulness (i.e., players connecting game elements to meaningful aspects outside of the game; e.g., Daneels et al., 2020), being emotionally moved or challenged (Bopp et al., 2016, 2018), and self-reflection (i.e., players seeking a better understanding of themselves; e.g., Mekler et al., 2018). Third, some scholars conceptualize eudaimonic gaming experiences as deep social connectedness and bonding with fellow players or in-game characters (e.g., Colder Carras et al., 2018; Coanda and Aupers, 2021). Fourth, we identified conceptualizations that are not as commonly used in the gaming literature, such as nostalgia (Wulf et al., 2020), awe (Possler et al., 2018), or elevation (Daneels et al., 2020).

Expanding from this apparent multifaceted nature of eudaimonia, it is fruitful to differentiate an extensional definition

from an intensional definition of eudaimonic gaming experiences. An *extensional definition* describes the broad theoretical scope of a given concept (Häder, 2022)—for example, a complete or saturated list of eudaimonic video game states. The overview provided by Daneels et al. (2021a) is a good starting point for such an extensional definition of eudaimonic gaming experiences, although we note a common limitation of extensional approaches is that they are bound by existing observations (i.e., they cannot account for "unknown unknowns"). In contrast, an *intensional definition* describes a concept's deeper meaning (Häder, 2022)—in this case, the properties necessary for a gaming experience to be understood as eudaimonic. A useful starting point for developing such an intensional definition may lie in the philosophical underpinnings of eudaimonia. The concept originates from Aristotelian philosophy (Tiberius and Mason, 2009; Kraut, 2022), and is defined by Huta and Waterman (2014) as activities or experiences "reflecting virtue, excellence, the best within us, and the full development of our potentials" (p. 1427). Applying this definition to games, we can understand gaming experiences that reflect human virtues and encourage players to fully develop their potential as human beings as eudaimonic.

Table 1 presents an intensional and extensional working definition of eudaimonic gaming experiences that will serve as the conceptual foundation in subsequent sections of this manuscript. We acknowledge that this definition may not be consensual among all game, eudaimonia, and eudaimonic gaming scholars. We invite researchers to criticize and further develop this definition in the future.

2.2. The characteristics and layers of video games

Generally, the preconditions for explaining the formation of game experiences via active video game use include properties of the player (e.g., motives, moods, or dispositions), as well as the message and medium (i.e., game's content and mechanics), and the context (e.g., the situation of game use; Vorderer et al., 2004; Elson et al., 2014). As mentioned above, characteristics of the message and medium have most often been regarded as antecedents of eudaimonic gaming experiences in the literature (Daneels et al., 2023). While video gaming shares many characteristics with other media, *interactivity* is a key characteristic that is shared by all games and distinguishes them from other entertainment (Grodal, 2000; Juul, 2005; Bowman, 2018; Melzer and Holl, 2021)—Weber et al. (2014) even call interactivity the "hallmark of the medium" (p. 79). Little consensus exists about the definition or nature of interactivity in video games (Stang, 2019), but a useful, integrative approach is offered by Weber et al. (2014) as the "possibility for users to manipulate the content and form of communication and/or the possibility of information exchange processes between users or between users and a medium." (p. 82). However, games do not only enable but also require players to actively interact with the medium (Klimmt, 2003; Jansz, 2005), although this demand can vary between and within gaming sessions, as discussed later (also see Bowman, 2018).

Interactivity manifests itself in various ways and shapes many other characteristics of video gaming, including those that are not necessarily unique to gaming (Elson et al., 2014; Klimmt and Possler, 2021). To exemplify this, Klimmt and Possler (2021) argued that video games present narratives similar to books or movies. However, the way in which stories are told and unfold is highly different in games due to interactivity which enables players to affect the narrative structure (e.g., speed), sequence (e.g., order of events), or even the content (e.g., choosing between endings, Lee et al., 2006; Ip, 2011; Aarseth, 2012).

To further indicate the specificities of games shaped by interactivity, many authors have proposed to distinguish different "layers" of games (e.g., Hunicke et al., 2004; Elson et al., 2014; Klimmt and Possler, 2021). These layers can be understood as pragmatic categories of game characteristics that help scholars to identify and describe the factors underlying the formation of gaming experiences. While different frameworks of such layers have been suggested (e.g., Hunicke et al., 2004; Elson et al., 2014), we draw on the ANSA framework (Klimmt and Possler, 2021) in the present manuscript, as it describes game characteristics from a psychological, user-centered perspective and considers the often-neglected aesthetic dimension of games [relevant for eudaimonic experiences such as awe (Possler et al., 2018; Possler, 2021), and nostalgia (Makai, 2019)]. The model suggests that agency, narrative, sociality, and aesthetics are especially relevant to gaming experiences. As defined:

1. **Agency**: Interactivity *enables* players to influence the game according to its rules and mechanics (Elson et al., 2014; Klimmt and Possler, 2021). Moreover, games also often *demand* player activity: Video games present scenarios that require players to monitor the game state, make decisions, and implement those (Klimmt, 2003). The output of such scenarios and the progression of the game as a whole depends on the activity of the player (Grodal, 2000; Jansz, 2005; Bowman, 2018).
2. **Narrative**: As mentioned above, video games often present narratives (Lee et al., 2006). The complexity of these stories can vary substantially, ranging from 'Save the Princess' in *Donkey Kong* to complex, morally loaded, multi-chapter,

TABLE 1 Intensional and extensional definition of eudaimonic gaming experiences.

	Eudaimonic gaming experiences
Intensional definition	Eudaimonic gaming experiences are those experiences caused by playing that reflect "virtue, excellence, the best within us, and the full development of our potentials" (Huta and Waterman, 2014, p. 1427)
Extensional definition	Eudaimonic gaming experiences may manifest in various forms, e.g., appreciation, meaning, being emotionally moved or challenged, self-reflection, deep social bonds, nostalgia, awe, elevation (Daneels et al., 2021a)

and multi-protagonist narratives in games such as *Heavy Rain* (Klimmt and Possler, 2021). Players play an active role in shaping the trajectory of these narratives (Wellenreiter, 2015), although the extent of this influence varies greatly, as discussed later.

3. **Sociality**: Like many other media (e.g., movies, television, and radio), video games can be used together with other people. However, social interaction is often "deeply woven" (Klimmt and Possler, 2021, p. 626) into a video game due to their interactive nature (Klimmt and Hartmann, 2008). Players can frequently communicate via games, for example, in text and voice chats (Klimmt and Hartmann, 2008; Wadley et al., 2015). Moreover, playing with or against others is central to many video games (Schmierbach et al., 2012; Peña, 2015), including otherwise single-player games (Consalvo et al., 2018). That means, players collectively influence the state of the game (Steinkuehler and Williams, 2006).
4. **Aesthetics**: Video games are aesthetic artifacts that combine a subject matter and a style or form (Possler and Klimmt, 2023). The style refers to how the "physical/sensory qualities [of games] are organized and affect sensory experiences" (Cupchik and Kemp, 2000, p. 249). Hence, video games address players' sensory modalities—vision, hearing, and haptics—"in a specific and organized manner" (Possler and Klimmt, 2023, p. 143). Due to interactivity, players are often able to shape game aesthetics—either deliberately (e.g., turning off background music) or indirectly (e.g., by triggering music when entering a particular location in the game world; Possler, 2021).

3. Systematization of existing theoretical approaches based on game layers

After discussing the cornerstones of theorizing the formation of eudaimonic gaming experiences, we now turn to these different explanations. To systemize the approaches, we consider existing scholarship through the lens of the ANSA framework (Klimmt and Possler, 2021), categorizing extant theoretical approaches based on the layer to which the formation of a eudaimonic experience is attributed. We did a secondary analysis of 39 manuscripts from Daneels et al.'s (2023) recent systematic review of eudaimonia in digital games research. We only focused on those manuscripts that Daneels et al. coded as (a) having a theoretical framework and (b) dealing with eudaimonic experiences, and we additionally incorporated manuscripts of relevance to the current manuscript but not included in the prior work's more stringent inclusion criteria.[1,2] These papers were then categorized based on: (1) the specific eudaimonic experience(s) the study focused on (i.e., the specific manifestation of eudaimonia; see Section 2.1), (2) the theory or framework that the study employed, (3) the underlying assumption or explanation the theoretical framework offered in the study connected to the focal eudaimonic experience(s), and (4) the specific game layer(s) that elicited the eudaimonic experience.

3.1. Theoretical perspectives transcending the four game layers

Several theoretical approaches involve multiple ANSA layers to explain the formation of eudaimonic gaming experiences (e.g., Elson et al., 2014; Argenton et al., 2016; Possler et al., 2020; Phillips et al., 2021; Williams, 2021). Among these approaches, the most commonly employed one is the *self-determination theory* (SDT, Ryan and Deci, 2000). SDT being this prominent is unsurprising, given SDT's extensive use in prior games research (Tyack and Mekler, 2020). Broadly, this research argues that video games are adept at satisfying intrinsic human needs of competence (i.e., the need to master a demanding task), autonomy (i.e., the need to act voluntarily and self-determined), and relatedness (i.e., the need to have close and meaningful social relationships). Critically, these needs are also key to the formation of eudaimonic experiences (e.g., Ryan and Martela, 2016). In eudaimonic gaming research, studies have shown how game layers identified in the ANSA model can fulfill these needs, in turn leading to eudaimonic responses. *Agency* is related to players feeling invested in and having autonomy over the path of their gameplay, as players shape their own adventures (see Oliver et al., 2016; Rogers et al., 2017; Wang and Hang, 2021). Moreover, very intense or cooperative challenges on the agency layer can result in meaningful achievement (Rogers et al., 2017) or mastery experiences (Seaborn et al., 2019). Complex and emotionally intense *narratives* have often been associated with satisfying needs of relatedness and insight into existential issues, fueling players' experiences of appreciation of the game (Oliver et al., 2016; Rogers et al., 2017). Strong or close social connections to in-game characters (i.e., narrative layer: Kümpel and Unkel, 2017; Tyack and Wyeth, 2017; Conway and Elphinstone, 2019) or to other human players (i.e., the *sociality* layer: De Schutter and Brown, 2016; Vahlo, 2018; Daneels et al., 2020; Wang and Hang, 2021) also satisfy players' need for relatedness, in turn leading to eudaimonic experiences of meaningfulness, personal growth, and social bonding. Studies linking SDT to *aesthetics* are less clear, although Possler et al. (2018) argue aesthetics can evoke awe which promotes a sense of being connected to something larger (e.g., "nature," "all gamers"), potentially satisfying relatedness needs (Possler, 2021). Moreover, Wang and Hang (2021) argue that buying aesthetic in-game goods (e.g., skins) facilitates autonomy via self-expression (buying goods for oneself) or relatedness (buying goods for others). As such, the SDT provides a valuable framework for explaining how gaming forms eudaimonic experiences: through the satisfaction of players' basic needs.

Beyond SDT, explanations for eudaimonic experiences that involve multiple game layers are often less well studied. For

1 These $N = 39$ manuscripts are included in our references list marked with an asterisk, following standard practices in systematic reviews and meta-analytic scholarship.

2 A noted limitation of the review by Daneels et al. (2023) is that manuscripts were only included if they explicitly specified a theoretical framework (required for their analyses). This would have excluded manuscripts that briefly summarized theories, which is common in published manuscripts with shorter literature reviews.

example, Possler et al. (2020) draw on evidence from *uses and gratifications* research (Scharkow et al., 2015) to argue that gaming facilitates specific gratifications that influence appreciation. These gaming gratifications can be linked with most of the four layers. For example, a game's *narrative* and its characters can facilitate the gratification of assuming a different identity, the *agency* layer can evoke a sense of meaningful accomplishments and the *sociality* layer may result in deep social connections. Following a similar logic but relying on *means-end theory* (Olson and Reynolds, 2001), Vanden Abeele et al. (2020) illustrate that the immediate functional consequences of playing games influence how meaningful players perceive a game to be. These functional consequences seem to result from the *agency* layer (i.e., ease of control, progress feedback, goals and rules, and challenge) and the *aesthetic* layer (i.e., audiovisual appeal). Applying this approach to learning games, a study by Verkuyl et al. (2022) suggested that functional consequences affecting meaningfulness may also result from the *sociality* layer (i.e., the richness of the simulated social interactions). To give yet another example, Elson et al. (2014) proposed the *integrated model of player experience* to explain how the *narrative*, game mechanics (i.e., *agency* layer), and the playing context (esp., social interactions; *sociality*) contribute to eudaimonic responses.

3.2. Agency

One prominent concept relevant to agency and eudaimonic gaming experiences can be found in *poetic gameplay*. This perspective describes how intentionally breaking players' gameplay expectations facilitates reflection about the form of the game as well as on broader societal topics games might address (Mitchell, 2016)—notions also suggested in scholarship on time perception in slowly paced games (Alvarez Igarzábal, 2020) and on disorienting dilemmas (Murray, 1997; also see Bowman et al., 2020 as applied to gaming). Here, game mechanics and goals within a game are altered to defamiliarize players' expectations, for instance, regarding interaction possibilities (e.g., unexpected controls, speed of user input) or when winning the game is either impossible or undesirable. In close readings of different games, Chew and Mitchell (2020) and Mitchell et al. (2020) identified a variety of possible alterations to games' mechanics and alienations of agentic possibilities that may lead to players' eudaimonic reflective experiences. Wong et al. (2021) showed how these techniques can be used in a serious game to promote contemplation about health issues.

3.3. Narrative

Provided that the narrative has been discussed and identified as a key game element to elicit eudaimonic responses among players (e.g., Roth and Koenitz, 2016; Rogers et al., 2017; Daneels et al., 2020; Jacobs, 2021; Stenseng et al., 2021), it is unsurprising that much prior theorizing has focused on this specific game layer. For example, Fleck and Fitzpatrick's (2010) theory of *transformative reflection* argues that people's reflections occur on a continuum from superficial to transformative, and this has been used to categorize different levels of reflective experiences when playing video games. Prior research showed that most players reflect rather superficially on aspects related to the game itself, while few make reflections that change players' own behavior or which provide them with new insights on broader social issues outside of the game (Mekler et al., 2018; Whitby et al., 2019). Both studies focused mostly on game narratives to explain the elicitation of reflective experiences (although explanations were also made on the agency and sociality layers).

Green and Jenkins' (2014) *framework on interactive narratives* has been used to explain how an interactive narrative can improve people's prosocial behavior, mediated by the eudaimonic notion of appreciation (Steinemann et al., 2017). The model explains how interactivity allows users or players to control and change the course of a narrative according to their personal preferences. These changes, in turn, lead to more engagement (e.g., in terms of identification and transportation) and the possibility to explore different roles of the self (e.g., in terms of feeling responsibility toward game characters or trying out different possible selves). In the end, these elements will elicit entertainment experiences of enjoyment and appreciation as well as attitudinal or behavioral change.

We can also consider models of moral psychology relevant to narratives in video games (e.g., Holl, 2019). For example, Melzer and Holl (2021) draw on moral psychology theories such as *moral foundations theory* (Haidt and Joseph, 2004) and the *model of intuitive morality and exemplars* (Tamborini, 2011), suggesting that moral decision-making is a key to fostering eudaimonic game experiences.

Beyond these perspectives, some studies used broader political or psychological theories that were relevant given the specific context of the study's topic. De Angeli et al. (2018) used the notion of *agonism* (i.e., a theory that emphasizes the positive aspects of conflict) to demonstrate how game narratives related to war can lead to players' reflective eudaimonic experiences when these games show the perspectives of all actors involved—perpetrators, victims, and bystanders. Another example is the game analysis of Tavares et al. (2021), which used concepts of *Jung's analytical psychology* (e.g., the individual's psyche, unwanted aspects of the self) to argue that games with narratives that include characters' weaknesses or characters fighting their inner demons can trigger players reflecting about their own personal weaknesses and, in turn, lead to personal growth key to eudaimonia.

Focusing more closely on narrative protagonists, models of *player-avatar relationships*, Banks and Bowman (2016) argue that gamers can and do form deep and meaningful social interactions with their on-screen avatars, leading to deeper emotional connections key to eudaimonic experiences. Moreover, drawing on *character attachment* (Lewis et al., 2008) and *identification theory* (Klimmt et al., 2009), it was argued that players can identify as their avatars relevant to the foundation of eudaimonic gaming experiences (Bowman et al., 2016; Kartsanis and Murzyn, 2016). For example, assuming the identity of an avatar may allow self-exploration and self-expression (Kartsanis and Murzyn, 2016). Finally, close or even intimate relationships may also occur between players

and believable non-player characters (Coanda and Aupers, 2021).

3.4. Sociality

Scholars have also described the social context of playing with others as a relevant basis for the formation of eudaimonic gaming experiences (e.g., Bonus et al., 2018; Comello et al., 2019; Daneels et al., 2020; Phillips et al., 2021; Pearce et al., 2022). For example, adolescent players in Daneels et al. (2020) mentioned that working together toward a common goal led to socially bonding experiences, while Bonus et al. (2018) found that playing *Pokémon GO* with others led to friendship initiation and intensification and Pearce et al. (2022) found that playing *Animal Crossing: New Horizons* during COVID-19 lockdowns helped parents to feel a sense of connection with others. However, most of this research did not *a priori* theorize about the role of socializing in eudaimonic experience but rather, these emerged as unexpected findings.

Broadly, theorizing about the role of the social layer in the formation of eudaimonic gaming experiences is scarce (at least outside SDT-based research; see above), which is surprising given the relative importance of socializing in video games (e.g., Williams et al., 2006). For example, Steinkuehler and Williams (2006) suggested that video games serve as digital third spaces, borrowing from Oldenburg's (1989) sociological research on *third places* key to how humans engage with each other and grow. Likewise, the notion of *tandem play* (Consalvo et al., 2018) argues that even when players are not actively engaging each other on-screen—such as the case in single-player games or when viewing game streams—there are still critical social bonds being formed. As alluded to in Elson et al. (2014), social dynamics around video gaming can leave lasting impressions on players, including providing memorable experiences key to feelings of self-relevance and nostalgia later in life (Wulf et al., 2020; Bowman and Wulf, 2023).

3.5. Aesthetics

Finally, we can see scholarship into the aesthetics of gameplay as relevant to the elicitation of eudaimonic experiences. For example, Bopp et al. (2021) discussed how players can have artistic experiences from playing games using insights from *empirical aesthetics* (see Tinio and Smith, 2014), which led to several emotional and eudaimonic reactions, including feelings of beauty, awe, feeling moved, and nostalgia. Possler and Klimmt (2023) also theorized how the aesthetics of games lead to eudaimonic experiences. Building on the *model of aesthetic appreciation and aesthetic judgments* (Leder et al., 2004), Possler and Klimmt (2023) argued that under certain circumstances (e.g., feelings of safety, no strong game demands), players may reflect on the form of a game rather than just its content. In such situations, appreciation can arise when players recognize symbolic references in the game's aesthetic to their own meaningful experiences, and awe and admiration may occur as a response to the developers' aesthetic achievements.

4. Exploring the interplay of interactivity and game layers in theories of eudaimonic gaming experiences

As discussed in Section 2.2, interactivity is a key characteristic of video games. As we will demonstrate below, the degree of interactivity can vary considerably between and within gaming sessions (Section 4.1) which likely affects how eudaimonic gaming experiences can emerge (Section 4.2). Against this background, we develop a heuristic framework that suggests on what level of interactivity the explanatory power of the theoretical approaches identified in Section 3 should be highest (Section 4.3).

4.1. The dynamic variability of game interactivity

Video games enable and demand players to actively shape the game (Bowman, 2018, 2021), inviting gamers to co-author the experience unfolding (Wellenreiter, 2015). That said, interactivity is hardly a monolithic concept, and players' degrees of freedom in this co-creation vary significantly both between different types of video games and dynamically within any given gaming session.

Regarding different levels of interactivity *between games*, we can understand some attempts to classify video games into unique genres as a representation and recognition of the known variability of interactivity between games.[3] For example, first-person shooting and fighting games could be understood as *action video games* (Green, 2018): A common gameplay element among them is a very high level of near-constant interactivity—players needing to quickly and constantly engage with an ever-changing and rapid-paced on-screen environment. Such games would sit at a high level of interactivity, requiring a great deal of cognitive and physical demand (see Bowman, 2018, 2021). In contrast, *interactive drama games* are quite limited in how often they ask for or allow players to engage with the on-screen content, usually limiting these interactions to synchronized and timed button-pressing for characters otherwise engaging action automatically.

Dynamic shifts of interactivity *within a gaming session* can be illustrated by basic principles of game design. For example, a classic learning mechanism in many video games is to present players with different abilities or options and immediately let them test these out (Bowman et al., 2015). Consider first-person shooters that provide players new weapons and then immediately afterwards, waves of enemies to practice using the new weapons. Moreover, games with

3 We acknowledge that recent research suggests that genre conventions may not be as well suited to explain the variance in gameplay in modern video games, which often combine multiple game elements (see Green, 2018). Nonetheless, we believe that interactivity is a key discriminating factor between games of different types, with some game genres marked by having higher levels of interactivity than others.

focal narrative content and character development often employ cinematic cut-scenes at key moments (Ip, 2011), forcing players to temporarily relinquish nearly all control over the content.

In both cases, the notion of action affordances provides a useful framework for us to understand interactivity variability. We can consider the various "behaviors" that video games allow their players to engage with in terms of the *affordances* allowed by a given system (see Gibson, 1979; Gaver, 1991). Eden et al. (2018) considered the latitude of on-screen behaviors that were granted to the player, noting that players might not always be aware of their agentic potential—or at times, might misinterpret or overestimate their relative agency over in-game actions (see also Stang, 2019). That said, we can still focus on the action affordances provided by video games to understand their variable interactivity. Similarly, Wolf (2006) argues that the degree of interactivity of a game can be understood in terms of what actions a game affords as a consequence of the number of possible player decisions, the options available per decision, the speed with which the decision is required, and the extent of its consequences. As such, video game interactivity can be understood as a continuum (Vorderer, 2000) ranging from "no player control" (scenarios in which the system is in full control over manifest on-screen content, such as cut-scenes) to "total player control" (scenarios in which the player is in full control over the manifest on-screen content, such as with level editors or sandbox games). Games falling in the middle of this continuum might include interactive drama games at the lower end and open-world games that encourage player activity within the confines of a given game world at the higher end. Figure 2 illustrates this continuum.

4.2. Eudaimonic game experiences at endpoints of the interactivity continuum

As shown above, a game's degree of interactivity closely aligns with how it can and must be used. This interactivity, in turn, shapes the psychological processes of playing, for example, the degree of cognitive resources strained (e.g., Bowman, 2018, 2021) or the immersive experiences resulting from playing (e.g., Wirth et al., 2007). Consistently, prior research has demonstrated that some game entertainment mechanisms only work at certain degrees of interactivity (e.g., entertaining distractions from stress arise primarily with higher interactivity and associated higher demands: Bowman and Tamborini, 2012). We argue that the mechanisms of how eudaimonia arises also vary between different levels of interactivity. This is most striking at the extreme points of the interactivity continuum (see Figure 3).

When games take most or full control (e.g., in long cut scenes), they essentially revert to a "lean back" medium (Jansz, 2005, p. 222). Here, players are left with no influence over what happens on screen and are not responsible for the game's progression. In such situations, eudaimonic experiences may result from mechanisms already identified in the literature on non-interactive media, such as film (see Raney et al., 2019). This research suggests that in the absence of interactivity, narrative is relevant for the formation of eudaimonic experience—especially stories that convey lessons about life and provide insights into values, virtues, and existential issues (e.g., Oliver and Hartmann, 2010). Such content is typically characterized as cognitively or affectively challenging, for example, due to illustrating moral dilemmas (Bartsch and Hartmann, 2017). Eudaimonic experiences such as a sense of meaning are usually thought to arise when audience members are willing to carefully process these narratives and successfully deal with the emotional and cognitive challenges (e.g., making sense of the portrayed hardships, coping with negative affect; e.g., Lewis et al., 2014; Bartsch and Hartmann, 2017). This explanation seems to extend well to games: cognitive and affective challenges (Kümpel and Unkel, 2017; Bopp et al., 2018), insights resulting from narration (Oliver et al., 2016), and reflection on the narrative (e.g., Whitby et al., 2019) are all pertinent factors in the formation of eudaimonic gaming experiences, and might be most effective when players can fully focus on the narrative due to reduced interactivity.

At the other end of the spectrum, games offer players a great deal of control. For example, level editors or sandbox games allow players to freely "engage in almost any way they choose" (Bowman et al., 2015, p. 46). An often-studied example is *Minecraft,* a game in which players can design a whole world based entirely on their imagination (Rahimi and Shute, 2021). Arguably such titles are not typical games (for a definition see Juul, 2005), as they lack a predefined winning state, rely less on fixed rules, and allow higher flexibility in how gameplay can unfold.[4] Indeed, *Minecraft* seems to be closer to 'open-ended play' (De Valk et al., 2013)

4 This should not imply that sandbox games do not rely on rules. Every game is built on mechanics and, thus, possesses rules for (and constraints on; Stang, 2019) how the interaction between player and game proceeds. However, sandbox games offer high degrees of freedom in how the mechanics can be used and combined, allowing flexibility and improvisation. This can be seen for example in the discussion of affordances (Eden et al., 2018): Sandbox games encourage players to discover myriad affordances of in-game objects, while other games might intentionally restrict 'player degrees of freedom' to focus instead on mastering specific mechanics and actions.

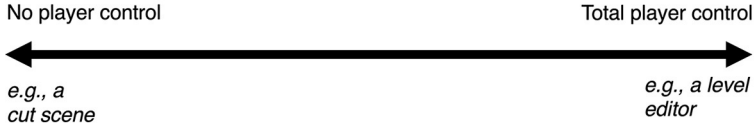

FIGURE 2
Continuum of video game interactivity.

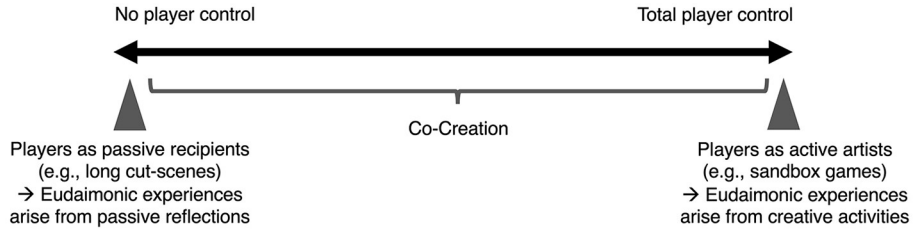

FIGURE 3
Continuum of video game interactivity and eudaimonia-inducing mechanisms at its endpoints.

than to a classical game. In this form of video game, eudaimonic experiences are likely to result from mechanisms identified in the research on creativity (see Bowman et al., 2015). While play is always a creative process (Gee, 2005), sandbox games were found to hold a particularly rich potential to foster creativity due to their open-ended nature (for a recent review: Rahimi and Shute, 2021). For example, studies have shown that playing *Minecraft* can promote creativity (e.g., Checa-Romero and Pascual Gómez, 2018; Blanco-Herrera et al., 2019; but see Moffat et al., 2017). Pursuing creative activities, in turn, has often been associated with eudaimonic experiences such as growth and self-realization (e.g., Cropley, 1990; Forgeard and Eichner, 2014). For example, creating visual artworks, music, or literature has been associated *inter alia* with sense-making (i.e., finding meaning for one's existence) or bonding with others (Lomas, 2016), and daily creative behavior was found to promote flourishing (i.e., feeling a sense of meaning in life, engagement, and social connectedness; Conner et al., 2018).

Applied to video games, we argue that when interactivity is maximal, players become "artists": They can play by their own rules (i.e., agency), tell their own stories (i.e., narrative), design their own forms of competition or cooperation (i.e., sociality), and create their own aesthetics. This creative form of gameplay has been linked in prior research to eudaimonic experiences such as reflection and meaningfulness (Hall et al., 2020).

4.3. Between the poles: the relevance of the game layers for eudaimonic experiences

The discussion above suggests that the mechanisms underlying the formation of eudaimonic gaming experiences likely differ between the endpoints of the interactivity continuum. However, as a medium that is co-authored by developers and players (Wellenreiter, 2015), video games should often operate between these extremes. For these intermediate conditions, the theoretical approaches described in section 3 should provide practical explanations for the emergence of eudaimonic gaming experiences. Yet, we argue that their explanatory power also differs at relative levels of interactivity. It is beyond the scope of this manuscript to review how interactivity affects the precise explanatory power of each theoretical approach. Instead, we draw on the ANSA model (see Section 2.2) to focus our discussion on those theoretical approaches that are most useful for explaining eudaimonic gaming experiences at various levels of interactivity. Put another way, we present an "interactivity sweet spot" for each group of theoretical approaches on the formation of eudaimonic experiences identified in Section 3. Moreover, to aid in our discussion, we heuristically divide the interactivity continuum into rough levels ranging from "very low" to "very high" (see Figure 4), serving as an organizing framework to guide future research. Finally, we note that a limitation of our approach is that we do not explicitly incorporate individual differences in gameplay preferences and motivations (for such differences see Vahlo, 2018). Instead, we focus on how game features *vis-a-vis* ANSA layers combined with interactive affordances make some theoretical approaches more relevant than others.

First, we argue that theoretical explanations that attribute the formation of eudaimonic gaming experiences to the *agency* layer of video games have the highest explanatory power at lower to higher levels of interactivity (see Figure 4). Some of these approaches assume that players have certain expectations about gameplay mechanics or established patterns of agency in the game, which are then disrupted or defamiliarized and ultimately evoke eudaimonic reflection (e.g., Elson et al., 2014; Whitby et al., 2019; Chew and Mitchell, 2020; Mitchell et al., 2020). Yet for players to realize such defamiliarization, a basic level of control over the game must be possessed beforehand (and sometimes even during the defamiliarization process). For example, unexpected gameplay patterns (i.e., "winning is impossible", Mitchell et al., 2020, p. 890) in the game *September 12th: A Toy World* (a serious game on terrorism; Whitby et al., 2019) can only be observed when players leverage agency within the game world. Furthermore, other approaches suggest that significant achievements (Rogers et al., 2017), competence experiences (Possler et al., 2020), or mastery experiences (Seaborn et al., 2019) contribute to meaningful eudaimonic experiences for players. The formation of such experiences likely also requires players to have a basic level of control over the game so that a challenging interplay of inputs and game outputs can emerge (Klimmt, 2003).

However, at very high levels of interactivity, the agency-related mechanisms in our model might become less useful for explaining the formation of eudaimonic experiences. Especially, *predefined* challenges and moments of defamiliarization should occur less frequently, as developers are less able to plan such effects when players' control is very high (as it is unclear how the game will be used, broadly and in the service of those eudaimonic experiences). Yet, under such conditions, players may still set their own goals and rules (De Valk et al., 2013), so meaningful mastery experiences could occur even in very highly interactive games. However, this

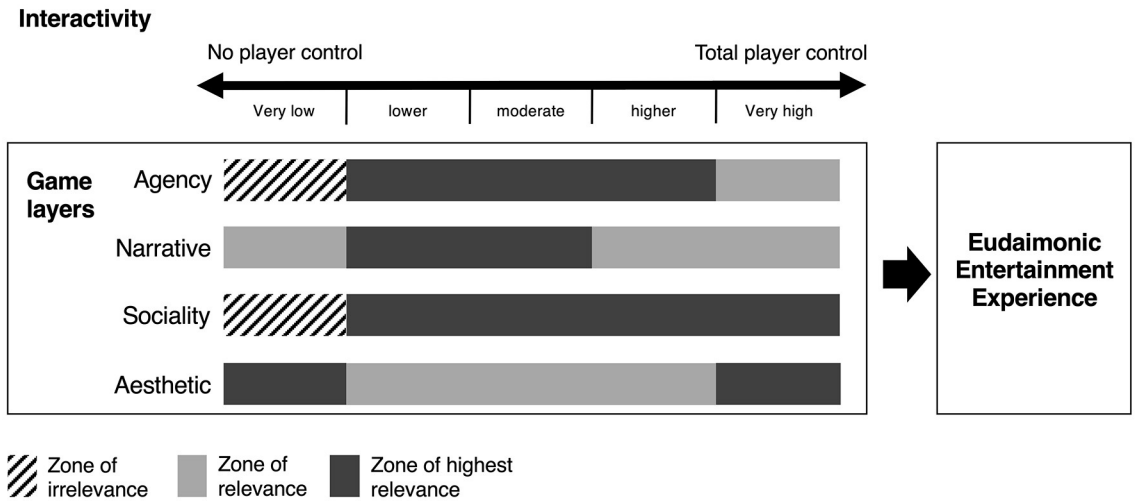

FIGURE 4
Heuristic model of the relevance of the game layers and associated theoretical approaches for the formation of eudaimonic experiences depending on the degree of interactivity.

requires consideration of additional factors beyond the game itself (such as player motivations). Moreover, although players could use a sandbox game as a canvas for artistic expression or for setting and conquering their own challenges, neither are de facto outcomes of highly interactive games. For these reasons, we would maintain that agency-based approaches are mostly likely to consistently explain eudaimonic experiences at lower to higher levels of interactivity, as this would represent scenarios in which gameplay itself, rather than meaning injected into that gameplay by players (see headcanon via McKnight, 2018) is likely to elicit outcomes.

Second, the ***narrative*** mechanisms underlying eudaimonic gaming experiences are likely to be most useful at lower to moderate levels of interactivity (see Figure 4). As noted in Section 4.2, game narratives can elicit eudaimonic experiences absent interactivity, similar to mechanisms from non-interactive media such as film. However, most theoretical approaches assume that interactivity facilitates the formation of eudaimonic gaming experiences through the narrative. This is often attributed to three reasons (see also Green and Jenkins, 2014). First, interactivity can facilitate the formation of immersive experiences such as identification (Klimmt et al., 2009) or presence (Wirth et al., 2007), which engage players and cause them to react to events in the story as they would to events outside the game (e.g., Oliver et al., 2016; Holl et al., 2020; Bowman et al., 2021) so that game narratives feel more "real" and "meaningful." Second, interactivity allows players to make decisions that heighten their responsibility for narrative consequences (e.g., Elson et al., 2014; Steinemann et al., 2017; Melzer and Holl, 2021). For example, Holl (2019) demonstrated that player decisions in *Detroit: Become Human* (a narrative-focused game) largely determine the fate of the protagonists in the story. This makes players highly responsible for the outcome of the narrative and drives self-reflection when facing in-game dilemmas (Daneels et al., 2020) or emotionally moving and elevating experiences (Daneels et al., 2021b). Third, some approaches attribute the formation of eudaimonic experiences to players' forming close connections to in-game characters (e.g., Conway and Elphinstone, 2019). These close relationships are partly attributed to the (simulated) reciprocity of interactions with characters enabled by interactivity (e.g., Tyack and Wyeth, 2017; Coanda and Aupers, 2021). Too much interactivity, in turn, may be detrimental to the narrative induction of eudaimonic experiences as, under this condition, the presentation of a pre-planned, well-timed, eudaimonia-themed narrative is hardly possible (Ip, 2011). As explained above (Section 4.2), players can presumably narrate their own story in highly interactive games (see also Jenkins, 2004). However, this requires players to take on the role of creators instead of co-creators (which likely depends on their motivations). Thus, while a game's narrative can likely evoke eudaimonic experiences at any level of interactivity (see Figure 4), these mechanisms should work best and without further preconditions at lower to moderate levels of interactivity.

Third, approaches attributing the formation of eudaimonic experiences to a game's *sociality* are likely to have their highest explanatory power at lower to very high levels of interactivity (see Figure 4). The formation of eudaimonic experiences based on social interaction requires that players can play with or against other humans (Elson et al., 2014; De Schutter and Brown, 2016; Bonus et al., 2018; Possler et al., 2020; Pearce et al., 2022). A nominal level of interactivity seems required for these social interactions to occur: Players must be able to influence the game together (Steinkuehler and Williams, 2006). This can even be seen in single-player games, in which players form social bonds while co-influencing on-screen content, even if only one person interacts with the content at any given point in time (Consalvo et al., 2018). Moreover, it is not to be expected that too much interactivity impedes the sociality-induced formation of eudaimonic experiences, as complex social dynamics may even occur in many highly interactive games, such as massively multiplayer online games (e.g., Williams et al., 2006).

Fourth, we hypothesize that the *aesthetic* induction of eudaimonia works best at either very low or very high levels of interactivity (see Figure 4). Typically, approaches resting on this layer assume that eudaimonic experiences arise when players respond directly to the sensory sensations of the game (e.g., with awe: Possler et al., 2018; Possler, 2021) or intellectually reflect on the aesthetic components of the game (Bopp et al., 2021; Possler and Klimmt, 2023). In both cases, a prerequisite for the optimal functioning of the aesthetic pathways to eudaimonia is that players experience sufficient time and "safety" to engage with the aesthetic layer (Possler et al., 2018; Possler and Klimmt, 2023). In contrast, if the game demands are too high, players may lack the mindfulness required for aesthetic responses to arise. For example, in a fighting game, in which players need to closely monitor what is happening on the screen and respond by pressing buttons in a fast-paced manner, it is unlikely that they still have sufficient cognitive resources available to appreciate the aesthetics.[5] In contrast, when interactivity is very high or very low, players either relinquish responsibility for the game (low interactivity) or set their own pace (high interactivity), which should leave them with sufficient resources for experiencing eudaimonic aesthetic responses.

However, this should not imply that the aesthetic level can only elicit eudaimonic responses on the extreme levels of interactivity. For example, a very demanding, flow-inducing moment in a game may hold an aesthetic value on its own (e.g., the elegance of a perfect rhythm in a challenging music game; Atkinson and Parsayi, 2020). At the same time, for such a moment to evoke an aesthetic response, players must attend to the aesthetic properties of the experience (Atkinson and Parsayi, 2020, p. 530). It is unlikely that players fully acknowledge these aesthetic qualities in the moment of playing due to the high demands of the situation (indeed flow states are partly defined by a loss of awareness; Sherry, 2004).

5. Discussion

Our theoretical overview illustrates the innovation potential of eudaimonic gaming experience research: Although some approaches rest on theories that have frequently been used in games research (e.g., *self-determination theory*, see Tyack and Mekler, 2020), a variety of new frameworks have been developed (e.g., integrative model of moral processing: Melzer and Holl, 2021; the model on the entertaining effects of game aesthetics: Possler and Klimmt, 2023). These new models often apply theoretical foundations from other disciplines (e.g., moral psychology, empirical aesthetics) to games, substantially expanding the theoretical background of game research.

By categorizing the theoretical approaches according to focal game elements, it became apparent that all levels of video games—Agency, Narrative, Sociality, and Aesthetics—offer a rich potential for the formation of eudaimonia. At the same time, we revealed some gaps in current theorizing: While many approaches attribute the formation of eudaimonic experiences to games' agency and narrative layer, only a few explanations rest on the social and aesthetic layer. This is remarkable, as studies demonstrated the high relevance of both social interactions among players and game aesthetics for eudaimonic responses (Daneels et al., 2020; Bopp et al., 2021). Hence, we hope our overview encourages scholars to focus more on these layers in theory development.

In general, we see a major limitation of current theory development in the focus on *active play* as the form of engagement with games and in mostly considering game characteristics as antecedents of eudaimonic experiences (see Daneels et al., 2023). Engagement with video games and gaming culture beyond active playing (see Meriläinen, 2023) is rarely considered. However, we believe that these forms of engagement could be highly important for explaining the emergence of eudaimonic experiences—especially for highly involved gamers (for an overview of gamer mentalities, see Kallio et al., 2011). For example, deep social connections can likely also arise in gaming communities or from watching Let's Play videos (e.g., Kreissl et al., 2021), and the impact of meaningful narratives and characters is likely to be deepened through transmedia storytelling (e.g., books about a game) or further engagement in a game's lore (e.g., cosplay).

Finally, we developed assumptions about the relevance of the four game layers—and the theories that rest upon them—to the formation of eudaimonic experiences depending on heuristic levels of a game's interactivity. Although our goal was not to offer precise estimates of interactivity levels, our assumptions in marking these heuristic levels provide scholars with some initial guidance on which group of theories is particularly useful for explaining eudaimonic game experiences under specific conditions: as different types of games offer players different levels of interactivity, our overview suggests which theories and which game layer need to be considered when examining specific game types. Moreover, our assumptions also provide a first step in developing an overarching framework integrating the diverse theoretical approaches. Specifically, our overview allows identifying which approaches are complementary, contradictory, or might interact with each other based on the game layers they focus upon.

Despite this promising potential, we need to consider the limitations of our overview. Although our work was informed by a systematic literature review (Daneels et al., 2023), it cannot be ruled out that we overlooked relevant literature. Especially as Daneels et al. coded the presence of a theoretical background in a study only when it was explicitly mentioned. Next to this, future work should consider the relationship between interactivity and the usefulness of the theoretical approaches not only at the level of the layers but of the theories themselves. This may prove fruitful, as interactivity-related differences in usefulness can be expected in theories of one and the same layer. For example, while reflection may also occur in linear narratives (Whitby et al., 2019), moral decision-making (Melzer and Holl, 2021) necessarily requires some degree of interactivity. Finally, by analyzing the literature based on the ANSA model, we did not focus on antecedents of eudaimonic gaming experiences beyond game characteristics. Particularly, we did not identify individual differences in players that may result in differential susceptibilities (Valkenburg and Peter, 2013) to eudaimonic experiences (e.g., player dispositions, motives, or situational characteristics). While

5 However, we acknowledge that these processes are likely contingent on player skill, as skilled players may have more cognitive resources available that could be used to recognize aesthetic qualities, even in highly interactive games (Possler et al., 2018).

these additional characteristics have been considered less frequently in the literature (Daneels et al., 2023; for a notable exception see Wulf and Baldwin, 2020), they seem highly relevant for gaining a broader perspective on the emergence of eudaimonic experiences. For example, Vahlo (2018) has shown that players' individual gameplay preferences are critical in determining how much and what kinds of meaningful experiences arise from playing.

Overall, our overview highlights the potential of the existing theoretical approaches for understanding how eudaimonic experiences form when playing games. We hope that our work will prove a heuristic provocativeness (see DeAndrea and Holbert, 2017) for the further development of these theories, the filling of gaps in theorizing, and the integration of existing approaches.

Data availability statement

Publicly available datasets were analyzed in this study. This data can be found here: https://osf.io/fhxqw.

Author contributions

DP developed the working definition of eudaimonia and conceptualized the game layers and took the lead in writing these sections. RD conducted the literature overview. NB and DP conceptualized the interactivity continuum. All authors developed the assumptions of how interactivity shapes the theoretical approaches and discussed and commented on the manuscript. All authors contributed to the article and approved the submitted version.

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Conflict of interest

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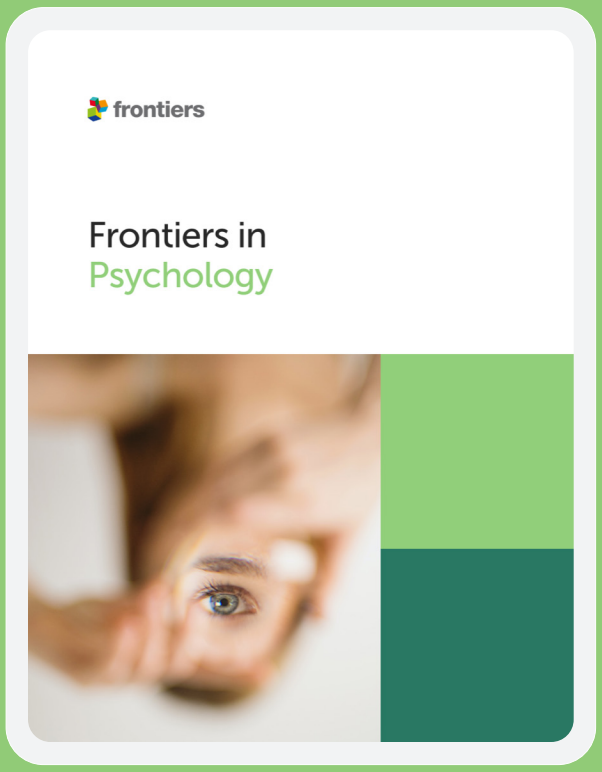

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