**Gaming Disorder:**

**A qualitative meta-synthesis of related case studies**

Stage 1 RR, v2

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**Abstract**

Several meta-analyses and reviews have been published on gaming-related health problems, which are today studied mainly in the context of the World Health Organization’s new mental disorder construct, “gaming disorder”. However, none of those reviews have focused on the problems reported by individuals seeking treatment. The present study synthesizes such evidence from case studies, case reports, and case series of treatment-seekers for gaming-related health problems. First, using deductive coding, the study will synthesize problems, reasons for seeking help, as well as the potential causal links between gaming and the reported problems. Second, a thematic synthesis will be applied to construct themes regarding the contexts of the individuals and the reported problems. A sensitivity analysis based on the level of informativeness of the studies will be carried out. Lastly, the study will assess how well the reported problems and their contexts align with the Coping model, Value fulfillment theory and the Theory of cultural dissonance.

KEYWORDS: gaming disorder, qualitative, meta-synthesis, case study, treatment, review

**Introduction**

Video games have become one of the dominant forms of pastime around the world in recent years. Research has suggested that gaming may be beneficial in many regards: for relaxation and stress reduction (Snodgrass et al. 2011), social health (Kowert et al. 2015), decreasing loneliness and social anxiety (Martončik & Lokša 2016) and general well-being (Johannes et al. 2021), as well as carrying several other benefits in the cognitive, motivational, emotional and social domains (Granic et al. 2014). On the other hand, concerns have been raised by parents and health professionals over gaming that seems excessive or interfering with other life areas (UNICEF 2017).

Being a subject of study since the 1980’s, gaming-related health problems have been described in numerous terms, e.g., compulsive Internet use (van Rooij et al. 2010), online gaming addiction (Charlton & Danforth 2007), problematic online game use (Kim & Kim 2010) and problem video game playing (King et al. 2011; Salguero & Moran 2002). The multitude of descriptions gives a preliminary idea of differences of opinion in the field (Ferguson & Colwell 2020). Included as a stand-alone diagnosis in the World Health Organization’s (WHO) International Classification of Diseases (ICD-11) since 2019, gaming disorder (offline or online) is today conceptualized as follows: a pattern of persistent or recurring gaming behavior described by impaired control over gaming, increasing priority given to gaming that is taking precedence over other life interests and daily activities, and continuation or escalation of gaming despite negative consequences. The DSM-5-TR (2022), in turn, proposes nine symptoms for future study: preoccupation, loss of control, tolerance, withdrawal, deceiving about the behavior, and jeopardizing important relationships or perspectives by continuing the behavior despite negative consequences.

Both the ICD-11 and DSM-5-TR based concepts have been challenged for multiple reasons, including ambiguous definitions, a scarcity of multidisciplinary and person-centered perspectives, and methodological weaknesses in published studies (see Smart 2019 for a summary). The main criticism has been directed at the criteria used by both diagnostic systems (e.g., Aarseth et al. 2017; Bean et al. 2017; Billieux et al. 2015), especially for their origins in the research on gambling and substance use. While neurobiological parallels have been found between some problematic gamers and those with substance-related disorders (Kuss et al. 2018), questions have been raised about the “addictive” elements in gaming-related problems (e.g., Kardefelt-Winther 2016). Moreover, problematic behavioral patterns associated with gaming might also be conceptualized through other mental health issues (Shaffer et al. 2004, Taipale 2017, West & Brown 2013).

It is important to note that mental disorder categories are not natural kinds, namely, their inclusion and exclusion criteria are social constructs that evolve and alter over time. Of the many relevant terms introduced above, in the rest of this study we use two. First, we use the term “gaming disorder” when specifically referring to the diagnosis in the ICD-11. Second, we use the term “gaming-related health problems” when generally referring to the phenomenon outside of the ICD-11 diagnosis. This operationalisation is also visible in the title of this article: although the work primarily contributes to the current research paradigms of gaming disorder, our historical approach will also be inclusive to relevant findings that were made before the formalization of the diagnosis. In other words, we are not only interested in cases that would likely qualify as “gaming disorder” today, but all cases of “gaming-related health problems” that have qualified for medical attention in the past and over time that contributed to the formation of the gaming disorder diagnosis.

Despite the recurring occurrence of new addictive behaviors with distinct diagnostic criteria and prevalence figures (Baggio et al. 2018), few theoretically sound models exist and there is no consensus regarding which ones are useful (Billieux et al. 2015; Karhulahti et al. 2023b). Kardefelt-Winther (2014a; 2014b; 2017) and Snodgrass et al. (2014) have been at the forefront to suggest gaming-related problems to serve as coping strategies*—*also known as the self-medication hypothesis in substance use psychiatry (Khantzian, 1997). This idea of compensatory use bears resemblance to Taipale’s (2017) efforts to rephrase “addictive” behaviors: Taipale suggests that what is wanted from an addictive “object” is modification of one’s potentialities, and therefore addictive behavior is a form of assisted self-regulation.

Alternatively, gaming problems have been interpreted as responses to childhood attachment issues (Schimmenti et al. 2012; 2014) or disorders of impulse control (Starcevic & Aboujaoude 2017). Karhulahti et al. (2023c) investigated 110 adults’ reasons for seeking treatment for their gaming problems and found five main sources of problems: addictive experiences being but one next to social, existential, and practical reasons as well as general wish for support. These miscellaneous reasons may at least partially reflect the conflicts that players have with local cultural values or the values of their own; the former having been theorized through “harmful dysfunction” (e.g. Wakefield 1992) and later “cultural dissonance” (e.g., Snodgrass et al., 2021), and the latter as “value fulfillment theory” (e.g., DeYoung & Tiberius, 2023).

Although the worldwide prevalence of gaming disorder has been estimated in meta-analyses at around 3% (Stevens et al. 2021; Ferguson et al. 2011), the use of varied methodological approaches significantly affects comparability of prevalence studies (Mihara & Higuchi 2017; Stevens et al. 2021). First, problems arise from basing inferences on samples that consist of selected populations such as children (Carbonell 2017) and thus are poorly representative. Second, numerous scales have been used to measure gaming behaviors (King et al. 2020). These different measures tend to identify different groups, suggesting the existence of multiple ontologically different underlying constructs instead of a single “gaming disorder” (Karhulahti et al. 2023a). As an example of this, using criteria that describe highly engaged players (e.g., cognitive salience, tolerance, and euphoria) versus those describing pathological ones is known to result in significantly different prevalence rates (Charlton 2002, Charlton & Danforth 2007, Kuss et al. 2017, Wood 2008).

In comparison with most psychiatric diagnoses, gaming disorder—or gaming-related health problems more generally—still has a relatively short history. Research community is still far from unanimous on what these problems are (Aarseth et al. 2017, Griffiths et al. 2016). As the gaming disorder diagnosis holds the criterion of ‘significant distress and impairment’, researchers owe it to the billions of players and their close ones worldwide to form a clearer understanding of what is known about the manifestations of such distress. This study aims to shed more light on the issue by synthesizing the extant evidence on problems and their context as reported in cases of gaming treatment-seekers.

Although it is beyond the present methodology to systematically review the entire field of gaming disorder research, almost all peer reviewed article publications (we estimate more than 95%) are driven by quantitative or statistical methods. Based on searches in PubMed (February 2024), no less than 228 meta-analyses (including umbrella reviews; e.g., Colder Carras et al. 2020) and/or reviews (including narrative reviews) have already been published on gaming disorder (with an alternative search word “game addiction”).. We were, however, able to find but one review focusing on qualitative findings (Douglas et al. 2008), and the focus of this meta-synthesis was on the diverse types of “internet addiction” (reviewing 10 articles), thus addressing gaming-related problems only tangentially.

Despite the lack of focus on qualitative and case studies, review authors often select one or more such publications as examples of clinical evidence. For example, Kuss & Griffiths (2012) cite a few qualitative studies in two sentences, whereas a review that aims to understand the underlying cognitive psychology of the disorder (King & Delfabbro 2014) cites one case study in the limitations. In an influential review provided by a group of clinicians and researchers convened via the WHO (Saunders et al. 2017), likewise, a few selected case reports are mentioned—e.g., one where “prolonged sitting at computer” was the direct cause of death (Lee 2004)—but it remains unclear how representative these selected cases are of the gaming disorder construct.

Considering the present situation, there is a dire need for a systematic review of qualitative research on gaming disorder, at least for three major reasons. First, reviewing the existing qualitative research will significantly help draw a more detailed picture of the evidence for gaming disorder beyond studies that draw quantitative and theoretical inferences. Second, with reference to the WHO expert group’s recent call for “phenomenological and qualitative work conducted in treatment-seeking gamers” (Castro-Calvo et al. 2022), a systematic review of previous qualitative work can significantly contribute not only to the current conceptualization of gaming disorder but also its historical understanding. Finally, and perhaps most importantly, reviewing qualitative evidence can help us improve the state of art regarding gaming disorder as a construct by assessing the (latent) entity in the light of actual treatment-seeking contexts. To make these contributions in this study, we focus on case studies of people with gaming-related problems, and ask:

RQ1.1: What are participants’ *reported problems* in case studies concerning gaming-related problems?

RQ1.2: What are the *reported reasons* for people to seek help for their gaming?

RQ1.3: What are the *reported causal links* between gaming and reported problems?

RQ2: What is the context of these individuals/problems?

RQ3: How do the outcomes of RQ1 and RQ2 differ between studies of high and low levels of informativeness?

**Methodology**

Because the vast diversity of qualitative methods easily leads to methodological review challenges, the present study will focus on case studies, case reports, and case series alone. This decision establishes a clear focus on detailed descriptions of individual treatment-seeking cases, which is the main function of case-based publication types. The review aims to answer our RQs by using two parallel coding approaches: deductively driven coding that will assess the relevant content of publications by predefined categories (RQ1), and thematic synthesis that will yield new, inductive themes regarding context (RQ2). Sensitivity analysis is carried out for the results overall (RQ3). We explain both approaches in more detail below.

In this study, our epistemology is a mix of critical and semi-positivist knowledge. We value objectivity as an epistemic scientific goal but simultaneously believe that both the reviewed studies and our own review of them can be meaningfully influenced by the implicit positions of researchers. Therefore, we code the researcher positions reported in the reviewed studies and make coder views regarding the controversial topic of gaming-related health problems visible too (<https://ore.jyu.fi/english/our-team>). Our ontology, in turn, is socially pragmatic: we do not believe that gaming disorder ‘exists’ as a natural concept but it is rather a social construct that is currently in psychiatric use in some cultural contexts for practical purposes. More generally, our work follows a pragmatist philosophy of science (Chang 2023) and its ‘epistemic iteration’ where:

“successive stages of knowledge are created, each building on the preceding one, in order to enhance the achievement of certain epistemic goals. In each step, the later stage is based on the earlier stage but cannot be deduced from it; later developments often correct and refine the presuppositions made in the earlier stage” (p. 208)

In line with these epistemological and ontological positions, our goal is to contribute to the ongoing iterative ‘reconstruction’ of knowledge regarding gaming disorder and its related (previous) concepts—ultimately to make such knowledge *useful* in theory and practice.

***Search***

The focal constructs of this review are “gaming-related health problems,” some of which have recently acquired an official diagnostic status as “gaming disorder.” To account for similar terms (including MeSH suggestions), the search string includes:

“gaming disorder” OR “problematic gaming“ OR “problematic play\*” OR “pathological play\*” OR “pathological gaming” OR “disordered gaming” OR “disordered play“ OR “addictive play\*“ OR “addictive gaming” OR “gaming addiction” OR “gaming dependency” OR “game addiction” OR “game dependency” OR “excessive gaming” OR “excessive play\*” OR “problematic play\*” OR “heavy gami\*” OR “heavy game\*” OR “internet addiction”

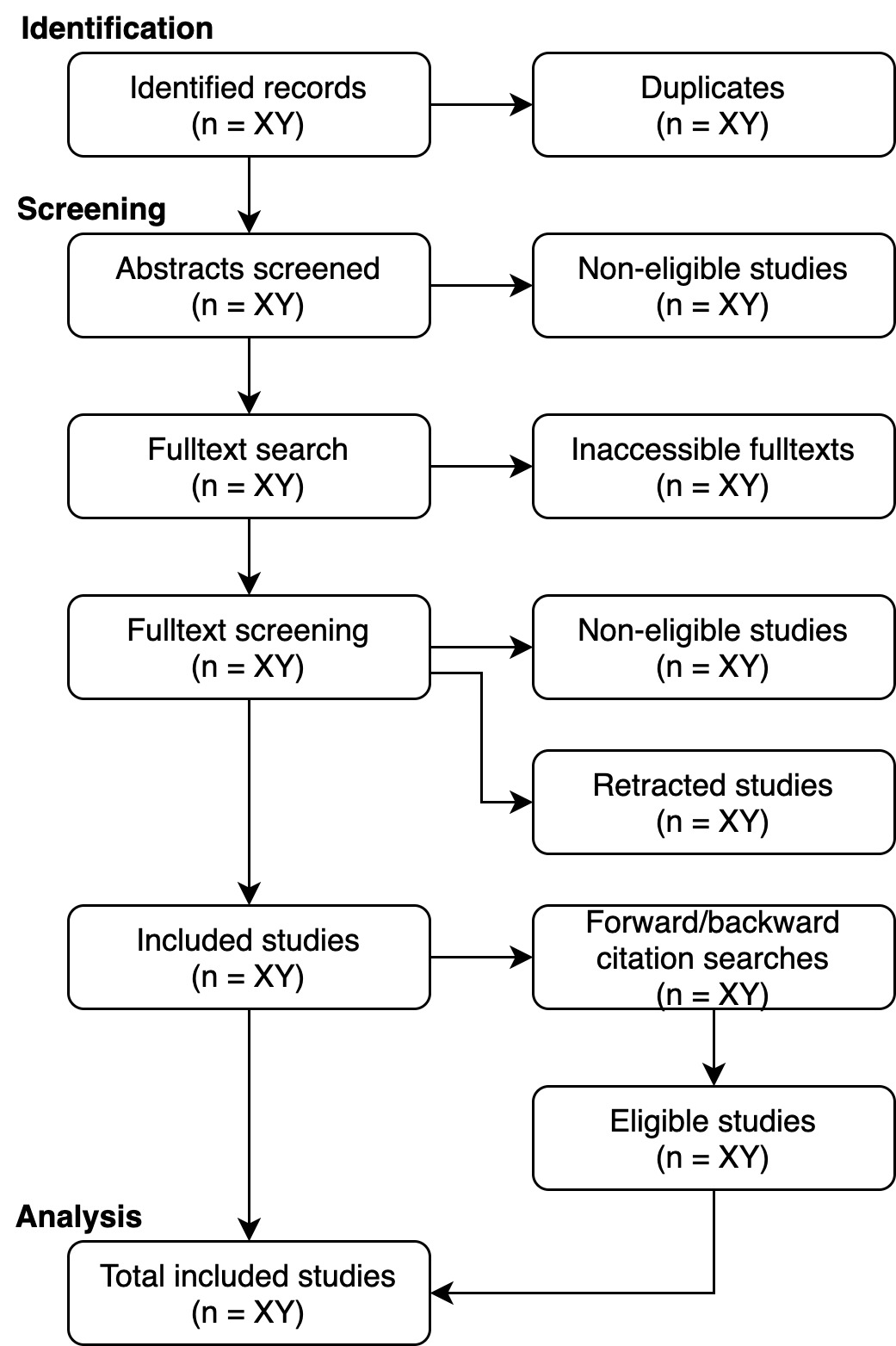
The term “internet addiction” is used additionally due to gaming disorder having been historically studied as such (e.g., Young 1998). As this review focuses on case studies, case reports, and case series, the terms mentioned above are coupled with “case”. The searches will be focused on titles, abstracts, and key words provided by the authors.[[1]](#footnote-1)

Forward and backward citation searches will be carried out on eligible studies. If we find an additional relevant study outside this systematic search, it will be added to the review. To be included as relevant, case studies, reports, and series must address problems related to gaming (playing video games), especially health problems (mental, social, physical) but not excluding other problems that may not fit the domain of health (e.g., overspending). The eligible studies will include participants who gained treatment for these problems. The only exclusion criterion is that a study only reports gambling problems without problems related to non-gambling video games. Following the ICD-11, we define gambling as the act of wagering real-world money or its virtual equivalent on outcomes that are at least partly determined by randomness outside of a player’s control, with the intention of earning a monetary reward.

The literature search will be carried out in Web Of Knowledge Core Collection, Scopus, and PubMed. The search will be limited to peer-reviewed articles, peer-reviewed conference proceedings, and case studies which are published as letters or editorials (i.e., it will not include monographs, dissertations, preprints, or non-peer-reviewed conference proceedings) written in English, Finnish, Korean, or Slovak language[[2]](#footnote-2). The eligible studies need to be explicitly framed as case studies or examinations of particular cases. We will exclude (1) instances which are merely detailed descriptions of selected participants in a larger qualitative dataset, as well as (2) studies that apply any systematic method to a dataset, such as thematic or content analyses, unless they are explicitly framed as case studies, reports, or series.

All the records found either by using the systematic search, forward/backward citation search, or studies found outside the systematic search will first be checked for duplicates. The study-related data and abstracts will be imported to Rayyan (Ouzzani et al. 2016), in which the initial (title and abstract) screening will be carried out by two independent coders (MA & TA) blinded to each other’s decisions. None of the studies will be excluded unless agreed upon by both coders (in case of disagreement, an additional coder will be consulted). Studies for which we will be unable to obtain the full text through database search or direct request from the corresponding author (including a gentle reminder after two weeks) will be excluded after three weeks of waiting. The process of study selection is depicted in Figure 1.

Figure 1. Study search and selection flowchart

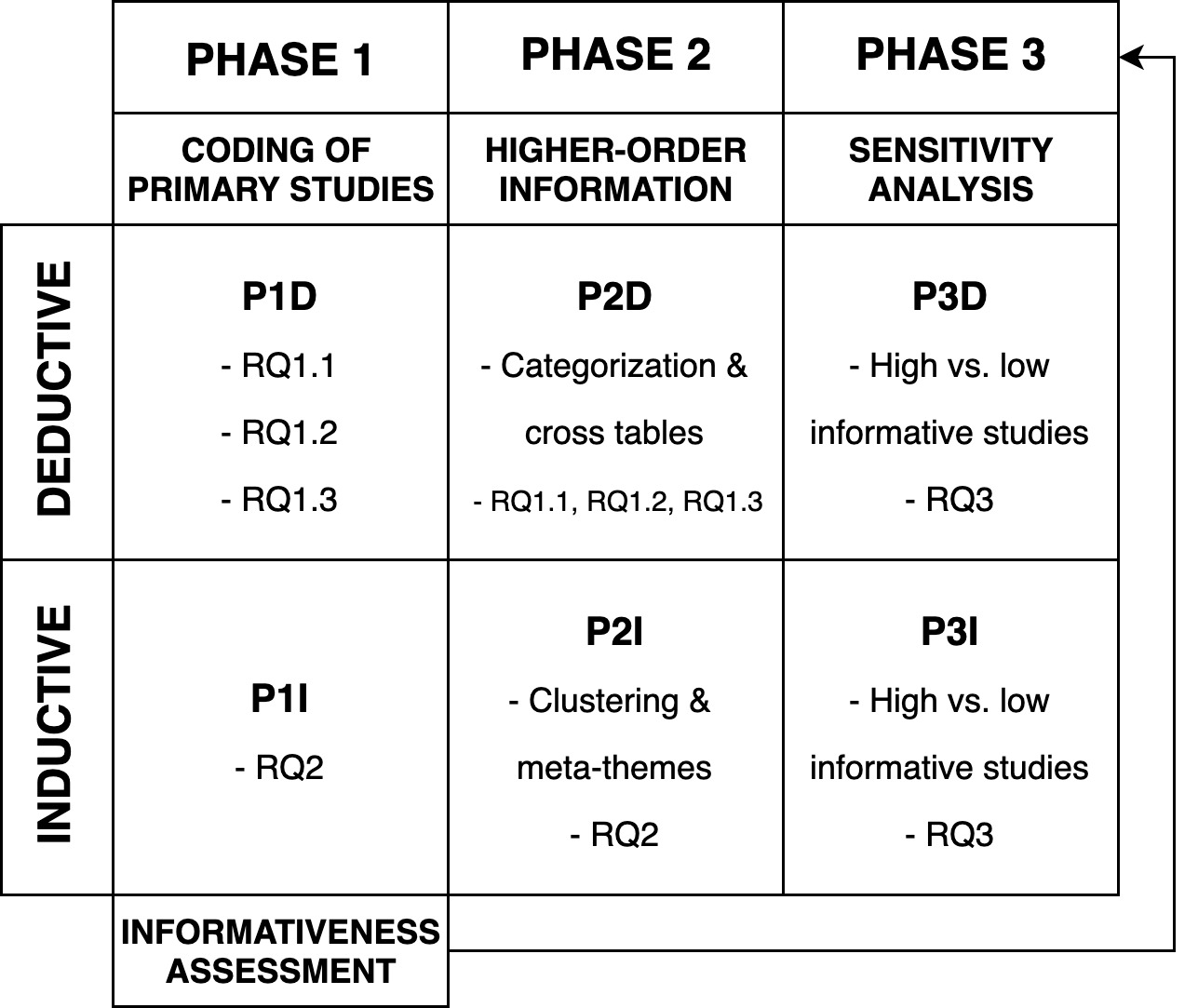


We will not constrain the search historically. The inclusion of the entire spectrum of the available literature ensures that the evolution of gaming-related health problems over time will be captured, minimizing potential biases caused by time as a confounding factor. For instance, in the 1980’s merely spending considerable time on video games was deemed unusual enough to warrant a case study. However, in the contemporary context, the bar for what is considered sufficiently peculiar to qualify for case study publication has evolved significantly due to the normalization of gaming and the discourse around gaming disorder.

***Coding workflow***

The coding plan was generated by iteration in two pilot rounds where three independent members of the team applied the draft sheet for two randomly selected case studies (Ng et al. 2003; Sattar & Ramaswamy 2004). The team met and updated the coding sheet based on feedback from both rounds until agreement. The coding was agreed to be conducted in three phases: (P1) coding of primary studies, (P2) synthesis of higher-order information, and (P3) sensitivity analysis. Each phase involves a deductive (D/RQ1) and inductive (I/RQ2) part. The team held two collective training sessions to synchronize the process of coding and theme generation, and to familiarize themselves with the three theories described below. An overview of the coding workflow is depicted in Figure 2, while a scheme of the whole analytic workflow is presented in Figure 3.

Figure 2. An overview of the coding workflow



Complete coding information with instructions is attached (Supplement 1). In **P1D**, primary studies will be coded by extracting (copy-pasting) the following information.

* RQ 1.1: Reported description of the problem with information whether the problem is identified by the participant, clinician, or original authors
* RQ 1.2: Reported reasons for seeking help
* RQ 1.3: Reported causal link between gaming and the problems

Additionally, the coders will collect bibliographic information and meta-data (reported COIs, number of citations), description of the case (demographic characteristics; comorbidity[[3]](#footnote-3); exclusion of hazardous gaming and bipolar disorder[[4]](#footnote-4), played games, online vs. offline gaming, and dominant gaming device), positive effects of gaming on the case, informativeness scores (see below), and how the study authors nosologically position the case (according to DSM, ICD, or other). The coders will finally assess whether the reported problem(s) and their context fit

1. the *coping model* by which we refer to the idea that gaming-related problems manifest primarily as an outcome of earlier, underlying problems, for which gaming serves as an ameliorating means (e.g., Kardefelt‐Winther, 2017).
2. the *value fulfillment theory*, by which we refer to the idea that well-being is defined by the degree to which an individual is able to fulfill their values (e.g., DeYoung & Tiberius, 2023).
3. the theory of *cultural dissonance*, which here refers to the conflict between gaming and cultural values, and the subsequent attempts to minimize such conflicts (e.g., Snodgrass et al., 2021). We also code whether dysfunction was present to generate evidence also in the light of the harmful dysfunction model (e.g., Wakefield, 1992).

We stress that theoretical assessment is exploratory and does not aim to answer any RQ. The exploratory results can be used as a basis for further theoretical investigation in later studies.

**P2D** continues with the above copy-pasted sections identified as codes. In this second deductive phase, such codes are further clustered by a new pair of coders into existing and potentially new categories, as explained below.

* RQ 1.1: The identified problem descriptions are given five predefined categories. *Physical*, *mental*, and *social health* are selected based on the WHO’s three core areas of health, in addition to which problems related to occupational *performance* and *finances* are selected due to the strong current evidence for them to be common problem types in relation to video games (as listed in ICD-11; Kleinman & Das 2020). Problems not fitting to any of these categories will be classified as “other” and an extra category will be created if there are at least three instances of that new problem type.
* RQ 1.2: The identified reasons for help seeking are categorized by eleven predefined categories *(social compliance, social improvement, resolvement of lost meaning in gaming, resolvement of lost meaning in life, amelioration of performance harms, amelioration of health harms, amelioration of financial harms, change of behavior, acknowledgement of problems, interaction and experiences sharing, gaining guidance*) based on an earlier study (Karhulahti et al. 2023c), which explicitly aimed to identify such reasons. If an extracted reason is outside the scope of the predefined themes, it will be categorized into “other”. Reasons not fitting to any of these categories will be classified as “other” and an extra category will be created if at least three such instances occur.
* RQ 1.3: The identified descriptions of causality (or lack thereof) will be categorized by three classes: *gaming reported as the sole cause of problems*, *gaming reported as one of the causes of problems*, and *gaming reported as a consequence of problems*. These three categories are based simply on available logical possibilities, as the lack of any reported link between the two would not lead to a relevant case study. However, descriptions not fitting to any of these categories will be classified as “other” and an extra category will be created if at least three such instances occur.

To answer RQ1, we use descriptive reporting with cross tables in the results section. These results will be accompanied descriptively with the coding outcomes of variables that are not part of RQ1.

In **P1I**, thematisation will be carried out to identify related contextual factors. As a thematization method, we follow the established tradition of thematic synthesis (Thomas and Harden 2008), which is based on reviewing text line by line, constructing descriptive themes[[5]](#footnote-5), and generating analytical themes. Accordingly, the coders will

* RQ 2.0: code all contextual factors from the case studies by highlighting relevant lines in PDF text documents, after which turning them into descriptive thematic whole(s) and refining them, in the end, into complete analytic themes. For the present purposes, we define “contextual” as any type of relevant information linked to the participant’s gaming, life, or problems, as reported in the published case. Such analytic contextual themes should not repeat coded information but add depth or dimensions to them. In **P2I**, two new coders will synthesize all identified contextual themes into 3–6 meta-themes, which represent the overall literature.

Our rationale for choosing thematic synthesis is its ability to retain an explicit link to the primary research in a transparent manner: it is a fairly linear and modular method, which corresponds well with case-based reporting and is applicable to exploring the potential role for theories (Booth et al., 2016), such as those discussed above. Furthermore, thematic synthesis allows reviewing studies independent of their epistemology or thickness of data (Booth et al., 2016), which is important for case publications that often represent “thin” qualitative data and would be difficult to synthesize, for instance, by means of meta-ethnography. Finally, it is worth adding that thematic synthesis is a suitable method for producing findings that directly inform practitioners (Thomas & Harden, 2008).

Ultimately, **P3D** and **P3I** will serve as a sensitivity analysis and will be based on the informativeness scores[[6]](#footnote-6) obtained in P1D. Given the specifics of the present research and the available risk of bias assessment tools (e.g., Joanna Briggs Institute 2017; Joanna Briggs Institute 2020; Lewin et al. 2015; Noyes et al. 2019), we decided to develop a new tool for assessing informativeness of case studies for the purposes of meta-reviews and syntheses[[7]](#footnote-7). The tool is inspired by the available tools and provides an effective way to assess informativeness in each case study based on these relevant areas:

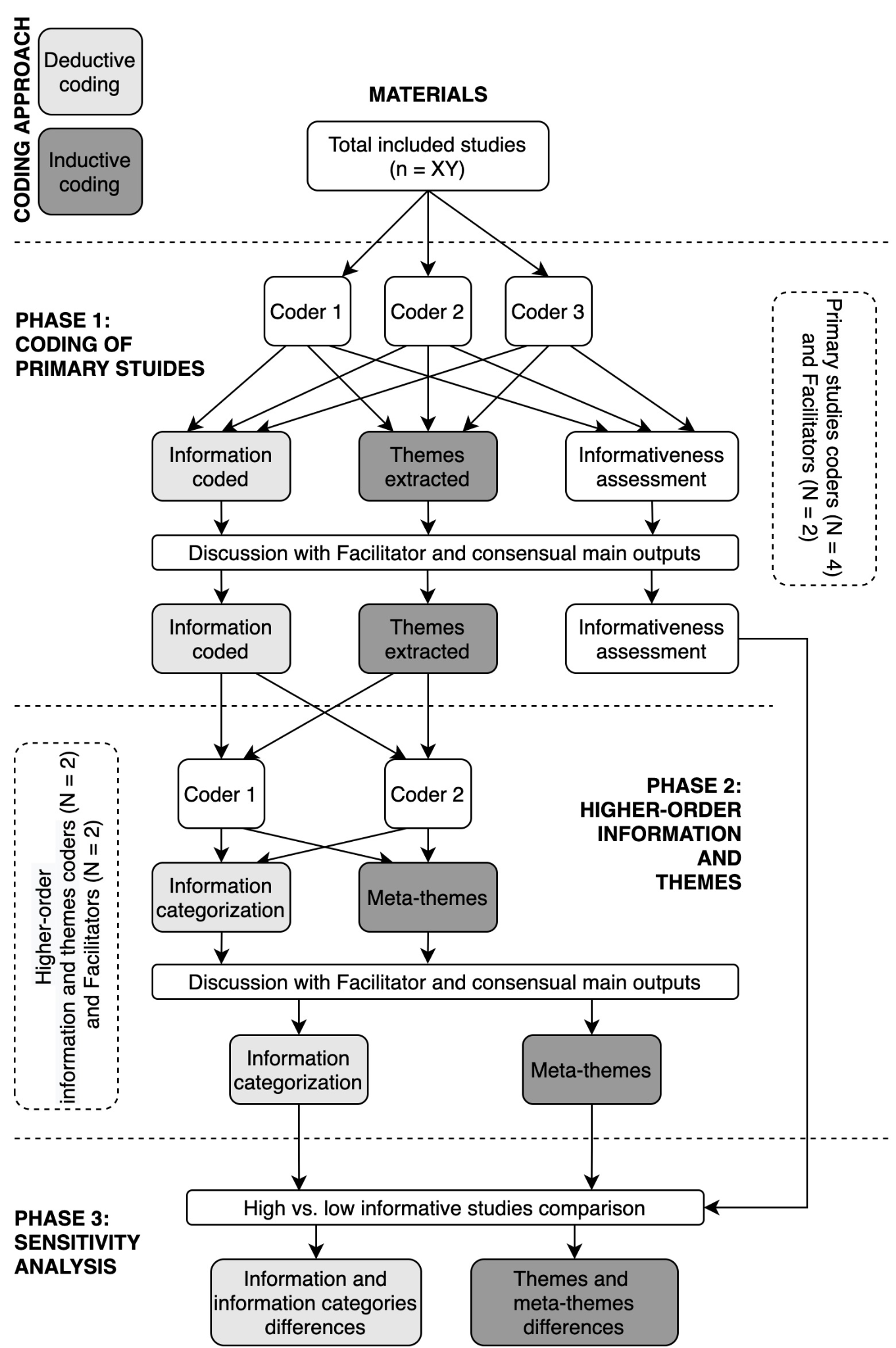
1. Coherence between investigation and interpretations
   1. Reported information is *not coherent* with provided interpretations (1)
   2. There are mostly *weak links* between reported information and provided interpretations (2)
   3. There are *both weak and strong* links between reported information and provided interpretations (3)
   4. Reported information is *mostly coherent* with provided interpretations (4)
   5. Reported information is *fully coherent* with provided interpretations (5)
2. Demographic characteristics, personal history, and context clearly described
   1. Only *basic* information (e.g., age and gender) about the participant and their biographical or sociocultural historical context is provided (1)
   2. In addition to basic information, *some relevant history or context* (e.g., social relationships) is described about the participant (2)
   3. Relevant context about the participant is described, but there are *clear contextual gaps* that could easily explain reported problems (3)
   4. *Almost all* relevant historical and contextual information is provided (4)
   5. *All* relevant historical and contextual information is provided (5)
3. Behavior (gaming) and related problems clearly described
   1. *Both* behavior (gaming) and problems are described very vaguely (1)
   2. *Either* behavior (gaming) or problems are described very vaguely (2)
   3. Both behavior (gaming) and problems are described sufficiently but *critical information* that could further explain the case is lacking (3)
   4. Both behavior (gaming) and problems are described well but *some information* that could further explain the case is lacking (4)
   5. Both behavior (gaming) and problems are described *in detail* (5)
4. Positionality clearly described
   1. There is *no information* about the backgrounds, beliefs, or views of the authors and experts whose interpretations are reported (1)
   2. There is *basic* information (e.g., clinical specialization) about *some* authors and experts whose interpretations are reported (2)
   3. There is *basic* information (e.g., clinical specialization) about *all* authors and experts whose interpretations are reported (3)
   4. *Deep* relevant positionality (e.g., related beliefs) is given for *some authors and experts* whose interpretations are reported (4)
   5. *Deep* relevant positionality (e.g., related beliefs) is given for *all* authors and expertswhose interpretations are reported (5)
5. Transparent reporting principles considered
   1. It is *unclear* how the data were obtained, selected, and the origin of reported information (1)
   2. There is *some transparency* about the data and reporting process, e.g. personal communication by the authors and participant (2)
   3. Data sources and the role of each author in their generation or interpretation are *mostly clear* (3)
   4. Data sources and the role of each author in their generation or interpretation are *clear*, and there are supplementary materials (4)
   5. Data sources and the role of each author in their generation or interpretation are clear, and the *data are available for reuse* (5)

The informativeness level will be assessed by each of the three coders in Phase 1. For each study, informativeness will be reported as a summary score from 5 to 25.

* RQ3: Scores by all three rates will be averaged. If a difference of 3 or more points occurs between raters, discrepancy is resolved during the collective discussion with the facilitator. Sensitivity analysis will be carried out in order to compare the studies with the lowest informativeness scores with the studies with the highest informativeness scores (50% threshold). Phase 2 is completely rerun with low and high scoring studies forming independent groups.

All the above tasks associated with the coding will be done by eight people (all authors of the study) divided into three independent work teams to prevent biases that could occur during the transfer process between the phases. **Team 1** will consist of four people. The team will be responsible for data extraction in Phase 1. Each eligible study will be analyzed by three coders, which are randomly selected from the team of four. The coders will work independently. The workload will be equally distributed across coders so that each author will code the same number of studies, with the caveat that the number of identified studies may lead some authors to code one study less. If we find Finnish studies, coders will be selected from our four Finnish authors. Korean and Slovakian studies will be coded only by two authors with native language expertise. **Team 2** will consist of two people who will be responsible for all the Phase 2 coding. Because this section operates with existing codes, there is less labor and half of the size of Team 1 was considered optimal. The coders will work independently. **Team 3** will comprise two people whose job will be to facilitate the discussions within each phase. Both facilitators will be present at all the discussions in Phase 1. With the facilitator’s help, the coders will qualitatively compare their reports, discuss and resolve the disagreements for RQ1.1, RQ1.2, and RQ1.3. In Phase 2, the facilitators will help collectively synthesize themes, which will be reported as the main output of RQ2. Any major discrepancies will be succinctly reported within the results section. Full versions of the reports of the specific coders will be available in supplementary material.

Figure 3. A scheme of the analytic workflow



**Para-exploratory analysis**

In addition to the research question and methods described above, which are non-confirmatory by nature, we will conduct analyses that we label explicitly as para-exploratory. We will use a large language model (LLM) to carry out all the phases of the coding process. Specifically, we plan to feed GPT-4 (its most recent version available at the time; or another LLM we deem the most appropriate for the task) with the eligible papers, prompting it to extract information related to RQ1 and conduct a thematic analysis related to RQ2. Additional prompts and fine-tuning might be necessary, and we will maintain a detailed record of the chat history. We aim for a balanced trade-off between deterministic and creative data processing by GPT-4. Accordingly, the temperature setting will be set to 1. This analysis will only commence after registering the results of the aforementioned analysis, ensuring that the research team's work is unaffected by the model’s findings. In the main paper, we will briefly summarize the outputs from GPT-4, while the full results will be included in the supplementary materials. This approach could unveil themes potentially overlooked by human coders and will serve as a primer for exploring the use of LLMs in qualitative text analysis.

As there might be heterogeneity in gaming-related health problems across different play styles, we will also carry out two additional sensitivity analyses. In the first analysis, we will examine how the outcomes of RQ1 and RQ2 differ between cases where video games are played predominantly online and offline. Because online video games were not widely available before the high-speed internet and wireless networks in the 2000s, this analysis can also yield results that are historically informative. In the second additional analysis, we will assess how the outcomes of RQ1 and RQ2 differ between cases that report gaming predominantly on domestic devices (e.g., computer, console) and portable devices (e.g., mobile phone, handheld). These sensitivity analyses will be limited to cases with a clear distinction and conducted only if at least three instances are identified in each subgroup.

Lastly, to control for negativity bias (see Baumeister et al., 2001), we will investigate the positive effects of gaming reported in the case studies. We will then divide them into two categories: (1) positive effect (e.g., cognitive benefits, social skills, education and learning); (2) enjoyment (e.g., entertainment, relaxation, achievement, community belonging).

**Limitations**

We pre-identified two main limitations of the present meta-synthesis. (1) Case studies typically represent instances that are notable for their rarity, peculiarity, or novelty within a specific time and cultural context. Despite their inherent bias (e.g., a high risk of selection bias and low certainty of evidence), case reports remain a valuable resource for guiding medical literature due to their unique insights. To alleviate the effects of selection bias, our review encompasses the relevant case studies without any time restrictions, incorporating historical context to provide a more comprehensive understanding of gaming-related health problems (some of which in the current scientific era are diagnosed as gaming disorders in certain cultures). For instance, health issues related to gaming identified in the 1980s have been well-documented over the decades, leading to the publication of more novel and specific case reports in recent times. Secondly, this study does not generalize the case findings to represent the entire spectrum of possible cases. Instead, we infer only about the published body of case reports. (2) A better understanding of gaming-related health problems necessitates considering the wide diversity of gaming practices as well as health expressions across different cultures. Ideally, our synthesis would have been enriched by including studies published in various languages besides English, Finnish, Korean, and Slovak. By making our methodology and coding sheet publicly available, we encourage researchers from other cultural and linguistic backgrounds to investigate case studies published in their languages and build upon our findings.

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**Conflicts of Interest**

VMK is one of the PCI Registered Reports recommenders. Salaries received in the past four years from game companies: YJ received salaries from Riot Games Korea from 2019 to 2021. Stocks owned in game companies: YJ owns stocks in Netmarble, Nexon Games. For historical transparency, more than a decade ago VMK was one of the co-founders and developers of the IGDB website, which is an open online database for various types of game knowledge. VMK never received salaries for that work, but when the website was turned into a company, he became a co-shareholder until a merger four years ago (2019) and has not been involved since. Non-financial interests: some authors have personal gaming histories and hobbies, which are documented as positionality statements: <https://ore.jyu.fi/english/our-team>. We also wish to make it transparent that our team is actively negotiating with gaming companies to establish research collaborations with the industry. We also work with various health professionals and organizations in research collaboration.

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1. Search strings are available as Supplement 2 at <https://osf.io/5jb2f>. [↑](#footnote-ref-1)
2. Studies in Finnish, Korean, and Slovak language will be screened for eligibility by a native author of that language. If eligible, Korean and Slovak studies will be coded by two people instead of three because our team has two native speakers in these languages. The extracted information will be translated to English in Phase 1. [↑](#footnote-ref-2)
3. Unless comorbidity is explicitly reported as a problem, we categorize it as a descriptive characteristic of the case. [↑](#footnote-ref-3)
4. The current version of the ICD-11 names hazardous gaming, bipolar type I disorder, and bipolar type II disorder as exclusions from gaming disorder. We will examine if these two have been considered historically. [↑](#footnote-ref-4)
5. Each coder will have a separate private sheet for descriptive themes coding. The descriptive themes will be shared as supplemental material (Conry-Murray et al. 2023). [↑](#footnote-ref-5)
6. Note that the informativeness score concerns a study, not the lived experiences of a participant. [↑](#footnote-ref-6)
7. There were three main reasons for constructing a new tool: (1) the available appraisal checklist for case reports (JBI 2017) includes items whose content does not align well with the present research questions, which could have led to biased sensitivity analysis; (2) the available tools for qualitative research assessment often include items, especially on methodology, that are not applicable to case studies by default; (3) we aimed to develop a comprehensive tool covering congruity (i.e., how well the interpretations are grounded in reported data), reporting practices (ensuring that the case study presents sufficient information about the context and conditions, allowing for a nuanced understanding of presented findings), and transparency (capturing layers of subjectivity), which will result in a continuum of scores. These are elements, which have central presence in both case and qualitative study guidelines but are not exclusive to them. [↑](#footnote-ref-7)