Reconstructing Gaming Disorder:

**A Taxonomy by Registered Report**

Stage 1 Registered Report, v2

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# Abstract

*Videogames have become one of the most prevalent cultural forms around the world. While their role in art, pedagogy, and everyday life keeps growing, the health debates on videogame play—gaming—culminated in 2022 with the World Health Organization’s historical inclusion of “gaming disorder” in the International Classification of Diseases. This made gaming, next to gambling, the first and only type of behavior with a diagnostic category of addictive use. The above echoes a greater conflict between culture and human development: how can science address potential problems in intensive technology use, while intensive use is also globally integrated into healthy everyday living? To build a foundation for answering this question, this longitudinal multisite registered report constructs a taxonomy of intensive gaming by three levels: health, design**interaction, and phenomenology of play. Based on rich mixed qualitative data (clinical and phenomenological interviews, diary-like entries, gaming logs) generated over three years with intensively gaming participants in Slovakia, South Korea, and Finland (total N=210–300), the study will produce a basis for a taxonomic system that helps distinguishing diverse life scenarios where gaming plays a significant role. As separate programmatic components, the study will additionally yield independent registered case reports based on the outlined methodological framework.*

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# Introduction

Videogame play, or gaming, has gradually become a significant part of human life across cultures. As parents and policymakers keep asking what kinds of videogames should be played and how much, in 2022 the World Health Organization (WHO) took “gaming disorder” into effective use as a new mental disorder in the International Classification of Diseases (ICD-11). Next to gambling, videogames became the first and only cultural products with a diagnostic category of addictive use. Meanwhile, scholars across disciplines keep debating whether technology use can be “addictive” to begin with—and if so, what would the lives of such addicts look like, as the current empirical evidence consists primarily of surveys (for critical methodological literature, see Ellis 2019; Griffioen et al. 2020; Karhulahti et al. 2021; Nielsen 2015; van Rooij & Kardefelt-Winther 2017).

Historically, the foundational research was conducted by Young (1998a; 1998b), who adapted a pathological *gambling* survey to measure “internet addiction” (see Aboujaoude 2010; van Rooij & Prause 2014). A decade of research later, the American Psychiatric Association considered including “internet use disorder” in their Diagnostic and Statistical Manual of Mental Disorders (DSM-5) (see Ferguson et al. 2020), but for unclear reasons, instead respecified and renamed the concept into “internet *gaming* disorder” and classified it as a condition for further study, adding a call for more research because the literature “suffers from a lack of a standard definition from which to derive prevalence data [and] understanding of the natural histories of cases” (APA 2013, p. 796).

Currently, the clinical relevance of gaming derives mainly from the lost time that could have been used for other activities—in the long run having the potential to indirectly entail *significant**distress and functional impairment* (see Billieux et al. 2015). However, when the WHO finally added gaming disorder to the ICD-11, there had been little time to systematically study what this “significance” actually means in socioculturally diverse contexts, and what the causal pathways of gaming and health in lives with and without mental disorders may be (for summaries, e.g., Dullur & Starcevic 2018; Ferguson & Cowell 2020; Janzik et al. 2020; Kardefelt-Winther et al. 2017; Reed et al. 2022).

Based on the disputed idea that addictions share similar components (e.g., West & Brown 2013) and gaming-related health problems are addictions, the related science has progressed slowly and, some argue, tautologically (Kardefelt-Winther 2017; see Shaffer et al. 2000). The embryonic state of research is most evident in the experts’ persistent inability to differentiate passionate from pathological play. The emerging culture of “esports”— competitive gaming that is now being considered for an Olympic sport (Scholz 2019)—further confuses psychiatrists and others who must repeatedly decide whether people who commit to gaming are champions or patients (Nielsen & Karhulahti 2017). The fact that similar conceptual-nosologic challenges have concerned numerous other activities (sports, work etc.) without them deserving diagnostic attention as behavioral addictions keeps spawning criticism from expert groups (e.g., van Rooij et al. 2018) and even the media and technology division of the American Psychological Association (Division-46 2018). What could make gaming, both with and without monetary stakes, the only clinically significant addictive behavior in the world?

The implications of the above do not concern gaming alone but represent a greater conflict between cultural and human development. As smartphones, social media, and streaming services, among others, haveall now started to negotiate their contested role in the mental health discourse in particular, how can science address potential problems in intensive technology use, when intensive use is also globally integrated into healthy everyday living?To make genuine progress in answering this question, a fundamental understanding of what intensive use isshould be pursued; however, this would require the paradigm to shift from confirmatory addiction models to exploratory research with interdisciplinary tools (see Davidson et al. 2019). Below, we briefly address relevant qualitative work—including our pilot findings—to motivate the research questions (for a systematic review of literature, see Supplement 6).

Essentially, the goal of this study is to build a foundation for understanding what intensive use of videogames is. This means going beyond the nosological discussion of classifying gaming medicallyand moving to investigate how interactions with specific types of videogame designs in specific sociocultural contexts *constitute* intensive gaming as a spectrum of lived experiences. Namely, we pursue a taxonomyof intensive gaming on three levels: ***health***, ***design* *interaction****,* and***phenomenology******of play***. Although we assess our participants’ health and this forms one of the three levels, the taxonomy is essentially structured on the *experiences* of people who play multiple hours daily in different sociocultural settings, with varying design interaction patterns. By having health as our baseline “multi-dependent variable” instead of “consequence,” we set two paths of inquiry that go beyond monocausal health assessment. The first concerns our ***phenomenology of play*** level and asks:

RQa: Is it possible to distinguish passionate from pathological gaming by the meanings and values that players attach to videogame play?

Building on earlier qualitative findings (Bleckmann & Jukschat 2015; Colder Carras et al. 2018; Domahidi & Quandt 2015; Shi et al. 2019; Snodgrass et al. 2021), we have recently collected phenomenological pilot evidence about the meaning(s) of intensive play for adults, including clinical treatment-seeking samples (Karhulahti 2020; Karhulahti et al. 2022a; Karhulahti et al. 2022b; Karhulahti et al. 2022d). Our findings thus far imply that experiences of “disorder” derive from gaming interfering with what one wants to be, do, and have throughout life, whereas the experiences of general intensive play derive from gaming being integrated into self throughout life. It is possible that the degree to which gaming is *internalized* (e.g., Kelman 1958; Ryan & Deci 2017) in one’s meaning and/or value system signals whether it is a controlled passion or a potential disorder (see also Vallerand 2015). Accordingly, how the participants’ meanings and values are connected to their sociocultural contexts will be a key area of exploration. Following the above, but more related to the ***design interaction*** level, we further ask:

RQb: What are the design structures of videogames, which are played intensively and/or with gaming-related health problems?

There is a lineage in the design of videogames like World of Warcraft that have been associated with gaming-related health problems for a long time (e.g., Linderoth & Bennerstedt 2007) and the currently thriving esports that have become a new focus of discussion (e.g., Brevers et al. 2020). In both these types of gaming, players are given challenges under time pressure that afford motorically executed kinesthetic or physical satisfaction and short-term anticipation (see Vahlo & Karhulahti 2020; Koban & Bowman 2020). Furthermore, players in both are also provided years-long goals that carry value in their sociocultural context (long-term anticipation), that is, invested time becomes potentially transferable into out-game capital, too (see Consalvo 2009; King & Delfabbro 2009). It is possible that intensive gaming, understood as highly committed lasting engagement, needs to be mediated by bilevel videogames that provide both ephemeral kinesthetic satisfaction and long-term goals—and that the long-term goals be socially recognized outside the immediate context of play. Accordingly, such design structures will be a key area of exploration.

To access intensive gaming interactions and experiences, clinical-phenomenologicalinterviews and diary-like instruments are applied primarily in South Korea, Slovakia, and Finland longitudinallyover three years. To further increase cross-cultural depth, other countries are involved in the process by an open collaboration approach later. In order to understand these experiences from a technological perspective as well, the structures of the videogames played by the participants will be analysed and networked with the rest of the data . The taxonomy pursued by these procedures will serve not only as a qualitative foundation for reconstructing “gaming disorder” but also allows situating such potential cases in the colorful spectrum of gaming lives and design interaction at large.

# Data and Methodology

Participants will be recruited initially from Finland, Slovakia, and South Korea (for a full methodological overview, see Figure 1). Because the participants are difficult to reach and retain, some of the participants may be recruited from nearby, culturally similar countries that share a language group; namely, Slovakian recruitment may be extended to Czech and Finnish recruitment may be extended toSweden, Denmark, and Norway. As compensation, the participants receive an annual gift card worth approximately 40 euros (in Finland and Slovakia) and 120 euros (in South Korea). The cultural contexts of all three main countries are different and will be reflected on in the analysis (see Supplement 1). The participants will be followed for 36 months. Because there will be necessary temporal differences regarding when participants join and engage with this research, we use participant-specific time stamps with one-month accuracy. The data are planned to be supplemented by further data in yet-undecided countries (see Duplication section).

Three groups of participants will be recruited by purposive homogeneous sampling, i.e. they represent specific groups of research interest (Table 1). The sample size for both adult groups (A and B) was determined by our previous phenomenological research (Karhulahti 2022b), which indicated that n=15 would be a realistic and theoretically useful sample for in-depth analyses of these special groups. Because it would be problematic to directly target similar special groups in the adolescent population (as young as 12 years), this group will be four times larger in total, but only selected participants will be invited for phenomenological interviews (see later for selection criteria).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Group** | **Age** | **Min. (N)\*** | **Stop (N)** | **Interview** | **Diary** | **Description** |
| **A** | 16+ | 45 | 60 | Clinical & Phenomenological | Every four months | Treatment-seekers |
| **B** | 16+ | 15 | 30 | Clinical & Phenomenological | Every four months | Amateur esports players |
| **C** | 12-14  (flex) | 150 | 210 | Selective | Every four months | Gaming adolescents |
| ***D\*\**** | *Any* | *N/A* | *15* | *Clinical & Phenomenological* | *N/A* | *Treatment-seekers* |
| ***E\*\**** | *Any* | *N/A* | *5* | *Clinical & Phenomenological* | *N/A* | *Amateur esports players* |

Table 1. Total number of participants, to be studied for 36 months in Finland, Slovakia and South Korea. Equally distributed between countries (A=15–20, B=5–10, C=50–70).

\* If it would turn out that we cannot recruit the registered minimum number of participants in one country within the given time-line, in such a case we compensate for the lacking number of participants via Duplication with collaborators in a similar cultural setting.

\*\* Per each collaborator. See section Duplication for details.

Group A: Participants who have sought treatment—of their own will either as self-initiated or persuaded by someone—for their gaming from professionals such as healthcare providers, psychiatric or psychological services, and therapy centers. To reduce data management load, participants below age 16 (by Western means of calculating age) will be excluded. Additionally, participants must have gaming as a primary motive for their treatment-seeking (e.g., gambling may be a related problem but not the primary one).

* *N* = 45–60 (*n* = 15–20 per country). Local professional clinical experts and institutions are utilized for reaching participants. Institutions and experts that collaborate will be asked to share invitations for potential participants (see Supplement 2).

Group B: Participants who self-identify as players of esports games (as “I am a player of esports games”—see Supplement 2) to an amount of 30 hours per week or more without self-perceived gaming-related health problems. Because these participants are investigated as a counter-sample to the treatment-seekers, we are explicitly seeking intensively gaming healthy individuals. As earlier, participants below age 16 (by Western means of calculating age) will be excluded. To avoid conceptual overlap with work-related health issues, those who identify as professional players (defined as esports being a central source of financial income) will also be excluded.

* *N* = 15–30 (*n* = 5–10 per country). Local esports organizations are utilized for reaching participants by distributing an open call in their networks. Because this is the smallest group in the study, here we use purposive non-probability sampling to ensure gender balance and representation of gaming in different esports title ranks. Organizations that collaborate will be asked to share invitations for potential participants (see Supplement 2).[[1]](#footnote-1)

Group C: Participants are adolescents (age 12–14 by Western means of calculating age but we may also include older adolescents if they have entered school at older age) in one of the collaborating schools and currently gaming actively, as defined by approximately two hours of daily engagement. Engagement does not refer only to playing, but also other gaming activities, such as watching gaming videos and participating in gaming communities or events. Both the participants and their caregivers must consent.

* *N* = 150–210 (*n* = 50–70 per country). Participants will be recruited from local schools . Schools that collaborate will be asked to share invitations for potential participants (see Supplement 2).

We expect a dropout of approximately 30% during the first year, for which we plan to oversample by 20% and are prepared to carry out a second recruitment round with the same criteria. The new participants will be recruited gradually along with the dropout so that they may be integrated in the time-critical wave of analysis (see below). We also expect changes in the samples over the years, e.g. treatment-seeking participants may successfully receive help and no longer experience problems, and other participants might quit gaming entirely. Such cases would yield highly informative data and we plan to keep them as representatives of their groups until the end of the study.

Considering the age differences between our adolescent and other participants, we do not expect the samples to be directly comparable; our idiographic phenomenological approach is suitable for addressing these discrepancies by looking at the data on individual levels. All interviews are carried out primarily in-person, but remote communication may be used as well. The interviews are recorded in audio and transcribed into text verbatim. The transcribers will be either hired externally or recruited from our university BA/MA students based on their appropriate expertise (i.e., their education fits the tasks). Three types of interviews and a remote diary-like instrument will be used to generate data across groups, as follows.

Clinical interview: All participants from **Group A–B** will be interviewed by a licensed psychiatrist or clinical psychologist every 12 months, which means a total of four interviews during the period of three years (0–12–24–36). To prevent unnecessary intrusion of participants, participants from Group C are not invited for this interview annually but only in special circumstances; namely, if and when gaming exceptionally large amounts or having problems, if and when moving toward gaming-related careers as in esports, and if and when unexpected events relevant to this research take place that cannot be predicted (see Programmatic Components). The interview will be carried out by a local external expert in each country in the native language, unless otherwise preferred by the participant. We may use multiple experts in each country to ensure language proficiency and maximize cultural knowledge (e.g., in the potential case of immigrant participants). The interview format is semi-open, i.e. the clinical expert is free to use their personal professional knowledge in structuring the interview for investigating potential diagnoses (see Supplement 3). The interview will last approximately two hours with the primary goal to construct an overview of the participant’s mental health, and the secondary goal to explore how gaming is dis/connected to/from the participant’s mental health. In other words, instead of approaching gaming-related problems with the confirmatory approach, the expert is asked to explain and spell out these problems in the overall health context. If mutually agreed with the expert, one of our local team members may be present in the interview. Although such additional presence might be considered a distraction, a familiar team member can also add comfort to the situation and help us assess the nature of data generation with first-hand experience. After each clinical interview, data quality is ensured before transcription and, in case of low quality, the expert can be provided with appropriate feedback or replaced with a new expert.

Phenomenological interview: All participants from **Group A–B** will be interviewed by one or two of our team members every 12 months (Table 2), which means a total of four interviews during the period of three years (0–12–24–36). As earlier, up to 45 participants in total from **Group C** may be additionally invited for this interview annually. The interview will be carried out in the native language of each country. The interview will last approximately two hours and will be based first on the Phenomenology of Play (POP) frame, and in later years, on the follow-up frame (see Supplement 4).

Start interview: All participants from **Group C** will be interviewed by one of our local team members once at the beginning of their participation. The semi-structured interview (~ 30 minutes) is carried out in the participants’ native language and consists of general questions about gaming, life, and school with a localized Gaming Disorder Test (Pontes et al. 2021) administered orally (see Supplement 4).

Diary and gaming log: All participants will fill out a remote diary-like entry every four months, starting one month after the interviews. In total, this means nine entries over three years (1–5–9–13–17–21–25–29–33). The entries consist of responses to customized questions concerning the participants’ gaming and life. The questions will be based on our participant-specific knowledge generated in each respective interview (thus we do not have all questions yet, but see Supplement 5 for a dynamic template). As part of the diary-like entries, we have two additional components:

* Gaming log based on the participant’s gaming over the past week. The log is adapted from earlier research (Shi et al. 2019) and inquires the duration, frequency, and type of gaming over the past seven days. This will be sent in three parts over the week to counter recall bias.
* Screening scales for mental, physical, and social health (see Supplement 7). The instruments will be cycled annually and single-item checks will be used to control changes in constructs during diary rounds.

## Data From Other Cultural Contexts: Duplication

After having successfully started the first round of data generation in all three countries, we will duplicate the data generation procedures regarding Group A and B interviews in approximately five more countries. The final number of countries will be decided and limited by our resources; namely, the accumulating costs of supporting work in each collaborating country (see below). Because we do not expect the results to replicate (i.e. similar thematic findings to occur), we call the process “duplication” that will enable us to further diversify the data by repeating the procedures as carefully as possible. In other words, as the cultural and contextual differences will essentially affect the procedures, our goal is not replication, yet we remain interested in all possible types of clinical and phenomenological overlap.

To seek collaborators, we set an open call for labs or teams who are willing to carry out the clinical and phenomenological interviews in their own country once (not in a longitudinal setting, unless preferred by the collaborator). Less and non studied countries will be encouraged as well as prioritized in selection. We do not set a minimum sample size for either group—even a few participants can make a valuable contribution to knowledge in non-studied cultures—but we aim to receive at least *n*=5 for both groups per country. Collaborators are expected to provide a local ethics review report or similar regarding their procedures. We will financially compensate and/or carry out the work related to transcription, translation, and other data management procedures. These data will be analyzed following similar procedures as the base data from Finland, Slovakia, and South Korea (see the next section) with two caveats:

* To interpret the clinical interview data, we will invite up to three external clinical professionals (see Lakens 2020) with local knowledge to provide an expert statement regarding each interviewed participant based on the transcript.
* We may not be able to have the local researcher join phenomenological analysis, in which case we seek another expert with local cultural knowledge (see Table 2).

The duplication data and their analyses will be merged with those of other data in order to be further refined in the Taxonomization section.

## Analysis of Finnish, Slovakian, and South Korean Data

Our epistemology is Bayesian and protean, following critical scientific realism (Niiniluoto 1999), by which we refer to a semi-positivistic approach that acknowledges researcher positionality as a component of the data being generated and interpreted. In other words, while we do believe in and pursue knowledge that has truthlikeness, we are aware that the present methodology is defined by interpretive uncertainty and affected by how our team with collaborators perceive the world. Therefore, we are always prepared to update our beliefs and the knowledge we produce in the light of new evidence. Our positionality statements are publicly available (<https://ore.jyu.fi/english/our-team>), and the team consists of researchers who are diverse in terms of cultural background, career stage, gaming habits, and gender. We are prepared to apply member checking by recruiting researchers and non-researchers with treatment-seeking gaming backgrounds to comment on our interpretations (for a related critical discussion, see Colder Carras et al. 2022). Below, the method for analyzing each dataset and syntheses thereof are described in detail.

Clinical interviews: Up to 30 clinical interviews are carried out in each country annually for adults (A–B), with up to 15 adolescents in addition (C). Of those interviews, all Group A transcripts are selected for external expert analysis. We may additionally include selected Group B and Group C transcripts; for instance, if the interviewing expert recommends further assessment for specific cases. Five local licensed clinical psychologists and/or psychiatrists are invited to an expert panel. The goal is to invite experts with different views on diagnosing and understanding gaming disorders. Because an open call would unlikely reach experts with optimal diversity in our small countries, each panelist will be personally invited. The function of the panel is not to authorize “correct” or “consensus” interpretations (although the degree of consensus is assessed); rather, the panel serves to make transparent how different interpretations are constructed by documenting the arguments, premises, and reasoning provided by practicing experts who engage with in-depth cases. We will utilize this expert-generated “supra-data” in the analysis by showing how (expectedly) diverse interpretations can apply to individual cases. The panel members are provided with the interview transcripts, asked to answer three questions and reflect on potential gaming disorder diagnosis in each case (Supplement 3). Explicitly, each expert will be asked to explain why gaming disorder may or may not be present. A closed 2-day workshop will be organized for the five experts in their native language by our local team member. The goal of the event is to discuss and resolve discrepancies in their assessments. Ideally, the panel pursues agreement in the form of a collective report (approximately one page), yet minority views are expected and documented as well. The discussions are transcribed and translated with the original assessments into English by a professional translator. This process is repeated in each country three times annually—after 0, 12, and 24 months but not after 36 months because we must start final analysis at that point— producing a total of 9 panel reports over the years.

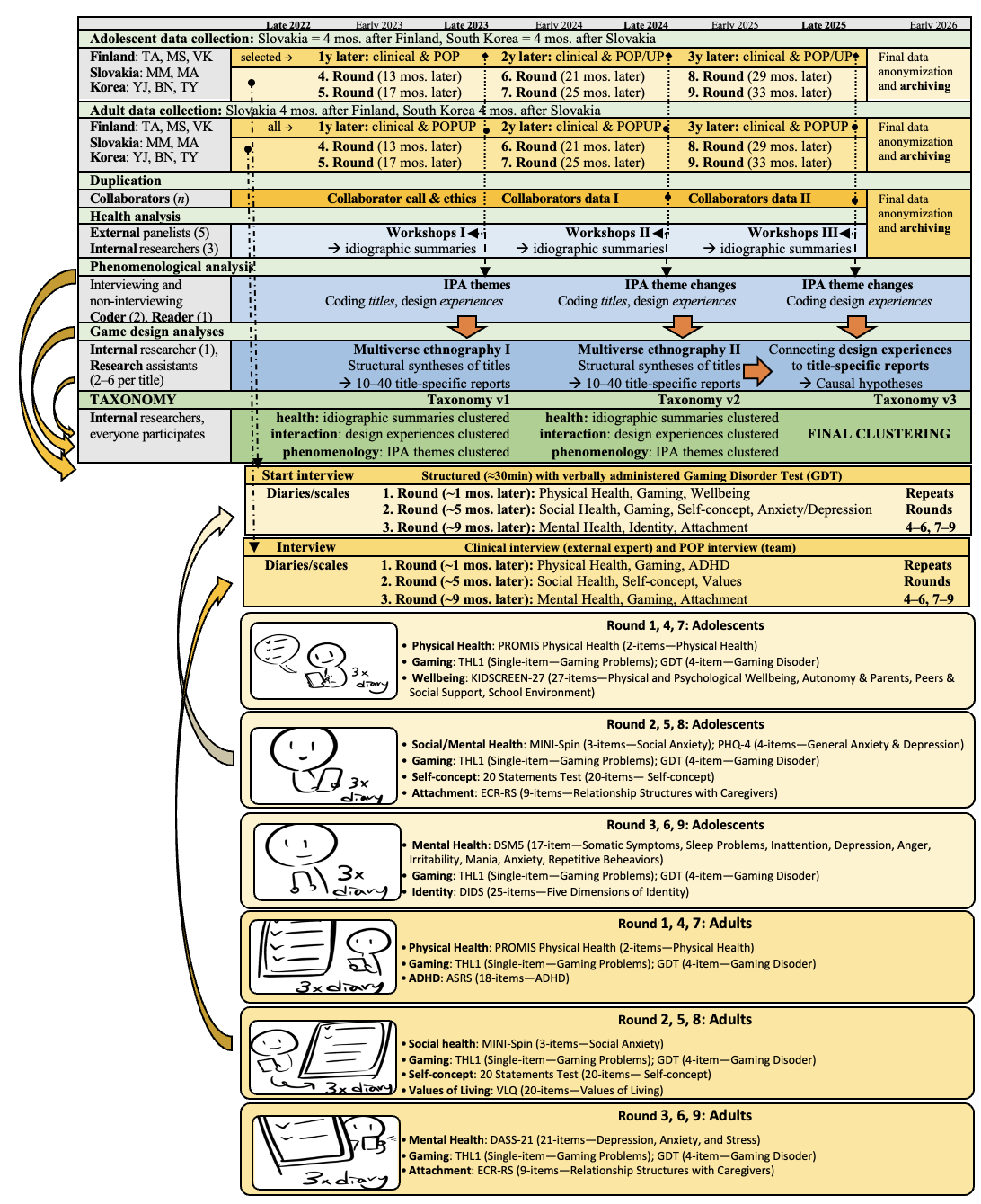
Phenomenological interviews: Up to 45 phenomenological interviews are carried out annually (A–C). We follow the principles of interpretive phenomenological analysis (IPA; Smith et al. 2022) to carry out an idiographic scrutiny of each participant. Before the analysis of each case, their clinical interview transcript will be read to better understand their mental health contexts. In line with our pilot (Karhulahti et al. 2022b)—where we analyzed two player groups (n=6, n=10) and synthesized idiographic themes (3–6 per participant) into three group-specific themes—the goal is to produce subordinate themes for each participant individually as well as overlapping themes within different countries and groups (i.e., nine sets of overlapping themes consisting of three groups in three countries). For each transcript, coding will be carried out by one interviewing researcher and one non-interviewing researcher. Additionally, a third researcher will read the transcripts, and all three will meet to discuss and resolve discrepancies until agreement. In case of no agreement, multiple alternative interpretations of themes will be reported. With the follow-up interview transcripts, the analysis will focus on longitudinal thematic changes, i.e. how the experiences have evolved—in particular but not limited to narrative changes (new reported events), participant reinterpretations (old events restructured by the interviewee), researcher reinterpretations (old events restructured by the researcher), and the witnessing of no changes (see McCoy 2017). Additionally, the analyzers will be instructed to code all *gaming titles* and experiential events related to distinct elements of gamedesign *(design experiences)*, and these codes will be collected into a codebook for later use (see below). Following the first year, the process is repeated annually with one modification: relevant diary contents will be included as additional materials for analysis (see below). For Group C participants, their Start interview transcripts will be included into analysis.

Diary and gaming logs: All 210–300 participants (A–C) will provide diary-like entries for three years, consisting of open narrative content, gaming log, and health scales. All narrative content and gaming logs will be included in phenomenological analysis (above) and, as earlier, *gaming titles* and *design experiences* are coded into a list (code + quote from original text). Each participant’s IPA themes will be supplemented with a summary of their gaming titles, with the caveat that privacy concerns may not allow us to share detailed lists for every participant. The outcomes of the health scales are used to support and triangulate the clinical interview gold standard assessment of mental and social health during the taxonomization phase (see Taxonomization).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Country** | **Clinical interview** | **Panel discussion** | **Phenomenological interview** | **Phenomenological analysis (IPA)** |
| **Finland** | Externally recruited local psychiatrist or clinical psychologist | Externally recruited local psychiatrists and/or clinical psychologists (5) | TA, VMK, MS (one or two authors per interview) | Interviewing and non-interviewing team member |
| **Slovakia** | Externally recruited local psychiatrist or clinical psychologist | External local psychiatrists and/or clinical psychologists (5) | MA, MM (one or two authors per interview) | Interviewing and non-interviewing team member |
| **South Korea** | Externally recruited local psychiatrist or clinical psychologist | Externally recruited local psychiatrists and/or clinical psychologists (5) | YJ, BN (one or two authors per interview) | Interviewing and non-interviewing team member |
| **Duplication countries by open invitation** | Collaborating local psychiatrist or clinical psychologist | Three experts with local knowledge | Local collaborator | Interviewing and non-interviewing collaborator\* |

Table 2. A summary of task distribution with human data.

\* = If a collaborator is not available, we seek an expert with local cultural knowledge.



## Analysis of game design

The goal of this analysis is to systematically investigate the connection points between videogame design structures and the specific experiences that our participants have with them. Primarily, these results will be used as a basis in the construction of design interaction taxa, in addition to which we aim to formulate causal design→experience hypotheses for the purposes of future studies and theory development. As the first step, all coded *gaming titles* will be collected into a list that is continuously updated over the three years, as new data are generated. Annually, starting from the titles that are mentioned most often, we carry out multiverse ethnography (Karhulahti et al. 2022c) on each title. The process is as follows:

* A lead analyst (joins in 2023) will carry out ethnographic play until having written summaries of 12 areas of physical, structural, communicational, and mental design levels (Aarseth & Grabarczyk 2018). Fieldnotes will be collected, based on which the analyst will decide on the most significant *design areas* for further analysis.
* The design areas marked above will be turned into a title-specific codebook for selective, reflexive fieldnote-taking. For this purpose, two, four, or six assistants (recruited university students with expertise) will carry out ethnographic game analysis per title. The scope of their analysis is adjusted for the depth of each title.
* The assistants will switch their notes and review them with potential discrepancies marked. The lead game analyst will meet with all assistants to negotiate agreement and produce a final *structural synthesis* of the title based on the generated data.

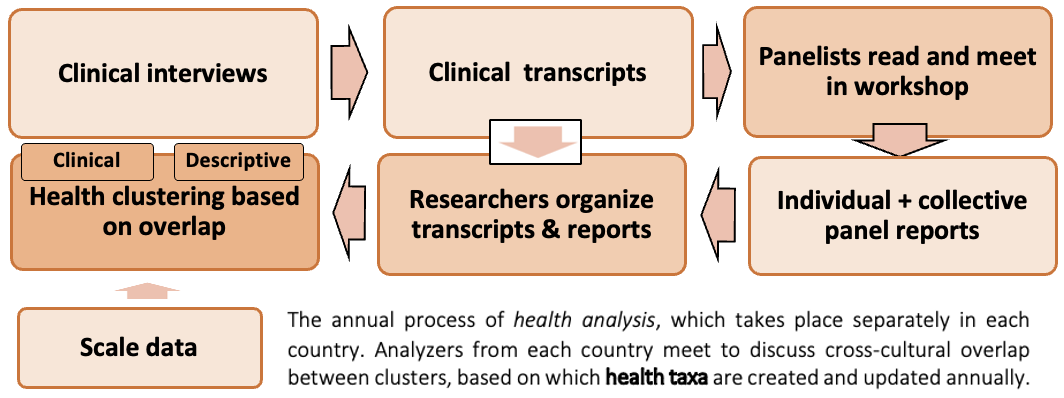
A structural synthesis consists of all coded design elements, which the lead analyst and assistants agree to carry high significance for playing the title intensively. Each design element is described from the ethnographically constructed perspective of the player and networked to other relevant elements, thus producing transparently documented interaction chains and loops. Each game-specific structural synthesis report will be stored for open use with fieldnotes and coding (<https://osf.io/tqnpk/>). No less than 20 and up to 80 titles will be analyzed with this method.

Ultimately, all the previously coded design *experiences*(direct quotes from interview and diary data) will be connected to each report. The lead analyst will review the participants’ title-specific codes one by one and establish connection points between respective design elements and experiences, thus forming a basis for clustering design interaction taxa. Throughout the process, they will also keep a log of repeating interaction chains and loops in order to justify a list of causal hypotheses regarding specific game designs, i.e., how certain design structures may lead to particular experiences. In the end, all crafted hypotheses will be shared in a separate supplement and, depending on the results, some may be involved in the discussion.

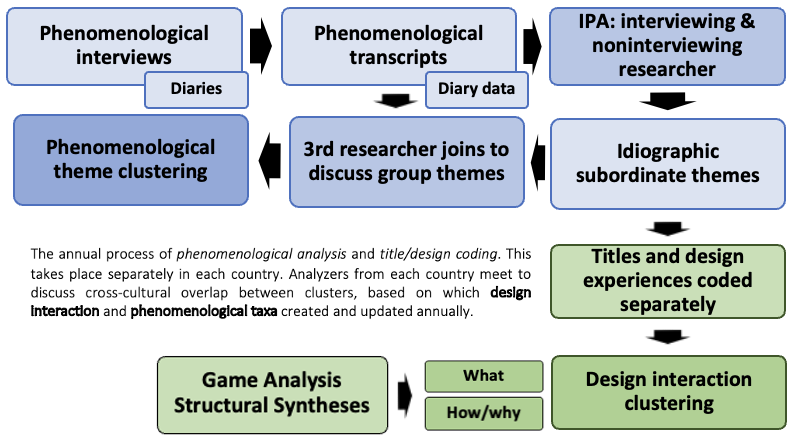
## Taxonomization

Having completed annual data collection and analyses, we initiate clustering with a goal to construct a taxonomy of gaming lives on three levels: ***health***, ***design* *interaction***, and ***phenomenology of play***. For each level, we synthesize participants’ life situations into groups with major overlap. Because the participants’ lives evolve over the years and their gaming along the way, one participant may be clustered more than once—these instances are marked in the final model. Each level is constructed annually and updated with accumulating data (see Figure 1 for an illustrative model).

Health: On this level, clustering is carried out based on expert reports (individuals, collective workshops) as well as raw data (clinical transcripts, scale outcomes). Clustering occurs in two dimensions: clinical diagnoses (mainly mental but also physical if explicitly reported) and descriptive elements (non-diagnosable distress, gaming, etc.). Clinical diagnoses will only be justified by expert reports; scale data contributes to assessing non-diagnosable distress. Because our primary goal is to reconstruct gaming disorder as a complex, contextually dependent construct in a wide spectrum, we will assess gaming’s health-relevance, when appropriate, in the descriptive dimension and not in the verifying dimension—the latter could only be done by pre-existing criteria, for which both positive and negative findings would be tautological. The degree of agreement in experts’ evaluations of gaming problems will nevertheless be descriptively reported by calculating intraclass correlations (ICC; Shrout & Fleiss, 1979) for each subgroup of cases as well as the whole panel session (see Supplement 3). For each participant, data points in both dimensions will be listed into a summary, which allows clustering data point overlaps into taxa. We expect to construct 10–20 unique health clusters (taxa).



Design interaction: On this level, under each health cluster, we continue by further clustering the life situations by how participants interact with game design. These clusters are primarily based on the discovered connection points between the game-structural syntheses reports and coded design experiences, i.e. how certain game structures are linked to specific lived experiences of playing by these designs. The clusters are thus two-dimensional, consisting of what is played and how or why. For each participant, their relevant data points are collected and compared to the above structure-experience connection points, which serve as key clusters; nonetheless, we may also establish new clusters to sufficiently cover the variety of design interactions. We expect to construct 3–5 unique design interaction clusters (taxa) under each health cluster.



Phenomenology of Play: On this level, under each design interaction cluster, we continue by further clustering the participants’ phenomenologies of play. These clusters are based on the subordinate themes produced in IPA analysis. Participants with significantly overlapping themes will be clustered together, but due to the diversity of phenomenological themes, we do not expect clustering to occur on this foundational level as much as above. We follow transparent theme reporting, which allows us to carry out justified clustering with reference to participant-specific idiographic interpretations.

In the results, we model our taxonomy with each taxa explained, visualized, and supporting analyses summarizing all participants in taxonomic terms. For in-depth details, idiographic phenomenological themes with design interaction and health reports are provided as attachments. Due to the large size of the final taxonomy, the results section focuses on carefully selected cases, which represent different cultures, genders, and types of gaming. The reporting will explicitly address how the selected case represents each taxonomic level (health, design interaction, and phenomenology of play). We acknowledge that our findings may not be fully transferable to cultural or regional contexts, which we do have data from. However, the taxonomy will also be shared separately online in a dynamic, modifiable form,which allows it to be expanded and revised afterwards by other researchers. Following our critical Bayesian epistemology, each discovered taxon will be established with a confidence level (0–1), and when evidence accumulates, confidence can decrease or increase. If the confidence of a taxon approaches zero, it can be removed or changed along with progressing cumulative science, and new levels or clusters can be added as responses to the evolving, culturally and otherwise diversifying gaming changes and habits.

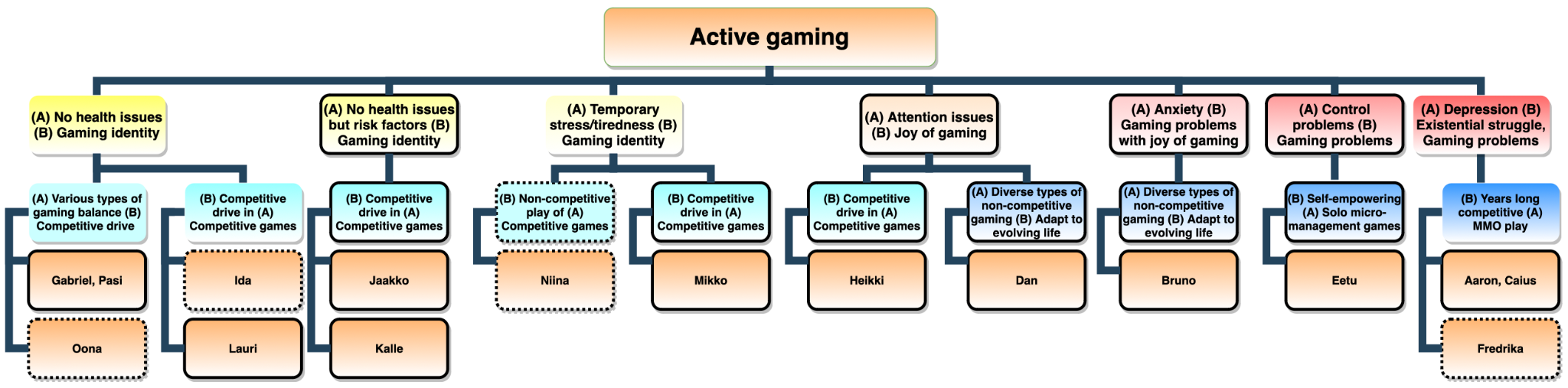


Figure 1. A pilot model of the taxonomy based on the data (N=16) from our earlier study (Karhulahti et al. 2022b). Please note that all taxa are significantly simplified for the present exemplary purposes. Because we did not carry out clinical interviews, we coded all transcripts for signals of health and combined them with the collected scale data. The overlap was assessed, producing seven ***health*** clusters (topmost taxa) in two dimensions (A/B)—these are not to be considered reliable or exhaustive assessments of the existing data. Likewise, because we did not analyze game design in the pilot, a consensus on ten two-dimensional (A/B) ***design interaction*** taxa was reached based on comparing the participants’ general gaming histories and habits. Notice how some taxa (e.g., “competitive drive in competitive games”) occur several times under different health taxa, i.e. similar design interactions may manifest under different health conditions. Finally, the ***phenomenology of play*** *taxa have been labeled by original pseudonyms, the themes of which can be located in the study; in two instances, participants have been clustered due to thematic similarity. A solid line around a taxon refers to men-specific; a dotted line around a taxon refers to women-specific*. This Figure is removed at Stage 2; it is only for illustrative peer review purposes. Finally, we stress that in the final taxonomy each taxon is provided with detailed descriptions regarding what they involve, e.g. the above “attention issues” would consist of two very different types of attention-related problems.

## Data Statement and Ethics

The study has received a positive appraisal from the ERC ethics review board (European Research Council), Human Sciences and Ethics Committee of the University of Jyväskylä (Finland), Ethics Committee of Presov University (Slovakia), and is currently going through ethics review in Yonsei University (South Korea). The research generates large amounts of sensitive data, also from minors. We will share as much as possible of the generated data via Finnish Social Science Data Archive utilizing anonymization, pseudonymization, and abstraction techniques. For example, we do not use exact participant ages, but will report and store such information in an abstracted form such as appropriate age ranges. In the same way, indirect identifiers like occupations, study programs, and regional locations are abstracted, which will allow us to store the data for safe reuse. We apply flexible and dynamic consent practices, i.e. participants can change and update their consent over the years of participation. These processes are expected to produce reusable “big qual” datasets—hundreds of interviews and thousands diary-like entries—)but the participants may also use their right to demand non-open forms of participation, for which we must acknowledge the reality that some parts of the data may not be possible to share. Due to the sensitivity of the topic with multiple potentially vulnerable participants in groups such as minors and treatment-seekers, we have developed internal guidelines for unexpected situations in order to provide efficient support and solutions in cases where participants need help or guidance. All data will be translated to English to maximize reuse and transparency; all translation work will be carried out by hired professional translators with document-by-document quality control by our local team members.

## Programmatic components

This Stage 1 research proposal includes a plan to publish additional case studies/series. Due to the large number of participants and data generated over several years, further details of the planned case studies/series are limited at this point. We aim to publish at least one such study/series per participant group, selecting relevant cases for closer reporting and utilizing all data types and countries, as registered in the current plan. We make use of an adapted “analytic direction” approach (Sale 2022) in case selection; namely, we will maintain a team-internal list of potential directions that surface over the years, and when enough evidence accumulates for a certain direction, this will be chosen to guide a programmatic component. CARE guidelines (Riley et al. 2017) will be followed in reporting. A summary plan of each component is below.

***Programmatic component 1: treatment-seekers***. Qualitative in-depth knowledge regarding actual treatment-seekers is scarce. We carried out a systematic review to map out existing case study/series publications (Supplement 6), and we found no studies with a focus on cultural diagnostic challenges. Therefore, our plan is to select one case from each country (South Korea, Finland, Slovakia) for a case series report with three participants. The goal is to select similar cases from each country, namely, all three participants will ideally represent similar age, gender, and gaming type. In order to have both men and women represented, we aim to write two separate case series publications based on the data, as generated by the registered procedures. The reports will have an explicit focus on the culture-specific contextual factors, which contributed or were related to the participants having sought treatment. We will construct an English-language study-specific coding manual, which enables researchers to systematically code all units that relate to culture from clinical and phenomenological transcripts as well as diary data. All data that have been generated by the time of research (per selected case) will be coded. Two independent coders are used for each of the three participants—native and non-native coder—and they together negotiate agreement on the most prominent contextual factors to be reported for each case study. Codes and coding materials are shared.

***Programmatic component 2: esports players***. With reference to the systematic review noted earlier (Supplement 6), there is a strong need for case studies/series that focus on intensively playing individuals who do not meet diagnostic mental disorder criteria. Whereas a possible reason for the lack of such studies is the general interest in positive cases (i.e., publication bias), we assert that understanding clinically significant cases also requires knowledge of clinically non-significant cases where numerous daily hours of gaming are not related to distress but good wellbeing (e.g., Griffiths 2010). As earlier, our case series aims to report a single participant from each country (Finland, Slovakia, South Korea) and will utilize all data that have been generated by the time of research, per each selected case. A similar coding manual approach is pursued as above, but in this case the goal is to map out gaming-related aspects of wellbeing, which will help to identify factors that distinguish intensively gaming healthy players from those who have problems. For this programmatic output, as an exception to the registered protocol above, we reserve the option to *additionally* invite participants who fall under the second exclusion criterion (“those who identify as professional players will be excluded”), that is, we may also invite players of esports games who currently work in a related professional position. In such a case, these data would be exclusive to this programmatic component and not included in the taxonomic analysis (except for exploratory purposes, if considered relevant).

***Programmatic component 3: gaming adolescents***. Following the above two programmatic components, the present one utilizes the adolescent data with a goal to contribute to the same knowledge gaps. Because our adolescent participants have not sought treatment at the time of recruitment, we vision a number of possible scenarios that lead to related programmatic case studies. *In the first case*, gaming becomes a problem for some of the participants over the three years to such an extent that expert support is needed; this will be a reason for us to produce a detailed etiological report based on the life changes, as followed in the project. *In the second case*, gaming becomes a profession-like activity for some of the participants over the three years, e.g. by a person signing a contract with an esports team; this will be a reason for us to produce a detailed analysis of the conditions surrounding the rare instance of initiating a gaming career. *In the third case*, we witness other unexpected gaming-related events, which deserve distinct reporting; as we cannot (by definition) list such events exhaustively here, our line of action in these instances is to contact the recommender with a brief description, and with the recommender’s permission proceed to case reporting.

# Results

# Discussion

# Conclusions

## Competing interests

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

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## Supplement 1: Cultural Contexts

Below we provide brief cultural context descriptions regarding each of the three main data countries. Our interpretations will be carried out in these contexts, referring to appropriate cultural components whenever applicable. When collaborators join the enterprise in the Duplication phase, new cultural context entries will be added.

**Table 1.** Basic Country Information

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Population** | **Demography** | **Official language** | **GDP per capita**1 | **Religious background** | **Tertiary & higher attainment**2 | **Unemployment**3 | **World Happiness Report** 4 |
| **FI** | 5.5M | 91.5% Finnish5 | Finnish,  Swedish | 53,654 USD | No state religion6 | 42% | 7.5% | 1st |
| **SK** | 5.4M | 84% Slovak, 8% Hungarian7 | Slovak | 21,391 USD | No state religion8 | 29% | 6.7% | 35th |
| **KR** | 52.7M | 96.8% Korean9 | Korean | 34,997 USD | No state religion10 | 69% | 3.5% | 59th |

[1] World Bank (2021). Available: <https://data.worldbank.org/indicator/NY.GDP.PCAP.CD>

[2] Organisation for Economic Cooperation and Development (2022). Available (link leads to FI but other countries searchable too): <https://www.oecd-ilibrary.org/sites/0b972e33-en/index.html?itemId=/content/component/0b972e33-en>

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[5] Statistics Finland (2022). Available: <https://www.stat.fi/tup/suoluk/suoluk_vaesto_en.html#Population%20structure%20on%2031%20December>

[6] Finland’s culture is influenced by the Evangelical Lutheran and the Orthodox.

[7] Statistical Office of the Slovak Republic (2021). Available: <https://slovak.statistics.sk/>

[8] Slovakia’s culture is highly influenced by Catholicism.

[9] Statistics Korea (2022). Available: <https://kostat.go.kr/portal/korea/kor_nw>

[10] South Korea’s social customs and traditions are highly influenced by Confucianism.

**Table 2.** Health Country Information

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Alcohol- related disorders1** | **Other Substance- related disorders1** | **Anxiety disorders2** | **Depres- sive disorders2** | **ADHD3** | **Suicide**  **per**  **100 0004** | **Bullying ages 13–155** | **Insufficient physical activity ages 11–17 6** | **Health**  **professionals**  **per 100 0007** | **Antide-**  **pressants (/1000)8** |
| **FI** | 2.49 % | 1.13 % | 4.39 % | 4.55 % | 1.79 % | 13.43 | 26 % | 75.44 % | **Nurses** 51.97  **Psychologists** 109.5  **Psychiatrists** 23.59  **Social workers** 2.75 | 74.8 |
| **SK** | 2.49 % | 0.77 % | 3.68 % | 2.90 % | 1.14 % | 9.31 | 19 % | 71.53 % | N/A | 41.1 |
| **KR** | 2.53 % | 0.87 % | 3.49 % | 2.27 % | 1.49 % | 21.16 | 15 % | 94.18 % | **Nurses** 13.66  **Psychologists** 1.59  **Psychiatrists** 5.79  **Social workers** 8.40 | 21.1 |

[1] IHME, Global Burden of Disease (2019). Available: <https://ourworldindata.org/drug-use#prevalence-of-substance-use-disorders>

[2] IHME, Global Burden of Disease (2019). Available:<https://ourworldindata.org/mental-health>

[3] Our World in Data (2019). Available:<https://ourworldindata.org/neurodevelopmental-disorders#prevalence-of-adhd>

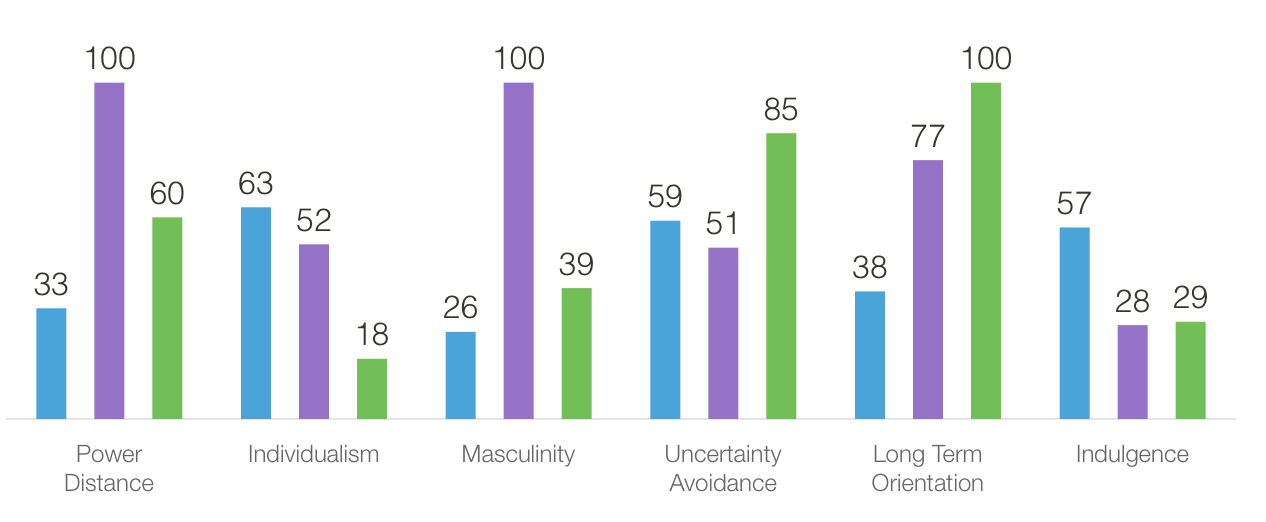
[4] WHO (2019). Available: <https://www.who.int/data/gho/data/themes/mental-health/suicide-rates>

[5] Experiences of being bullied in the past two months. Unicef (FI/SK data from 2018; KR data from 2015). Available: <https://data.unicef.org/adp/global-overview/?protection=Experience+of+bullying>

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[8] Our World in Data (2018). Available: <https://ourworldindata.org/grapher/antidepressants-per-capita>



***Figure 1:*** *Hofstede index (*[*https://www.hofstede-insights.com/*](https://www.hofstede-insights.com/country-comparison/)*) of Finland (blue), Slovakia (purple), South Korea (green).*

Each country is described through the following domains, according to *Hofstede index* that is widely used in nation culture comparison in organization culture studies: (a) **Power Distance** - the degree to which the less powerful members of a society accept and expect that power is distributed unequally, (b) **Individualism** (versus collectivism) - high degree of individualism be defined as a preference for a loosely-knit social framework in which individuals are expected to take care of only themselves and their immediate families, (c) **Masculinity** - a preference in society for achievement, heroism, assertiveness, and material rewards for success and thus more likely the society being competitive, (d) **Uncertainty avoidance** - the degree to which the members of a society feel uncomfortable with uncertainty and ambiguity, (d) **Long term orientation** - the nation that score high on this dimension tend to take a more pragmatic approach and encourage thrift and efforts in modern education as a way to prepare for the future, (e) **Indulgence** - high degree in this dimension indicates the society allows relatively free gratification of basic and natural human drives related to enjoying life and having fun.

### Finland

**Overview:** Finland (Capital: Helsinki) is a Northern European country that occupies a peninsula and surrounding islands in the Baltic Sea, bordering Sweden, Norway and Russia. For a long time, Finland was largely ethnically homogenous. In the past decade, more migrants have been accepted, with a significantly larger number of immigrants than emigrants. On the other hand, people of African descent have been found to face the most racism in Finland in a recent comparison of 11 EU countries (FRA 2018).

**Demography of gameplay:** In a recent survey, 89% of Finns between 10 to 75 years were considered as active game players, who play either digital or non-digital games at least once a month. For digital games, 80.3 % of Finns play at least occasionally and 65.1 % play actively (at least once a month). The most dominant platform is mobile games, followed by PC and consoles. The strongest active gaming population are those under 20, with 42,2% reporting playing daily and 76,2 % weekly. Finns used on average more than 6.8 hours per week on gaming in 2022 (Kinnunen et al. 2022).

**Local game industry:** In the 1980s, foreign imported computers and gaming devices became a seed to the country’s early-stage videogame studios in the 1990s despite the economic recession after the Soviet Union's fall in 1991. This sparked the rise of “Demoscenes” in Finland, best known with the *Assembly* event that has been organized since 1992. Some of the other noticeable events in Finnish game history include the success of the Snakegame in Nokia phones in the 1998, worldwide success of *Max Payne* (Remedy Entertainment, 2001), and the online community *Habbo* (2001). After the birth of smartphone markets in 2008, the country quickly shifted to mobile game industry hotspots with a success of *Angry Birds* (Rovio 2015) and *Clash of Clans* (Supercell 2012), which made founders of these game studios the biggest local tax payers in Finland for several years (e.g., EK 2019). Such publicity of the game industry’s success have significantly contributed to positive cultural perceptions of technology and gaming in the region.

**Local game discourse:** Finns have slightly positive attitudes towards gaming, according to a recent barometer survey (Kinnunen et al. 2022). According to this report, 52.9 % of the respondents in Finland considered gaming as a beneficial activity, while 41.1 % think the Finns think gaming is harmful. There was also significant overlap between these two, with 19.9 % of respondents answering that playing games was simultaneously both beneficial and harmful. Finnish esports players and teams have been relatively successful by winning several world championship level esports tournaments, such as those of *Dota 2* (Valve 2013) and *Starcraft 2* (Blizzard 2010).

**Gaming disorder**: As a historically unique element of Finnish game regulation, the country remains the only one in Europe with a national gambling monopoly. Gambling services can be provided only by Veikkaus—government-owned betting agency—and its profit distribution is determined in the law (e.g., spreading the profits across culture, education, and health services). In this context, it is perhaps surprising that videogame regulation has been little discussed and engaged. Currently, the central psychiatric services (e.g., Helsinki University Hospital) do not provide support for treatment-seekers with gaming problems, but such individuals are generally directed to private practitioners or third-party services. At the time of writing, there are two major third-party service providers, Restart and SOSPED, which provide (primarily) remote support for treatment-seekers, such as cognitive behavioral therapy, motivational interviewing, and peer group meetings. In the past years, Restart has received approximately 50 applications per year. A recent nationally representative survey (Karhulahti et al. 2022) identified 0.4 % prevalence using the Gaming Disorder Test (Pontes et al. 2021) in the general population across all age groups, genders and regions, and 6.9 % prevalence by the Game Addiction Scale (Lemmens et al. 2009).

**Education context:** After decades of 9-year compulsory education from the age of 7, a 2021 legislation expanded this to age 18 to provide all students with an upper secondary education. Finland is generally considered having a high level of education; all primary school teachers have a pedagogical Master’s Degree. In addition, all schools are funded equally in proportion to their student population. Most schools are considered good options with relatively little interest for children and adolescents to compete for access to private or special schools (but concerns about change have been voiced recently; see Karvi 2020). Several educational institutions from primary schools to universities have now come to offer various gaming-related courses and degrees, and technically, elite esports players can carry out their compulsory military service by gaming as well (yet to our knowledge, none have done so far). All children in Finland study either Swedish or Finnish as native language and the other official language as a compulsory language in primary school. Although in higher educational levels some universities and study subjects have limited intake with low acceptance rates (e.g., legal and medical degrees in the capital are) there are no significant entrance or access fees, and studies are supported financially by the government so that, in theory, it is possible to earn a higher education degree without savings or working at the same time.

**Sociopolitical context:** The country’s social security benefits are generous on a global scale, which counters socioeconomic risks related to unemployment and other adverse life events. Citizens are also entitled to decentralized public healthcare (see World Economic Forum 2020).

**Cultural context:** Historically, Finnish culture is characterized by Lutheran faith. However, the share of those belonging to the Evangelic-Lutheran Church has declined to 65,1%, with significant variation by location (KT 2022). The capital area is very multicultural, with a quarter of those aged 30 to 34 and 0 to 6 being of foreign background (Statistics Finland 2022). Based on the Hofstede index, Finland has the highest score in individualism (63) and indulgence (57) among the initial three countries participating in this research. This implies that individuals are expected to take care of themselves (and their immediate families only). In Individualist societies offense causes guilt and a loss of self-esteem, the employer/employee relationship is a contract based on mutual advantage, with very few inter-institutional hierarchies. The indulgence score generally indicates that Finnish society tends to acknowledge a higher degree of importance on leisure time, acting as they please and spending money as they wish.

**Historical context:** In 1906, Finland was the first country to give women full rights to vote and run for the office. After gaining independence in 1917 and becoming a republic in 1919, in the aftermath of the February Revolution in Russia, the country suffered series of conflicts and battles during the world war times; Finnish Civil War (1918), Winter War (1939-1940), Continuation War (1941-1944), and Lapland War (1944-1945). During the Cold War era, Finland retained a democratic constitution and free economy while laid in the gray zone between the Western countries and the Soviet Union. Finland hosted the 1952 Summer Olympics, first joined the European Free Trade Association as an associate member in 1961 (later a full member in 1986) later also signed an agreement with the European Community in 1973. It was during this time when Finland faced transition from agricultural society to manufacturing, services and trade, which quickly affected population density in the urban areas. After suffering the economic recession in 1991–1993, the country recorded high GDP growth amongst OECD countries until halted by the downfall of Nokia and the effect of global economic crisis in the early 2010s. Finland became one of the EU member states in 1995. Currently, the majority of Finnish ministers are women and the country ranks one of the top 5 in the EU gender equality (Gender Equality Index 2022).

### Slovakia

**Overview:** Slovakia (capital: Bratislava) is a landlocked country in Central Europe bordering Austria, Poland, Hungary, Czech Republic, and Ukraine. The country is a member state of the EU and NATO, and it is regarded as a young country; more than half of the country’s population consists of people in the working age (15-64 years).

**Demography of gameplay:** Based on a representative online survey of Slovaks older than 15 years old, 55.2% of the population played digital games (Nielsen Admosphere Omnibus, 2020). Women reported mostly playing logical or strategic games and men reported playing mostly strategic, action, and racing games. Compared to women, men reported more frequent play habits and reported playing at an older age. The strongest active player population is between the ages of 25 and 34. Less than a quarter of the Slovak population engage in gaming at least once per a week and only around 5 percent play videogames every day (NOC, 2018).

**Local game industry:** There are more than 40 game development companies in Slovakia (SGDA, 2021) that employ more than 1,000 employees with an overall turnover of more than 84M euros as of 2021. The companies mostly focus on the development of PC and mobile (Android) games with the cooperation of third parties. The most famous local titles are *Train Station 2* (Pixel Federation, 2019), *Shadows: Awakening* (Games Farm, 2018), *Vikings: Wolves of Midgard* (Games Farm, 2017), *Air Conflict* (Games Farm, 2011), *Football Cup 2021* (InLogic Games, 2019), *Little Wheel* (Functu, 2009), and *Athletics Mania* (PowerPlay Manager, 2007).

**Local game discourse:** Less than a quarter of the Slovak population considers videogames as their regular hobby (NOC, 2018). Esports development is currently managed and supported by the Slovak Association of Electronic Sports. However, the history of esports in Slovakia goes back to the early 2000s, for example, participating in several games already at The World Cyber Games championship in 2003. Most noticeably, Slovakian *Trackmania* (Ubisoft, 2003) players from the eSuba team achieved several top tier awards at Electronic Sports World Cup since 2011. Slovakian esports players’ international spotlights continues even today, including individual players of *Counter-Strike: Global Offensive* (Valve 2012), *League of Legends* (Riot Games, 2009), and various simulation racing games such as *RaceRoom Racing Experience*, *Assetto Corsa*, or *Project Cars*. Inter-country events are also becoming popular, for example since 2019, numbers of Slovakian local high school and university esports leagues jointly connected hundreds of players in Slovakia and the Czech Republic. In recent years, local esports teams also began collaborating with the local football clubs.

**Gaming disorder:** There are no official data on gaming problems in Slovakia. Based on our yet unpublished data from another ongoing project that aims to map the mental health of Slovak inhabitants longitudinally, we can currently conclude the following. On average, in four representative samples (*N*s=1814–1880 after exclusion of careless participants), 37.8% (range 34.5% to 41.6%) of the participants had been playing videogames for more than 2 hours per week. Out of those, on average, about 0.7% surpassed the threshold for disordered gaming as suggested by Gaming Disorder Test (Pontes et al., 2021). From a longitudinal perspective, a slight decrease (modeled as a continuous variable) was observed between December 2021 and December 2022. Treatment of gaming problems in Slovakia is still in its beginning phase. For example, in the country's biggest center for addiction treatment, there are only one or two treatment seekers per year (Personal communication).

**Education context:** In Slovakia, school attendance is compulsory from age 6 to 16. The education system is free, with the exception of private schools and private universities. In 2020, a total of 41 universities were operating in Slovakia with about 35k graduates annually each year including Bachelor’s, Master’s, and PhD degrees. However, of those with a university degree, only about a quarter work in the field they graduated from. One university (Comenius University in Bratislava, founded in 1919) has long been ranked among the top 500 universities in the world (Uniba, 2022).

**Sociopolitical context:** Slovakia has a parliamentary democratic system. Historically, the most successful political parties are from the left wing. Slovakia is a country with the lowest economic inequalities among the OECD countries (OECD, 2023). However, the one-sided focus on the car industry is considered a serious economic problem.

**Cultural context:**  Slovaks are predominantly (~60%) Christians and a quarter are without religious affiliation. Historically, different ethnic groups lived in the area of today’s Slovakia and thus the country is among the most culturally diverse states in Central Europe. The interactions between the ethnic groups and the majority have resulted in changes in culture, language, and traditions, many of which have been preserved. The country has a substantially high Hofstede index in Power Distance and Masculinity, reaching 100 in both. This indicates the country’s society highly favors success in life, and people consider it important to be regarded as successful. Organizations tend to have hierarchical structure, with visibility of the result and reporting as an important factor in achieving goals. Leaderships are also expected to provide supervision to their workers, with a general atmosphere that favors a strong and decisive leadership style. Status symbols like cars, houses, and clothes may play an important role in socializing, and people may work hard in long hours to achieve a high living standard.

**Historical context:** Slovakia was a socialist country for more than 40 years in the late 20th century. The country once formed a common state with the Czech Republic (at the time, the Czechoslovak Socialist Republic) in 1960-1990. In the aftermath of the anti-Communist Velvet Revolution in 1989, the state was renamed to Czech and Slovak Federative Republic in 1990. It was also around this time of history when Slovakia’s centralized planned economy was transformed into a market economy. The dissolution of Czechoslovakia took effect in 1993 when two separate independent states, the Slovak Republic and the Czech Republic, were established. Then in 2004, Slovakia became a member of the EU as well as a member of NATO.

### South Korea

**Overview:** South Korea (officially the Republic of Korea, with the capital in Seoul) is a country in East Asia situated on the southern half of the Korean Peninsula, sharing a land border with North Korea (the DPRK) and sea borders with Japan, China, and Russia. South Korea has the world's third-highest life expectancy (approx. 83 years) (World Bank 2022) but also one of the fastest countries growing old due to the lowest birth rate in the world (Reuters 2021). The country is the ninth-largest exporter and ninth-largest importer in the world.

**Demography of gameplay:** A survey report from The Korea Creative Content Agency (KOCCA), one of the most significant nationally funded game-related market agencies in the country, indicates that 74.4% Koreans between the ages of 10 and 65 have played videogames. Mobile (84.2%) and PC (54.2%) were the most dominant gaming platforms in the country, followed by a smaller margin of consoles (17.9%) and arcades (9.4%). Gender-wise, both male (75.3%) and female (73.4%) groups reported a similar margin of gamer population. The report also indicated that those identified as gamers play videogames 132 minutes per day on weekdays and 209 minutes per day on weekends, roughly 18 hours per week (KOCCA 2022b).

**Local game industry:** South Korea is one of the leading players in the global game scene. The country is the fourth largest games market globally with a market share of 6.9%, following the U.S, China and Japan (KOCCA 2021). In terms of revenue, the total size of the South Korean gaming market was approximately 13 billion USD, with the export being approximately 7 billion USD in 2020 (KOCCA 2021). South Korea is also widely regarded as the world's esports capital and a mecca for professional gamers. In 2020, there were 1,046 game development and publishing firms, 9.970 PC bangs (i.e., internet cafes), and 83,303 individuals working in the industry, with mobile gaming accounting for 57.4% of revenue, followed by PC gaming at 26.0% and PC bangs at 9.5% (KOCCA 2021). Furthermore, the country’s demand for immersive and interactive experiences with the notion of “metaverse”, South Korea’s virtual reality gaming market is predicted to increase at an annual growth rate (CAGR) of 23.38% from 2022 to 2027 (IMARC 2021).

**Local game discourse:** South Korea’s economic recession in the midst of the 1997 Asian financial crisis sparked the widespread internet cafes (PC bangs) that also offered videogames as an affordable entertainment media experience to many South Koreans (e.g., Stewart & Choi 2003). This aided gaming businesses in Korea such as Nexon and NCSoft in developing competitive online/PC games in response to increased demand, as well as in the development of distinct esports cultures and ecosystems after the nation-wide successes of grass-rooted professional game leagues of *Starcraft* and *League of Legends* (see Huhh 2008). The South Korean market has just adjusted to the change from PC to mobile gaming. Gaming in South Korea goes beyond simply playing games; according to the New York Times Magazine, esports is a "national pastime" in Korea (Mozur, 2014). Such popularity paved the way for the early creation of modern esports, and quickly adopted esports in conventional media: the world’s first esports-dedicated television channel Ongame.net from 2000 (Jin 2020). However, the South Korean publics’ perspective on gaming is still rather divided. On one hand, market discourse highlights the Korean game industry’s economic gains from the nation’s most exporting cultural products with South Korean game exports surpassing the country’s film, music, and media exports combined (KOCCA, 2022b). In contrast, pedagogical and medical discourses call for top-down regulations on gameplay behavior. A prime example of societal division over gaming was the South Korean parliament’s legalization of “Youth Protection Revision Act” (commonly known as “Shutdown law”) in 2011, which forbade those under the age of sixteen to play online games between 00:00 and 06:00 AM (Lee et al. 2017). Provoking nation-wide debates and strong oppositions from the game industry, the act was later concluded ineffective and unnecessary by the South Korean government, stating it does not meet with the reality of growing gameplay demographics and is violating minor’s free will (SK 2021). The act was later revoked by the partial amendment in January 2022. The sharp tension between these two contrasting discourses on gaming still remains, limiting the space for the nations’ open gaming discourse.

**Education context:** South Korea offers compulsory and free public education for 9 years from age 7 until 16. The focus of the Korean education system has heavily geared towards the college entrance exam, called “College Scholastic Ability Test (CSAT)” that heavily affects potential household income and career. Thus, the Korean classroom atmosphere is generally highly competitive with extensive pedagogical curriculums and frequent nation-wide performance assessments every year. While such a competitive education system benefits the country’s high rate of tertiary (or higher) attainment—one of the top among OECD countries—criticism has mounted amongst the both public and pedagogical sectors. Many South Korean parents face financial stress due to necessity for private education spending. This is followed by issues of migrating wealth gaps to educational gaps and elderly poverty. Korea’s birth rate is among the lowest (see earlier), as young couples consider potential financial challenges upon raising a child. Education also raises mental and other health concerns over minors with scarce leisure time and overweight concerns over poor study performance. For instance, South Korean high school students’ (age 17-19) average sleep is 5.8 hours a day (Ministry of Gender Equality and Family, 2022). More than half (55.1%) of South Korean parents think gaming distracts youngsters from studying (KOCCA 2022b). These conditions may help explain the country’s suicide rate (24.1 per 100,000), which is the highest among OECD countries and particularly high in adolescent and retired age groups (OECD, 2020). Pedagogical attempts to mediate gaming and studying, such as game-based learning and gamification of classroom, are not widely implemented in South Korea with schools’ concerns over students’ low performance in CAST and lack of adequate public infrastructures.

**Sociopolitical context:** South Korea ranks 19th on the Human Development Index (HDI) (United Nations Development Programme, 2022). The country recently increased their significance with domestically produced cultural and entertainment products—music (K-pop), TV dramas (K-dramas), films, and games—and exporting them to global audiences (see Yoon & Jin 2017). South Korea’s June Democratic Struggle in 1987 led to the constitutional amendment, which transitioned the country from authoritarianism to democratic society with a direct presidential election system. The right to vote to directly elect a president had been given to Korean citizens over the age of 20 since the 1950s and then 19 in 2005.

**Cultural context:** Half of the South Korean population is non-religious, while Christians account for 20%, Buddhists 17% and Catholics 11% (HanKook Research, 2021). This explains South Korea’s highest score in long-term orientation (100) on the Hofstede index, and the society with a strong pragmatic view over resolution of the problems; the notion of the one and only almighty God is not familiar to South Koreans. The country’s uncertainty avoidance score (85) is one of the highest in the world, which indicates there is an emotional need for rules—regardless of the efficiency or adequacy of the rule. People consider time to be money, with an inner urge to be busy and work hard. Precision and punctuality are the norm. The low individualism score (18) corresponds to the country’s strong Confucianist cultural background that emphasizes the group’s collective value over individuals’ choice, resulting in employer-employee relationships being perceived as communal bonds, as of family or friend link. Furthermore, with the low score of 29 in indulgence, South Korean culture has a tendency to cynicism and pessimism that do not put much emphasis on leisure time but rather favor the attitude of hard work. Being able to control their desires is perceived as a proper way of work and life.

**Gaming Disorder:** Upon the WHO's recognition of gaming disorder, the Korean Standard Classification of Diseases (KCD) proposed it could become one of the country’s official diagnoses in 2025. Since the early 2000s, the weighing concerns over the notion of “game addiction” became a major topic in the country’s domestic game discourse, which penetrates the gaming disorder discourse even to this day. In the mid 2000s when the term “game addiction” first emerged from the academic scene, scholars first addressed its lack of rigorous scientific or medical evidence. For this reason, a different wording for clinically significant gaming problems—*game overindulgence*—remains dominant over “gaming disorder” in the South Korean discourse. Collective initiative on game overindulgence from various parental, pedagogical, and conservative religious groups have gained a political stance, also passing over to the medical field. In 2008, the South Korean government began to establish a foundational ground for game overindulgence prevention and treatment, alongside with the parliament’s partial amendment of the Game Industry Act. With growing political pressure on the gaming industry to take social responsibility for minors’ gaming, a fund (the Game Culture Foundation) was jointly formed by South Korean gaming companies in 2010 that continues to operate game overindulgence rehabilitation clinics nationwide. Upon the enactment of the “Shutdown law” in 2011, the discussion on game overindulgence and its treatment have brought South Korean game discourses closer together. Since then, the government has been conducting an annual comprehensive survey to gain up-to-date data of adolescents’ game overindulgence in order to study and undergo necessary institutional measures. According to a recent survey (KOCCA 2022a), the “(game) overindulgence group” [those unable to control gaming excessively] is generally less than 1%, while the “overindulgence risk group” accounts for about 1-3%. The same survey also showed that gaming among teenagers increased significantly during the Covid-19 global pandemic. However, it did not lead to an increase in the overindulgence group or the overindulgence risk group.

**Historical context:** Following the end of the war in 1953, the country formed a military alliance with the United States and its ravaged economy began to recover, recording the world's fastest growth in average GDP between 1980 and 1990. With the advancement of IT infrastructure, particularly high-speed internet, and active government participation in the late 1990s, the South Korean technology market, including gaming, began to proliferate, concentrating on the online sector (Jin 2010).

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## Supplement 2: Invitation Letters and Other Participant Documents (translated to English)

The documents for each of the three groups are found in the “Participants” folder.

## Supplement 3: Instructions for Experts (translated to English)

The documents for interviewing and panelist experts are found in the “Experts” folder.

## Supplement 4: Interviews: Phenomenology of Play (POP), Follow-up (POP-UP), Start Interview (translated to English)

The documents for each of the three groups are found in the “Measures” folder under the “Qualitative” section.

## Supplement 5: Diary and Gaming Log Templates

The documents for each of the three groups are found in the “Measures” folder under the “Qualitative” section.

## Supplement 6: Review of Literature

The document can be found in the “Literature Search” folder.

## Supplement 7: Annually Applied Scales

The following scales are applied annually. Please note that, following critical realist epistemology, the scales are used to gain knowledge and will be triangulated with other data sources rather than interpreted as direct independent representations of constructs. The scales have been chosen with the following three criteria:

a) They should make sense in all three cultural contexts and serve the present research goals,

b) They should have existing tested translations in all three language groups or there should be a permission to translate them with our own professionals,

c) They should be suitable for both adolescents and adults or there should be adapted versions,

d) They should not be commercial but available for free research use,

e) If multiple scales meet the above criteria, prioritize scales that have high-quality validation studies.

The following scales were considered most optimal for the present study. Note that, over the next four years, we may exploratively add other scales as well if considered relevant for a certain group or country, but those scales will not be part of the below systematic measurement plan. If we identify a critical problem with a scale or find strong evidence that an alternative scale would be more informative, we can replace any (cultural version of a) scale, but only with exceptional circumstances in order to not undermine continuity. All new translations will apply a systematic 2-forward-reconciliation method where two experts create independent translations and then discuss differences until agreement, involving at least one language professional.

**Gaming** (administered every round)

* Single-item Measure of Gaming Problems (**THL1;** Salonen et al. 2015) directly asks how often the respondent has had problems with their videogame play over the past 12 months. The measure was developed for public health use by the National Institute of Health and has been applied henceforth in Finnish studies (e.g., Karhulahti et al. 2022). We will translate the measure into Slovak and Korean. After the first time, we will use the length of the round (4 months) instead of 12 months.
* Gaming Disorder Test (**GDT**) is a 4-item measure based on the ICD-11 diagnostic criteria. It was originally developed in English and Chinese (Pontes et al. 2021) with a mixed adolescent-adult group, and we have tested Slovak (Martončik et al. 2021) and Finnish (Karhulahti et al. 2022) translations in previous research. We have acquired permission to create a Korean translation. Note that, for adolescents, the first time will be administered orally during the initial interview. After the first time, we will use the length of the round (4 months) instead of 12 months.

**Mental Health**

* Patient Health Questionnaire 4 (**PHQ4**) is a combined 4-item scale that measures both general anxiety and depression, each by two respective items (Kroenke et al. 2009). The measures are in frequent use by Finnish health researchers (e.g., Kujanpää et al. 2014; Koskela et al. 2018), Slovak health researchers (Kralova et al. 2022), and Korean health researchers.
* Adult ADHD Self-Report Scale (**ASRS**) is a 18-item scale that measures ADHD in adults. The measure was originally developed for English-speaking participants (Kessler et al. 2005) but Finnish (Smalley et al. 2007), Slovak, and Korean (Kim et al. 2013) translations exist nowadays as well.
* Adolescent ADHD Self-Report Scale (**ASRS-A**) is an adapted version of the above ASRS and has been validated in Swedish (Sonnby et al. 2015). Although ASRS is commonly used for non-adult samples as well, ASRS-A was developed to introduce changes that improve reliability in adolescent samples. We have acquired permission to translate these changes into Finnish, Slovak, and Korean.
* Depression Anxiety Stress Scales – Short Form (**DASS**) is a 21-item measure for the titled mental health challenges (Antony et al. 1998). Official translations exist in all three languages (<http://www2.psy.unsw.edu.au/Groups/Dass/translations.htm>). The scale has been developed specifically for adults and we only apply it with our adult participants.

**Social Health**

* Mini-Social Phobia Inventory (**Mini-SPIN**) is a brief 3-item measure for screening social anxiety disorder. It was originally developed in English (Connor et al. 2001) but Finnish (Ranta et al. 2012), Slovak and Korean (Kim et al. 2021) versions exist as well.
* Experiences in Close Relationships-Relationship Structures (**ECR-RS**) is a 9-item scale that measures attachment style in both adolescents and adults. The scale was developed and has been used for measuring various close relationships (Fraley et al. 2011), but we will use it specifically for measuring parental attachment. Finnish (Flykt et al. 2011), Slovak (Švecová et al. 2021) and Korean (Kim & Lee 2015) versions exist.
* **KIDSCREEN-27** (Ravens-Sieberer et al. 2014) is a multidimensional, health-related quality of life scale for adolescents that measures physical and psychological wellbeing, social relationships (autonomy/parents, peer/social support), and school environment. All three language versions were developed as part of the original research (KIDSCREEN Group Europe 2006). In addition to providing valuable information about social relationships, the first two dimensions complement our physical and psychological health measures.

**Physical Health** (administered every round)

* For measuring physical health, we will use the first two items from the Short Form Health Survey (Ware Jr & Sherbourne 1992) with a modification that “physical health” is used instead of “health” alone. Translations exist for Finnish (e.g., Aalto et al. 1999), Slovak (e.g., Ulbrichtová et al. 2019), and Korean (e.g., Kim & So 2015). The shortness of this applied scale (**PH2**) with only two items will allow us to administer it exceptionally every four months throughout three years.

**Identity and Self**

* **20 Statements Test** is a simple measure developed in the 1950s (Kuhn & McPartland 1954) for assessing attitudes of self. Participants are asked to answer 20 times the question "Who am I?" by "I am..." in an open format. Although there are ways to quantify results, we do not plan to apply any existing systems of self-classification but rather use the results as exploratory self-concept data idiographically. Due to the special nature of the scale, we will apply self-created new translations.
* Dimensions of Identity Development Scale (**DIDS**) is a 25-item measure of developing identity in adolescents. After original development (Luyckx, Schwartz, et al., 2008), it has also been validated in Finnish (Mannerström et al. 2017) and Korean (Park et al. 2021). We have acquired the permission to translate the scale into Slovak.
* Valued Living Questionnaire (**VLQ**; Wilson et al. 2010) is a 20-item scale that measures both personal values (first half) and to what degree one lives according to them (second half). Finnish (Kyllönen et al. 2018) and Korean (Park & Lee 2012) versions exist, and we have the permission to translate the scale into Slovak.

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1. During the Stage 1 review of this study, we were contacted by game industry representatives who offered support to ensure completion of the study. At the time of writing, negotiations are ongoing and we have not agreed on anything. The current plan under negotiation goes as follows. Because the highest risk in this study is the failure to recruit 15 treatment-seekers—sharing their qualitative experiences for research over three years—in all countries, a collaborating game company can be utilized for sharing the invitation link directly to their thousands of highly engaged players not only for Group B but also Group A recruitment—with the premise that some intensively gaming players have sought treatment and thus rather meet the inclusion criteria of Group A. This all could be done by targeting players in our studied countries, thus there would be no change in the present protocol, but certain videogames would merely serve as additional sharing platforms for the invitations that target both esports players and treatment-seekers. The Ethics committee (University of Jyväskylä) has been consulted about this and tentative approval has been received. A) If we decide to agree upon such a contract with a game company, a supplement will be written at Stage 2 outlining all details; in all possible scenarios, a company cannot interfere with our data in any way and we retain the full right and responsibility to choose the participants who comply with inclusion and exclusion criteria. B) If we decide not to agree with a company, this footnote is turned into an endnote postmortem. [↑](#footnote-ref-1)