Tampere University

ILKKA VUORINEN

Problems Beyond Gambling and Gaming

A social psychological approach to excessive behaviors

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In 2015, my life changed in two fundamental ways: I became a father and a Tampere University student in social psychology. Suddenly, there was a profound sense of meaning and purpose that came with the former change, whereas the latter one sparked hope that I could eventually advance to the kind of positions in society that match my strengths and ambitions. My willingness to improve myself and the world around me had finally found the more personal "why" and "how" to carry on, no matter what. During my bachelor's and master's studies, I had the privilege of learning from many teachers in social sciences, psychology, health sciences, social work, philosophy, and education, to better understand the human condition. The seemingly unlikely possibility had become a reality, motivating me to continue towards doctoral studies and an academic career.

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ABSTRACT

Games have been an integral part of human cultures throughout history, but new technologies have made them a more prevalent part of everyday life. In contemporary societies, gambling and digital gaming have raised concerns due to many psychological, social, and economic problems that have been associated with them, particularly when these behaviors become excessive. Therefore, problematic gaming and gambling are at the forefront of the ongoing discussion on behavioral addictions.

This social–psychological dissertation approaches addiction as a means of coping with the challenges of life. From the perspective of this paradigm, excessive involvement in gambling or digital gaming and related issues arise from wider psychosocial difficulties in life that make people vulnerable to problematic behavioral patterns. This dissertation comprises four survey studies. Study 1 investigated the direct and indirect associations of loneliness, sense of mastery, and psychological distress in predicting gambling problems among Finnish (N = 1200), American (N = 1212), Korean (N = 1192), and Spanish (N = 1212) young people aged 15–25 years. Study 2 examined how the satisfaction and frustration of basic psychological needs are associated with gaming and gambling problems in Finnish individuals aged 18–75 years (N = 1530). Studies 3 and 4 used longitudinal methods, continuing with the data used in Study 2 but with multiple timepoints. Study 3 analyzed the effects of materialist values and mental health issues on gambling problems, while Study 4 observed the effects of stress and loneliness on gaming and gambling problems.

The results of these studies imply that those who experience problems with their gaming and gambling behaviors are likely to also experience much wider issues in life that could exacerbate the problems. Although the causal links tend to be complex, these studies indicate that higher scores on factors such as loneliness, mental health issues, low sense of mastery, and stress can increase gaming and gambling problems, thereby emphasizing the need to expand the focus to broader issues of well-being when something appears excessive or addictive and problems emerge.

Keywords: Addiction, gambling problems, gaming problems, loneliness, mental health, distress, basic psychological needs

TIIVISTELMÄ

Pelit ovat olleet kiinteä osa ihmiskunnan kulttuurihistoriaa, mutta uusien teknologioiden myötä niistä on tullut näkyvämpi osa jokapäiväistä elämää. Rahapelit ja digitaaliset pelit ovat myös saaneet aikaan huolta nykyisissä yhteiskunnissa niihin liitettyjen useiden psykologisten, sosiaalisten ja taloudellisten ongelmien vuoksi, varsinkin näiden käytösmallien muuttuessa liiallisiksi. Ongelmallinen rahapelaaminen ja digipelaaminen ovatkin käyttäytymisaddiktiota koskevan keskustelun eturintamassa.

Tämä sosiaalipsykologinen väitöskirja käsittelee addiktiota selviytymiskeinona elämän haasteiden edessä. Tästä lähestymistavasta tarkasteltuna liiallinen rahapelaaminen ja digipelaaminen sekä niihin liittyvät ongelmat kumpuavat laajemmista vaikeuksista elämässä, jotka tekevät ihmiset haavoittuvaisiksi monenlaisille ongelmille. Väitöskirja koostuu neljästä kyselytutkimuksesta. Ensimmäisessä artikkelissa tutkittiin yksinäisyyden, hallinnan tunteen ja psykologisen kuormittuneisuuden suoria ja epäsuoria yhteyksiä nuorten ja nuorten aikuisten rahapeliongelmiin Suomessa, Yhdysvalloissa, Etelä-Koreassa ja Espanjassa. Toisessa artikkelissa puolestaan tarkasteltiin kuinka psykologisten perustarpeiden tyydyttyminen ja turhaumat ovat yhteydessä rahapeli- ja digipeliongelmiin suomalaisten 18–75-vuotiaiden keskuudessa. Kolmannessa ja neljännessä aineistossa hyödynnettiin useamman aikapisteen aineistoa ja pitkittäisanalyysimenetelmiä. Kolmas artikkeli käsitteli materialististen arvojen ja mielenterveyden haasteiden vaikutuksia rahapeliongelmiin, kun taas neljännessä artikkelissa tutkittiin yksinäisyyden ja stressin vaikutuksia rahapeli- ja digipeliongelmiin.

Näiden tutkimusten tulokset viittaavat siihen, että rahapeli- ja digipeliongelmia kokevilla on todennäköisesti myös laajempia vaikeuksia elämässä, jotka voivat vähintään pahentaa näitä ongelmia. Vaikka kausaaliset yhteydet ovatkin yleensä monimutkaisia, nämä tutkimukset osoittavat, että yksinäisyys, mielenterveyden haasteet, matala hallinnan tunteen ja stressi voivat lisätä rahapeli- ja digipeliongelmien määrää. Yleisempi hyvinvoinnin tarkastelu voikin siksi olla tarpeellista addiktioon viittaavien ongelmien ilmetessä.

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ABBREVIATIONS

BPNSFS	Basic Psychological Need Satisfaction and Frustration Scale
DSM	*Diagnostic and Statistical Manual of Mental Disorders*
GHQ	General Health Questionnaire
ICD	*International Classification of Diseases*
IGDT	Internet Gaming Disorder Test
IRR	Incidence Rate Ratio
MHI	Mental Health Inventory
MVS	Material Values Scale
OR	Odds Ratio
PGSI	Problem Gambling Severity Index
SOGS	South Oaks Gambling Screen
ZINB	Zero-Inflated Negative Binomial

ORIGINAL PUBLICATIONS

Publication 1 Vuorinen, I., Oksanen, A., Savolainen, I., Sirola, A., Kaakinen, M., Paek, H.-J., & Zych, I. (2021). The Mediating Role of Psychological Distress in Excessive Gambling among Young People: A Four-Country Study. *International Journal of Environmental Research and Public Health*, *18*(13), 6973. https://doi.org/10.3390/ijerph18136973

Publication 2 Vuorinen, I., Savolainen, I., Hagfors, H., & Oksanen, A. (2022). Basic psychological needs in gambling and gaming problems. *Addictive Behaviors Reports*, *16*, 100445. https://doi.org/10.1016/j.abrep.2022.100445

Publication 3 Vuorinen, I., Hagfors, H., Savolainen, I., & Oksanen, A. (2024). A longitudinal study on the effects of materialism and mental health on gambling problems in Finland. *International Gambling Studies* (accepted 6.2.2025). https://doi.org/10.1080/14459795.2025.2467936

Publication 4 Vuorinen, I., Savolainen, I., Sirola, A., & Oksanen, A., (2024). The impacts of stress and loneliness on gambling and gaming problems: A nationwide longitudinal study. *International Journal of Social Psychiatry*, 7*0*(7). https://doi.org/10.1177/00207640241264661

1 INTRODUCTION

In 2013, the American Psychiatric Association (APA) brought official recognition to the concept of behavioral addiction by categorizing a "gambling disorder" into a reframed category known as "substance-related and addictive disorders" and including "Internet gaming disorder" as a condition that would require further research in the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5; APA, 2013). Although gambling problems have been well-known throughout history (Ferentzy & Turner, 2013; Reith, 2002) and earlier versions of the DSM have also included criteria for "pathological gambling" already in 1980 (Lesieur & Rosenthal, 1991; Griffiths, 1996a), the diverse and substantial financial, social, legal, and mental health problems that are associated with it and affect individuals, families, communities, and societies have drawn more and more public interest within the recent decades (Orford, 2011; Sulkunen et al., 2019). Similarly, excessive time spent in virtual worlds, inattentiveness, psychosomatic problems, impairments in academic performance, and a decrease in real-life sociability that are associated with harmful gaming have become causes for concern (Kuss & Griffiths, 2012). Suicidal ideation and even suicidal attempts have also been linked to both gaming and gambling problems (Erevik et al., 2022; Kristensen et al., 2024); however, the evidence is more robust regarding gambling problems, although the lack of longitudinal research has made it difficult to establish causal links.

Gaming and gambling industries have been growing rapidly in recent decades, being worth tens and even hundreds of billions of dollars, with mobile technologies and the Internet spurring their growth (Sulkunen et al., 2019; Wardyga, 2023). Nowadays, people can play games almost anywhere and anytime. Being a gamer myself since childhood and having observed friends, relatives, and now my own children play digital games, I recognize how fascinating digital games can be at their best, but also how easily this abundance of entertainment can capture attention and make hours and occasionally even days pass by if no one is willing, precautious, and sufficiently aware to consciously set limits to these activities. Companies develop gaming and gambling experiences that keep people in front of their games, while also

continually attracting new customers (Schüll, 2012; Wallace, 2015), which calls for sufficient regulation as a counterweight to achieve balance.

Globally, it is estimated that almost half of the adult population has engaged in some form of gambling within a 12-month interval, and a little over 1% were evaluated to be problematically involved in gambling (Gabellini et al., 2023; Tran et al., 2024). In comparison, approximately four out of five Finnish individuals had gambled within a similar interval and approximately 3% were estimated to gamble problematically in 2019 (Salonen et al., 2020). Studies that report the prevalence of digital gaming tend to be more difficult to find, as the focus is typically on harmful gaming. However, Finnish national statistics reveal that approximately half of the country's population plays digital games—with the prevalence being higher in younger age groups— whereas approximately 5% of the respondents reported having felt at least occasionally that their gaming was problematic and 1.3% matched the criteria for problematic gaming (Salonen et al., 2020). In turn, the global pooled prevalence for the gaming disorder is estimated to be approximately 3% or just under 2% when adjusting for more stringent criteria (Stevens et al., 2021). While the percentages may appear low, they still imply that tens and hundreds of thousands of people are directly affected by their gambling or gaming problems, and even more people are affected by these problems in the context of families, communities, and societies.

In this dissertation, I approach harmful gambling and digital gaming behaviors from the perspective of social and psychological conditions that can contribute to the severity of these problems. More specifically, my aim is to investigate the role of mental well-being in gaming and gambling problems. Leaning into the framework of the self-determination theory and particularly its mini-theory on the necessity of basic psychological needs in human functioning (Deci & Ryan, 2000; Ryan & Deci, 2017), I argue that the severity of problems depends on the level of psychosocial well-being, thereby integrating the idea of addiction as an adaptive behavior (Alexander, 2008) into the overall approach. In the next chapter, I review extant literature on gaming and gambling, moving on to literature on addiction and well-being that provides a more in-depth reasoning for the selected framework. In Chapters 4–6, I summarize the aims, methods, and results of the publications included in this dissertation, after which I discuss the findings in relation to the available literature.

2 GAMBLING AND DIGITAL GAMING

Considering that contemporary life, where mobile technologies have made it easier to contact each other but also created distractions with an abundance of entertainment, different kinds of games have become popular, a few even on a global scale. People play games to be entertained, to get challenged, or to connect with peers, among many other reasons (Binde, 2013; Wallace, 2015). In this chapter, I provide an overview of gambling and digital gaming as human behavior and what is the background for the concerns on excessive involvement in them.

2.1 The human desire to play

Regarding the motives of playing different kinds of games, the first question to address is why people play at all. Undoubtedly, there are many ways to explain this, and the answer therefore depends on the theoretical stance one uses to understand people. While one person would emphasize the fun and challenging sides of play, another person might view at least some forms of play as a waste of time. Indeed, as J. Nina Lieberman (1977) summarizes different theoretical rationales, play has been typically considered as either discharge or recharge of energy, skill practice, growth, fun or socializing, but usually as an irrational and useless activity. To many, play appears to mean something "that is not 'serious' or 'work'," and the young and the old alike could engage in it, and in formal or playful ways (Bateson & Martin, 2013, p. 2). However, it can also be stated that play and playfulness foster novel ways of thinking and acting, thereby implying that it has a fundamental connection to imagination, creativity, and innovation (Bateson & Martin, 2013; Lieberman, 1977). According to Richard Ryan and Edward Deci (2017), humans have a pervasive tendency to be active, curious, playful, explorative and spontaneous, which is integral to their development and health. Therefore, play can be thought of as something which we are intrinsically motivated to do for its own sake.

Humans are a relatively complex species in comparison to other animals, and our capability to imagine and create is unparalleled in our current knowledge. Regarding play, Mark Nielsen (2012) argues that an important aspect that allowed human

cultures to flourish was the emergence of infancy and childhood characterized by pretend play and imitation. This, in turn, was made possible when the species gained sufficient energy resources, were buffered from serious stress, were susceptible to boredom, and their lifestyle began involving "complex sequences of behavior in varying conditions" (Burghardt, 2005, p. 172). A social species such as humans acquired new behavioral repertoires by learning to act creatively and spontaneously when solving problems instead of having to learn behavior patterns again in each generation (Bateson & Martin, 2013). Furthermore, it has been argued that playfulness increases mating success and has given rise to various cultural phenomena such as games, sports, arts, and humor (Moraes et al., 2022). Although it is challenging to recognize archeological objects used for play, Riede et al. (2018) see that it is very likely that, given the material culture of humans, prehistoric children would also likely have played with material objects that consequentially primed their innovativeness.

Games have been played throughout history, although not purely for entertainment. For example, dices and even board games have been found in ancient ruins and tombs (Imataka et al., 2024). Dating back thousands of years, the ancient dice games and lot casting most likely involved magical beliefs of getting sacred signs from deities, since the separation of chance from religious beliefs began only around the seventeenth century (Reith, 2002). As stated by Ferentzy and Turner (2013, p. 6), risk taking "has always been an essential part of survival," and this willingness to take risks is partially the reason why gambling exists in most human cultures. In ancient Rome, lots would be cast to choose leaders, settle disputes or determine whether someone was guilty, but gambling was also viewed as a vice during the third century BCE when dice games gained popularity and many people began getting into trouble with their gambling debts (Rosenthal & Faris, 2019). Board games, lotteries and card games were known in China long before their arrival to Europe (Wu & Lau, 2015; Sulkunen et al., 2019), but the technological and societal changes in Europe from the fifteenth to the seventeenth century allowed these activities to spread wider and grow even more popular (Reith, 2002). Around that time, casinos were being developed reciprocally with probability mathematics (Ferentzy & Turner, 2013). Overall, these developments show how the context of gambling has changed from earlier magic-based belief systems to a more commercialized modern environment.

New forms of entertainment emerged in the twentieth century. Technological developments had made moving pictures possible around the turn of the century, with the evolution from silent films to color films and digital films that are seen in recent decades (Gomery & Pafort-Overduin, 2011). Different kinds of transmissions could be sent to homes, first through radios, then through televisions, and through

computers and the Internet by the end of the century. In the realm of gambling, new technologies were harnessed in the form of mechanical slot machines that subsequently gave way to electromechanical machines and then to digital machines during the twentieth century (Ferentzy & Turner, 2013; Reith, 2002). According to Raento (2014), these new innovations entered Finland in the 1920s due to the influence of international trends, becoming a fashionable way for the growing middle class to have fun, while also bringing revenues to support non-governmental social welfare and health organizations.

Arguably one of the biggest technological changes of the twentieth century was the development of computers. According to Fox (2013), computers were first built for specific tasks, but after the 1940s the need to build more generally usable computers and the introduction of new, smaller hardware made it eventually possible for ever-widening groups to use computers. In the 1970s, microprocessors were created, which he sees as the turning point in the development of personal computers, pointing out how today one can buy relatively cheap handheld devices that are more powerful than typical computers merely a decade earlier. The commercial creation of digital games began in the 1970s with the establishing of coin-operated arcade games and games that could be bought for home consoles for infinite replay (van Roessel & Švelch, 2021). From Magnavox Odyssey to Nintendo Entertainment System to personal computers and PlayStation, the game industry grew every decade, eventually utilizing the Internet and mobile devices in the twenty-first century (Egenfeldt-Nielsen et al., 2012).

Given this background, the current abundance of games and gamers does not appear too peculiar. Games are one specific means for people to play alone or together for many kinds of reasons, and as Burghardt (2005) summarizes, play can be voluntary, pleasurable, and self-rewarding as well as cruel, risky, and immersive. The simple yet important answer to why people play games is therefore that they can bring the kind of content to people's lives that matches with their motives.

2.2 Gambling

Dice and card games a lotteries and slot machines have been among the most popular types of gambling throughout history (Ferentzy & Turner, 2013; Reith, 2002). Other forms of gambling, such as roulette, bingo, scratch cards, or betting could be added to the list. However, the definition of gambling should be clarified, since it is not limited to these particular games. There have been various views on gambling in

the past, from fraudulent gameplay to wagering with random or uncertain outcomes to playing games of chance, and before the medicalized view, those who experienced problems were regarded simply as gamblers with problems (National Research Council (US) Committee on the Social and Economic Impact of Pathological Gambling, 1999). A modern definition of gambling is "placing a wager on a fortuitous event with a chance of winning it back with multiple value but also with a higher chance of losing it" (Sulkunen et al., 2019, p. 1). On the broadest level, we can all be regarded as gamblers if the persistence of risk and uncertainty in life is taken into consideration, as suggested by Reith (2002).

Following this broad notion, it is worthwhile to recognize that we all have to take our chances sometimes: rely on unfamiliar people, choose a path that seems like a shortcut, or invest in something whose future value we are not promised. As conceptualized by Thekdi and Aven (2023), risk is a constant and enduring factor of life that can be managed and can result in both good events as well as negative ones. In turn, Ferentzy and Turner (2013, p. 17) indicate that the willingness to take risks is perhaps an important factor influencing why humans have come to "dominate the planet"; from this perspective, gambling games can be regarded as "a culturally limited form of risk taking."

However, gambling with games of chance is not universal and factors such as societal complexity, the presence of commercial money, and social inequality appear to facilitate gambling activities, whereas the influence of monotheistic religions tends to limit them (Binde, 2005). According to Walker et al. (2008), the preconditions for gambling to emerge in a society are the motivation among people to acquire wealth, the existence of play, and the ease of distributing or transferring wealth through money. Industrialization, urbanization and colonialism of the nineteenth century contributed to making gambling a more global phenomenon, while the need for reconstructions after the two world wars provided countries with a justification for gambling monopolies; moreover, the deregulation of financial markets together with digitalization provided even more room for the gambling industry to grow (Sulkunen et al., 2019). Similar observations can be made regarding the Finnish history of the gambling monopoly system controlled by The Finnish Slot Machine Association (RAY), Veikkaus and FinToto, the public image of gambling as a means to contribute to the common good, and the loosening regulations of gambling and the introduction of online gambling since the 1990s (Matilainen, 2017). As argued by Nicoll (2019), the line between recreational and problematic gambling is a matter of acceptance. In Finland, different types of gambling have been exceptionally widely

available (Matilainen, 2017), thereby emphasizing the issues that relate to gambling both on the individual and societal levels.

Psychologically, the reasons why people gamble are very understandable. Along with a powerful money motive, Binde (2013) argues that people gamble for the dream of transforming their lives for the better or to gain social recognition, new challenges, or a change in their mood. However, the many biases of the human mind can make it difficult for people to understand the actual probabilities of the games they play. For example, they may overestimate the low odds of winning (Kahneman & Tversky, 1979) and rely intuitively on the representativeness heuristic ("chance is a self-correcting process") or the availability heuristic (the "ease with which instances or occurrences can be brought to mind") (Tversky & Kahneman, 1974). Therefore, people may overestimate their chances of winning when jackpot wins are over-represented in the news. Furthermore, the representativeness heuristic may contribute to fallacies such as the gambler's fallacy (the probability of something is increased after a consecutive streak of another thing) or hot hand fallacy (the probability of something is increased after a consecutive streak of the same thing), which are not in line with the reality of probabilities (Czerny et al., 2008; Xu & Harvey, 2017). It is obvious that such biases can contribute to serious gambling losses, which highlights the role of awareness and knowledge in preventing personal risk.

Although psychological understanding and personal awareness are important, there are also differences between games of chance that affect how people can control their gambling. For example, there is a contrast between a relatively slow-paced distribution of wealth through lottery and the more recent fast-paced slot machines that often tend to be associated with harmful gambling (Dickerson & O'Connor, 2006). Some features that can contribute to the attractiveness of gambling include the immersion produced by sensory effects, the illusion of skill that the games create, fast event frequencies, loss mechanisms that create the sensation of winning (e.g., "near miss" situations), and occasionally the ways of payment that make players misjudge the amounts of real money being played (Sulkunen et al., 2019). Moreover, the lights and sounds of the gambling environment as well as ergonomic seats, labyrinth-like setting of gambling machines, and opportunities to consume alcohol or smoke tobacco can increase the immersion of gambling (Courtwright, 2019; Schüll, 2012; Sulkunen et al., 2019). While games of chance might have changed only a little since their invention, the landscape has changed substantially, and accumulating knowledge provides a viable basis for establishing regulatory policies.

2.3 Digital gaming

Currently, there are countless digital games that can be played on computers, consoles, and even mobile devices. Although digital games differ from gambling in that money is not in a very central role from the perspective of the gamer, the game industry has developed different monetization strategies since the early 1970s, initially developing coin-operated arcade game machines, moving on to shareware, in-game advertising, subscriptions, and freemium (free-to-play with in-game purchases) models after new technologies allowed gamers to play in their homes or wherever they went (van Roessel & Švelch, 2021). Since the success of the Nintendo Entertainment System, major console manufacturers and game developers have continued to improve the quality of games, which eventually lead to the dominance of the so-called "triple-A" games such as *Call of Duty* or *Final Fantasy* franchises which cost tens of euros upon release and are widely popular among gamers (Keogh, 2023). However, there is an abundance of digital games in the world that do not necessarily cost a lot of money—some being even free to play—and can then be played repeatedly without additional payments.

Digital gaming can be regarded as a broad umbrella category that includes the games that are played using digital equipment, such as computers or mobile devices (Oksanen et al., 2024). Therefore, it can be considered similar to videogames, which Tavinor (2009, p. 26) defines as "an artifact in a visual digital medium, [that] is intended as an object of entertainment and is intended to provide such entertainment through the employment of one or both of the following modes of engagement: rule and objective gameplay or interactive fiction." According to the classic game model given by Juul (2005), a game is "a rule-based formal system with variable and quantifiable outcomes," in which the player attempts to influence the outcome with multiple differently valued possibilities, the player has emotional attachment to the outcome, and an activity in the game has optional and negotiable consequences. These definitions, of course, apply to many kinds of games; however, within the realm of digital gaming, the activity is typically mediated through digital devices with a screen.

Although it is challenging and perhaps even controversial to categorize digital games, it is also a useful way to differentiate one type of game from another. Whereas an action game might require fast reflexes, a strategy game requires critical thinking, and while an adventure game might have an epic, engaging storyline, a casual game might have none and focus on puzzles instead (Wallace, 2015). Games can be played predominantly as single-player journeys, or they can be based on multiplayer elements of competition or collaboration (Joseph & Knuttila, 2023). This competitive

element has been present in digital games from the early 1970s onward when a tournament of *Spacewar!* was held at Stanford University. Moreover, the expansion of the industry, the Internet, and gaming communities have made competitive digital game events—nowadays known as *eSports*—popular in the new millennium (Zhouxiang, 2023). Since games have rules that interact with the half-real fictional worlds of the games (Juul, 2005), it is very understandable that some people might eventually be interested in spectating a competitive eSports event (Hamari & Sjöblom, 2017) or even watch others play games on streaming platforms (Sjöblom & Hamari, 2017).

Because of this variation in different game types and the complex ways of participating in gaming, it is difficult to provide a simple explanation for why digital gaming motivates people. Although the obvious answer would be that games are just a lot of fun, SDT-based research suggests that games offer ways for people to successfully apply their skills, create personalized experiences, and interact socially with others, thereby contributing to player engagement and enjoyment (Ryan & Deci, 2017). In contrast, extrinsic and arbitrary rewards are one of the reasons why educational digital games have traditionally not been very successful products (Egenfeldt-Nielsen et al., 2012). According to Wallace (2015), players typically evaluate the level of complexity, social interaction, challenge, diversion, and immersion in selecting the games they play, which implies that there are different types of players—occasionally with conflicting motives. It can also be argued, like McGonigal (2011), that games offer easily available satisfaction to the kinds of needs people find difficult to satisfy in the real world.

Games appear to have many benefits. They can improve cognitive functioning, persistence on difficult tasks, induce positive mood states, encourage prosocial behavior, and strengthen a patient's adherence to treatment programs (Wallace, 2015). However, there are also potential downsides to digital gaming. Players can get too absorbed in the games, and game violence and frustrations can transfer to aggressiveness in the real world, at least in the short term (Ryan & Deci, 2017; Wallace, 2015). Moreover, some games that are seemingly free utilize business models where they create needs—for example, by limiting the free flow of the game or letting the players customize their favorite characters—that can be fulfilled with small payments that bring revenue to the companies (Marder et al., 2019; Nieborg, 2015; Ramirez, 2016). Although it is understandable that game developers look for ways to profit from their products, Roessel and Švelch (2021) have indicated that they often lack transparency in their communication toward general audiences regarding their monetization decisions.

Some attention has also been given to the convergence of gaming and gambling. What this convergence refers to is that the lines between gaming and gambling have become blurred, as both industries borrow increasingly from each other (Derevensky & Griffiths, 2017; Gainsbury et al., 2015). With regard to digital games, gaming companies can obtain revenue through different kinds of additional purchases for the base game that might occasionally even be free to play. According to Turner and Shi (2024), microtransactions can be used for multiple purposes in these games, including 1) to unlock expansion features, 2) to skip in-game advertising, 3) to add attractive features, 4) to open loot boxes, 5) to gain more virtual credits for social casino games, 6) to speed up in-game progress, and 7) to upgrade the characters. In turn, gambling platforms have evolved to include elements of digital gaming, such as more complex or popular themes, graphics, or interactive characters (Gainsbury et al., 2015; Kolandai-Matchett & Wenden Abbott, 2022). Much of this convergence is occurring because technological advancements have made it possible to create new ways to make the experiences more immersive (Kim & King, 2020). However, the available research does not provide sound evidence that engagement in gambling or digital gaming would predict engagement in the other, although higher-risk gamblers can get attracted to gambling-like mechanisms in digital games, such as loot box spending (Delfabbro & King, 2020; Oksanen et al., 2024).

2.4 Excessiveness

While the gaming and gambling technologies have provided people with innovative ways to have individual or social fun and even made notable cultural contributions, there are a few important psychological, social and financial risks in gaming and gambling that may create problems on many levels. This is particularly true for gambling, which may result in the gambler losing huge sums of money (e.g., Sulkunen et al., 2019), but digital gaming has its risks too. Games require time, occasionally at the expense of other activities, and they also affect people's mood and behavior (Egenfeldt-Nielsen et al., 2012), which may not always integrate well with important areas in life, such as being with family or friends or attending school or work. It is the core issue that I focus on in this dissertation from the perspective of psychosocial risk factors; however, before I move on to present this perspective in further detail, the current public understanding regarding the risks of excessive gaming and gambling need to be addressed.

The term *excessive appetite* was coined by psychologist Jim Orford (2001a, 2001b) to describe the psychology behind addiction in relation to sociocultural norms. Following Orford, I conceptualize that what people regard as problematic in these kinds of appetitive behaviors, that is, activities that can become habitual due to a strong motivational pull towards them, are in fact a secondary set of complications that arise when the behavior is excessive in comparison to what is considered normal, thereby creating conflict between the activity and an individual's sociocultural obligations. Thus, it also explicitly establishes that irrespective of how people attempt to frame the issues related to excessive behavior, it is difficult to stay morally neutral.

Excessive gambling was considered problematic in ancient Rome, where the gambler could lose their fortune and become a debt slave (Rosenthal & Faris, 2019). Perhaps due to all the risks, gambling has been historically viewed as a vice among many other potentially excessive activities (Courtwright, 2019). According to Ferentzy and Turner (2013), many religions have had an ambivalent relationship with it, although they have typically been critical toward such excess that would come in the way of faith—a view that would eventually be shared by more secular movements and lawmakers. In contrast, since digital gaming is a more recent phenomenon, the concerns, or even moral panic, have been mostly regarding violence and obscenity in games as well as gamers becoming socially isolated or inactive (Bowman, 2016).

During the twentieth century, the medical community began to play a stronger role in defining vices and deviant behavior. Walker (1996) noted that the medicalization of "excess" originated from a psychoanalytic idea of over-indulgence as an example of mania, which built ground for the Western society and medical community to subsequently adopt the term "compulsive gambling" to describe excessive forms of gambling. In 1980, The American Psychiatric Association Task Force included it in the DSM-3 as part of their efforts to include every disorder that was known and could be sufficiently defined, categorizing it to "Impulse Control Disorders Not Elsewhere Classified" and naming it "pathological gambling" (Rosenthal, 2019). According to Reilly and Smith (2013), the term changed again for the DSM-5 to "gambling disorder" with the intention to reduce the experience of stigma, and the label was moved from "Impulse Control Disorders" to a reframed category called "Substance-Related and Addictive Disorders." Furthermore, the threshold for a diagnosis was lowered from five criteria to four, and committing criminal acts was excluded from the criteria. The current diagnostic criteria—four of which need to be observed within the preceding 12 months—are listed below (APA, 2013):

1. Needs to gamble with increasing amounts of money in order to achieve the desired excitement.

2. Is restless or irritable when attempting to cut down or stop gambling.
3. Has made repeated unsuccessful efforts to control, cut back, or stop gambling.
4. Is often preoccupied with gambling.
5. Often gambles when feeling distressed.
6. After losing money to gambling, often returns another day to get even.
7. Lies to conceal the extent of involvement with gambling.
8. Has jeopardized or lost a significant relationship, job, or educational or career opportunity because of gambling.
9. Relies on others to provide money to relieve desperate financial situations caused by gambling.

In contrast, excessive gaming has been discussed for a shorter period of time, and according to Griffiths (2016), the early studies from 1980s and 1990s were mostly small-scale ones and had many gaps in their designs. He indicates that in the twenty-first century, the number of studies have increased and provided more rigorous analysis on the problems that had arisen related to technological advancements and new patterns of play. This gave the workgroup that was preparing the DSM-5 sufficient reason to include "internet gaming disorder" in Section 3 of the manual as a condition that needs further research (Petry & O'Brien, 2013). The current diagnostic criteria—four of which need to be observed within the preceding 12 months—are listed below (APA, 2013):

1. Preoccupation with Internet games (gambling excluded).
2. Withdrawal symptoms when Internet gaming is taken away.
3. Tolerance or the need to spend increasing amounts of time engaged in Internet games.
4. Unsuccessful attempts to control the participation in Internet games.
5. Loss of interests in previous hobbies and entertainment as a result of, and with the exception of, Internet games.
6. Continued excessive use of Internet games despite knowledge of psychosocial problems.
7. Deception of family members, therapists, or others regarding the amount of time spent on Internet gaming.
8. Use of Internet games to escape or relieve a negative mood.
9. Jeopardization or loss of a significant relationship, job, or educational, or career opportunity because of participation in Internet games.

The inclusion of gambling disorder and internet gaming disorder to the DSM-5 as addictive disorders and the subsequent inclusion of these same disorders to the

eleventh edition of the *International Classification of Diseases* (ICD-11) (World Health Organization [WHO], 2019) have brought official recognition to the idea of behavioral addiction that has been conceptualized for decades (e.g., Griffiths, 1996b; Marks, 1990; Orford, 2001b; Peele & Brodsky, 1975). Although the conflicts and other sources of harm regarding gambling or gaming activities are the experienced reality of many gamblers or gamers, and their social networks, there is quite a lot of controversy and many different theoretical views surrounding the concepts and causalities. But whatever thoughts one might have on these matters, they always seem to focus on how the activities have become excessive in comparison to what is considered normal and the problems recognized by the gamblers or gamers themselves or other people in their lives. Therefore, I talk about gambling or gaming problems when I refer to the more observable behavior and use excessiveness as a more general concept throughout this dissertation.

3 ADDICTION AND WELL-BEING

Living a good and fulfilling life is something that all people attempt to achieve in one way or another. While there can be multiple ways to achieve a satisfactory state of being, some ways can be regarded as more sustainable than others. Continuing the topic of excess, I present the perspective of the self-determination theory (SDT) in this chapter (Ryan & Deci, 2017) in the context of well-being and discuss several factors that can undermine it, such as loneliness, stress, anxiety, and depression.

3.1 Addiction

Before moving on to other psychological and social factors that affect well-being, it is important to further discuss the concept of addiction. Although I focus on gaming and gambling problems, one of my main underlying theoretical interests lies in contributing to the understanding of addiction, so explaining the concept and the controversies surrounding it is crucial in contextualizing the purpose of this dissertation.

First, addiction is a socially constructed concept (West & Brown, 2013), and people tend to have multiple differing definitions on what it exactly is (Alexander, 2008). Obviously, this creates much of the controversy and confusion surrounding it. Addiction has been defined in different ways, such as "a chronic, relapsing disease of the brain" (Leshner, 1997), "a disorder of choice" (Heyman, 2009), or "an attachment to an appetitive activity" that is excessive (Orford, 2001a). Alexander (2008, pp. 27–37) presented four different definitions for the concept that have been derived from the traditional use of the word *addiction* as a devotion or dedication to habits, pursuits or superiors: $addiction_1$ includes harmful "overwhelming involvement" with psychoactive substances, $addiction_2$ adds harmful but "non-overwhelming involvement" with these substances, $addiction_3$ encompasses any harmful "overwhelming involvement with any pursuit", and $addiction_4$ includes all non-harmful "overwhelming involvement with any pursuit."

A second important point that is linked to the previous one is that different definitions of addiction involve moral implications. A typical interpretation from previous centuries that some people still have is that the individual who appears to have

lost self-control has also failed morally (Sripada & Railton, 2019). In contrast, the medical interpretation of addiction as a disease aims to eliminate this moralizing attitude but brings yet another moral burden to the individual by implying that they are both powerless against addiction and responsible for their recovery (Ruuska & Sulkunen, 2014; Sripada & Railton, 2019). Moreover, the stigma of addiction is very persistent in language, whether it is by calling people "addicts" or "junkies" or conflating physical withdrawal symptoms with psychological urge to return to a particular activity by mixing the terms "dependence" and "addiction" (Wakeman, 2019). These remarks already highlight the challenges around addiction as a concept, but a look into its history offers further reason to be critical of its use.

According to Rosenthal and Faris (2019), the word *addiction* has its roots in the Latin compound word *addicere*, which refers to speaking to or adjudging someone, or to enslave someone. The authors note how this original usage of the word in the Roman Republic also had ties to gambling, both in the positive implication of gods "speaking" through lots, auspices, or dice and in the judicial implication of sentencing an indebted gambler to become the creditor's property. In contrast, the current understanding of addiction began to develop in preindustrial times in opposition to the excessive use of distilled alcohol, as religious authorities warned people from getting addicted to vices (Warner, 1994). From this growing concern and observations of excessive drunkenness, at the end of the eighteenth century, physician Benjamin Rush formulated a model of individuals losing control over their drinking and declared total abstinence as the only cure, thus marking the beginning of the medical conceptualization of addiction as a disease (Levine, 1978). However, it should be noted that at the time *disease* was not yet considered to refer to a separate "entity" but instead to an imbalance and discomfort caused by the disregard of moderation and the harmful consequences that followed (Porter, 1985).

Fast forward to recent decades, addiction remains an ambivalent concept—although people generally consider it to refer to preoccupation and loss of control—that now includes overwhelming involvement with psychoactive substances or attractive activities. While researchers may discuss "appetitive needs," health professionals and policies usually follow the categorizations in the DSM-5 or ICD-11, which approach substance- or behavior-related excessive activities as disorders (Sussman & Wright, 2022). Nevertheless, the scientific evidence implies that there is no collection of "addictions," but instead a common bio-psycho-social addiction process with varied opportunistic expressions (Shaffer & Shaffer, 2019). In other words, there are several indicators that can exist in various combinations in relation to different kinds of excessive appetitive behaviors.

Finding a conclusive list of the indicators of addiction can also be somewhat arduous. For example, Goodman (2008) lists "recurrent failure to control the behavior" and "continuation of the behavior despite significant harmful consequences" as the two key features of addiction, whereas Griffiths (2005) argues that salience, mood modification, tolerance, withdrawal, conflict and relapse are common to all excessive appetitive behaviors. Based on the literature search on the definition of addiction, Sussman and Sussman (2011) conclude that there are five elements commonly associated with the process—engagement in the behavior, preoccupation, temporary satiation, loss of control, and negative consequences. However, the philosophical questions of what is necessary or sufficient for something to be considered addiction remain controversial (Foddy 2010; Sussman & Sussman, 2011).

With its potential for misunderstanding, addiction is not an easy concept to understand. Therefore, as stated in Chapter 2.4, I prefer to use the term *excessive appetite* given by Orford (2001a, 2001b), which emphasizes the importance of social, psychological, and contextual factors in behavior that is considered addictive. This model includes multiple cognitive factors—such as incentive learning, memory, and emotional regulation—that are found within social and cultural contexts, and since the focus is more on individual vulnerability instead of the dangers associated with the activity, the model can apply to various appetitive behaviors. The psychological processes that make this kind of excessive behavior possible can be summarized in the following manner (Orford, 2011):

- *Operant learning,* where the activity becomes a habit through repetition of rewarding elements associated with it.
- *Pavlovian learning*, where previously neutral stimuli become increasingly associated with the activity, inciting toward a continuation of it.
- *Cognitions*—particularly biased attention, memory, or thinking—that further contribute to overvaluing the activity at the expense of other activities.
- *Conflicting motives* that create tension and dissonance in the person's life and intensify the attachment to the activity, thereby creating a vicious circle.

Psychologically, then, appetitive behaviors have a risk of becoming excessive through habit learning that undermines engagement to other activities, causing conflict in one's life. But there are differences in vulnerability to this kind of excess. For example, regarding gambling, the commonly known pathways model (Blaszczynski & Nower, 2002; Nower et al., 2022) lists ecological factors (availability, accessibility, and acceptability) as the common preconditions for people to be at risk of developing gambling problems, whereas emotional and biological vulnerability factors may create additional vulnerability to problems. Following the emotional vulnerability

pathway, this dissertation is inspired by the *dislocation theory* of Alexander (2008), who views all kinds of excessive involvements as more of a consequence than a cause of social problems—an adaptative mechanism to "sustained dislocation" in an unpredictable society. This is very much in line with the basic psychological needs mini-theory of SDT (Ryan & Deci, 2017), which is why I present, in detail, both theoretical ideas together in the next subchapter.

3.2 Basic psychological needs

Happiness, well-being, and flourishing are the kind of mental states that many people attempt to achieve in their lives. Nevertheless, quite often, people are burdened with adversities, worries, sorrows, and other problems that make these themes difficult to achieve. While a few people may become passive and even apathetic, at the other end of the spectrum a few people may anxiously attempt to find ways to improve the situation. Theories such as the SDT (Ryan & Deci, 2017) provide a framework for understanding this complexity of general well-being.

Edward Deci and Richard Ryan developed the SDT originally in the 1970s as a response to the behaviorist focus on human motivation, thereby moving the focus from external reinforcers and punishments to intrinsic processes of the self (Ryan & Deci, 2019). They attributed the origin of the idea of intrinsic motivation to Harry Harlow, who is known for his studies on primates. During recent decades, Deci and Ryan have expanded the SDT from one mini-theory to the current six mini-theories: the cognitive evaluation, organismic integration, causality orientations, basic psychological needs, goal contents, and relationship motivation theories (Ryan & Deci, 2017, 2019). This dissertation approaches well-being from the perspective of the basic psychological needs theory.

The existence of needs is well recognized, and many psychological theories have been formed to conceptualize the structure of human needs. As one example, Reeve (2009, pp. 77–78) defines a need as "any condition within the person that is essential and necessary for life, growth, and well-being," continuing to categorize the needs into physiological needs (thirst, hunger, and sex), psychological needs (autonomy, competence, and relatedness), and social needs (achievement, affiliation, intimacy, and power). To be included as a basic need, several key criteria need to be fulfilled (Vansteenkiste et al., 2020, 2023):

- The satisfaction of the need is *essential* for health, integrity, and wellness; the frustration of not meeting this need creates obstacles in these areas.

- The basic need is concerned with the *psychological* functioning of individuals.
- The effects of need satisfaction should be *pervasive* across a broad range of motivational, cognitive, and behavioral outcomes.
- The need should be *universal* and apply to wellness regardless of the cultural differences that may be present.
- The need should form an *inherent* part of functioning due to its fundamentally adaptive properties.
- The need should be *distinct* from other identified needs.
- The *content-specific* nature of the need manifests in specific behaviors, experiences, and language.
- The need is *directional* in that it shapes people's thinking, acting, and feeling.
- The *explanatory* role of the need reveals why certain contexts promote wellness and others thwart it.

The self-determination theory currently includes the previously mentioned three basic psychological needs that are considered to match the key criteria. *Autonomy* refers to the experience of self-endorsement and internal willingness to act, *competence* refers not only to feelings of effectiveness in interacting with the environment but also to having the opportunities for skill development, and *relatedness* to having a caring and reciprocal connection to others (Ryan & Deci, 2017). Deci and Ryan (2000) state that these needs underlie the socially and culturally varying behaviors and values of individuals and that they all must be satisfied to provide conditions for optimal functioning and integrity. Social environments can either support, deprive, or thwart the needs, thereby contributing to high or low satisfaction, or even frustration of the needs (Vansteenkiste & Ryan, 2013). From this perspective, then, the relationship people have with their social environment is important for their well-being, which tends to receive less attention in the more individual-centered views on addiction or motivation in general.

Similarly, Alexander (2008) theorized in his dislocation theory that "overwhelming involvements" are a potential consequence of the lack of psychosocial integrity. He was one of Harlow's students and participated in the research on maternal deprivation; however, eventually contemplating Harlow's constant intoxication (Slater, 2005), and although he did not continue to study intrinsic motivation like Deci and Ryan, he mentioned similar psychological needs in his book entitled *The Globalization of Addiction: A Study in Poverty of the Spirit* as vital for psychosocial integration, which he defined as "a profound interdependence between individual and society," as a sense of identity, and as a set of social relationships (Alexander, 2008, p. 58). Research-wise, Alexander is known for his "rat park" studies (Alexander et al., 1978,

1981; Hadaway et al., 1979), where he and his colleagues investigated the effects of more species-typical living conditions on the use of morphine in rats and found that isolated rats used morphine more than social rats.

Although Alexander's ideas have gained popularity, the small sample size of his rat park studies, complexity of the study designs, and mixed results in replication studies have reduced their credibility (Gage & Sumnall, 2019). Furthermore, his focus on Western individualism downplays the impact that all kinds of cultural influences—from norms to practices and responses—can have on appetitive behaviors (e.g., Room, 2015) as well as the habitual nature of these behaviors that likely requires attention regardless of the level of psychosocial integrity one has (Oxman, 2019). Nevertheless, Alexander's contribution to understanding excessive appetites is worth exploring to expand from the limitations of individual-focused research.

Then, from the perspective of both the SDT and the dislocation theory, the integrity provided by the satisfaction of basic psychological needs is rather important. But both proximal and pervasive contexts do not often support this kind of satisfaction and may even thwart an individual's needs, thereby leading to frustration, compensatory maladaptive coping styles, and ill-being (Deci & Ryan, 2000; Ryan & Deci, 2017; Vansteenkiste & Ryan, 2013). Although agreeing with this, Alexander (2008) argues that even self-destructive behaviors are not necessarily maladaptive from an evolutionary perspective because they may help beings survive and cope through difficult circumstances where less harmful alternatives have failed. Furthermore, the involvement in an activity has been theorized to be harmonious or obsessive depending on the extent to which an individual has an integrated sense of self (Vallerand, 2008). Indeed, studies suggest that while need satisfaction in an activity predicts both harmonious and obsessive involvement, lower levels of need satisfaction beyond the activity predict obsessiveness and negative outcomes, whether the activity is music, sports, work (Lalande et al., 2017), gambling, or gaming (Holding et al., 2021; Mills et al., 2018, 2021; Tóth-Király et al., 2019). Therefore, despite the risks that may be involved in psychoactive substance use, gambling, and gaming, excessive or overwhelming involvement in them and the related problems that arise can be expected to emerge from the social and psychological conditions of an individual. The next subchapters focus on a few of these conditions.

3.3 Loneliness

As established above, relatedness is an important part of being human, and as highly social animals, people typically crave connection to others. In their highly cited article, Baumeister and Leary (1995) revealed this core assumption of social psychology by reviewing a vast array of evidence in favor of their hypothesis that the need to form social attachments and resist the loss of these attachments is one of the main motivators for people in life. However, support for this assumption can also be drawn from other fields, such as evolution and neuroscience. For example, according to Dunbar (2016), the main explanation for the larger brains in primates is linked to the size and complexity of their social groups. Similarly, in an extensive study using neuroimaging and behavioral data, a group of researchers found that regular participation in social group activities was associated with a corresponding variation in their brains (Kieckhaefer et al., 2023). With such a high need to belong, the opposite scenarios are likely to hurt.

Loneliness has been given various definitions, but according to Perlman and Peplau (1998), the core assumption underlying most theoretical approaches is that loneliness is a result of social deficiencies and that it is a subjective, unpleasant phenomenon. They also noted that loneliness can be conceptually divided between a more general *trait loneliness* and a more situational *state loneliness*, or *emotional loneliness* that reflects an emotional distance in close relationships and *social loneliness* that implies the absence of adequate social connections. Cacioppo and Patrick (2008, p.7) even regard loneliness as a social equivalent for physical pain that is an evolutionary survival mechanism to warn humans of deficient protective bonds, and while we all feel it sometimes, it becomes an issue only when it creates "a persistent, self-reinforcing loop of negative thoughts, sensations, and behaviors." Studies also reveal that it tends to affect an individual's health and well-being, although this can vary depending on gender and sociocultural values (Park et al., 2020), and any kind of social isolation has been found to be a risk factor for early mortality (Holt-Lunstad et al., 2015). Despite this, many Western societies have seen upsurges of solitary living and loneliness, perhaps due to individualism, valuation of privacy, and major changes in family and work stability (Snell, 2016). Such shifts are what Alexander (2008) considers threats to the psychosocial integrity of all individuals, when everyone is expected to pursue their own interests at the expense of safety nets and communities.

If excessive behaviors are an adaptive mechanism, as claimed by Alexander (2008), they should be more of a response to than a cause for the social and psychological conditions of an individual. According to Cacioppo and Patrick (2008),

people tend to become more aggressive, self-destructive, and passive as loneliness can cause declines in their executive control and self-regulation and, thus, diminish the rewarding feelings they could obtain from social interactions. Systematic reviews appear to support these claims, at least regarding substance use, as people who experience problems with their substance use tend to be lonelier (Dyal & Valente, 2015; Ingram, Kelly, Deane, Baker, Goh, et al., 2020); moreover, unhelpful cognitions are an important factor underlying this reciprocal relationship (Ingram, Kelly, Deane, Baker, et al., 2020). Problematic gaming has also been linked with loneliness, possibly indicating a reciprocal relationship (van Rooij et al., 2014; Wang et al., 2019). In a study by Stockdale and Coyne (2018), young American gamers who were playing games excessively reported feeling more isolated. Furthermore, Mun and Lee (2022) found that parental loneliness could be a risk factor for adolescents' excessive gaming. However, the results appear to be more mixed regarding gambling problems. For example, Savolainen et al. (2020) found that loneliness was associated with gambling problems only among South Korean adolescents and young adults—in comparison to American and Finnish ones–whereas Edgren et al. (2016) found loneliness to be a risk factor for at-risk gambling in Finland.

3.4 Stress

Another major psychosocial factor to be considered in the context of this dissertation is stress. Biologically, it can be conceptualized as a response to situations in which the equilibrium of a living organism is threatened by internal or external adverse effects (Chrousos, 2009). As described by Selye (1976), the stress caused by these *stressors* cannot be avoided as this is necessary to create adaptative processes in an organism; hence, there is a distinction between good stress (*eustress*) and bad stress (*distress*). However, the terminology is vague, and Bienertova-Vasku et al. (2020) have argued that it is more accurate and less confusing to simply discuss stress instead of dividing it by assumptions of desirability. Alternatively, one way to understand this distinction could be through the related concept of coping, which Lazarus and Folkman (1984, p. 141) define as "constantly changing cognitive and behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person."

In contemporary societies, stress has become a modern phenomenon that people are aware of, maybe even to the extent that being stressed has become a part of their lifestyle (Hutmacher, 2021). However, stress can have serious consequences for

health and well-being. As Russell and Lightman (2019) have indicated, the stress response is an important evolutionary adaptive process that is in danger of becoming maladaptive when the environment provides constant exposure to stressors; this increases the risk for the development of a wide variety of mental and physical diseases. It has also been known for a while that traumatic stress particularly increases the vulnerability for problematic substance use (Goeders, 2007; Ruisoto & Contador, 2019) and gambling (Buchanan et al., 2020; Russell et al., 2022). Furthermore, stress has been found to intensify the association between gambling expenditure and gambling problems as well as between in-game spending and gaming problems (Savolainen et al., 2024). Moreover, while the experience of stress and the responses to it are primarily matters that are part of the internal world of an individual, psychosocial circumstances such as disempowerment (Marmot, 2015, 2017; Marmot & Brunner, 2005) and marginalization (Heilig et al., 2016) are suggested to be important contributors to why some people develop more maladaptive response patterns than others.

3.5 Mental health

A broader phenomenon that often becomes a topic of discussion is the co-occurrence of excessive appetites and mental health issues. Some of the most noteworthy examples of evidence would be the national epidemiologic surveys conducted in the United States (Lai et al., 2015; Regier et al., 1990; Stinson et al., 2005) that reveal that an extensive percentage of those who need treatment for their problematic use of substances tend to also have at least one comorbid psychiatric disorder (e.g., depression or anxiety disorder). Based on this, Heyman (2009, 82–85) argues that psychiatric impairments are likely to contribute to the persistence of appetitive behaviors "by undermining the ability to engage in and enjoy competing activities." Similarly, Alex Blaszczynski and Lia Nower (2002) recognize in their pathways model that a subgroup of those who engage problematically in gambling have an emotional vulnerability that predisposes them to gamble primarily to relieve aversive affective states. According to Orford (2011, pp. 75–77), gambling is one of the most "powerful mood modifiers" that can offer rewarding experiences in versatile ways, ranging from excitement of the game to distracting oneself from one's worries, to spending time with people. The same also applies to digital gaming (King et al., 2013). All of this suggests that mental health issues are considerable risk factors for developing excessive behavior.

Mental health, as defined by the WHO (2005, 2022), is a complex continuum on which the severity of psychiatric symptoms and mental well-being vary depending on multiple interacting social, psychological, and biological factors. Other definitions also exist. For example, a group of psychiatrists created a definition on behalf of the European Psychiatric Association according to which mental health is conceptualized as "a dynamic state of internal equilibrium which enables individuals to use their abilities in harmony with universal values of society" (Galderisi et al., 2015). Based on these definitions, mental health is crucial for the functioning of an individual, it has a certain social importance, and it is not a simple matter of whether one has a mental disorder. Moreover, it is not limited to individual vulnerabilities. The *World Mental Health Report* (WHO, 2022) lists multiple risk factors related to the family (e.g., abuse, loss of a loved one), community (e.g., bullying, unemployment) and social structure (e.g., crises, poor access to services, inequalities) that undermine mental health; moreover, social disadvantage has a close link to mental ill-health.

What I want to point out with this coverage of different psychosocial factors is that they are bigger issues than mere consequences of gambling or digital gaming—or any potentially excessive behavior—although excessive or risky appetites might also play a role in the development of how lonely, stressed, depressed, or anxious people feel. For example, while studies have revealed that there is suicidal ideation among those who gamble or play games problematically, such studies are mainly cross-sectional (Erevik et al., 2022; Kristensen et al., 2024), and, as Alexander (2008) suggests, excessive involvement in something might also keep one from killing themselves. Although it is beyond the scope of this dissertation to investigate this possibility, the proposition is nevertheless a noteworthy one.

There is indeed evidence that games can be used for coping with life stressors. Review studies have concluded that avoidant coping styles are typically linked to problematic gambling (Neophytou et al., 2023) and problematic online gaming (Melodia et al., 2022). Furthermore, one review study showed that during the COVID-19 pandemic, those gamers who had avoidant coping styles experienced higher psychological distress in the long run whereas gaming had beneficial effects on other gamers (Pallavicini et al., 2022). Gambling and gaming problems do not seem to be caused only by gambling or gaming involvement, which is why my intention in this dissertation is to investigate the role of different psychosocial factors in these problems at the population level.

4 STUDY AIMS

Summarizing the theoretical background for this doctoral dissertation, I approach the topic of addiction and the problems commonly associated with gambling or digital gaming behaviors from the framework of addiction as an adaptation. To put it more precisely, the main objective of my dissertation is to produce knowledge on these problems as a result or a consequence of social and psychological issues instead of vice versa. It is well known that excessive time spent on digital games can come at the expense of engaging in other activities (Egenfeldt-Nielsen et al., 2012) or that reckless spending of money in gambling can create substantial financial troubles (Sulkunen et al., 2019). Thus, my intention with this dissertation is to consider the possible determinants that could contribute to gambling or gaming problems. These issues cover, for example, loneliness, stress, and difficulties with mood or anxiety, but even more generally the basic psychological needs that have been stated as being universal for all people (Deci & Ryan, 2000; Ryan & Deci, 2017). The research articles in this dissertation share this common perspective, approaching the topic in different methodological ways and their own sets of research questions. Each individual article contributes to the wider aims of this dissertation, which are 1) to investigate the association of social and psychological well-being with gaming and gambling problems, and 2) to analyze the similarities and differences in how basic psychological needs, stress, and loneliness predict gaming and gambling problems.

4.1 Research questions and hypotheses

In Article 1, we investigated the associations among loneliness, sense of mastery, and psychological distress to gambling problems among adolescents and young adults. Our aim was to examine how loneliness and sense of mastery are associated with gambling problems both directly and indirectly through psychological distress. Consequently, our main hypothesis was that psychological distress would mediate the relationship of loneliness and sense of mastery with gambling problems. We also expected that these relationships would remain significant in a similar manner across the youth in all the four countries that were part of the study.

Article 2 continued from the previous one with a similar idea, but the study included only Finnish people instead of people from multiple countries, and older age groups were also included in the study. In this study, we analyzed how satisfaction and frustration of not having basic psychological needs met are associated with gaming and gambling problems in the Finnish population. We also controlled for mental health issues and took age and gender into account as background variables. Based on the available literature, we formulated three hypotheses: H1) higher need frustration is associated with higher gaming and gambling problems; H2) higher need satisfaction is associated with the absence of gaming and gambling problems; and H3) mental health issues interact with need satisfaction and frustration.

Article 3 was the first article to have a longitudinal design, and it also had a slightly different perspective on the overall theme of psychosocial factors that would affect gambling behavior. While the other studies focused mainly on well-being, we investigated the contribution of materialist values to gambling problems when mental health issues were also included in the models. In addition to the typical age and gender controls, we controlled income level, as we felt it was important to take its effect into account, particularly in relation to materialist values. Our aim for the study was to analyze the effects of materialist values and mental health issues on gambling problems, hypothesizing that problems would increase when materialism and mental health issues increase.

In Article 4, we continued with a similar longitudinal design as in the previous article, this time focusing on the impact of stress and loneliness on gaming and gambling problems. We set out to examine both the individual impacts of these conditions and the interaction between them, since previous studies have indicated that they have a reciprocal connection to each other (Brown et al., 2018; Cacioppo et al., 2015; Campagne, 2019; Segrin, 2019). In this article, we proposed the following hypotheses: H1) Perceived loneliness increases gaming and gambling problems; H2) perceived stress increases gaming and gambling problems; and H3) gaming and gambling problems are further exacerbated by the combination of stress and loneliness.

Table 1. Research questions for each of the articles

	Article name	Research questions
1.	The Mediating Role of Psychological Distress in Excessive Gambling among Young People: A Four-Country Study	1. How do loneliness, sense of mastery, and psychological distress associate with gambling problems? 2. How does psychological distress mediate the associations among loneliness, sense of mastery, and gambling problems?
2.	Basic psychological needs in gambling and gaming problems	1. How do basic psychological needs relate to gaming and gambling problems? 2. Do mental health issues interact with need satisfaction or frustration and how?
3.	A longitudinal study on the effects of materialism and mental health on gambling problems in Finland	1. How do materialistic values and mental health issues contribute to gambling problems?
4.	The impacts of stress and loneliness on gambling and gaming problems: A nationwide longitudinal study	1. What is the impact of stress and loneliness on gaming and gambling problems? 2. Does stress interact with loneliness and how?

5 DATA AND METHODS

Having identified the aims of the research and the research questions set out in each individual article, the next step is to examine the data and the methodological choices employed. In this chapter, I provide an overview of the research articles by presenting the surveys that formed the basis for these articles and the statistical methods I used to look for answers to the research questions. This also includes going through all the variables that were created and used in each study.

5.1 Data

While the articles had the same underlying aims for the research, each of them had a few differences in terms of the data that was used. The greatest difference was between the first article that used cross-sectional *YouGamble* survey data sets of the *Problem Gambling and Social Media* research project, and the rest of the articles that used the survey data of the *Gambling in the Digital Age* research project. Both research projects were led by Professor Atte Oksanen and funded by the Finnish Foundation for Alcohol Studies, *Problem Gambling and Social Media* from 2017 to 2019 and *Gambling in the Digital Age* from 2021 to 2024.

The *YouGamble* data we used in Article 1 consists of four cross-sectional survey data sets that were collected from 15–25-year-old adolescents and young adults by a survey research company called Dynata. The data collection process was thoroughly explained in doctoral dissertations by Savolainen (2020) and Sirola (2020), on which I base the following description of the process since I was not part of the research team during the time. Each data set was collected in a different country. The first survey was conducted in Finland during Spring 2017, which yielded a data set (Oksanen, Sirola, & Kaakinen, 2020) of 1,200 participants with a mean age of 21.29 (SD = 2.85). Half of the participants identified as men and the other half as women. The second data set (Oksanen et al., 2022) was collected in the United States in January 2018. Before this, the research group translated the survey in English and had it translated back to Finnish to ensure that the translation was consistent and

accurate. This data set consisted of 1,212 American participants, had a mean age of 20.05 (*SD* = 3.19), and 50.17% identified as women. The research group proceeded to collect a third data set (Oksanen, Kaakinen, Sirola, Savolainen, & Paek, 2024) from South Korea soon after, using a similar procedure, thereby completing the data collection in March 2018. This data sample had 1,192 South Korean participants, with the mean age being 20.60 years (*SD* = 3.24), and 50.42% of the participants identifying as women. Finally, the fourth data set (Oksanen, Kaakinen, Sirola, Savolainen, & Zych, 2024) was collected in January 2019 from Spain after similar preparations. This sample consisted of 1,212 Spanish participants, the mean age was 20.07 (*SD* = 3.16), and 48.76% identified as women.

All four surveys consisted of self-reported measures and an experimental vignette section where the participants were divided into different groups to investigate the effect of gambling messages and perceived social norms in social media conditions (Sirola, 2020; Savolainen; 2020). In the self-reported measures, participants were asked about their sociodemographic situation, social media and internet use, gambling behavior, alcohol and drug use, psychological and social well-being, sense of mastery, impulsivity and preference between smaller immediate rewards or bigger delayed rewards. The time required for the completion of the survey was estimated to be approximately 15 minutes.

The *Gambling in the Digital Age* research project was a continuation of the previous project, and the planning phase began during summer 2020. This time, our research group collaborated with a data provider company called Norstat to contact the participants through its panels via email and their own mobile application. The first data collection point (T1) was in April 2021, with a response rate of 34.6%. After checking for biased responses—such as odd, extreme, or irrational patterns—and a review of open-ended feedback, we excluded three participants from the survey. Consequently, the final data consisted of 1,530 Finnish participants. The data was meant to represent the demographics of the general Finnish population in the age range of 18–75 years, and the mean age in the data was 46.67 years (*SD* = 16.42). Furthermore, gender now included three categories due to the inclusion of a category for genders other than men and women. In the first data, 50.3% of the participants identified as men, 49.4% as women, and 0.3% as other, undefined gender. We used this cross-sectional data in Article 2.

After April 2021, we continued the research project by having Norstat contact the same participants every six months. The second timepoint (T2) for the survey was collected in October–November 2021, and 79% of the participants who participated in the first survey also participated in the second survey. After excluding two

participants for biased responses, the data included 1,198 participants (M_{age} = 48.87; *SD* = 16.11). From this timepoint on, only those identifying as men or women participated, and 50.75% identified as men in T2. Accordingly, T3 data was collected in April–May 2022, T4 in October–November 2022, T5 in April–May 2023, and T6 in October–November 2023. The response rate for T3 was 72% (in comparison to T1), and after excluding three participants for biased responses, 1,095 participants remained (M_{age} = 49.72; *SD* = 16.16) in this timepoint, with 50.05% identifying as men. For T4, the response rate was 65.62%, and after excluding four participants, 1,004 participants remained (M_{age} = 50.73; *SD* = 15.90), with 50.40% identifying as men. T5 data had a response rate of 61%, and after excluding three participants, 934 participants (M_{age} = 51:91; *SD* = 15.42) remained, with 50.54% identifying as men. Finally, the response rate for T6 was 58%, and 889 participants remained after three participants were excluded. In this timepoint, 50.28% of the participants identified as men, which implies that the gender distribution was balanced in every timepoint. We performed the analyses in Articles 3 and 4 using this longitudinal data. In Article 3, we used only T2, T4, and T6 data, whereas Article 4 included all six timepoints.

The surveys for the *Gambling in the Digital Age* project were mostly similar to each other, but some of the measures were left out in some timepoints to make room for other kinds of measures. Furthermore, some measures were used only once or twice since we evaluated them to be relatively constant through time (e.g., personality traits). Participants were asked about their sociodemographic situation, social media and internet use, gambling and gaming behavior, alcohol use, basic psychological need satisfaction and frustration, materialist values, and psychological and social well-being. The time required for the completion of the survey was again estimated to be approximately 15 minutes.

5.2 Main variables

5.2.1 The dependent variables

All the analyses were based on investigations of the kinds of impact different well-being-related variables have on gaming and gambling problems. Therefore, gambling problems were set as the dependent variable in all the articles, and gaming problems were set as the dependent variable in two of the articles. While the *YouGamble* surveys

were translated to Finnish, English, Korean, and Spanish, the *Gambling in the Digital Age* surveys included questions only in Finnish.

Since Article 1 used *YouGamble* data, a few variables were measured differently than in other articles. One of the key differences here was the use of the revised South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1993) instead of the Problem Gambling Severity Index (PGSI; Ferris & Wynne, 2001) to assess gambling problems (although we had chosen to use "excessive gambling" in the article when referring to the problems). The SOGS was first developed by Lesieur and Blume (1987) at South Oaks Hospital as a questionnaire to screen pathological gambling—based on the DSM-III and DSM-III-R criteria—in clinical settings. Subsequently, Lesieur and Blume (1993) created a revised version of the SOGS to include more significant others in the third question of the SOGS and to change a few wordings. For the *YouGamble* survey, the research group used a slightly modified version to better accommodate the Finnish cultural setting (Savolainen, 2020). An example of the SOGS item is "When you gamble, how often do you go back another day to win back money you have lost?" that can be answered from 0 (*never*) to 3 (*every time I lose*) but only options 2 and 3 are scored. However, most of the items are scored from 0 (*no*) to 1 (*yes*) by default and can be used as they are. While the questionnaire had 16 questions, questions 1, 2, 3, and 12 as well as three of the money acquisition options included were not counted, thereby resulting in a scale that ranges from 0 to 20.

Although the SOGS has been used a lot in recent decades, its popularity has declined in research settings due to its tendency to overestimate false positives in general population samples, whereas instruments such as the PGSI have retained their popularity in assessing gambling problems in a survey setting (Grigsby, 2020). Therefore, we replaced the SOGS with the PGSI in *Gambling in the Digital Age* surveys. The PGSI is a collection of nine items from the 31-item Canadian Problem Gambling Index given by Ferris and Wynne (2001) that was created to measure gambling problems in general population surveys. Its items—for example, "Have you borrowed money or sold anything to get money to gamble?"—were scored on a scale of 0 (*never*), 1 (*sometimes*), 2 (*most of the time*), and 3 (*almost always*), thereby resulting in a scale in the range of 0–27 when combined, and the participants were asked to evaluate their experiences within the last six months. Since the thresholds for the cut-off scores in categorizing both the SOGS and the PGSI can be criticized for their arbitrariness (Currie et al., 2010; Goodie et al., 2013; Stinchfield, 2002; Stone et al., 2015), we used them as continuous count variables in the analyses.

The other dependent variable for the analyses was gaming problems, measured using the 10-item Internet Gaming Disorder Test (IGDT-10; Király et al., 2017) that

was developed to assess the Internet Gaming Disorder based on the nine DSM-5 criteria. In the survey, the participants were asked to evaluate how the questions matched their experiences within the last six months, with 0 indicating *never*, 1 indicating *sometimes*, and 2 indicating *often*. For the creation of the variable, we used two different scoring techniques: in Article 2, we simply combined the variables, which resulted in a scale of 0–20, whereas in Article 4, we decided to follow the scoring proposed by Király et al. (2017), recoding variables into a dichotomous format in which one point is given only for the answer *often* and the participant could only get one point in total from items 9 and 10, thereby resulting in a scoring that ranged from 0 to 9. Like the SOGS and the PGSI, we used the IGDT-10 as a continuous count variable in the analyses to avoid using the arbitrariness of the categories.

5.2.2 The independent variables

Our analyses included multiple independent variables that were mostly utilized to measure a certain aspect of psychosocial well-being. The impact of mental health issues was analyzed in all the articles, whereas the impact of loneliness was analyzed in two articles, the role of mastery in one article, the impact of stress in one article, the impact of materialism in one article, and the role of basic psychological needs in one article. Age and gender were used as control variables in all articles, and income level was controlled for in one article.

General mental health was measured using two different variables. In Article 1, we used the 12-item General Health Questionnaire (GHQ-12; Goldberg et al., 1997), and in two other articles we used the five-item Mental Health Inventory (MHI-5; Berwick et al., 1991). The GHQ-12 is a brief measure of the original 60-item questionnaire developed to assess the present mental health of the patients in a clinical setting (Goldberg & Blackwell, 1970). It consists of questions such as "Have you recently felt constantly under strain?" or "Have you recently been thinking of yourself as a worthless person?" that were assessed on a scale of 0 (*not at all*) to 3 (*much more than usual*). The brief measure was found to work as well as the longer scale in surveys, and we followed the bimodal scoring (0-0-1-1) which Goldberg et al. (1997) deemed to be the best scoring method for the instrument. In this manner, the GHQ-12 had a range between 0 and 12 in the article.

We switched to using the MHI-5 in *Gambling in the Digital Age* surveys, as it was a shorter instrument and was still as good as the GHQ in identifying mental health issues (Berwick et al., 1991). The original 38-item screen was created by Veit and

Ware (1983) to measure psychological distress and well-being in the general population, and the five-item version was found to still have excellent capabilities in detecting affective disorders (Berwick et al., 1991). It includes items such as "How much of the time have you… felt so down in the dumps that nothing could cheer you up?". Again, we used the timeframe for the last six months in the survey, and the response options ranged from 1 (*not at all*) to 6 (*all the time*). After reversing items three and five that were inverse in relation to other items on the instrument and summing the scores, we used two ways to code the final variable: in Article 2, the scores were divided by five to bring the variable to a range of 1–6, whereas in Article 3, the range was 5–30.

Both research projects included the short three-item Loneliness Scale (Hughes et al., 2004) for measuring loneliness among the participants. It was developed from the revised Loneliness Scale (R-UCLA; Russell et al., 1980). Originally created at the end of 1970s at the University of California (UCLA; Russell et al., 1978), the full measure consists of 20 items that assess the variation in loneliness (Russell et al., 1978, 1980). In turn, the three-item Loneliness Scale was developed to simplify and shorten the original scale so that loneliness could be measured well in settings such as telephone surveys, where the full scale would be too long (Hughes et al., 2004). Using this version, participants were asked to evaluate how often they have felt that they lack companionship, that they have been left out, or that they are isolated from others on a three-point Likert scale that was slightly different in both surveys (from 1 to 3 in *YouGamble* surveys and from 0 to 2 in *Gambling in the Digital Age* surveys; higher scores indicated higher perceived loneliness). In Article 1, the items were summed up and divided by three to keep the range of the variable between one and three, while in Article 4, the items could be summed up within a range of 0–6.

Article 1 also included the Pearlin Mastery Scale (Pearlin & Schooler, 1978) that was originally constructed to measure a dimension of coping in which the individual feels they are in control of their chances in life. The scale comprises seven items, out of which five needed to be reversed to unify the scoring with other variables. In the survey, the participants were asked to evaluate how strongly they agree with statements such as "I have little control over the things that happen to me" on a four-item Likert scale where—after the reversion of the items—a higher score would indicate a lower sense of mastery. The items were summed up and divided by seven to maintain the range of 1–4.

The Basic Psychological Need Satisfaction and Frustration Scale (BPNSFS; Chen et al., 2015) was a fundamental part of measuring basic psychological needs in Article 2. It contains 24 items, and according to its manual (Van der Kaap-Deeder et al.,

2020), it can be used in multiple ways—either by creating a composite scale of all the items combined; two separate scales for need satisfaction and need frustration; three separate scales based on autonomy, competence, and relatedness needs; or six separate scales for the satisfaction and frustration of each separate need. We followed the second procedure—separately analyzing need satisfaction and need frustration. Consequently, the two variables both had 12 items with seven-point Likert scales, and we created the variables by summing the items and then dividing them by 12, thus leading to a range from one to seven for need satisfaction and need frustration.

In Article 3, we measured materialism with the nine-item Material Values Scale (Richins, 2004), a shorter version of the original Material Values Scale (MVS; Richins & Dawson, 1992) that was created to measure materialism among individuals. The original MVS consists of seven items that measure how central material possessions and their acquisition are in one's life (centrality subscale), six items that measure how strongly one defines success through possessions (success subscale), and five items that measure how much one views possessions as a source of happiness (happiness subscale); in contrast, in the shorter version, these subscales have an equal number of items (Richins, 2004; Richins & Dawson, 1992). In our analyses, we used both the nine-item full scale and the three subscales, all with their own models. The participants were asked to evaluate claims such as "I'd be happier if I could afford to buy more things," with the response options ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). By summing the items together—after reversing one inverse item—the range for the full nine-item MVS was 9–63, and for each subscale it was 3–21.

In Article 4, we measured stress with the Perceived Stress Scale (PSS; Cohen et al., 1983; Cohen & Williamson, 1988). We slightly modified the 10 items by asking the participants to evaluate how well the claims—an example being "you have felt that you were unable to control the important things in your life"—applied to them within the last 30 days on a scale from 0 (*never*) to 4 (*very often*) only in the beginning of the scale instead of asking it in every item. After reversing four inversed items, we combined the items. In this manner, the variable ranged from 0 to 40.

5.3 Statistical analysis methods

For the analyses, we utilized Stata statistical software by StataCorp in all the articles, using versions 16, 16.1, and 18. The reason for this was that Stata was relatively easy to use to create advanced models such as zero-inflated negative binomial regression, path analysis, or hybrid multilevel mixed-effects models. We provided tables for

descriptive statistics in three of the articles, but not in Article 1, which relied more on displaying how gambling problems (measured with the SOGS) were distributed in the four included countries. Along with the typical measures for the mean values and ranges for each scale, we used McDonald's ω in Articles 2–4 to estimate scale reliability, since psychometricians such as Hayes and Coutts (2020) have recommended its use over the more well-known Cronbach's α, which was still in use in Article 1. Regardless of which measure of reliability we used, the variables had mostly high internal reliability scores, the lowest ones being for the Pearlin Mastery Scale (0.71–0.79) and the Material Centrality Subscale (0.68), with most variables ranging from 0.84 to 0.95 in terms of internal reliability.

Our primary concern for the analyses was that the dependent variables were extremely right-skewed and slender-peaked, which could result in biased estimates if we opted to use linear regression by default. Orford (2001a, p. 19) described this curve in terms of the distribution of any excessive appetite in the population: "the majority of people are found to conform more or less to a relatively moderate norm, with smaller and smaller proportions of people displaying consumption in excess of this norm to a greater and greater degree." The distributions for our dependent variables perfectly matched this description, since approximately three out of four participants reported no problems related to gambling or gaming and the problems accumulated to an ever-decreasing number of participants. Because we wanted to keep the variables continuous to avoid following arbitrary cut-off points (Currie et al., 2010; Goodie et al., 2013; Stinchfield, 2002; Stone et al., 2015) that would enable the use of logistic regression, we had to overcome this dilemma. Following Baggio et al. (2018), we eventually chose to assume a negative binomial distribution and estimated robust standard errors in our models.

Zero-inflated negative binomial regression (ZINB) was used in Articles 1 and 2. The reason for resorting to ZINB was that in addition to modeling for a negative binomial distribution, it also deals with the excess zeros by distinguishing those that are assumed to be in a "non-susceptible" group and estimating the probability of whether someone belongs in this group (Yang et al., 2017). By using the ZINB, we were able to separate the excess number of zeros to its own section. In this manner, the influence of this excess on the negative binomial regression would be reduced. What this implied for both articles was that the model would include two part: a count part that displayed the estimates on how much increase can be predicted in the dependent variable(s) when the values for the independent variables increase, and a logistic part that showed the estimated probability of belonging to the "non-susceptible" group. Both parts of the model would then require exponentiation: the

coefficients in the count part would be analyzed as incidence rate ratios (IRR) and the coefficients in the logistic part as odds ratios (OR). In Article 1, both sections included the 12-Item General Health Questionnaire, the 3-Item Loneliness Scale, and the Pearlin Mastery Scale, along with the control variables age and gender, to measure their effects on the South Oaks Gambling Screen scores in four countries. Similarly, in Article 2, the effects of the five-item Mental Health Index, age and gender were analyzed on the Problem Gambling Severity Index and the 10-item Internet Gambling Disorder Test scores first independently before adding The Basic Psychological Need Satisfaction Scale to the "non-susceptible" section and The Basic Psychological Need Frustration Scale to the "susceptible" section.

In addition to the ZINB models, we conducted path analyses for each of the four countries in Article 1 using generalized structural equation modelling. This enabled us to examine the direct and indirect associations between loneliness and gambling problems, and sense of mastery and gambling problems, placing mental health as the mediating variable in both indirect paths. We used Stata to calculate the indirect and total effects for loneliness and sense of mastery also using another command with a 5,000-sample bootstrapped standard error to support the analyses.

Our analyses were longitudinal in the other two articles, and for the main analyses, we created hybrid multilevel mixed-effects models that were able to provide both within-person and between-person effects of time-varying independent variables in their relation to the time-varying dependent variable(s). The hybrid models are based on generalized mixed modeling and have the advantages of fixed- and random-effects models but provide more flexible estimation than those models (Schunck, 2013; Schunck & Perales, 2017). In Article 3, we used timepoints T2, T4, and T6—since we had measured materialism at these timepoints—and included only participants who had gambled on at least one game type at least once a month (n = 837, M_{age} = 51.94 years; 56.39% men), after which we developed four hybrid models. While all these models examined the effects of mental health issues, income level, age, and gender on gambling problems, each model included a different composition of the nine-item material values scale. The first model included the entire scale, whereas the second model had the scale split into subscales instead. Furthermore, we formed three additional models, one for each subscale, and tested the interaction between the fixed effects of the full material values scale and income level. In Article 4, we used all six timepoints and included only participants who answered all timepoints. This time, we used both gaming and gambling problems as dependent variables—thereby implying that we created two hybrid models to investigate the impacts of stress and loneliness—and age and gender as control variables.

Additionally, we created random-effects overdispersion models in Article 4 to determine whether there would be an interaction between stress and loneliness in their impact on gaming and gambling problems. We made this decision to switch to another method because the interaction term could not be created in hybrid models. Furthermore, we standardized the two independent variables to avoid potential issues that could arise from the use of two different kinds of scales.

5.4 Ethical considerations

Throughout the studies detailed above, a few ethical perspectives needed to be considered. First, we complied with the principles determined by the Finnish National Board on Research Integrity (2019) by conducting the research as carefully and openly as we could—storing the data securely and treating all stakeholders with respect. For both research projects, the research groups asked The Academic Ethics Committee of Tampere region to review the plans and received their approval for the research before beginning the data collection. The participants were also informed regarding the aims of the research at the beginning of the survey, and they provided their consent for participation by filling out the entire survey. Furthermore, the research groups worked only on anonymized survey data and only those with the necessary permission could access the data.

Table 2. Overview of the data and methods employed in each article

	Article 1	Article 2	Article 3	Article 4
Data	*YouGamble* Finland (2017), The United States (2018), South Korea (2018), and Spain (2019)	*Gambling in the digital age* survey (T1)	*Gambling in the digital age* survey (T2, T4 and T6)	*Gambling in the digital age* survey (T1–T6)
Participants	15–25-year-olds (N=4,816)	Finnish population aged 18–75 years (N=1,530)	Finnish population aged 18–78 years (N=837)	Finnish population aged 18–78 years (N=753)
Statistical techniques	Zero-inflated negative binomial model; path analyses	Zero-inflated negative binomial models	Hybrid multilevel models; fixed-effects model	Hybrid multilevel models; random-effects models
Dependent variable(s)	SOGS	PGSI, IGDT-10	PGSI	PGSI, IGDT-10
Independent variables	The General Health Questionnaire, UCLA Loneliness Scale, and Pearlin Mastery Scale	Basic Psychological Need Satisfaction and Frustration Scales; Mental Health Inventory	The Material Values Scale, and the Mental Health Inventory	The Perceived Stress Scale, and the UCLA Loneliness Scale
Background variables	Age, gender	Age, gender	Income level, age, gender	Age, gender

6 OVERVIEW OF THE MAIN FINDINGS

As described in the previous two chapters, the four studies included in this dissertation aimed to examine how different psychosocial factors impact problematic gaming and gambling. The designs in all the studies were quantitative, with two studies being cross-sectional and the other two being longitudinal. Furthermore, one of the cross-sectional studies had only gambling problems as a dependent variable, whereas the other one also had gaming problems as a dependent variable, and the same applied to the two longitudinal studies. This chapter presents the findings of these articles in four consequent subchapters, each dedicated to one of the articles.

6.1 Article 1: The Mediating Role of Psychological Distress in Excessive Gambling among Young People: A Four-Country Study

In Article 1, we investigated how loneliness, low sense of mastery, and general psychological distress are associated with gambling problems among young people in four different countries. Two different methods were included in our article. First, we created ZINB regression models for each country, and then we created path models with supporting statistics for these countries.

The ZINB models had a few general similarities but also very notable differences. A sense of mastery had a consistent and statistically significant link to gambling problems in that young people with a lower sense of mastery were likely to have more gambling problems. This was particularly so in South Korea where each decrease in the sense of mastery doubled the probability of gambling problems. In contrast, distress had a significant positive association only in Finnish and American data, and loneliness only in Korean and Spanish data. From among the control variables, gender was a significant predictor of gambling problems in each country, and men had more severe gambling problems than women, whereas age had a small significant negative relationship with gambling problems only in South Korean data.

With regard to the variables predicting the excess zeroes—or belonging to a non-risk-group—there was more variation among the countries. Distress reduced the

probability of belonging to this group only in the United States data, but otherwise the coefficients for the main independent variables were not significant. Moreover, higher age significantly reduced the probability in Finland, the United States, and Spain, and women were significantly more likely to belong to this group in Finland and Spain.

Further, the path models and their supporting statistics included the direct and total effects among three independent variables (distress, loneliness, and low sense of mastery) and gambling problems as well as the indirect effects in which distress was considered a mediating variable. Similarly to previous models, these models also had a few slight differences in each country sample, but they were also more consistent. Most of all, the models confirmed the consistency of the relationship between a low sense of mastery and gambling problems, as the direct effect was strong in each of the countries, while loneliness had a direct effect only in South Korea and Spain. However, psychological distress had a small significant direct effect on gambling problems in all four models and mediated the indirect effect of both loneliness and low sense of mastery on gambling problems. Overall, the predictive power of these variables were low, but our results still revealed that they do contribute to gambling problems and that there is a sociocultural variation in these associations.

6.2 Article 2: Basic psychological needs in gambling and gaming problems

Article 2 continued with a similar idea as Article 1, but this time the data encompassed the general Finnish population, and older age groups were included in the data. In this study, we used the IGDT-10 as an independent variable in addition to the PGSI to examine how the satisfaction and frustration of basic psychological needs are associated with gaming and gambling problems when mental health issues, age, and gender are controlled for. We formed the ZINB based on our hypotheses that higher need frustration would be associated with higher gaming and gambling problems, and that higher need satisfaction would be associated with the absence of these problems. Our third hypothesis was that mental health issues could interact with basic psychological need satisfaction and frustration, and we tested this by creating an additional interaction model.

Before moving on to the ZINB models, we examined the descriptive statistics and the correlations among the variables. To emphasize the skewness and high kurtosis of the dependent variables, we included a brief description of the distributions

for gaming and gambling problems in the T1 data we used in this study. For gambling problems, we found that 27.91% of the participants had experienced at least some problems and 6.08% crossed the cut-off for "problem gambling," whereas for gaming problems, 35.82% had experienced at least some problems and 10.8 crossed the cut-off for "problem gaming." Moreover, almost all variables had statistically significant correlations with each other, the highest correlations being between the two dependent variables, and between need satisfaction and frustration, or either one of these variables and mental health issues.

We first created a model without the need satisfaction and need frustration scales. This model indicated that mental health issues were positively associated with gaming and gambling problems, but lower mental health issues were significantly associated with merely the absence of gaming problems. Men were more likely to have gaming and gambling problems, but gender had a significant association only to the gaming problem. Similarly, older age reduced the likelihood of experiencing any gambling or gaming problems, but age had a significant relationship only with gaming problems, as every increase in age slightly reduced the severity of these problems.

In the full models, the inclusion of the basic psychological need frustration scale made the effect of mental health issues statistically nonsignificant, whereas the inclusion of the need satisfaction scale did not change the significant negative relationship of mental health issues—or the significance of age and gender—to the absence of gaming problems. Thus, the models provided support to our first hypothesis in that gambling or gaming problems are likely to be more severe when need frustration is higher. However, our second hypothesis was not supported, as need satisfaction did not play a significant role in the absence of these problems. Furthermore, our additional analyses on the interaction between mental health issues and the satisfaction and frustration of basic psychological needs were not significant, which also implied that our third hypothesis was not supported by these results.

6.3 Article 3: A longitudinal study on the effects of materialism and mental health on gambling problems in Finland

The main objective of Article 3 was to examine how materialism contributes to gambling problems on a population level. We also focused on mental health issues, investigating their impact on gambling problems. Since we already had data from multiple timepoints, the effects could be analyzed longitudinally. Based on the data from three timepoints between late 2021 and late 2023 that were approximately one year

apart from each other, we created two main and three additional hybrid multilevel models to inspect these effects over time.

Further, we included a correlation matrix to see how different variables would correlate in the first timepoint—which was the October–November 2021 data in this study. This helped us see how different compositions of the MVS would correlate both with each other and the other variables. As expected, the subscales correlated very strongly with the full scale and moderately with each other. Interestingly, materialism had an almost moderate negative correlation with age, and a weak but still significant negative correlation with income level, mainly through the material happiness subscale. The subscale was also moderately correlated with mental health issues with a much higher correlation than the other subscales or the full scale.

The hybrid models each had two sets of variables: those showing the within-person effects and those showing the between-person effects. Our results for the within-person variables were rather consistent and straightforward, as the included variables had almost identical coefficients in different models. While materialism and income level did not have significant impact on gambling problems at the within-person level, mental health issues had a small but still significant impact on them. More specifically, the risk of having more gambling problems—if the person gambled at least once a month—could be estimated to be approximately 1.04 times higher by every increase of mental health issues.

In addition, mental health issues had the strongest effect on the between-person level in comparison to the other two independent variables. However, materialism had a significant between-person effect on gambling problems, both as a full scale and as separate subscales. When the subscales were included in the same model, only material happiness subscale had a significant effect on gambling problems. Therefore, having higher scores on these scales increased the risk for gambling problems, which provided some support for our hypothesis even though we did not find a significant within-person effect for materialism. Gender was also significantly linked to gambling problems, as men were more likely to experience them. The other control variables, age and income level, either did not have a significant effect on gambling problems or their effects were negligibly small, and we could not find any significant results for the interaction between the fixed effects of the full material values scale and income level.

6.4 Article 4: The impacts of stress and loneliness on gambling and gaming problems: A nationwide longitudinal study

We performed another set of longitudinal analyses in Article 4, in which our aim was to examine how stress and loneliness impact gaming and gambling problems. Based on the literature on the reciprocal link between stress and loneliness, we decided to analyze the interaction of these two independent variables along with their independent effects. Furthermore, we used all six timepoints collected between spring 2021 and autumn 2023 (since the data allowed it) and included only those participants who had responded to all survey waves.

All correlations between the variables were statistically significant, except for the correlation between age and gender. Overall, the correlations were relatively weak, but the correlation between stress and loneliness was strong, which gave more reason to check how the two would interact in the hybrid models.

The hybrid models had two parts. For the within-person level, we observed the effects of stress and loneliness, and the between-person level also included the control variables for age and gender. Our results revealed that loneliness had significant within- and between-person effects on gaming problems, but not with gambling problems when other variables were included. In contrast, stress had significant within- and between-person effects for both types of problems. The additional analyses indicated that there was a small negative interaction between the random effects of stress and loneliness; thus, it appears that when the participants reported having both stress and loneliness, the scores for gaming and gambling problems tended to be slightly lower compared to the situation in which the participants were only stressed or lonely. Again, the effects of age and gender were consistent with those found in previous articles, as older participants tended to have fewer problems and men tended to have more problems related to gaming and gambling.

7 DISCUSSION

My objective for this dissertation was to approach the problems related to excessive gambling and digital gaming as an outcome of wider ongoing psychological and social issues. The four empirical research studies included in this dissertation followed this approach, each with their own aims and designs. While the first two studies had cross-sectional designs, the last two studies used longitudinal data and could, therefore, provide more indication on the causal relationships between the included variables. Furthermore, the first study investigated these issues among young people aged 15–25 years in Finland, the United States, South Korea, and Spain, thus giving this dissertation a cross-national insight into how loneliness, sense of mastery, and psychological distress relate to gambling problems; the other three studies focused on these issues within the general Finnish adult population. Although the links among all the variables that influence well-being are complex, approaching the problems from this perspective provided an important insight into the role that general mental well-being can play in problematic gambling and digital gaming.

In the first article, we examined not only the direct effects of loneliness, sense of mastery, and psychological distress on gambling problems but also the indirect effects of loneliness and sense of mastery on gambling problems—mediated by psychological distress—among the youth in four different countries. We found that a lower sense of mastery consistently predicted more gambling problems in all four countries both directly and indirectly through distress, but loneliness had an indirect effect on the problems in all countries and direct effect only in Spain and South Korea. However, the indirect effects were not strong, as psychological distress was not a strong predictor of gambling problems. Therefore, the results highlighted the importance of having a sense of control over difficulties in life, and how a low sense of mastery is reflected in the vulnerability to gambling problems from adolescence and early adulthood onward. Loneliness and distress also increased gambling problems, but there was some variation between countries in how significant the associations were. In Finland and the United States, distress was a more significant predictor of gambling problems, whereas in South Korea and Spain, loneliness was the significant predictor instead. This might be due to sociocultural differences between

the countries, perhaps reflecting how individualistic or socially cohesive the countries are and it can influence the perception of well-being or gambling behavior.

The second article focused more exclusively on basic psychological needs. In the article, we assessed how need satisfaction was related to the absence of gaming and gambling problems and how need frustration was associated with the severity of these problems. To our surprise, need satisfaction had no significant relationship with either of the problems. However, need frustration was associated with increases in problems, which was in line with the view that individuals with frustrated needs tend to resort to maladaptive substitutes in their search for at least temporary satisfaction (Ryan & Deci, 2017; Vansteenkiste & Ryan, 2013). Previous studies have also linked low self-control and feelings of being controlled to the relationship between need frustration and gambling or gaming problems (Mills & Allen, 2020; Mills et al., 2021), which creates an interesting connection between basic psychological needs and the sense of control people have on their lives. Our subsequent longitudinal study (Hagfors et al., 2023) further confirmed that need frustration increases gambling problems, adding that it also moderates the relationship between the motivation to win money and gambling problems. This topic needs further investigation, considering how central motivation is to all behavior and how clearly the frustration of basic psychological needs influences gaming and gambling problems.

Next, we continued with longitudinal designs. In the third article, we had material values and mental health issues as the predictor variables, analyzing their within- and between-person effects on gambling problems. Since the chance of winning money is central to gambling (Binde, 2013), we decided to check how material values contribute to problematic gambling while also taking mental health into account. Indeed, the results revealed that higher materialism increased the likelihood of having more gambling problems among monthly gamblers. Similarly, mental health issues predicted more gambling problems, and variation in mental health also predicted gambling problems within individuals over the two-year measuring period. Because of this, we concluded that mental health is a more important factor in problematic gambling, although paying attention to the materialistic values underlying gambling could provide more ways to motivate change in risky gambling patterns.

The fourth and final article for this dissertation investigated the impacts of stress and loneliness on gaming and gambling problems using similar multilevel model designs. We also analyzed the interaction between stress and loneliness in relation to these problems, since previous studies had established a reciprocal link between the two variables (Brown et al., 2018; Cacioppo et al., 2015; Campagne, 2019; Nowland et al., 2018; Segrin, 2019). Our findings revealed that loneliness contributed to

gaming problems only when other predictors were considered, whereas stress had an impact on gaming and gambling problems over time. Moreover, the interactions between stress and loneliness were negative, which could be due to their close relationship. Nevertheless, the results provided longitudinal insight into these associations and revealed that more stressed individuals tend to have more gaming and gambling problems, and that a higher level of loneliness can increase gaming problems.

7.1 Implications

According to the SDT, people need to have their basic psychological needs met in order for them to flourish in an integrated manner, whereas thwarted needs lead people toward maladaptive behavior patterns and substitutes (Deci & Ryan, 2000; Ryan & Deci, 2017). Most importantly, people have an innate need to belong (Baumeister & Leary, 1995), and excessive appetitive behavior can be regarded as an adaptive mechanism to conditions that do not nourish these needs (Alexander, 2008). The results of the studies included in this dissertation provide some support for these claims, even when the associations are not huge. Based on these studies, it can be said that need frustration and stress predict problematic gaming and gambling, that mental health issues and material values predict higher gambling problems, and that loneliness predicts higher gaming problems. However, loneliness seems to have more complicated associations with gambling problems depending at least on the cultural setting. Although the connections were not as significant as one might expect based on the theories, they are still important considering that these are population-level studies instead of clinical studies.

Examining a wider sociocultural context, it is important to remember that people have many ways to cope with everyday stressors. Not all people enjoy playing digital games or gambling that much to resort to them during challenging times. Like Orford (2001a, p. 19) indicated, the consumption curves for any appetitive behavior tend to be "skewed towards the higher consumption end of the distribution." This was true for both *YouGamble* and *Gambling in the Digital Age* survey data, as most of the participants had relatively low gaming and gambling problem scores. Furthermore, the associations might not be strong outside clinical settings because most of the people do not have unbearably high mental health difficulties to burden them. In fact, according to Heyman (2009) most people can manage their addictions when better alternatives are available if they do not have difficult psychiatric illnesses that

can limit their ability to cope. Considering this, finding significant associations in nationwide data is already an important indication that well-being is of significance not only in clinical populations but also among the general population.

7.2 Limitations

In this study, there are important limitations to the extent that the data and methods can provide answers to research questions. First, the theoretical framework I follow in this dissertation should be considered more as a lens through which to interpret the results obtained than a straightforward theory to be empirically tested. Both the self-determination theory and dislocation theory comment on well-being on a socio-ocultural level as well, which adds a broader view to them that does not easily translate to social psychological research designs. Of course, epidemiologists such as Richard Wilkinson and Kate Pickett (2009) have provided global data on inequality affecting well-being that is in line with these theories, but such broad analyses can still create controversies on what was measured and how. For the purposes of this dissertation, the focus of the studies was limited to the level of individuals without forgetting the social dimension of well-being when interpreting the results.

Although the studies provide interesting findings about the associations between the variables, they are not conclusive about causal directions. Especially in the first two articles, the cross-sectional designs do not make it possible to argue that gambling problems would follow from a low sense of mastery or require the presence of frustration. Instead, they indicate that gambling problems can be predicted to be higher among those with higher frustration or lower sense of mastery. Even in the two longitudinal studies, the between-person effects merely reveal how gambling or gaming problem scores correspond to differences between individuals in the included variables over time. In contrast, the within-person effects indicate the changes in gaming and gambling problems over time based on the variation in the independent variables, thereby providing more basis for causal arguments. Nevertheless, the causal relationships in the broad field of well-being are complex and studies like the ones included in this dissertation can only cover a small proportion of this complexity. The results become more meaningful when they are integrated with the entirety of research in the field, to which these studies contribute by investigating the associations in nationally representative datasets.

All the studies relied on survey data which were collected from volunteers, which leaves room for selection bias, as certain participants might have been more

interested in responding to the surveys than others. However, the data collection procedure was set to collect data that would match the demographics of the national profiles. Furthermore, there is a possibility that certain answers are biased, depending on how well the participants understood the questions. The surveys also included items about behaviors that are socially resented, which could have caused underreporting regarding the behavior. For example, people might prefer to report being less lonely than they are (Russell et al., 1980), and with the public stigma related to problematic gambling (Quigley et al., 2020), it is possible that people wish to understate their problems. Nevertheless, the anonymity of the online surveys is likely to make it easier to give honest answers in comparison to less anonymous data collection methods such as telephone surveys. Moreover, quality checks were implemented to eliminate participants with obviously biased response patterns from the survey data, improving the reliability and trustworthiness of the data.

7.3 Conclusions

The fact that habits can become so excessive that they conflict with important things in life is an interesting example of how complicated we people can be. With the abundance of pleasurable activities and many challenges in life, it might sometimes seem difficult to evaluate whether involvements stay moderate and healthy. Courtwright (2019) called the current times the "age of addiction" and Alexander (2008) argued that free-market ideology would increase the likelihood of excessive involvements globally. Even if these claims probably oversimplify the current global situation, it is still likely that social instability would affect social animals like humans who need to rely on each other to survive. Technological innovations have brought a substantial amount of entertaining content for consumption and perhaps made our lives easier in a few ways, but the universal needs that form the basis for our well-being remain, not to be forgotten.

Overall, the results of the included studies indicate that wider issues in well-being contribute to the severity of problematic gaming and gambling, and this is evident among general nationally representative data and on a mere two-year timespan. It is well known that there is a vicious cycle between mental health issues and excessive appetites; the results presented in this dissertation add to the existing literature by providing information on the predictive associations that several challenges to well-being have with gaming and gambling problems in the general Finnish population, without neglecting a cross-national perspective. They also show that these kinds of

associations exist among young people and adults alike. Stress, loneliness, and mental health issues are connected to wider areas of life than merely gaming and gambling, thereby highlighting the importance of paying attention to what kind of resources people have for coping with the difficulties in their lives. From the perspective of basic psychological needs, it also becomes central to recognize how autonomous, competent, and socially connected people generally feel in their lives and whether frustrations have led to substitutive behavior patterns or external pursuits of material wealth. Addiction does not exist in a social vacuum.

I end this dissertation by coming back to the moral weight of addiction and the ethical implication that can be expressed regarding responsibility. Based on the theoretical perspectives and empirical evidence that I have included in this dissertation, I consider it unsustainable to focus on individual people or activities without examining the safety nets of communities and societies and the actual chances of living a personally meaningful and integrated life that one can believe in. Each of us is responsible for making this happen, depending on our level of empowerment. Perhaps in the future our approaches to well-being and mental health are more comprehensive than they currently are, but until then we need to strive for inclusiveness and caring within our communities and help each other feel more meaningful and internally motivated in our everyday lives.

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PUBLICATIONS

PUBLICATION 1

The Mediating Role of Psychological Distress in Excessive Gambling among Young People: A Four-Country Study

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Article

The Mediating Role of Psychological Distress in Excessive Gambling among Young People: A Four-Country Study

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Abstract: Background and aims: Loneliness and a low sense of mastery are associated with excessive gambling, but the underlying processes of these relationships remain unstudied. Because psychological distress can increase vulnerability to excessive gambling, we investigated its mediating role in these relationships among young people. To meet the need for cross-country research, we also observed how these relationships occur in four countries with different cultures. Design, setting, and participants: Demographically balanced cross-sectional survey data were collected from 15–25-year-olds in Finland (n = 1200; 50% male), the United States (n = 1212; 49.8% male), South Korea (n = 1192; 49.6% male), and Spain (n = 1212; 51.2% male). Measurements: Excessive gambling was measured with the South Oaks Gambling Screen, psychological distress was assessed with the 12-item General Health Questionnaire, loneliness was measured with the three-item Loneliness Scale, and low sense of mastery was assessed with the Pearlin Mastery Scale. Associations were examined first using zero-inflated negative binomial regression analyses with excessive gambling as the outcome. In addition, path analyses were performed to study how loneliness and low sense of mastery relate to excessive gambling, with psychological distress as the mediating variable. Findings: Loneliness and low sense of mastery were associated indirectly with excessive gambling via psychological distress in all country samples. Low sense of mastery was also directly associated with excessive gambling. There was a direct association between loneliness and excessive gambling only in samples from South Korea and Spain. Conclusions: Psychological distress is an important factor in understanding how loneliness and sense of mastery relate to gambling.

Keywords: excessive gambling; psychological distress; loneliness; sense of mastery; adolescents; young adults

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1. Introduction

There is a growing concern worldwide regarding gambling as a potential source of harm. For example, in the United States, a group of researchers recently signed a call for the gambling industry, stakeholders, and the federal government to take more responsibility so problems related to gambling can be minimised with properly scaled prevention, treatment, and recovery [1]. Global gambling expenditures have risen to hundreds of billions of euros transferred from consumers to the industry each year, whereas individuals, families, and communities tend to experience multiple financial, mental, and social problems because of excessive gambling [2]. Moreover, despite age restrictions and other limitations placed

on underage gambling, positive social portrayal and technological advances have made gambling popular and even accessible among adolescents [3–5].

One of the most notable dangers of gambling is that it can become excessive in a way comparable to substance-related addictions [6–8]. Because most research concentrates on harms that are expected to be caused by excessive behaviours, situational and sociocultural risk factors have received less attention. However, some evidence suggests that people with underlying psychosocial problems related to mental health and self-regulation are more vulnerable to excessive behaviours [9,10]. In this study, we adopted the latter assumption, identifying risk factors that predict excessive gambling.

The healthy functioning of individuals depends on their psychosocial well-being and the integration of experiences through social interaction [9,11,12]. In particular, interpersonal traumas and maltreatment in childhood are linked to later distress, poor integration into society, and addictive behaviours [13,14]. Similarly, comorbidity of other excessive behaviours or psychological distress is commonly associated with excessive gambling [2,15–19]. For example, Ciccarelli et al. [17] found that poor decision-making and negative affective states of depression, anxiety, and stress increased the likelihood of pathological gambling. Although it is not the only pathway to excessive gambling, Blaszczynski and Nower [10] recognized that psychological distress can increase vulnerability to excessive gambling. Based on prior research findings, their model suggests that psychological distress contributes specifically to emotional vulnerability towards problem and pathological gambling. Thus, emotionally vulnerable individuals are likely to gamble to alleviate aversive affective states. However, more up-to-date research is needed to examine the role of psychological distress in diverse and non-clinical samples.

Loneliness plays an important role in excessive behaviours. For example, recreational drug use is higher among the lonely [20] and problem gamblers experience more loneliness [21,22]. In addition, a great deal of research has associated loneliness with Internet and digital addiction [21,23–25]. Loneliness is a subjective feeling in which one's social relationships are qualitatively or quantitatively deficient [26]. Loneliness is an unpleasant experience and chronic loneliness due to prior experiences of isolation can be a major source of psychological distress [11,27]. Different social normative environments might increase the risk of loneliness for different reasons with a lack of satisfying relationships being more probable in stricter cultures and physical isolation being more probable in lenient cultures [28].

One possible explanation for excessive behaviours such as gambling lies in the predisposition towards being controlled by extrinsic factors. This predicts poor personal well-being, as people focus on external cues and fail to self-regulate [12]. As Orford [29] pointed out, power and powerlessness lie at the core of addictions, as industries and their stakeholders tend to profit at the expense of vulnerable populations. Sense of mastery refers to psychological resources that help individuals cope with difficult life situations [30]. High mastery means that an individual has control over their life and has the means to implement positive adaptation strategies [31]. Earlier research has related low sense of mastery to increased psychological distress [32–34] and excessive gambling [35]. Thus, high sense of mastery might help people cope with life stressors, whereas people with low sense of mastery might resort to excessive behaviours to cope with these kinds of stressors.

This article is focused on the mediating role of psychological distress in excessive gambling among 15–25-year-olds in Finland, the United States, South Korea, and Spain, with loneliness and sense of mastery as the predicting variables. Excessive gambling in young people is a global phenomenon, but there is a need for cross-country research investigating potentially related psychosocial factors [10,11,21]. This study's cross-country design facilitated the comparison of the same psychological phenomenon in culturally different settings. Finland, the United States, South Korea, and Spain are also geographically distinct, as they represent Nordic and southern European nations and larger Western and Eastern cultures. These countries share similarities in their gambling prevalence rates [36], although they differ in gambling laws and regulations.

Prior literature suggests that psychological distress increases the likelihood of excessive gambling [10,17], and individuals who experience loneliness [12–16] or have lower sense of mastery [28] are also more vulnerable to excessive behaviour. Furthermore, loneliness and low sense of mastery are related to higher psychological distress [25–27]. Based on the literature reviewed, our main research hypothesis was that psychological distress mediates the relationship between loneliness, sense of mastery, and excessive gambling. We also investigated differences in the relationships between the independent variables and excessive gambling in the four countries included in this study. In accordance with previous research, we expected that gambling behaviour among young people would be similar in different countries [37].

2. Methods

2.1. Participants

The sample consisted of 4816 young people aged 15–25 years, of whom 1200 were from Finland (mean 21.29, SD 2.85; 50% male), 1212 were from the United States (mean 20.05, SD 3.19; 49.8% male), 1192 were from South Korea (mean 20.61, SD 3.24; 49.6% male) and 1212 were from Spain (mean 20.07, SD 3.16; 51.2% male). All samples were demographically balanced in terms of age, gender, and living area. The samples were based on the general populations of the four countries and were not chosen on the basis of excessive gambling engagement. This allowed us to examine the associations between the independent variables and youths' excessive gambling in non-clinical samples. The participants were recruited from research panels administrated by Dynata. There were no missing data. The ethics committee of the Tampere region stated in December 2016 that the study included no ethical issues.

2.2. Measures

Excessive gambling was measured using the South Oaks Gambling Screen (SOGS), which is based on the diagnostic criteria of pathological gambling [38]. The participants were asked to assess whether they had experienced gambling-related problems, such as gambling more than intended, arguments with people about gambling, and borrowing money from multiple sources during the past 12 months. The scale contains 20 binary-scored items, giving a range of 0 to 20. The scale had good internal consistency. Cronbach's alpha (α) was 0.89 in Finland, 0.90 in the United States, 0.80 in Spain, and 0.68 in South Korea. To minimise possible biases in estimates of excessive gambling that might have resulted from arbitrary categorization and the use of low cut-off points [39,40], the SOGS was used as a continuous variable. Higher values indicated higher levels of gambling problems.

Psychological distress was measured with the 12-item General Health Questionnaire (GHQ-12) which is a widely used screener of mental health problems [41]. The questionnaire had items assessing general factors of well-being, such as concentration, enjoyment, self-confidence, and happiness. Cronbach's α was 0.88 in Finland, the United States, and South Korea, and it was 0.86 in Spain. The instrument was scored using bimodal scoring (0-0-1-1) for all 12 items, giving a range between 0 and 12. Higher values indicated higher psychological distress.

Loneliness was measured using the 3-item Loneliness Scale, which is a shorter but equally usable version of the original UCLA Loneliness Scale [42]. Its Cronbach's α was 0.83 in Finland, 0.82 in the United States, 0.81 in Spain, and 0.84 in South Korea. The participants were asked how often they felt a lack of companionship, left out, and isolated from others. The response scale was 1 (hardly ever), 2 (some of the time), and 3 (often). The items were summed up and then divided by 3 to acquire average scores with values ranging from 1 to 3. Higher values indicated a higher sense of loneliness.

Sense of mastery was measured using the 7-item Pearlin Mastery Scale [30]. The participants were asked to assess how strongly they agreed or disagreed with statements about their control over life events and problems (e.g., I have little control over the things that happen to me) using a scale ranging from 1 (strongly agree) to 4 (strongly disagree).

To unify the scoring with other variables, the first five items were inverted, after which a sum variable was created and divided by 7 to acquire average scores with values in the range of 1–4. Thus, higher values indicated a lower sense of mastery. Cronbach's α values were 0.79 in Finland, 0.76 in the United States, 0.72 in Spain, and 0.71 in South Korea.

Age and gender were used as demographic control variables.

2.3. Analyses

Analyses were conducted with Stata 16 statistical software by StataCorp, College Station, TX, USA. Several multivariate analysis methods were used to examine the associations between independent variables and the dependent variable. Although the sample size was considerably high, the distributions were moderately to highly skewed, which could result in biased estimates. This skewness applied especially to the SOGS (see Figure 1). Thus, the normality of the curves could not be assumed. Zero-inflated negative binomial regression (ZINB) analyses were conducted to account for overdispersion and excess zeroes. According to Yang et al. [43], ZINB models perform consistently well in such situations over alternatives. By analysing excess zeroes separately using odds ratios (ORs), ZINB gave more proper estimates of the effects of loneliness, mastery, and psychological distress on excessive gambling. These effects, in turn, were analysed using incidence rate ratios (IRRs), which are typically used to analyse count variables, such as those described here.

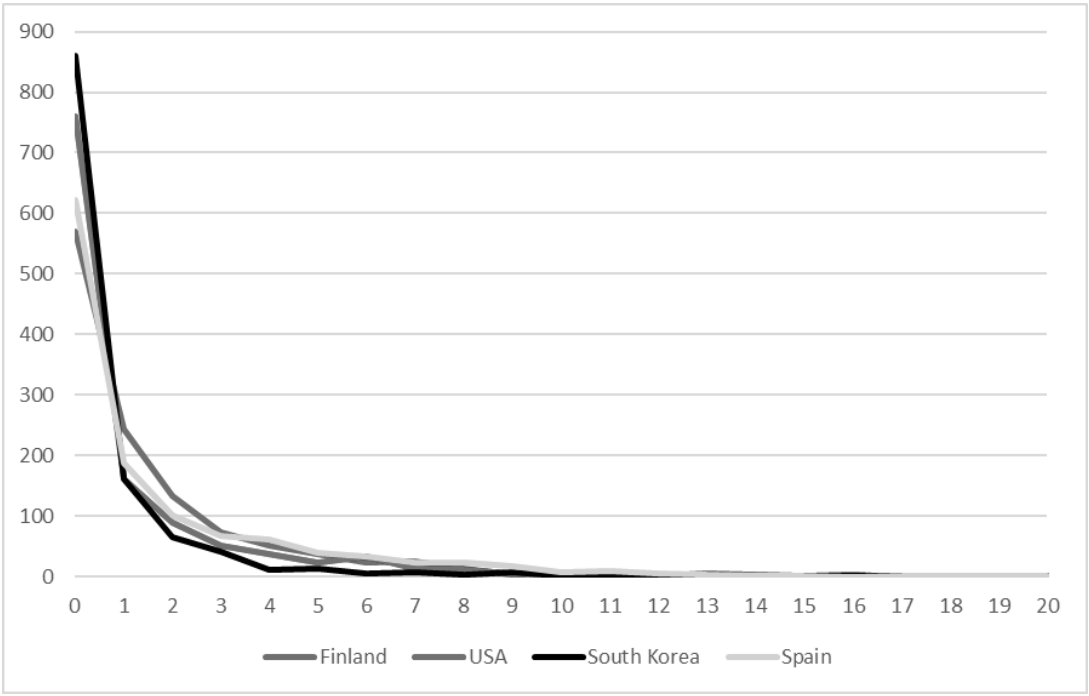

Figure 1. Distribution of excessive gambling in Finnish, U.S., South Korean, and Spanish data, as measured by the SOGS.

In addition to ZINB regression analyses, generalized structural equation models based path analyses were used to examine mediation between the dependent variable and independent variables. Psychological distress was positioned as a mediating variable, with loneliness and low sense of mastery as independent variables. The SOGS was the dependent variable in all analyses.

3. Results

Gambling was prevalent in all four country samples, but there were some minor differences in the distribution of SOGS scores (see Figure 1). In all countries, most respondents did not report experiencing problems related to excessive gambling. This was especially true in South Korea, where almost two-thirds of the respondents had a SOGS score of 0, whereas in Finland and Spain, only half of the respondents had similar scores. The highest rate of respondents who reported at least one gambling-related problem was observed in Finland (n = 631). However, the severity of excessive gambling was highest among Spanish respondents when a cut-off of 4 or more problems was crossed, and the differences evened out only in the proportion exceeding a score of 13 or more problems.

The results of ZINB analyses are reported in Table 1. Similarities and differences existed among the four countries with varying significance, especially in terms of excess zeroes, in other words, young people showing no excessive gambling. We found that distress was associated with a lack of excessive gambling only in the United States. In Finland, the United States, and South Korea, lack of excessive gambling was more common among younger respondents. Lack of excessive gambling was also more common among women in Finland and Spain.

Regarding the presence of excessive gambling in Table 1, only low sense of mastery and gender showed consistent significance in all countries. Rate ratios also varied between countries. The rate ratios for low sense of mastery varied from 1.31 (95% CI 1.02–1.67) in the U.S. data to 2.10 (95% CI 1.48–2.96) in the South Korean data, with the data from Finland (IRR: 1.56; 95% CI 1.24–1.96) and Spain (IRR: 1.39; 95% CI 1.10–1.74) falling in between. Thus, for every increase in low sense of mastery, the increase in SOGS scores can be expected to be 31 per cent in the United States, 39 per cent in Spain, 56 per cent in Finland, and 110 per cent in South Korea. Being male increased the SOGS scores by 69 per cent in Spain, 81 per cent in the United States, 101 per cent in Finland, and 185 per cent in South Korea.

In contrast, loneliness was a significant predictor of excessive gambling only in South Korea (IRR: 1.65; 95% CI 1.23–2.22) and Spain (IRR: 1.49; 95% CI 1.24–1.79), psychological distress was a significant predictor only in Finland (IRR: 1.06; 95% CI 1.02–1.10) and the United States (IRR: 1.07; 95% CI 1.02–1.12), and age was a significant predictor only in South Korea (IRR: 0.93; 95% CI 0.89–0.97). Here, every increase in loneliness showed a 65 per cent increase in excessive gambling in South Korea and a 49 per cent increase in Spain. Every increase in psychological distress showed an approximately 6–7 per cent increase in excessive gambling in Finland and the United States. Lastly, the relationship between age and excessive gambling was inverse in South Korea, meaning that every increase in age decreased excessive gambling by seven per cent.

Further analyses (Figure 2a–d, Table 2a–d) showed the direct, indirect, and total effects of loneliness and low sense of mastery on excessive gambling, with psychological distress as the mediating variable. The effects were similar to previous analyses, as low sense of mastery was the strongest overall predictor of the severity of excessive gambling. Loneliness had a strong, significant direct and total effect in South Korea and Spain but not in Finland and the United States. However, the indirect effect was significant in all four countries. Psychological distress had a fairly low direct effect on excessive gambling and was only a partial mediator for the indirect effects of loneliness and low sense of mastery on excessive gambling.

Table 1. Zero-inflated negative binomial regression models explaining the severity of excessive gambling and excess zeroes (no excessive gambling). * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

	Finland			United States			South Korea			Spain		
Excessive gambling	log(b)	IRR	Robust SE	log(b)	IRR	Robust SE	log(b)	IRR	Robust SE	log(b)	IRR	Robust SE
Distress	0.05 **	1.06 **	0.02	0.07 **	1.07 **	0.02	0.04	1.04	0.03	0.04	1.04	0.03
Loneliness	0.01	1.01	0.12	−0.10	0.90	0.12	0.50 **	1.65 **	0.15	0.40 ***	1.49 ***	0.09
Low sense of mastery	0.44 ***	1.56 ***	0.12	0.27 *	1.31 *	0.13	0.74 ***	2.10 ***	0.18	0.33 **	1.39 **	0.12
Age	−0.03	0.98	0.02	0.04	1.04	0.02	−0.07 **	0.93 **	0.02	0.01	1.01	0.02
Male gender	0.70 ***	2.01 ***	0.11	0.59 ***	1.81 ***	0.13	1.05 ***	2.85 ***	0.15	0.53 ***	1.69 ***	0.11
No excessive gambling	log(b)	OR	Robust SE	log(b)	OR	Robust SE	log(b)	OR	Robust SE	log(b)	OR	Robust SE
Distress	−0.03	0.97	0.10	−0.98 ***	0.37 ***	0.25	−2.12	0.12	1.66	−0.10	0.90	0.07
Loneliness	−0.03	0.98	0.57	−0.08	0.93	0.48	−1.26	0.03	1.15	0.28	1.32	0.24
Low sense of mastery	0.49	1.62	0.65	−0.16	0.85	0.38	0.97	2.63	0.77	−0.22	0.80	0.30
Age	−0.32 **	0.72 **	0.12	−0.33 *	0.72 *	0.14	0.13	1.14	0.12	−0.24 **	0.79 **	0.08
Male gender	−1.28 **	0.28 **	0.48	−0.04	0.96	0.64	0.46	1.59	1.03	−0.88 ***	0.41 ***	0.23
(/ln)alpha	0.03	1.03		0.79 ***	2.21 ***		1.00 ***	2.73 ***		−0.08	0.93	
Wald 0.066 χ^2: (5)	68.14			38.23			118.28			58.90		
Max. likelihood R^2	0.13			0.14			0.12			0.16		
Cragg & Uhler's R^2	0.13			0.15			0.14			0.16		
McFadden's Adj. R^2	0.03			0.04			0.05			0.04		

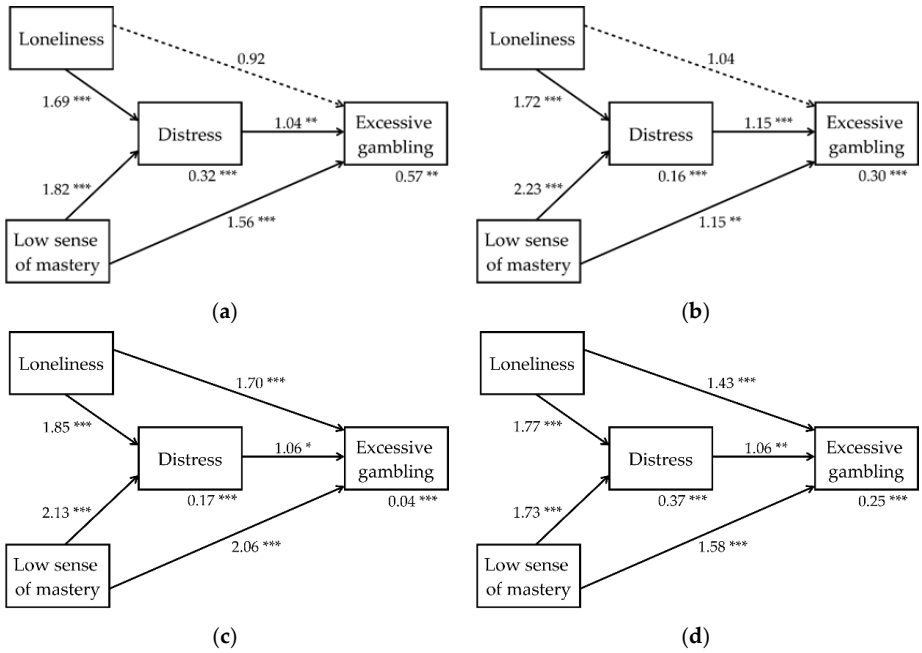

Figure 2. (**a**) Path model, Finnish data. The effect of loneliness and low sense of mastery on excessive gambling, with psychological distress as a mediating variable. (**b**) Path model, U.S. data. The effect of loneliness and low sense of mastery on excessive gambling, with psychological distress as a mediating variable. (**c**) Path model, South Korean data. The effect of loneliness and low sense of mastery on excessive gambling, with psychological distress as a mediating variable. (**d**) Path model, Spanish data. The effect of loneliness and low sense of mastery on excessive gambling, with psychological distress as a mediating variable. Values are expressed as rate ratios. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 2. Direct and indirect effects of loneliness and low sense of mastery, along with the direct effect of psychological distress on excessive gambling. (**a**) Finnish data. (**b**) U.S. data. (**c**) South Korean data. (**d**) Spanish data. Values are expressed as log(b). * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; bootstrap: 5000.

Excessive gambling		Direct Effect	Robust SE	Indirect Effect	Bootstrap SE	Total Effect	Bootstrap SE
(a)	Distress	0.04 **	0.02	-	-	0.04 **	-
	Loneliness	−0.08	0.09	0.02 **	0.01	−0.06	0.09
	Low sense of mastery	0.44 ***	0.09	0.03 **	0.01	0.47 ***	0.09
(b)	Distress	0.14 *	0.02	-	-	0.14 *	-
	Loneliness	0.04	0.11	0.08 *	0.01	0.11	0.11
	Low sense of mastery	0.35 *	0.12	0.11 *	0.02	0.46 *	0.12
(c)	Distress	0.06 *	0.02	-	-	0.06 *	-
	Loneliness	0.53 ***	0.13	0.04 *	0.02	0.57 ***	0.13
	Low sense of mastery	0.73 ***	0.17	0.04 *	0.02	0.77 ***	0.17
(d)	Distress	0.06 **	0.02	-	-	0.06 **	-
	Loneliness	0.36 ***	0.09	0.03 **	0.01	0.39 ***	0.09
	Low sense of mastery	0.46 ***	0.11	0.03 **	0.01	0.49 ***	0.10

4. Discussion

In this article, we aimed to examine how psychological distress mediates the associations between sense of mastery and loneliness and the severity of excessive gambling in cross-country data. Cross-country analyses showed that low sense of mastery was a consistently significant predictor of the severity of excessive gambling in all countries, both directly and indirectly, with psychological distress as a partial mediator. By contrast, loneliness predicted excessive gambling indirectly in all countries, but direct effects were found only in the South Korean and Spanish data. Moreover, indirect effects were not strong compared with direct effects, probably because psychological distress did not have a strong association with excessive gambling.

Low sense of mastery and loneliness had significant effects on psychological distress, which is in line with former research. Indeed, low sense of mastery is a likely stressor, so it contributes to the amount of distress a person might have [33]. Similarly, loneliness has been found to activate neuroendocrine stress mechanisms in both animal and human studies [27]. As discussed earlier, perceived loneliness varies in quality and quantity [20], and it is experienced uniquely in different social and normative environments. Thus, in collectivistic and socially cohesive societies such as Spain and South Korea, the role of loneliness—probably coming from a lack of satisfying relationships—might be stronger in addictive behaviours such as excessive gambling.

The low effect of psychological distress on the severity of excessive gambling was surprising, considering how closely psychiatric disorders are associated with excessive gambling [15,21]. One possible explanation for this result could be that there are multiple ways to attempt to cope with distress, and gambling is not among the most attractive alternatives if one does not already have a strong predisposition towards gambling.

In this cross-country study, the results provide insight into how different social and cultural environments might affect the psychosocial factors behind distress or excessive gambling. For instance, strict gambling regulations and overall negative gambling attitudes in South Korea might explain the overall lower excessive gambling levels among South Korean participants [44], whereas in Finland, different forms of gambling are widely available, making gambling a relatively easy and accessible habit [2]. However, male gender and sense of mastery predicted the severity of excessive gambling in all countries, suggesting that these factors may not be as country-dependent as other factors are. Because studies have linked trait impulsivity with excessive gambling [45,46], in future studies, it might be useful to consider whether sense of mastery is involved in these kinds of associations in some way. It is also worthwhile to recognize that, although gambling might be potentially harmful, psychosocial difficulties in life might also contribute to the development of excessive and harmful behaviours [9,10], even though the majority of people do not seem to form this kind of harmful relationship with gambling.

Our study had some limitations. First, no causal relationships can be established because of the cross-sectional nature of the data, and all suggested causalities are purely theoretical. Although our analyses provide some theoretical evidence for psychological distress as a mediating variable, this needs to be verified in longitudinal settings. Second, because of the complexity of human behaviour, the variables in our analyses may have more complicated and reciprocal relationships than we can provide here. Third, the data are not targeted exclusively at those who experience harm or even for those who gamble. The associations might be stronger in these groups. Finally, self-reported data are susceptible to pressure to provide socially desired answers, particularly in terms of stigmatized phenomena such as excessive gambling; however, it can be expected that the use of an anonymous online survey makes this bias less likely to occur compared with less anonymous situations.

This study showed some evidence for the effects of psychological distress on excessive gambling. Our study contributed to the theoretical discussion on the role of psychological distress in excessive gambling by scrutinizing how underlying factors such as loneliness and sense of mastery relate to distress and gambling. Loneliness and low sense of mastery

can be stressful and harmful to well-being. Impairments in psychosocial well-being can influence various harmful behaviours, but they do not necessarily lead to excessive gambling. However, psychological distress can increase the severity of excessive gambling among those who gamble. Prevention and intervention strategies should focus on recognizing and improving young individuals' overall well-being. Reinforcing youths' sense of mastery could be particularly beneficial in the prevention and treatment of gambling problems. For instance, educational programs focused on teaching young individuals how to build and strengthen their sense of mastery through expectation management and resilience might be beneficial and help them maintain overall well-being.

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Institutional Review Board Statement: The study was conducted according to the guidelines of the Declaration of Helsinki. The Tampere region ethics committee reviewed the research protocol before implementation and stated that the research did not involve any ethical issues (Decision 62/2016).

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Data Availability Statement: YouGamble 2017–Finnish Data are publicly available in the Finnish Social Science Data Archive (http://urn.fi/urn:nbn:fi:fsd:T-FSD3399) (accessed on 26 June 2021). Data from the United States, South Korea, and Spain will be made publicly available in the Finnish Social Science Data Archive during 2021. The data are available from the corresponding author (A.O.) with a reasonable request.

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Basic psychological needs in gambling and gaming problems

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Basic psychological needs in gambling and gaming problems

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ABSTRACT

Background and Aims: Studies on self-determination theory (SDT) have placed satisfaction of basic psychological needs (autonomy, relatedness, and competence) at the core of well-being, whereas frustration of these needs results in multiple potentially unhealthy mental and behavioral patterns. This study analyzed how need satisfaction and frustration relate to the severity of gambling and gaming problems.

Methods: A survey study with 18–75-year-old Finnish participants ($N = 1530$; 50.33% male) was conducted in April 2021. Basic psychological needs were measured with the Basic Psychological Need Satisfaction and Frustration Scale, mental health issues with the five-item Mental Health Inventory, gambling problems with the Problem Gambling Severity Index, and gaming problems with the Internet Gaming Disorder Test. Zero-inflated negative binomial analyses were conducted to examine how satisfaction and frustration of basic psychological needs, together with mental health issues, are associated with gaming and gambling problems.

Results: Mental health issues were associated with gambling and gaming problems, but this association became nonsignificant when basic psychological needs were added to the model. However, better mental health still was associated with the absence of gaming problems. While need satisfaction had no association with the absence of gaming or gambling problems, need frustration was associated with increases in the severity of both gaming and gambling problems.

Discussion: Frustration of basic psychological needs for autonomy, relatedness, and competence is associated with both gambling and gaming problems and should be considered when developing treatment and support for those who experience such problems.

1. Introduction

Gambling and digital gaming have become increasingly popular forms of entertainment as technological advancements such as personal computers, gaming consoles, the Internet, and smartphones have brought them closer and made them more accessible. In Finland, 29% of the population gamble, and 28% play digital games at least once a week (Salonen et al., 2020). For most people, these games may represent personal and social rewards or simply a chance of winning (Binde, 2013; Boyle et al., 2011), but the risks for personal, social, and financial problems increase along with increased gambling and gaming (Buono et al., 2020; Castrén et al., 2018; Jeffrey et al., 2019).

As with other potentially excessive behaviors, nationwide prevalence estimates for more severe gambling and gaming problems are usually low. The most recent national prevalence rates in Finland were 0.7% for "probable pathological gambling" (Problem Gambling Severity Index [PGSI] $\geq$ 8) and 1.3% for "problematic gaming" (Gaming Addiction Scale [GAS-7] $\geq$ 4), although gambling and gaming problems affect a larger proportion of the population (Salonen et al., 2020). It is also more likely for young men to belong to high-risk groups (Dowling et al., 2017; Macur & Pontes, 2021). In psychiatry, gambling and gaming problems are thought to include preoccupation, attempts to escape adverse mood states, difficulty to control the activity, deception, and jeopardized or lost social opportunities and relationships (American Psychiatric Association [APA], 2013; Petry et al., 2014). Comorbidity with mental health issues such as depression, anxiety, excessive substance use, and impulse-control disorders is common in severe gambling and gaming problems (APA, 2013; Kessler et al., 2008; Kuss & Griffiths, 2012; Petry et al., 2005). However, estimates of prevalence and comorbidity vary depending on factors like study design (Dowling et al., 2015; Ferguson et al., 2011).

One possible yet relatively overlooked theoretical perspective regarding gambling and gaming problems is the perspective of basic psychological needs. According to the Self-Determination Theory (SDT;

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Ryan & Deci, 2000, 2017), there are three interdependent basic psychological needs—autonomy, relatedness, and competence—that must be satisfied for a person to flourish and function in a healthy way. *Autonomy* refers to the need to self-regulate one's experiences and actions, whereas the need to feel socially connected and engaged is the core element of *relatedness*. Finally, *competence* depicts the need to feel optimally efficient and skillful in one's efforts. Neurologically, these needs have been described to associate particularly with reward processing networks and insular activity, which are present in various motivation-based and emotional tasks (Reeve & Lee, 2019), including addictive behaviors (Heilig et al., 2016; Volkow & Boyle, 2018). It can therefore be assumed that basic psychological needs are also involved in the trajectories of gambling and gaming behaviors.

Even though satisfaction of basic psychological needs is a necessary requirement for a person to flourish, social contexts may not always support the fulfilment of these needs, which can lead to various maladaptive substitute behaviors (Deci & Ryan, 2000). Basic psychological needs can also be actively thwarted, and further developments of SDT have suggested that the resulting frustration might not be adequately captured by looking merely at low scores of need satisfaction (e.g., it is different to feel rejected than dissatisfied in one's love affairs), making the constructs of need satisfaction and need frustration asymmetrical (Bartholomew, Ntoumanis, Ryan, & Thøgersen-Ntoumani, 2011; Bartholomew, Ntoumanis, Ryan, Bosch, et al., 2011; Costa et al., 2015; Vansteenkiste & Ryan, 2013). Vansteenkiste and Ryan (2013) also pointed out that people with chronic need frustration are more likely to pursue external indicators of worth such as popularity or wealth, behave rigidly, lack self-control, and display oppositional defiance, which promote negative cycles of further frustration, maladaptation, and ill-being.

In the field of addiction research, studies have mostly applied a broader SDT framework to study motivation in treatment outcomes (e.g. Chan et al., 2019; Kennedy & Gregoire, 2009; Kushnir et al., 2016), while many other studies have taken an approach toward gambling or gaming problems using concepts that are comparable to basic psychological needs. Concerning gambling problems, mediation analyses by Rodriguez et al. (2015) suggest that autonomously motivated individuals are less likely to try to win back gambling losses and gamble as an escape which in turn protects them against gambling problems. Studies have also found that strong social ties can be a protective factor against gambling problems (Nordmyr et al., 2016; Oksanen et al., 2021). Furthermore, Bergen et al. (2014) have demonstrated that gambling can enhance a sense of self-control that those who experience more severe gambling problems tend to lack in their everyday life.

Some recent studies have brought attention specifically to the satisfaction and frustration of basic psychological needs in the context of gambling or gaming problems. For example, Mills et al. (2021) found that general lack of motivation and motivation that is oriented towards external approval were associated with gambling problems through frustration of basic psychological needs. One study on elderly adults who gamble suggests that basic psychological need satisfaction decreases their risk for gambling problems (Dennis et al., 2017) and a study on Chinese adults shows that basic psychological need satisfaction predicts adherence to responsible gambling practices indirectly through flourishing (Tong et al., 2022).

Regarding digital gaming, earlier studies grounded in SDT have provided evidence that motivation and engagement towards playing a game is influenced by need satisfaction-supportive features of the game (Peng et al., 2012; Przybylski et al., 2010; Ryan et al., 2006). As for gaming problems, a study by Tóth-Király et al. (2019) suggests that general need satisfaction is a protective factor and need frustration a risk factor for obsessive and maladaptive passion towards gaming. Other studies have found that need frustration in daily life and need satisfaction in digital games are associated with the severity of gaming problems (Allen & Anderson, 2018; Bender & Gentile, 2020; Mills et al., 2018). Furthermore, it is possible that need frustration increases gaming problems at least partially by lowering self-control (Mills & Allen, 2020) and self-esteem as well as increasing depressive symptoms (Scerri et al., 2019). Hence, it can be stated that satisfaction and frustration of basic psychological needs for autonomy, relatedness and competence act an important part in problems related to gambling and gaming.

Although previous research has offered insight into how satisfaction or frustration of basic psychological needs relate to addictive behaviors, there is a lack of research investigating the role of these needs in gambling and gaming problems while accounting for comorbidity with mental health issues. In the present study, we analyze the association of basic psychological needs and gambling and gaming problems while controlling for mental health issues, age, and gender. Based on the available literature, our hypotheses are:

H1: Higher need frustration is associated with higher gambling and gaming problems.

H2: Higher need satisfaction is associated with the absence of gambling and gaming problems.

H3: Mental health issues interact with need satisfaction and frustration.

2. Material and methods

2.1. Participants

A cross-sectional survey was collected online from 18 to 75-year-old Finnish panel volunteers ($n = 1530$) by a data provider company, Norstat Finland, in April 2021. The participants were contacted randomly via email and the provider's mobile application. The mean age of the participants was 46.7 years ($SD = 16.4$ years); 50.3% of them were men, 49.4% were women, and 0.3% identified their gender as "other". The survey sample was designed to be nationally representative, and it covered all Finnish-speaking regions of mainland Finland. The response rate of the survey was 34.6%.

Before the start of the data collection, The Academic Ethics Committee of Tampere region gave their approval for the study. The participants gave their consent for participation by completing the full survey. The research group worked only with anonymized data provided by Norstat. Data quality checks were conducted to detect and evaluate possible biases in responses following a pre-established protocol. During a review of open-ended feedback, these checks revealed a few biased response patterns, which led to the exclusion of three participants; 1530 were left for the final data.

2.2. Measures

Gambling problems were assessed with the Problem Gambling Severity Index (PGSI; Ferris & Wynne, 2001), which is a commonly used survey tool for measuring gambling-related problems (Grigsby, 2020) and has been used previously in Finland (Edgren et al., 2016; Salonen et al., 2020). The PGSI consists of nine items that measure, for example, increasing costs of gambling, need for excitement, chasing money lost in gambling, negative social and economic feedback, and guilt. In this study, we asked the participants to evaluate their experiences during the last six months. The response choices were 0 (*never*), 1 (*sometimes*), 2 (*most of the time*), and 3 (*almost always*). Considering the dissenting views for the classification and threshold scores for problem gambling (Currie et al., 2010; Stone et al., 2014), we left the scale in its count form. The scale had excellent internal consistency (McDonald's omega, $\omega = 0.95$). However, 72.09% of the participants had not experienced any gambling problems within the last 6 months. This was reflected in a low mean value (1.31), high right-skewness (3.59), and extremely high kurtosis (17.38).

Gaming problems were measured with the Ten-Item Internet Gaming Disorder Test (IGDT-10; Király et al., 2017). The psychometric properties of the IGDT-10 have been good in international studies (Király et al., 2019) and among Finnish vocational school students (Männikkö et al., 2019). The ten items measured, for example, gaming-related

preoccupation, failure to moderate gaming, risking significant relationships, school, or work performance because of gaming, and playing despite negative consequences. The response choices were 0 (*never*), 1 (*sometimes*), and 2 (*often*). The participants gave their answers based on the previous 6 months here as well. Like the PGSI, we treated the IGDT-10 as a count variable, and the internal consistency of the scale was high ($\omega = 0.89$). Similarly, 64.18% of the participants had not experienced any gaming problems within the last 6 months. Thus, the mean value for IGDT-10 was 1.34, skewness was 2.70, and kurtosis was 11.37.

The Basic Psychological Need Satisfaction and Frustration Scales (BPNSFS; Chen et al., 2015) were used to measure the satisfaction and frustration of basic psychological needs. The 24 items were translated to Finnish and back translated to check for accuracy. The participants evaluated how autonomy-, relatedness-, and competence-measuring claims applied to themselves on a seven-point Likert scale. For the purposes of this study, a need satisfaction scale and a need frustration scale were formed by combining three satisfaction subscales and three frustration subscales. The need satisfaction scale included items such as "I feel a sense of choice and freedom in the things I undertake" (autonomy satisfaction), "I feel that the people I care about also care about me" (relatedness satisfaction) and "I feel I can successfully complete difficult tasks" (competence satisfaction). In contrast, the need frustration scale included items such as "I feel pressured to do too many things" (autonomy frustration), "I feel excluded from the group I want to belong to" (relatedness frustration) and "I feel disappointed with many of my performances" (competence frustration). Both scales had very good internal consistency ($\omega = 0.93$ for the need satisfaction scale; $\omega = 0.92$ for the need frustration scale).

Mental health issues, gender, and age were used as control variables. Mental health issues were measured with the five-item Mental Health Inventory (MHI-5; Berwick et al., 1991), a shortened version of the original 38-item screen. MHI-5 has been used previously in multiple Finnish studies (Castrén, Kontto, et al., 2018; Elovanio et al., 2020; Salonen et al., 2020; Talala et al., 2008), and it is proven to be a valid and reliable instrument especially in associative studies (Elovanio et al., 2020). The five items measured mood, nervousness, sadness, calmness, and happiness (e.g., "How much of the time have you felt so down in the dumps that nothing could cheer you up?") during the past month on a six-point Likert scale. Internal consistency of the measure was good ($\omega = 0.89$). Descriptive statistics are summarized in Table 1.

2.3. Statistical analyses

Analyses were conducted with Stata 16 statistical software by StataCorp (2019). The Omegacoef package was used to calculate ω coefficients (Hayes & Coutts, 2020). Analyses do not include respondents who identified their gender as "other" ($n = 4$), so the sample size for analyses is 1526.

As both the PGSI and the IGDT had very high rates of zero-values and, consequently, postestimation for preliminary linear regression models showed a notable number of outliers, zero-inflated negative binomial regression (ZINB) with robust standard errors was applied to examine the associations between the independent and dependent variables. By dividing the analyses into two separate processes—count (susceptible group) and inflate (nonsusceptible group)—ZINB models can handle overdispersion and zero-inflation relatively well compared to other models (Yang et al., 2017). The use of zero-inflated models allowed us to examine the association of need frustration with the severity of gambling and gaming problems while examining the association of need satisfaction with inflated zeroes separately. Considering that the data should represent the general population, it can be assumed that not everyone is at risk of gambling or gaming problems. Thus, analyzing inflated zeroes separately should minimize possible biases that the inclusion of no-risk groups may bring into the models.

3. Results

As indicated by descriptive statistics (Table A.1), the distributions of gambling and gaming problems are extremely right-skewed and leptokurtic (slender-peaked). Out of participants, 427 (27.91%) reported having experienced at least one gambling-related risk (i.e., PGSI > 0) and 548 participants (35.82%) reported having experienced at least one gaming problem. The cut-off point for "problem gambling" (PGSI ≥ 8) was crossed for 93 participants (6.08%) and the cut-off point for "problem gaming" (IGDT-10 ≥ 5) was crossed for 165 participants (10.8%). Furthermore, correlation matrix (Table A.2) shows that nearly all variables were significantly correlated with each other. The only exception was male gender, which had only weak correlations with gambling and gaming problems, and mental health issues. The highest correlations were between gambling and gaming problems (0.53), need satisfaction and need frustration (-0.69), need satisfaction and mental health issues (-0.63), and need frustration and mental health issues (0.74). Gambling problems had a weak correlation to need satisfaction, need frustration, and mental health issues, while gaming problems were weakly correlated with need satisfaction but moderately correlated with need frustration and mental health issues. Age had a moderate inverse correlation with gaming problems, need frustration, and mental health issues, a weak correlation with need satisfaction and a weak inverse correlation with gambling problems.

In our first models (Table A.3), weaker mental health was significantly associated with increased gambling problems (IRR = 1.43, 95% CI 1.15; 1.78, $p < 0.01$) and gaming problems (IRR = 1.48, 95% CI 1.33; 1.64, $p < 0.001$), yet better mental health was associated only with the absence of gaming problems (i.e., inflated zeroes; OR = 0.68, 95% CI 0.55; 0.86 $p < 0.001$). Gender and age were significantly associated with the absence of gambling and gaming problems. Men and younger participants were less likely to report having no problems, while male gender and younger age were associated only with the severity of gaming problems.

Our second models (Table A.4) are similar to the previous models, but with the addition of basic psychological need satisfaction and frustration scales. While mental health issues were significantly associated with both gambling and gaming problems in the previous models, this association became nonsignificant when need frustration was added to the models. Need frustration, in turn, was positively associated with the severity of both gambling problems (1.22, 95% CI 1.03; 1.43 $p < 0.05$) and gaming problems (1.34, 95% CI 1.21; 1.49 $p < 0.001$). However, better mental health still had a similarly strong association with the absence of gaming problems after the addition of need satisfaction. In fact, need satisfaction had no significant association with the absence of gambling or gaming problems. Moreover, gender and age were still associated with the absence of gambling and gaming problems and with the severity of gaming problems.

We also tested for the interaction between mental health issues and basic psychological need satisfaction/frustration but found that the interactions were not statistically significant. The only independent variable that held statistical significance was need frustration when gaming problems were the dependent variable (1.64, 95% CI 1.20; 2.26 $p < 0.01$), but as the interaction term was not significant, this association also held little practical significance.

4. Discussion

This study focused on the associations between satisfaction and frustration of basic psychological needs and gambling and gaming problems. We found that need frustration was associated with both gambling and gaming problems. When gambling or gaming problems were present, higher need frustration was associated with increases in their severity. Mental health issues had a significant association with the severity of gambling and gaming problems only before basic psychological need frustration was added to the models. However, our second

Table A1
Descriptive statistics.

	Mean	SD	Range (Scale min–max)	Skewness	Kurtosis	ω
Gambling problems	1.31	3.33	0–25 (0–27)	3.59	17.38	0.95
Gaming problems	1.34	2.64	0–20 (0–20)	2.70	11.37	0.89
Basic psychological needs						
Satisfaction	5.17	1.02	1–7 (1–7)	−0.48	3.03	0.93
Frustration	2.75	1.13	1–6.67 (1–7)	0.47	2.70	0.92
Mental health issues	2.48	0.95	1–6 (1–6)	0.85	3.33	0.89
Age	46.67	16.42	18–75	−0.02	1.78	
Categorical	**N**	**%**				
Gender						
Male	770	50.46				
Female	756	49.54				

Table A2
Correlation matrix.

	1.	2.	3.	4.	5.	6.	7.
1. Gambling problems	1						
2. Gaming problems	0.53***	1					
3. Need satisfaction	−0.21***	−0.26***	1				
4. Need frustration	0.23***	0.35***	−0.69***	1			
5. Mental health issues	0.23***	0.31***	−0.63***	0.74***	1		
6. Age	−0.16***	−0.32***	0.21***	−0.36***	−0.30***	1	
7. Male gender	0.11***	0.13***	−0.03	−0.03	−0.07*	−0.03	1

*p < 0.05; ** p < 0.01; *** p < 0.001.

Table A3
Zero-inflated negative binomial regression models for gambling and gaming problems.

	Gambling problems				**Gaming problems**			
	IRR	Robust SE	95% CI		IRR	Robust SE	95% CI	
Mental health issues	1.43**	0.16	1.15	1.78	1.48***	0.80	1.33	1.64
Male gender	1.42	0.35	0.87	2.30	1.48***	0.16	1.19	1.83
Age	0.99	0.01	0.98	1.00	0.99**	0.00	0.98	1.00
Inflated zeroes	**OR**	**Robust SE**	**95% CI**		**OR**	**Robust SE**	**95% CI**	
Mental health issues	0.43	0.53	0.04	4.73	0.68***	0.08	0.55	0.86
Male gender	0.46*	0.14	0.26	0.83	0.61*	0.12	0.42	0.89
Age	1.03*	0.01	1.00	1.05	1.05***	0.01	1.04	1.07
Wald $\chi 2$: (3)	34.23				73.72			
Max. likelihood R2	0.09				0.21			
Cragg & Uhler's R2	0.10				0.23			
McFadden's Adj. R2	0.03				0.08			

*p < 0.05; ** p < 0.01; *** p < 0.001

hypothesis was disputed, as need satisfaction was not associated with the absence of either of these problems, while better mental health was only associated with the absence of gaming problems. The relationship between mental health issues and the absence of gaming problems was inverse, meaning that the likelihood of having any gaming problems increases when mental health issues increase. Finally, our third hypothesis was disputed, as there were no significant interactions between mental health issues and need satisfaction or frustration.

Based on our results, gambling and gaming problems seem to be quite similar in regard to the frustration of basic psychological needs. Moreover, gender and age are similarly associated with absence but not with the severity of these problems. This suggests that men and younger people are more likely to develop at least some problems related to their gambling or gaming, but once problems exist, these same factors matter only for the severity of gaming problems. Our results also suggest that mental health issues increase the risk of having at least some gaming problems, but contrary to previous knowledge (APA, 2013; Kessler et al., 2008; Petry et al., 2005), the same was not true for gambling problems. However, mental health issues did have a significant association to gambling problems before the addition of basic psychological need frustration, and even while we found no significant interactions between these factors, the correlation matrix revealed a high correlation between them. Therefore, a possibility remains that there is a more complex interaction between the variables that we did not account for here. Further research could delve deeper into these complex dynamics between mental health, need frustration, and gambling or gaming problems.

According to the SDT, frustration of basic psychological needs can make the frustrated individual turn to maladaptive substitute behaviors to gain at least momentary satisfaction (Ryan & Deci, 2000, 2017; Vansteenkiste & Ryan, 2013). As gambling and digital gaming are pleasurable activities, with excitement related to their promises of

Table A4
Zero-inflated negative binomial regression models for gambling and gaming problems. Need frustration on the upper (count) section, need satisfaction on the lower (inflate) section.

	Gambling problems				Gaming problems			
	IRR	Robust SE	95% CI		IRR	Robust SE	95% CI	
Need frustration	1.22*	0.10	1.03	1.43	1.34***	0.07	1.21	1.49
Mental health issues	1.25	0.21	0.89	1.75	1.12	0.08	0.96	1.29
Male gender	1.31	0.31	0.82	2.10	1.47***	0.16	1.19	1.82
Age	0.99	0.01	0.98	1.00	0.99*	0.00	0.99	1.00
Inflated zeroes	**OR**	**Robust SE**	**95% CI**		**OR**	**Robust SE**	**95% CI**	
Need satisfaction	1.06	0.21	0.72	1.56	0.97	0.10	0.79	1.20
Mental health issues	0.58	0.53	0.10	3.45	0.65**	0.10	0.48	0.87
Male gender	0.47**	0.12	0.28	0.78	0.61**	0.12	0.42	0.89
Age	1.02*	0.01	1.00	1.05	1.05***	0.01	1.04	1.07
Wald $\chi 2$: (4)	34.20				123.59			
Max. likelihood R2	0.09				0.23			
Cragg & Uhler's R2	0.10				0.24			
McFadden's Adj. R2	0.03				0.08			

*$p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

winnable challenges (Binde, 2013; Boyle et al., 2011) it is understandable to seek a sense of satisfaction next to them. Following the SDT, need frustration relates to more problematic forms of gambling and gaming, which was our first hypothesis. Our models supported this hypothesis, as higher need frustration was associated with more severe gambling and gaming problems. This finding also supports previous studies that have found that need frustration is a mediating factor in the effects of motivation and amotivation on gambling problems and psychological distress and may increase gaming problems by lowering self-control (Mills et al., 2021; Mills & Allen, 2020).

Our second hypothesis about the satisfaction of basic psychological needs being associated with the absence of gambling and gaming problems was not supported by our models. This is surprising, considering how previous studies have shown that need satisfaction may protect against the risk of developing gambling or gaming problems (Allen & Anderson, 2018; Dennis et al., 2017; Tóth-Király et al., 2019). Having a nonsignificant association between these problems and need satisfaction indicates that this might not be the case, at least at the general Finnish population level. One obvious explanation for this could be that in a country like Finland, where gambling and gaming are widespread and visible activities, people might still experience some gambling- or gaming-related problems even with high need satisfaction. This should be investigated further in future research.

Furthermore, our additional analyses on interactions between need satisfaction/frustration and mental health issues did not seem to support our third hypothesis, as the interaction term was not significant. While it is likely that some covariance exists, considering the high correlations between these variables (see Table 1), VIF tests showed that multicollinearity was not a problem. Therefore, it is reasonable to conclude that need satisfaction and frustration can be considered independently associated with the severity of gambling and gaming problems when mental health issues are controlled.

The current study includes some important limitations. First, response rate for the survey was 34.6% and limited to panel participants, which may introduce potential self-selection bias. For example, it is possible that our participants found the topic of the survey more interesting than those who did not respond to the survey. Moreover, our sample includes slightly more gamblers than some population estimates (Salonen et al., 2020). However, considering the aims of the study, this is not a limitation, as our analyses are robust, and the data is demographically balanced. Due to the cross-sectional study design, no causal assumptions can be based on these results. While it can be assumed that the frustration of basic psychological needs or problems with mental health can lead to gambling or gaming problems, the reverse assumption is equally plausible. The survey was also based on self-reports, which means the measures are more subjective and influenced by interpretations that the participants might have of their situation. Design-wise, we did not analyze each basic psychological need separately, as our focus was on their combined association with gambling and gaming problems.

All in all, our findings add to the growing number of studies that approach gambling and gaming problems from the perspective of satisfaction and frustration of basic psychological needs. Further research is needed to study the effects of autonomy, relatedness, and competence separately to learn about their possible individual relationships to these problems and whether there are similarities or differences in these associations. More importantly, longitudinal designs could clarify the cause-and-effect relationships between basic psychological needs and gambling and gaming problems to see in more detail how they influence each other.

4.1. Conclusions

Basic psychological needs are considered necessary factors in well-being. This study approached gambling and gaming problems as possible results of low need satisfaction and high need frustration. While need satisfaction was not associated with the absence of these problems, need frustration was associated with the severity of both gambling and gaming problems. Theoretically, our results are very much in line with other studies testing the premises of SDT and suggest that problems related to gambling and gaming coexist with frustration of basic psychological needs. It would thus be worthwhile to consider how these needs are fulfilled in the daily lives of those who experience these problems when they seek support and treatment. More importantly, these results highlight the importance of (preferably society-wide) need supportive environments in management of problems that might accompany behaviors such as gambling and gaming.

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CRediT authorship contribution statement

Ilkka Vuorinen: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Resources, Software, Validation, Visualization, Writing – original draft, Writing – review &

editing. **Iina Savolainen:** Conceptualization, Data curation, Funding acquisition, Investigation, Resources, Writing – original draft, Writing – review & editing. **Heli Hagfors:** Conceptualization, Funding acquisition, Investigation, Resources, Writing – original draft, Writing – review & editing. **Atte Oksanen:** Conceptualization, Data curation, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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PUBLICATION 3

A longitudinal study on the effects of materialism and mental health on gambling problems in Finland

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The impacts of stress and loneliness on gambling and gaming problems: A nationwide longitudinal study

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The impacts of stress and loneliness on gambling and gaming problems: A nationwide longitudinal study

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Abstract

Background: Problems related to gambling and digital gaming have been a topic of concern for years. Less attention has been paid to the probable psychosocial factors behind these problems. While previous studies have established links between stress, loneliness, and addiction, there is a lack of longitudinal research investigating how stress and loneliness affect addictive behaviors, including problem gambling and gaming.

Aims: This study uses multilevel mixed-effects generalized linear models to analyze the between- and within-person effects of stress and loneliness on gambling and gaming problems. The interaction between stress and loneliness was also investigated.

Methods: A representative sample of Finns ($N = 1{,}530$) answered a survey in 6-month intervals between spring 2021 and autumn 2023; 49.22% of the sample took part at all six time points. The Problem Gambling Severity Index and the Internet Gaming Disorder Test were used to measure gambling and gaming problems. The three-item UCLA Loneliness Scale was used to assess loneliness, and the Perceived Stress Scale was used to evaluate stress.

Results: After controlling for gender and age, loneliness was found to increase only gaming problems at both the between- and within-person levels, but not gambling. In contrast, stress enhanced both gambling and gaming problems at the between- and within-person levels. Additionally, loneliness and stress were found to have negative interaction suggesting that their combined effect was lower than their separate effects.

Conclusion: The findings provide longitudinal insight into the psychosocial vulnerabilities behind problem gambling and gaming, which can be helpful in designing targeted interventions.

Keywords

Gambling problems, gaming problems, loneliness, stress, addiction

Introduction

People play digital games and gamble sometimes to the extent that problems emerge. This has raised concerns in Finland, where different forms of gambling are widely available. In the country, 78.4% of those aged 15 to 74 years gamble at least once a year, and 29% of the same population do so at least once a week (Salonen et al., 2020). In comparison, digital games are played at least sometimes by 80.3% of those aged 10 to 75 years, and entertainment games are played at least once a week by 41.1% of this population (Kinnunen et al., 2022). While gambling is typically something that revolves around money or other stakes, digital games are usually story- or challenge-driven pastimes. However, technological advancements have blurred the distinction between these two activities, and monetary and gambling-like features are now common revenue models in digital games; also, gambling games increasingly utilize narrative elements adapted from video games (Gainsbury et al., 2014; Macey & Hamari, 2022).

As pastimes, gambling and playing digital games do not necessarily cause problems. However, spending excessive amounts of time and money on these games can. This has been recognized even in the DSM-V as a conditions that can lead to many clinically significant issues relating

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to mental health, preoccupation, and jeopardized social obligations (American Psychiatric Association, 2013). As with all potentially addictive behaviors, gambling and gaming problems are more likely to accumulate among individuals who are somehow more vulnerable, such as those who have lower socioeconomic status (Kochuchakkalackal et al., 2020; Sharman et al., 2019). In addition to other mental health conditions associated with problem gambling and gaming (e.g. emotion regulation, anxiety, and mental distress; Marchica et al., 2019; Savolainen et al., 2022), it is important to investigate how stress and loneliness impact the vulnerability to these problems, especially as loneliness rates are increasing and people encounter a multitude of stressors in their lives.

Stress is a physical response that is triggered when the body's homeostasis is threatened by either an actual or a perceived threat (Chrousos, 2009). Stress can be acute or chronic. Acute stress involves a response to a specific stimulus or situation. Once the stressor is removed, the body returns to its normal state. Chronic stress persists over a longer period, stemming, for example, from difficult life situations or enduring hardships. Elevated levels of stress hormones can result in a wide array of negative symptoms and health issues (Russell & Lightman, 2019). Stress is known to accompany addictive behaviors. For instance, it can contribute to and worsen as a result of alcohol or drug addiction (Ruisoto & Contador, 2019), and it can increase the risk of relapse (Roche et al., 2017). Stress has also been found to contribute to problem gambling and gaming through coping motives (Maroney et al., 2019; Thomas et al., 2011), which suggests that these behaviors are sometimes used as ways to cope with life stressors. Perceived stress has also been shown to influence consumer behavior. According to a study of gambling and gaming during the COVID-19 pandemic, perceived stress intensified the association between spending money on gambling or within digital games and gambling or gaming problems (Savolainen et al., 2023).

Loneliness is a painful experience of perceived discrepancy between one's desired and actual levels of social connection (Perlman & Peplau, 1981). It is often divided into social and emotional loneliness; the former refers to a lack of social connections in general, while the latter pertains to a lack of meaningful and close relationships (Weiss, 1973). Loneliness has crucial clinical significance due to its association with many well-being deficits and even premature death (Park et al., 2020). As social animals, humans have a psychological need to belong (Baumeister & Leary, 1995; Ryan & Deci, 2017), and addiction is often associated with challenges in normal social interactions (Alexander, 2008; Heilig et al., 2016; Rachlin, 2000).

Several studies have investigated how loneliness is related to gambling and gaming. While the condition is a risk factor for gaming problems (Kochuchakkalackal et al., 2020), the available cross-sectional evidence provides mixed results on this relationship (Nordmyr & Forsman, 2020), suggesting that its causal associations are complex. The literature has shown that anxiety and loneliness are associated with problem-gambling behavior, particularly during youth (Savolainen et al., 2020) and at an older age (Parke et al., 2018). Loneliness can also lead to mental distress and thus more intense gambling problems (Vuorinen et al., 2021). One experimental study found that lonely individuals were more likely to show interest in gambling content in online settings (Sirola et al., 2019). Qualitative research also indicates that loneliness is a reason for gambling (Nordmyr & Forsman, 2020). However, there is a need for longitudinal evidence in this area.

Given the complexities among psychosocial variables, perceived stress and loneliness are likely to coexist. Chronic loneliness can increase stress responses (Cacioppo et al., 2015), and studies have shown that higher loneliness predicts exaggerated stress responses when dealing with acute stressors (Brown et al., 2018). Lonely people can also perceive social situations as stressful and threatening (Nowland et al., 2018), which may be due to underlying deficits in social skills (Segrin, 2019). Indeed, it has been hypothesized that stress tendency can be one underlying causal factor for feelings of loneliness (Campagne, 2019). Thus, stress and loneliness are likely to have a close reciprocal link.

This study investigated the impacts of stress and loneliness on problems associated with gambling and digital gaming. Its main hypotheses were the following: (1) Perceived loneliness increases gambling and gaming problems; (2) perceived stress increases gambling and gaming problems; and (3) gambling and gaming problems are further increased by the combination of stress and loneliness. Based on the available literature, it is to be expected that stress and loneliness intensify gambling and gaming problems, but the dynamic relationships in question have not been previously explored in longitudinal population-wide settings.

Methods

Participants

This study used data from the longitudinal six-wave *Gambling in the Digital Age* survey, which was collected in 6-month intervals between spring 2021 and autumn 2023. The initial data were collected in April 2021 from a panel of Finnish volunteers aged 18 to 75 years by Norstat Finland, a data-provider company, upon request by the research group. The response rate at the first collection point was 34.60% (N = 1,530; M_{age} = 46.7 years; 50.33% men). Each subsequent data collection point had some loss of participants (N_{T2} = 1,198; N_{T3} = 1,095; N_{T4} = 1,004; N_{T5} = 934; N_{T6} = 889; respectively); despite this, the overall data remained robust in its demographic representativeness,

Table 1. Descriptive statistics.

Variables	Range	*M* (SD), T1	*M* (SD), T2	*M* (SD), T3	*M* (SD), T4	*M* (SD), T5	*M* (SD), T6
PGSI	0–25	1.31 (3.33)	1.18 (3.15)	1.18 (3.18)	1.06 (2.93)	1.00 (2.80)	.89 (2.63)
IGDT	0–9	.15 (.69)	.12 (.61)	.08 (.49)	.09 (.59)	.08 (.45)	.10 (.58)
PSS	0–40	13.61 (7.04)	13.43 (6.95)	13.68 (6.87)	13.25 (6.81)	12.88 (6.96)	12.72 (6.72)
UCLA-LS	0–6	1.76 (1.77)	1.74 (1.70)	1.77 (1.71)	1.71 (1.71)	1.60 (1.67)	1.53 (1.67)
Age	18–75	46.67 (16.42)	48.87 (16.11)	49.72 (16.16)	50.73 (15.90)	51.91 (15.42)	53 (15.27)
		N_{T1} (%)	N_{T2} (%)	N_{T3} (%)	N_{T4} (%)	N_{T5} (%)	N_{T6} (%)
Male	0/1	770 (50.33)	608 (50.75)	548 (50.05)	506 (50.40)	472 (50.54)	447 (50.28)

both internally and compared to the Finnish adult population. In the end, 753 participants (49.22%) took part in all the survey waves. Each survey took approximately 15 minutes to complete.

Several important steps were made to ensure the ethical quality of the study based on the Declaration of Helsinki. First, the Academic Ethics Committee of the Tampere region approved the study before the start of data collection. Second, the participants were informed of the purpose of the research at the beginning of the survey and could withdraw from the study at any time without consequences. The completion of the full survey was taken as a consent for participation. Third, Norstat Finland provided only anonymized data to the research group. Fourth, the researchers conducted quality checks following a preestablished protocol to detect and remove participants with consistently or logically biased response patterns.

Measures

This study had two outcome variables. Gambling problems were measured with the Problem Gambling Severity Index (PGSI; Ferris & Wynne, 2001). The PGSI consists of nine items, which measure different kinds of gambling harms, as indicated in the DSM-V (American Psychiatric Association, 2013), using a 4-point scale from 0 (never) to 3 (almost always). All the items of the PGSI were combined to form a scale from 0 to 27. As most of the participants had no gambling problems, the resulting scale had a very low mean and was highly skewed to the right. The omega (ω) coefficients ranged from .94 to .95 at all time points, which indicates excellent internal reliability.

Gaming problems were measured with the Ten-Item Internet Gaming Disorder Test (IGDT-10; Király et al., 2017). Its 10 items measure various gaming harms from preoccupation to playing despite negative consequences, and they use a 3-point scale ranging from 0 (never) to 2 (often). Following the scoring guide developed by Király et al. (2017), all the items were coded in binary form, with only the answer 'often' giving 1 point and items 9 and 10 giving a maximum of 1 point. Thus, the total score ranged from 0 to 9. As was the case for the PGSI, most of the participants had no gaming problems, which resulted in a low mean and high right skewness. The ω coefficients ranged from .87 to .88, indicating high internal reliability.

Stress was measured with the Perceived Stress Scale (PSS; Cohen et al., 1983; Cohen & Williamson, 1988). The PSS is a 10-item scale that measures the experience of stress in the past month via questions such as 'How often have you felt that difficulties were piling up so high that you could not overcome them?' The answers were provided on a 5-point scale ranging from 0 (never) to 4 (very often). When the items were combined, the total score ranged from 0 to 40. The ω coefficients ranged from .88 to .89, which indicates good internal consistency across the time points.

Loneliness was measured with the 3-item UCLA Loneliness Scale (Hughes et al., 2004). This is a short version of a much wider loneliness questionnaire, and it uses a 3-point scale from 0 (hardly ever) to 2 (often). This short measure has been shown to efficiently capture different aspects of perceived loneliness in survey studies. The total scores ranged from 0 to 6. The ω coefficients ranged from .84 to .86.

In addition to the measures above, age and gender were included as background variables. Gender was transformed into a binary variable to compare men (1) to women and other genders (0). The descriptive statistics can be found in Table 1.

Statistical analyses

The analyses were conducted with the software Stata 18 (StataCorp). Instead of Cronbach's alpha, the more refined McDonald's ω (*omegacoef* command) was employed to measure the reliability of the scales (Hayes & Coutts, 2020).

For the main analyses, hybrid multilevel-regression models were run with the *xthybrid* command, which is based on generalized linear mixed modeling (Schunck & Perales, 2017). These kinds of hybrid models are helpful in analyzing both the within-person (changes within an individual) and between-person (average differences between individuals) effects of time-varying independent variables on time-varying dependent variables as they combine the advantages of both fixed- and random-effects models with

Table 2. Correlation matrix (T1).

Variables	1.	2.	3.	4.	5.	6.
1. PGSI	1					
2. IGDT	.47***	1				
3. PSS	.23***	.19***	1			
4. UCLA-LS	.18***	.18***	.62***	1		
5. Age	−.16***	−.15***	−.31***	−.22***	1	
6. Male	.07***	.05*	−.11***	−.08**	−.03	1

*$p < .05$. **$p < .01$. ***$p < .001$.

Table 3. Hybrid models of the effects of loneliness and stress on gambling problems and gaming problems. Only those who participated in all survey waves are included.

Variables	Gambling problems			Gaming problems		
	B	Robust *SE*	IRR	*B*	Robust *SE*	IRR
Within-person variables						
Loneliness	0.05	0.03	1.05	0.10***	0.03	1.10
Stress	0.02*	0.01	1.02	0.02**	0.01	1.02
Between-person variables						
Loneliness	0.04	0.08	1.04	0.15*	0.07	1.16
Stress	0.17***	0.02	1.18	0.09***	0.02	1.10
Age	−0.03***	0.01	0.97	−0.06***	0.01	0.95
Gender (M:1)	0.71***	0.17	2.04	0.44**	0.14	1.55
/lnalpha	−1.49	.29	.23	−1.35	.23	.26
Random part						
Variance (constant)	7.19	0.63	1322.71	3.50	0.28	33.19

*$p < .05$. **$p < .01$. ***$p < .001$.

more flexible estimation (Schunck, 2013; Schunck & Perales, 2017). The skewed distributions of the dependent variables were taken into account by choosing a negative binomial family with a log link and robust standard errors, which are commonly used in similar circumstances (Baggio et al., 2018). Only those participants ($n = 753$) who answered at all time points were included in the analyses. The model assumptions were checked by obtaining the VIF scores from the linear-regression models at different time points.

The *xtnbreg* command was used to create random-effects overdispersion models of the interaction between stress and loneliness. By doing so, the models could still consider skewed dependent-variable distributions while allowing the use of interaction terms, unlike hybrid models. To avoid potential issues, the loneliness and stress variables were standardized.

Results

The correlation matrix (Table 2) shows that almost all the variables were significantly correlated. Gambling and gaming problems had low-to-moderate correlations with the independent variables. The highest correlation was between stress and loneliness ($r = .62$), but age had also relatively high correlations with stress ($r = -.31$) and loneliness ($r = -.22$). Stress was more strongly correlated with gambling problems ($r = .23$) than gaming problems ($r = .19$), but loneliness had the same correlation with both ($r = 18$).

Table 3 shows the effects of loneliness and stress on gambling and gaming problems. The incidence-rate ratios (IRRs) indicate that every unit increase in perceived loneliness multiplied gaming problems by 1.10 at the within-person level and by 1.16 at the between-person level. In contrast, loneliness had no significant effect on gambling problems. Stress multiplied both gambling and gaming problems by 1.02 at the within-person level, but at the between-person level, it multiplied gambling problems by 1.18 and gaming problems by 1.10 per every unit increase.

Age and gender were included as background variables to control for their impacts. Both had statistically significant effects on the outcome variables. While every increase in age lowered gambling problems by a multiplier of .97 and gaming problems by a multiplier of .95, male gender increased the former by 2.04 and the latter by 1.55. Thus, male gender had the highest effect on both outcome variables, even though, as a binary variable, the effect was limited.

Table 4. Interactions between loneliness and stress, random effects.

	Gambling problems			Gaming problems		
Variables	*B*	Robust *SE*	IRR	*B*	Robust *SE*	IRR
Loneliness (standardized)	0.13**	0.05	1.14	0.24***	0.04	1.27
Stress (standardized)	0.23***	0.05	1.26	0.21***	0.04	1.24
Loneliness × stress	−0.06*	0.03	0.94	−0.06**	0.02	.94
Age	0.00	0.01	1.00	−0.04***	0.00	0.96
Gender (M:1)	0.77***	0.36	2.16	0.34**	0.12	1.40
Random part						
/ln_*r*	.53	0.12		0.96	0.11	
/ln_s	−1.72	0.08		−0.92	0.08	
r	1.70	.20		2.62	.29	
s	0.18	0.01		0.40	0.03	

*$p < .05$. **$p < .01$. ***$p < .001$.

Interaction models were run to verify the presence of interaction between the random effects of loneliness and stress. These models (Table 4) revealed significant interaction between the two variables regarding both gambling and gaming problems. For both models, the interaction term was negative, with a multiplier of .94. This means that the combined effect of loneliness and stress can be expected to be slightly lower than when the effects are analyzed separately. The standardized IRR multipliers for loneliness were 1.14 when gambling problems were the outcome variable and 1.27 when gaming problems were the outcome variable. Similarly, the standardized IRRs for stress were 1.26 concerning gambling problems and 1.24 concerning gaming problems. The background variables had fairly similar effects in these models as in the hybrid ones, with the exception of age, which lost its significance as a predictor of gambling problems.

Discussion

This study investigated how stress and loneliness impact gambling and gaming problems. The hypotheses were based on the assumption that stress and loneliness increase these problems separately and cumulatively. Hybrid multilevel-regression models were created to evaluate separate effects, while random-effects overdispersion models were run to check for the interaction between loneliness and stress. Based on the results, the first hypothesis was only partially supported, since perceived loneliness increased only gaming problems, significantly. Regarding the second hypothesis, perceived stress enhanced both gambling and gaming problems. Finally, contrary to the third hypothesis, the interaction models revealed that the combined effect of stress and loneliness was in fact lower than their separate effects.

Psychological suffering is at the core of addictions, and the associations between these two phenomena are usually quite complex and multifaceted. On its own, stress increased both gambling and gaming problems. The same was true of loneliness, but only as a predictor of gaming problems. These findings are in line with the literature, where stress has been associated with gambling and gaming problems (Maroney et al., 2019; Thomas et al., 2011). Loneliness has also been recognized as a risk factor for these problems, although with a more complicated causal relationship (Kochuchakkalackal et al., 2020; Nordmyr & Forsman, 2020; Vuorinen et al., 2021). Both of these factors are tied to individual life circumstances and might thus change when people's lives change. For instance, loneliness and problem gambling are particularly associated among the elderly (Parke et al., 2018). Older people playing slot machines is a common sight in Finland, and since the results of this study indicate that aging reduces problem gambling, focusing on their psychological and social well-being could help to reduce this behavior among those who appear to play excessively.

The negative interaction presented in this study can have multiple explanations. A practical one could be that people who are both stressed and lonely enough may simply not have the motivation to play. Based on the high correlation between stress and loneliness, another explanation could be that these two conditions coexist to the extent that they are partly the same phenomenon. This would also be in line with the literature that links stress with loneliness (Cacioppo et al., 2015; Campagne, 2019; Nowland et al., 2018). It is also possible that there is a confounding factor that was not included in the present study. For example, stress has been found to be indirectly associated with gambling and gaming problems and loneliness with gaming problems through different coping mechanisms (Maroney et al., 2019; Melodia et al., 2022; Thomas et al., 2011).

Limitations

Some potential limitations of our study should be considered. Although the survey data matched the population

demographics well, the response rate for the first survey was only 34.6%, which means that the study could have attracted people who were interested in gambling as a topic. Despite this, the number of those who reported having experienced gambling or gaming problems was only slightly higher than the official national estimates found in Salonen et al. (2020). Furthermore, as the survey was based on self-reports, the answers might have varied depending on people's interpretations, the underreporting of socially undesirable behaviors (e.g. gambling), and the reliance on memory when answering.

Implications and future research

People have many reasons to play games or gamble, and problems related to these activities are tied to a complex array of factors. This longitudinal study approached gambling and gaming addictions based on the assumption that the wider psychosocial issues of perceived stress and loneliness could increase such addictions. The results suggest that these issues contribute to increasing gambling and gaming problems over time, although some differences exist in their impacts and people who experience both loneliness and stress might not have the energy to play or gamble at the population level. Clinical samples could be utilized in future studies to investigate the interaction of these factors among people who have experienced gambling or gaming addiction. Nevertheless, it would be beneficial for society to target the factors that cause stress and loneliness as a preventive measure to reduce these forms of addiction.

Conclusions

In this study, stress and loneliness were hypothesized to increase gambling and gaming problems both separately and in conjunction. While they did mostly increase these problems, loneliness enhanced only gaming addiction, and the interaction effect of stress and loneliness was lower than their separate effects. This study contributes to our understanding of how these factors influence problem gambling and gaming by investigating their interaction at the population level and revealing slight differences in how they affect gambling and gaming addictions. Although gambling and digital-gaming behaviors are considered problematic when performed in excess, it is necessary to look for wider psychosocial factors that might aggravate this situation and ensure that people feel well in their everyday lives.

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