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Published online: 24 Jul 2023.

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Perceived stress moderates spending money on digital games and gambling: a nationwide study of Finnish adults

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ABSTRACT

People face numerous stressors in their life. Some engage in buying behavior as a way of relieving or coping with stress. Gambling and digital gaming are examples of popular past time activities that can distract from stressors and involve spending money. This survey study investigated the role of perceived stress in the relationship between in-game buying behavior and gaming problems, and the relationship between spending money on gambling and gambling problems. We base our study on prior literature on stress during the COVID-19 pandemic and the escape theory applied to buying behavior as a coping strategy. Participants were Finnish adults ($N = 1530$; $M = 46.67$; 50.33% male). Stress was measured with the Perceived Stress Scale (PSS). Spending money on gambling and gaming and in-game buying behavior were asked using single items. The Problem Gambling Severity Index (PGSI) assessed gambling problems and the Internet Gaming Disorder Test (IGDT-10) measured gaming problems. Analyses utilized robust regression estimation. According to the results, perceived stress significantly moderated the association between in-game buying behavior and gaming problems and the relationship between spending money on gambling and gambling problems. Undergoing stress may influence spending on gaming and gambling activities and amplify gaming and gambling problems.

Introduction

Research has shown that people sometimes respond to stressful or life changing situations by altering their consumption habits (Durante & Laran, 2016; Somer & Ruvio, 2014). This study investigates the role of perceived stress in gambling and digital gaming expenditure. Specifically, it analyzes if experiencing stress is related to gambling and gaming problems by interacting with spending on gambling and in-game buying behavior.

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When faced with a stressful situation that is difficult to cope with, acquiring and consuming products can become an attempt to gain control or alleviate adverse emotions (Hama, 2001; Kennett-Hensel et al., 2012; Moschis, 2007; Müller et al., 2012). Shopping, gambling, and playing video games are popular consumer activities that people engage in as a way of relieving or coping with stress (Buchanan et al., 2020; Calleja, 2010; Cheah et al., 2022; Jouhki et al., 2022; Melodia et al., 2020). Stress can be acute (short-term) or chronic (long-term) and both types have been shown to impair cognition and decision making (Lenow et al., 2017; Sandi, 2013; Wemm & Wulfert, 2017). Acute stress has been further linked to a higher likelihood of taking risks, including those related to financial decisions (Porcelli & Delgado, 2009).

Engaging in activities that help people forget about the stressors of everyday life and feel at ease, or *escapism*, is considered a maladaptive coping mechanism characterized by disengagement and its effects are typically temporary (Cohen & Taylor, 2003; Grunberg et al., 1999; Hagström & Kaldo, 2014; Kardefelt-Winther, 2014). In research literature, escapist coping is often associated with addictive behaviors like alcohol and drug use, smoking, media consumption, as well as gambling and digital gaming (Henning & Vorderer, 2001; Jouhki & Oksanen, 2022; Maroney et al., 2019; Reid et al., 2011; Richman et al., 2009; Stenseng et al., 2021). However, other consumption behaviors like shopping and buying have been also identified as coping strategies for stress in multiple contexts. Stressors such as having a dull life or failing at a school or work task have been associated with diversion buying (Hama, 2001). One study found that when attempting to cope with heightened levels of academic stress, adolescents increasingly turned to compulsive buying (Roberts & Roberts, 2012). Traumatic stress experience has also been connected to shopping escapism (Kennett-Hensel et al., 2012; Somer & Ruvio, 2014).

Stress and escapist buying behaviors have been examined especially from the perspectives of avoidance coping and terror management theory which pose that under a stressful or even life-threatening situations, people alter their consumer behavior and decision making. Buying behavior becomes a way of distracting oneself and reducing stress, while attempting to induce feelings of wellbeing (Hama, 2001; Müller et al., 2012). To that effect, Somer and Ruvio (2014) examined civilians from two communities representing high-stress and low-stress environments. They found that among those individuals living in a high-stress environment, posttraumatic distress had a stronger significant association with shopping escapism. The authors suggest that shopping escapism was likely seen as a way of gaining resources and distracting one's mind from the bleak environment (Somer & Ruvio, 2014). Another study found that being exposed to death-related stimuli that reminded individuals of their own mortality induced spending and the number of purchases made (Mandel & Smeesters, 2008).

Ultimately, stress influences the way we perceive our environment. This can lead to biased judgments about the resources and options that are available and cause over-exploitation of the available options (Lenow et al., 2017). Recent studies have shown that anxiety and stress were predictors of increased panic buying and impulsive buying in the beginning of the COVID-19 pandemic in early 2020 (Çelik & Köse, 2021; Im et al., 2022; Lins et al., 2021). On a global scale, the COVID-19 pandemic has presented a major stressor that rapidly and significantly altered the lives of people (Kowal et al., 2020;

Pfefferbaum & North, 2020). In Finland, which is the focus country of this study, the pandemic remained largely under control during its first year (Moisio, 2020; Oksanen et al., 2020). The second year of the pandemic, however, starting in early 2021, was characterized by a rise of different variants of the virus and there was a significant increase in infections in the country (Kant et al., 2021). As a result, new restrictions were implemented and the worsening crisis situation diminished Finnish people's hopefulness and increased perceived stress (Kestilä et al., 2021).

Large scale global events like the COVID-19 pandemic burden peoples' wellbeing and add major external stressors into their lives (Oksanen et al., 2022). At the same time, opportunities to game and gamble are ubiquitous. Therefore, the role of stress in gaming and gambling consumer behavior requires continued attention. The aim of this study is to model for two adjacent phenomena and investigate the moderating role of perceived stress in 1) the relationship between in-game buying behavior and gaming problems and 2) the relationship between spending money on gambling and problem gambling. Specifically, we are interested in examining if stress is associated with increased in-game buying behavior and spending on gambling during a societally stressful time. Whereas previous research has established a connection between stress and gambling behavior, and between stress and online gaming, fewer studies have focused on examining the role of stress in expenditure on these activities, especially in a highly stressful societal context.

Stress, digital gaming, and in-game buying behavior

Playing digital games is a widely popular activity and there has been a shift in considering digital gaming merely as a past-time activity of teenagers (Griffiths et al., 2003; Sublette & Mullan, 2012). People play video games for multiple reasons, including enjoyment, entertainment, socializing, fantasy, and escaping reality (Boyle et al., 2012; Melodia et al., 2020). One significant motivation for digital gaming is stress-reduction as gaming can be relaxing and offer a diversion from the stressor (Dong & Potenza, 2014; Young & De Abreu, 2010). Multiple studies have found that perceived stress is related to disordered gaming. For instance, Canale et al. (2019) found that perceived stress was positively associated with higher internet gaming disorder (IGD) scores among Italian adults. Another study (Che et al., 2017) concluded that perceived stress was related to online gaming addiction among adolescents. A recent systematic literature review further indicated that perceived stress is a prevalent factor of online gaming addiction among children and young adults (Rosendo-Rios et al., 2022).

Studies on in-game buying behavior so far have found that purchasing virtual goods inside games is associated with factors like image management, social motives, and satisfaction of using such goods in the game (Hamari & Keronen, 2016; Hamari et al., 2017). Much of the research on spending money withing digital games, however, is focused on purchasing loot boxes and has identified different factors predicting increased buying behavior. One study found that loot box spending was related to higher gambling symptomology and those who spent more money on loot boxes experienced greater negative mood and distress (Drummond et al., 2020). Hall et al. (2021) compared isolated gamers to non-isolated gamers during the COVID-19 pandemic quarantine and found that isolated gamers had a higher association between loot box spending and excessive

gaming symptomology. Psychological distress and fear of contamination were also weakly associated with loot box spending (Hall et al., 2021).

Digital gaming is characterized by social elements as many games found online can be played together with other gamers (Griffiths et al., 2011). By investigating players of the battle and survival game *Fortnite*, King et al. (2020) found that spending money on microtransactions (e.g. purchasing virtual items and goods, such as opening loot boxes) was socially influenced and associated with how often the players' closest friends spent money on the game, in addition to having greater accessibility to the game through multiple devices and playing on a higher level in the game (King et al., 2020). Many digital gaming platforms and forums also include their own online communities and involvement in such online communities has been shown to influence gamers' spending habits (Sirola et al., 2021). Kaptein et al. (2015) suggest there is an aggregate-level positive relationship between online community activity and buying and spending on a service relevant to that online community. Increased spending on virtual goods, such as loot boxes, during online gaming has been associated with greater negative outcomes, including distress and gambling problems (Drummond et al., 2020; Spicer et al., 2022; Zendle et al., 2020).

Stress, gambling, and spending money on gambling activities

Gambling is a common and popular activity providing excitement and entertainment to individuals. The opportunity to win money after placing an initial bet or purchasing a scratch ticket or lottery is appealing to many individuals, most of whom engage in such activities without experiencing gambling-related harms (Hayer & Griffiths, 2015). In excessive forms, however, gambling can become problematic and have extensive negative consequences such as damaging one's wellbeing, bringing economic hardship, and loss of important relationships (Castrén et al., 2018; Tulloch et al., 2022).

Gambling initiation can be motivated by having fun or with the hope of winning money, but research has indicated that experiencing stress is a significant factor contributing to gambling engagement (Buchanan et al., 2020). Different forms of stress, such as childhood trauma or everyday life stressors have been found to contribute to problem or pathological gambling (Buchanan et al., 2020; Elman et al., 2010). A study by King et al. (2016) found that those young social casino users who reported higher psychological distress were more likely to pay for the use of the casino service and spend money on its activities. They were also more likely problem gamblers. Gambling may be practiced as a way to cope with stress or to escape it altogether, as engaging in gambling may help forget the stressor or deal with a negative emotional state (Flack & Stevens, 2019; MacLaren et al., 2015).

Gambling as a stress-reliever, however, is counterproductive as research has identified that gambling itself can become a stressor to some (Buchanan et al., 2020). It is conceivable that when individuals begin to experience stress over their gambling, they are more likely to spend increasing amounts of money while engaged in the game. Indeed, spending money on gambling is highly disproportionate, pathological gamblers spending more money on gambling activities than non-problem gamblers (Fiedler et al., 2019). Also, individuals gambling at a risk-level

have been found to be less likely to adhere to monetary limit-setting prior to gambling (Nower & Blaszczynski, 2010).

During the COVID-19 pandemic most onsite gambling venues were closed in Finland and Sweden, while online gambling continued to offer means to partake in the activity, causing concerns that harms caused by online gambling would increase (Håkansson, 2020, Marionneau & Jarvinen-Tassopoulos, 2022). However, the influence of the COVID-19 pandemic on gambling is inconclusive. On the one hand, gambling maintenance and problem gambling have decreased during the pandemic, likely due to the shift in gambling behavior from offline to online because of quarantine (Shaw et al., 2022; Turner et al., 2022). But on the other hand, problem gambling has increased (Brodeur et al., 2021; Sachdeva et al., 2022). More research is needed to build a more comprehensive understanding of the pandemic's impact on gambling and related behavioral reactions (Brodeur et al., 2021).

The current study

The COVID-19 pandemic has been a prominent stressor to people, especially in its first years, causing not only health-related concerns but financial ones as well (Hertz-Palmor et al., 2021). Stress has been shown to influence cognitive processes and it has been related to overexploitation of available resources (Lenow et al., 2017). Digital gaming and gambling are both characterized by the ability -or need to spend money, and undergoing stress could potentially lower the threshold of how much money people are willing to spend on these activities. Spending money on gambling and gaming activities may be justified through biased appraisal due to stress; for instance, feeling that placing more frequent or higher bets is defensible because there is an urgency to deplete all options in the current moment or feeling that a purchase is earned as a reward due to a trying day.

Although gambling and gaming in excessive forms can cause stress, in this study, we are interested in examining how stress together with in-game buying behavior and spending on gambling relates to gaming problems and gambling problems. Our main research question is: do individuals undergoing stress exhibit higher in-game buying behavior and spending on gambling and experience more gaming and gambling problems? This research design is supported by research literature addressing stress and consumption and coping during the unique time of the COVID-19 pandemic (Hall et al., 2021; Zulauf & Wagner, 2022). Based on the covered literature. we set to test the following hypotheses:

H1: Perceived stress is associated with gaming problems among adults.

H2: In-game buying behavior is associated with gaming problems among adults.

H3: Perceived stress is associated with gambling problems among adults.

H4: Increased spending on gambling is associated with gambling problems among adults.

H5: Perceived stress moderates the association between in-game buying behavior and gaming problems. We expect that gaming problems become more intense among highly stressed participants when in-game buying increases.

H6: Perceived stress moderates the association between spending on gambling and gambling problems. We expect that gambling problems become more intense among highly stressed participants when spending on gambling increases.

Methods

Participants and procedure

A survey investigating gambling and digital gaming habits and consequences was targeted to Finnish speaking adults in mainland Finland. Participants ($N = 1,530$) of the study were between ages 18 and 75 ($M = 46.67$, $SD = 16.42$, 50.33% male, 49.41% female, and .26% other gender). The majority (35.29%) entered the study from the greater Helsinki-Uusimaa region, 24.84% of participants were from Western Finland, 21.50% from Southern Finland, and 18.37% from Northern and Eastern Finland.

We compared the sample characteristics to the Finnish population by using population census figures provided by Statistics Finland (https://www.stat.fi/tup/index_en.html). Based on this comparison, the sample was nearly identical to the Finnish population in terms of the gender distribution of 18- to 75-year-olds (50.33% vs. 50.20% male, respectively) and the sample also mirrored the Finnish population according to age distribution of the 18- to 75 age group (mean age 46.67 vs. 46.89). Our sample included a slightly higher percentage of participants from the Helsinki-Uusimaa region than is represented by the census distribution (35.29% vs. 30.94%) and a smaller percentage of participants were from Northern and Eastern Finland (18.37% vs. 23.16%). Median income of the sample was between 2000 and 2999 euros a month, reflecting the median income of 2899 euros of the overall population.

Prior to the data collection in April 2021, the project's data quality protocol was stored on the Open Science Framework website. Data quality checks were conducted. These included attention checks and checks for rapid responses, patterned responses, and nonsensical responses (Curran, 2016). Additionally, open-ended comments left by participants were inspected to further evaluate potentially biased motives in participation.

Participants were recruited from an online participant panel administered by a data provider company, Norstat. Norstat's panels are high in quality and consist of volunteer participants. Norstat manages and assesses the quality of its panels regularly by comparing members' profiles to the official statistics. Potential gaps in demographics are filled up by targeting and recruiting matching people from the general population. Panel members are compensated by Norstat coins that can be turned into gift cards or participants can choose to donate their coins to charity.

The aim of the study was to investigate gambling and gaming habits of Finnish people, while taking into consideration the prevailing societal context, namely, the COVID-19 pandemic. Thus, criteria for participation were 1) being between the ages of 18 and 75 and 2) living in mainland Finland. Our aim was to gain a sample that mirrors the Finnish general population as closely as possible. Consequently, we did not target problem gamblers and gamers specifically. It should be noted, however, that especially gambling participation is very prevalent in Finland; 78% of national study participants having gambled in the past 12 months, as reported by the Finnish Institute for Health and Welfare (Salonen et al., 2020). Norstat contacted the panel members by sending them invitations to the study via e-mail. Based on our research aims, we estimated that a sample of at least 1,500 respondents would be needed. Response rate of the survey was 34.60%. A total of 1,533 adults volunteered to participate in the study and completed the survey online during April 2021. After data-quality inspections the final sample consisted of 1,530 participants.

The study procedures were carried out in accordance with the Declaration of Helsinki. The Academic Ethics Committee of the Tampere region reviewed the study protocol prior to implementation and concluded that the study did not involve any ethical concerns (24/2021). Participation was wholly voluntary, and participants were informed they could withdraw from the study at any time without consequences. Informed consent was provided before entering the survey online and by completing the survey, participants gave their consent to participate.

Measures

Gaming problems were measured with the Ten Item Internet Gaming Disorder Test (IGDT-10; Király et al., 2017). The test is a short instrument designed to screen for Internet gaming disorder as described in the fifth edition of *the Diagnostic and Statistical Manual of Mental Disorders* (DSM–5; American Psychiatric Association & American Psychiatric Association, 2013). The test consists of ten items measuring a range of gaming behaviors and negative outcomes of excessive gaming. We inquired about gaming problems with a six-month recall period (e.g. 'When you were not playing, how often have you fantasized about gaming, thought of previous gaming sessions, and/or anticipated the next game?'). Answers are provided on a scale from 0 to 2 (*never*, s*ometimes*, o*ften*) and higher points earned indicate a higher likelihood of having gaming problems. The measure has shown good psychometric properties across studies and languages (Király et al., 2019; Männikkö et al., 2019) and had good internal consistency in the current sample using McDonald's omega coefficient (Hayes & Coutts, 2020; ω = .89). The IGDT was used as a continuous variable in the analyses.

Gambling problems were assessed using the Problem Gambling Severity Index (PGSI; Currie et al., 2010; Ferris & Wynne, 2001). The PGSI consists of nine items which assess different features of problematic gambling and harms caused by gambling. The original measure inquires about gambling behaviors and harms experienced in the last 12 months. Similar to the IGDT, we measured gambling and its consequences experienced in the last six months (e.g. 'Thinking about the last six months, have you bet more than you could really afford to lose?'). The four response choices were 0 (*never*), 1 (*sometimes*), 2 (*most of the time*), and 3 (*almost always*). Higher points indicate a higher likelihood of

experiencing gambling problems. The scale had excellent internal consistency in the sample (ω = .95), and it was analyzed as a continuous variable.

Perceived stress was measured using the Perceived Stress Scale (PSS; Cohen, 1988; Cohen et al., 1983). The PSS is widely used and has shown good psychometric properties in various studies and settings (Järvelä-Reijonen et al., 2016; Lee, 2012; Taylor, 2015). The scale consists of 10 items measuring to what extent individuals appraise the situations in their lives as stressful (e.g. 'In the last month, how often have you been upset because of something that happened unexpectedly?'). Answers are provided on a scale from 0 (*never*) to 4 (*very often*). Higher points on a total scale from 0 to 40 indicate higher stress. The scale had good internal consistency in the sample (ω = .89) and was treated as a continuous measure in the analyses.

In-game buying behavior was assessed with a multiple response item asking if the respondent had spent money within digital games. Consistent with the IGDT, we measured engagement in buying behavior within games during the past six months. Response choices included, for example, buying virtual objects, virtual currency, and loot boxes. Each item was transformed into a 0/1 scale, where every time an answer option was chosen, a point was earned. This led to a total scale ranging from 0 to 7, higher score indicating a higher incidence of in-game buying behavior. The measure was treated as a continuous variable in the analyses to better capture different levels of buying behavior.

Spending money on gambling and *gaming* were both measured with single items. The first item asked the participants how much money, on average, they had spent on gambling during the past 30 days. Expenditure on gambling and gaming was limited to the past month given the fact that retrospective estimates of spending covering long periods of time can be more unreliable (Wood & Williams, 2007). A total of nine answer options were provided: 0 euros (0), 1–24 euros (1), 25–49 euros (2), 50–99 euros (3), 100–199 euros (4), 200–299 euros (5), 300–499 euros (6), 500–999 euros (7), 1000 euros or more (8). We also asked the participants how much money, on average, they believe they had spent on digital games. The same anchor and answer choices were used, replacing *gambling* with *digital games*.

Gambling type and frequency were assessed with the question 'How often have you engaged in or practiced the following in the last 6 months?' Choose all that apply selection included a range of gambling practices, including electronic gambling machines, online casinos, online poker, lottery, and scratch tickets. Frequency of use was indicated by selecting from the following options: 0 (*never*), 1 (*less than once a month*), 2 (*monthly*), 3 (*weekly*), 4 (*once a day*), 5 (*several times a day*).

Gaming type and frequency were similarly assessed by asking the participants 'What types of digital games have you played during the past 6 months?'. All that apply selection included game types such as action and adventure games, shooter games, driving games, and strategy games. Frequency of use was indicated with the same answer choices as given for gambling (0 [*never*], 1 [*less than once a month*], 2 [*monthly*], 3 [*weekly*], 4 [*once a day*], 5 [*several times a day*]).

Compulsive internet use was included in the models as a control variable to account for the effect of heavy internet use in the analyses. It was assessed using the 14-item Compulsive Internet Use scale (CIUS; Meerkerk et al., 2009). The 14 items of the scale measure elements related to compulsive or addictive behavior applicable to internet use. These include, for instance, loss of control, preoccupation, and withdrawal symptoms

(Meerkerk et al., 2009). The scale is rated on a 5-point scale ranging from 0 (*never*) to 4 (*very often*) where higher points indicate more compulsive internet use. The scale showed excellent internal consistency (ω = .94).

Additional control variables were income (measured as gross monthly income), age, and gender. Gender choices were male, female, and other. Given the low percentage of respondents reporting 'other' gender, we created a dummy variable by combining the female and other gender group together, resulting in a categorical variable where 0 = *female* and 1 = *male*.

Statistical analyses

All analyses were run using Stata 17 statistical software (Stata Corp.). Descriptive statistics and inter-item correlations were calculated these are reported inTables 1 and 2. Due to skewed distributions of the outcome variables and heteroscedastic residuals detected when checking for all assumptions of ordinary least ordinary least squares regression, we utilized robust regression analysis via m estimation as our multivariate method. This approach accounts for skewness of the distribution and provides more reliable estimation and 'inference across a broad spectrum of error distributions' (Yang et al., 2019, p. 10).

For the analyses, we z-standardized the independent variables so that they had a mean of 0 and a standard deviation of 1. This produces coefficients that are easier to interpret and compare. We then ran two separate robust models for both dependent variables. The first model (Model 1) estimated the direct associations between gaming problems (the dependent variable) and stress, spending money on gaming, and in-game buying behavior (the independent variables). A corresponding Model 1 estimated the direct associations between gambling problems (the dependent variable), stress, and spending money on gambling. Age, gender, income, and compulsive internet use were included in the models as controls.

To examine whether perceived stress moderates the association between in-game buying behavior and gaming problems, and spending money on gambling and gambling problems, interaction terms were added in the models. First, an interaction term between stress and in-game buying behavior was included in the second model predicting gaming problems (Table 3). Next, an interaction term between stress and spending was included in the second model predicting gambling problems (Table 4). In the tables, we report robust regression coefficients (*B*), standard errors (*SE*), *p*-values for statistical significance, and 95% confidence intervals. Robustness checks involved running the models without those who did not gamble at all. As the results did not change, these are not reported in the results.

Following the interaction models, we used the marginsplot -command (Royston, 2013) to plot the interaction analyses and portray them in a visual and easily interpretable manner. The produced graphs (Figures 1 and 2) show the predicted values of IGDT and PGSI under different conditions of stress. We assigned three recoded conditions to the moderator according to standard deviation; the lowest category ('Low stress') included those respondents whose score was not more than a standard deviation below the average. The middle category ('Moderate stress') was defined based on the mean of the standardized stress score and the highest category ('High stress') involved those respondents whose value was a standard deviation above the mean.

Table 1. Descriptive statistics of the study variables.

Continuous study variables	M	SD	Range
Stress	18.63	3.70	0–34
In-game buying behavior	0.25	0.75	0–7
Spending on gaming	0.39	0.89	0–7
Spending on gambling	1.33	1.48	0–8
Gambling problems (PGSI)	1.31	3.33	0–25
Gaming problems (IGDT)	1.34	2.64	0–20
CIUS	8.79	9.70	0–52
Age	46.67	16.42	18–75
Categorical information of variables	n	%	
Gender			
Male	770	50.33	
Female	750	49.41	
Other	4	0.26	
Problem gambling	93	6.08	
Gaming disorder	9	<1	
In-game buying categories			
Speeding up the game	41	10.90	
Virtual objects	62	16.49	
New levels	52	13.83	
Characters	46	12.23	
Loot boxes or similar	48	12.77	
Virtual currency	77	20.48	
Other	50	13.30	
Spending on gambling			
1–99 e/month	899	90.85	
100–199 e/month	81	5.29	
200–299 e/month	23	1.50	
300–499 e/month	15	0.98	
500–999 e/month	10	0.65	
1000 e or more/month	11	0.72	
Spending on gaming			
1–99 e/month	280	98.56	
100–199 e/month	11	0.72	
200–299 e/month	5	0.33	
300–499 e/month	-	-	
500–999 e/month	1	0.07	
1000 e or more/month	5	0.33	
Income			
<1000 e	250	16.34	
1000–1999 e	340	22.22	
2000–2999 e	412	26.93	
3000–3999 e	279	18.24	
4000–4999 e	119	7.78	
5000–5999 e	70	4.58	
6000–6999 e	24	1.57	
≥7000 e	36	2.35	

Note. Problem gambling is based on PGSI score of 8 or higher (Currie et al., 2013); Gaming disorder is based on IGDT score of 5 or higher on a risk-point scale ranging from 0 to 9 (Király et al., 2017).

Results

Descriptive statistics and correlations of the study variables are presented in Table 1 and Table 2. Playing the lottery and raffle games were the most popular forms of gambling in the sample with 33% of participants having engaged in those activities weekly. Weekly gambling on online platforms was also common (22%) as well as weekly sports betting (10%). Mean problem gambling (PGSI) score in the sample was 1.31 ($SD = 3.33$).

Table 2. Inter-item correlations.

	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. PGSI	-								
2. IGDT	0. 53***	-							
3. Stress	0.11***	0.16***	-						
4. Spending on gaming	0.38***	0.49***	0.11 ***	-					
5. In-game buying behavior	0.20***	0.42***	0.06*	0.42***	-				
6. Spending on gambling	0.57***	0.23	0.02	0.27***	0.07**	-			
7. CIUS	0.34***	0.53***	0.24***	0.32***	0.25***	0.07**	-		
8. Income	−0.01	−0.12***	−0.05	0.03	−0.07**	0.16***	−0.16***	-	
9. Age	−0.16***	−0.32***	−0.11***	−0.22***	−0.25	0.07**	−0.46***	0.21***	-
10. Gender	0.11***	0.13***	−0.10***	0.09***	0.10***	0.21***	−0.06	0.21***	−0.03

Note. *p < .05; **p < .01; ***p < .001.PGSI = Problem Gambling Severity Index; IGDT = Internet Gaming Disorder Test. CIUS = Compulsive Internet Use Scale.

Table 3. Robust regression models estimating gaming problems, $N = 1530$.

	B	SE	p	95% CI
Model 1				
In-game buying behavior	0.55	0.12	<.001	0.40, 1.10
Spending on gaming	0.74	0.18	<.001	0.32, 0.78
Perceived stress	0.01	0.02	.579	−0.03, 0.06
CIUS	0.52	0.09	<.001	0.35, 0.70
Income	−0.06	0.01	<.001	−0.08, −0.03
Male	0.30	0.05	<.001	0.20, 0.38
Age	−0.00	0.00	.029	−0.01, 0.00
Model 2				
In-game buying behavior	0.56	0.09	<.001	0.39, 0.73
Spending on gaming	0.77	0.16	<.001	0.45, 1.08
Perceived stress	0.03	0.02	.229	−0.02, 0.07
In-game buying behavior *Stress	0.09	0.02	<.001	0.04, 0.14
CIUS	0.49	0.09	<.001	0.32, 0.66
Income	−0.05	0.01	<.001	−0.08, −0.03
Male	0.25	0.04	<.001	0.17, 0.33
Age	−0.00	0.00	.022	−0.01, 0.00

Note. CIUS = Compulsive Internet Use Scale.

Table 4. Robust regression models estimating gambling problems (PGSI), $N = 1530$.

	B	SE	p	95% CI
Model 1				
Perceived stress	0.03	0.02	.219	−0.01, 0.65
Spending on gambling	0.79	0.09	<.001	0.62, 0.96
Income	−0.06	0.01	<.001	−0.09, −0.03
CIUS	0.29	0.04	<.001	0.20, 0.37
Male	0.06	.040	.126	−0.02, 0.14
Age	−0.01	0.00	<.001	−0.01, −0.00
Model 2				
Perceived stress	0.13	0.05	.005	0.04, 0.22
Spending on gambling	0.87	0.11	<.001	0.65, 1.10
Spending on gambling*Stress	0.30	0.09	.001	0.12, 0.48
Income	−0.07	0.02	<.001	−0.10, −0.04
CIUS	0.30	0.05	<.001	0.21, 0.40
Male	0.05	0.04	.227	−0.03, 0.13
Age	−0.01	0.00	.001	−0.01, −0.00

Note. CIUS = Compulsive Internet Use Scale.

Problem solving games were the most actively played digital games, 8% having played such games weekly. Action and adventure games were also popular, 7% of participants having played them weekly. Battle and shooter games, as well as strategy and simulation games were played weekly by 5% of participants. Mean IGDT-10 score was 1.34 ($SD =$ 2.64). Mean perceived stress (PSS) score was 18.63 ($SD = 3.70$). Altogether, most participants (98.56%) had spent between 0 to 99 euros on digital gaming and between 0 to 299 euros on gambling (97.65%) in the past 30 days. Nine percent of participants reported in-game purchases as a way of paying for digital gaming. Most popular categories of in-game purchases were virtual currency (20.48%), virtual objects (16.49%), and buying new levels for games (13.83%).

According to our Model 1 analysis, perceived stress was not directly associated with gaming problems ($b = 0.01$; $p = .579$). Higher amount of money spent on digital gaming and in-game buying behavior were related to increased gaming problems ($b = 0.74$; $p < .001$ and $b = 0.55$; $p < .001$, respectively). Compulsive internet use was a significant predictor of gaming problems ($b = 0.52$; $p < .001$). Smaller income ($b = -.06$; $p < .001$) and male gender were associated with a higher likelihood of having gaming problems ($b = 0.30$; $p < .001$). Model 1 predicting gambling problems showed that perceived stress was also not a significant direct predictor ($b = 0.02$; $p = .219$). Higher amount of money spent on gambling was significantly associated with gambling problems ($b = 0.79$; $p < .001$), as well as compulsive internet use ($b = 0.29$; $p < .001$), lower income ($b = -0.06$; $p < .001$) and younger age ($b = -0.01$; $p < .001$) (See Tables 3 and 4).

Our interaction analyses (Models 2) revealed a significant moderation by perceived stress in the relationship between in-game buying behavior and gaming problems ($b = 0.09$; $p < .001$) and in the relationship between spending money on gambling and gambling problems ($b = 0.30$; $p = .001$). The plot demonstrates that the relationships between in-game buying behavior and gaming problems, and between spending on gambling and gambling problems are consistently positive, but increasingly so when perceived stress is higher.
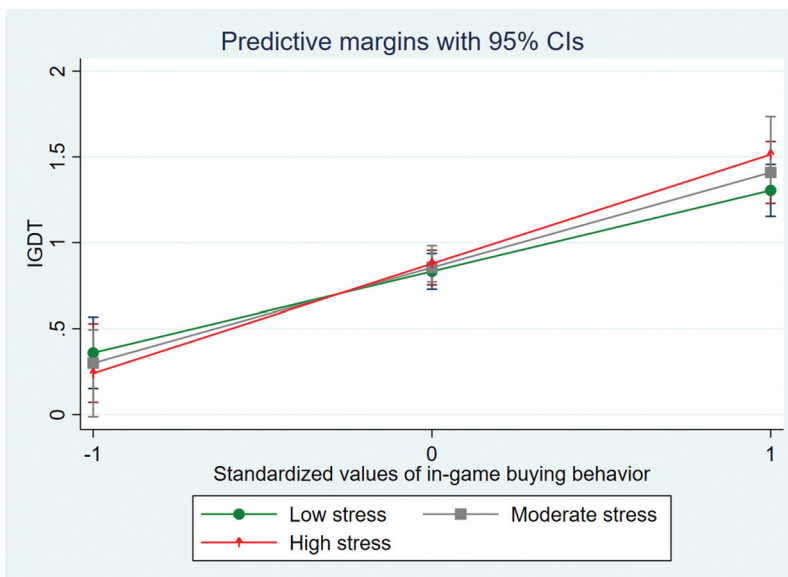

Figure 1. Adjusted predictions depicting the interaction between perceived stress and in-game buying behavior). Note. IGDT = Internet Gaming Disorder Test.
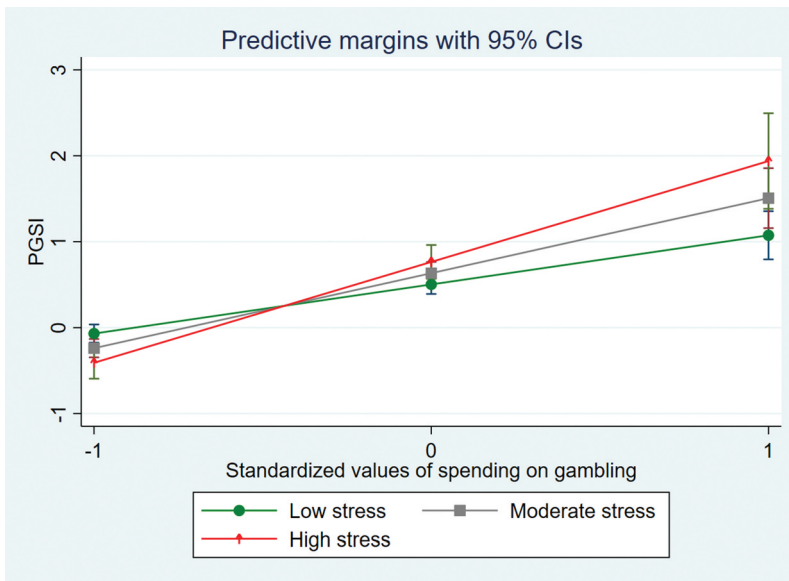
Figure 2. Adjusted predictions depicting the interaction between perceived stress and spending money on gambling. Note. PGSI = Problem Gambling Severity Index.

Discussion

This study investigated the role of perceived stress in the relationship between in-game buying behavior and gaming problems, and the relationship between spending money on gambling and gambling problems. The analyses are based on a national sample of adults and our theoretical framework relies on buying behavior as a coping strategy for perceived stress (Darrat et al., 2016; Somer & Ruvio, 2014). Results showed that more frequent in-game buying behavior and spending higher amounts of money on gambling were associated with gaming problems and gambling problems, respectively. Perceived stress was not found to be directly related to either gaming or gambling problems, but we did find a significant interaction effect between perceived stress and in-game buying behavior, and between perceived stress and gambling expenditure. Accordingly, the association between in-game buying behavior and gaming problems strengthened as perceived stress was higher. Similarly, higher perceived stress intensified the association between spending money on gambling and gambling problems.

The results support our second (H2) and fourth (H4) hypotheses regarding buying and spending and are in-line with past research indicating that those individuals engaging in more frequent in-game buying behavior or spending higher amounts of money on gambling activities experience more negative outcomes and problems related to gaming or gambling (Drummond et al., 2020; King et al., 2016).

According to our results and contrary to our hypotheses (H1, H3), perceived stress was not directly related to either gaming problems or gambling problems. These findings also deviate from prior research that has systematically shown higher perceived stress to be associated with disordered gaming and problem gambling (Buchanan et al., 2020;

Elman et al., 2010; MacLaren et al., 2015). In our study, however, perceived stress was found to interact with in-game buying behavior and gambling expenditure, subsequently strengthening the relationship between in-game buying behavior and gaming problems, and the relationship between gambling expenditure and gambling problems. These results confirm our fifth (H5) and sixth (H6) hypothesis.

Altogether, and considering the uncertain societal conditions presented by the pandemic during measurement, the results of this study suggest that undergoing stress might not have led to increased gaming and gambling problems per se. This would be in line with some previous findings showing that problem gambling has not increased during the COVID-19 pandemic (Shaw et al., 2022; Turner et al., 2022). Instead, higher perceived stress might have influenced individuals' cognitive processes regarding available resources and impacted consumer behavior where using money was a coping strategy, and thus hindered one's threshold of spending money on activities related to gaming and gambling. However, buying and spending are typically ineffective as a coping mechanism (Cohen & Taylor, 2003), and do not manage to provide the desired relief for stress. This is in line with our results showing that perceived stress indirectly with more frequent buying and spending contributed to increased gaming and gambling problems. These findings are also supported by previous studies which have shown that stressed individuals are more likely to shop and spend money as a way of relieving stress and attempting to induce feelings of happiness (Hama, 2001; Müller et al., 2012; Somer & Ruvio, 2014). Our results provide additional support to the established relationship between perceived stress and buying behavior as an escapist coping strategy (Darrat et al., 2016; Somer & Ruvio, 2014). Tied to the context of uncertainty and societal changes caused by the pandemic, our results suggest that during a collectively stressful time, people are willing to spend more resources (e.g. money) on activities that bring them relief.

With increasing expenditure on gambling and digital games, the likelihood of experiencing financial difficulties grows. In our sample, individuals with smaller income were more likely to spend money on gambling or make in-game purchases. This finding highlights that financial difficulties are more likely to fall on lower income individuals. In addition, higher amounts of money spent on microtransactions within digital games and on gambling activities extend the time spent on gaming or gambling which may actualize in a wider range of gaming or gambling harms.

Theoretical and practical implications

In our theoretical framework, buying behavior was seen as a coping strategy for perceived stress. Our results indicate that higher perceived stress is related to increased spending and buying behavior when engaging in gambling or digital gaming. This is in line with researchers' theoretical notions that negative escapist behavior is the result of other problems in life and ill-being, such as stress (Kardefelt-Winther, 2014). Future studies could elaborate this approach and findings theoretically and empirically using longitudinal data. Applying stress perspectives to gambling and digital gaming shows meaningful potential. It is possible that the desire to make virtual purchases or engage in different forms of online buying (such as place bets on online gambling) to distract from stress or prevailing stressful environment is behind in-game purchasing or initial placing

of bets on gambling. This type of buying motivation, however, should be investigated more thoroughly using longitudinal methods.

Our results have practical implications in terms of treating and managing problems caused by excessive gambling or online gaming. We found that perceived stress, especially in combination with in-game buying behavior or placing higher amounts of money on gambling, is associated with more intense gaming and gambling problems. Spending and buying behaviors should be given more attention in stress management practices to minimize their potentially long-lasting adverse consequences. Further, given that image-management is largely a motivating factor of in-game purchasing, and gambling also includes an element of success and status, materialistic values and other personality traits should be investigated in congruence with stress, gaming problems, and gambling problems.

Limitations

While our study involved a relatively large sample, the data are cross-sectional and do not allow for causal inferences or observing changes in stress, spending, and gaming and gambling problems. Further, our study was explorative in nature and the hypotheses were not pre-registered. Our study investigated the role of perceived stress in the relationship between in-game buying behavior and gaming problems, and the relationship between spending money on gambling and gambling problems. However, it is possible that existing gambling or gaming problems rather lead to higher stress which, in turn, increase the amount of money spent on gambling and gaming. Future longitudinal and experimental studies are needed to test the direction of these relationships. Additionally, our sample examined the general population rather than focusing specifically on problem gamers and gamblers. The results are indicative that perceived stress is a factor in such problems among the general population, especially during a societally stressful time.

The results of our study mainly support past studies, but they are tied to the societal context of Finland and the unique time of measurement, representing the peak of the pandemic. Thus, the results are not generalizable to other country settings or post-pandemic conditions and comparative cross-national studies should be conducted to verify these findings. Lastly, while most measures used in this study are validated and widely used, the item inquiring about the amount of money spent on gambling can be interpreted in various ways, impacting its consistency (Blaszczynski et al., 1997; Wood & Williams, 2007). Also, the varying time periods that were covered by the measures (i.e. past month of spending and perceived stress, and past six months of gambling and gaming problems) could have impacted the results. Future research should test these associations using measures that are systematic across the measurement periods.

Conclusions

Stress impacts people's lives across the lifespan in many ways. Stress is likely to influence individuals' consumption habits and digital gaming and gambling are increasingly common ways to cope with or escape from stressful situations. The results of this study suggest that perceived stress may have been a significant factor in increased in-

game buying behavior and spending higher amounts of money on gambling during an exceptionally stressful time represented by the COVID-19 pandemic. This may ultimately have led to or worsened existing gaming and gambling related problems.

In addition to the stressors people experience in their personal lives, societal events like the passing pandemic bring uncertainty and stress that cannot be controlled on the individual level. Large-scale collective stress impacts a vast number of people. Thus, the role of stress as a potential trigger for excessive spending or buying should be recognized, especially when stressed individuals seek distraction via gaming or gambling. Prevention and intervention work practices should incorporate this aspect to their education of at-risk and problem gamers and gamblers. It is important to help them recognize their consumption motives and habits in light of the fact that stressed consumers' financial decisions, including spending money on gaming and gambling, might be biased toward overspending or exploitation of resources.

Data availability statement

The data generated and analyzed in the current study are not publicly available due to the fact that they are part of research in progress but are available from author A.O. on reasonable request.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

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