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Personality Pathways to Gaming Problems Early on in the COVID-19 Pandemic

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Abstract: Media reports noted that video gaming behaviours increased during the initial stages of the COVID-19 pandemic. Some people may have had predisposing risk factors for excessive gaming and related problems during the onset of the pandemic. We examined pathways from four personality risk traits (i.e., hopelessness, anxiety sensitivity, impulsivity, and sensation seeking) to excessive gaming and related problems during the first month of the pandemic. We predicted that people high in anxiety sensitivity and hopelessness would engage in excessive gaming to cope with increased distress. We also predicted that the isolation and boredom resulting from the COVID-19 lockdown would lead those high in impulsivity and sensation seeking to game excessively to enhance their mood. Participants (*N*=332), recruited via Prolific, completed a single survey of their retrospective gaming behaviours for 30 days prior to, and 30 days following the initiation of the COVID-19 state of emergency (March 2020). People high in anxiety sensitivity were initially at risk for excessive gaming and related problems due to elevated coping and self-gratification motives. People high in hopelessness were at risk for increased gaming-related problems through coping and self-gratification motives. Contrary to hypotheses, participants high in sensation-seeking had more excessive gaming and related problems due to elevated coping (but not enhancement) motives. Those high in impulsivity were at risk of gaming-related problems due to self-gratification (but not enhancement) motives. Addressing the motivation to game can assist in tailoring treatment plans to individual needs, especially as we continue to navigate the longer-term impacts of the pandemic.

Keywords: COVID-19, Videogaming, Gaming Disorder, Personality.

Video games can provide much needed entertainment and relief from day-to-day life. For most people, it is a simple and enjoyable pastime that presents little risk, and offers benefits, like socializing (Granic et al., 2014). However, for a small proportion of gamers, excessive videogaming can lead severe gaming-related problems (Charlton & Danforth, 2007; Loton et al., 2016). Since March 2020, the COVID-19 pandemic has presented new challenges to people worldwide. There has been an upsurge of mental health and addiction issues since the beginning of the COVID 19 outbreak (Center for Addiction and Mental Health [CAMH], 2020). During the initial stages of the COVID-19 pandemic, people were suddenly limited to activities that could be done within their own homes due to pandemic-related lockdowns. People who were vulnerable to gaming problems prior to COVID-19 may have disproportionately increased their playing time, which in turn, may have increased their risk of experiencing gaming related problems following the outbreak of COVID-19. Accordingly, the purpose of the present study was to explore the pathways from personality risk profiles (Castellanos-Ryan & Conrod, 2012; Woicik et al., 2009) to increased gaming and related problems during the uniquely stressful early stages of the COVID-19 outbreak.

The Four Factor Personality Model (FFPM)

The FFPM suggests that there are four personality profiles that increase the likelihood of excessive gaming through negative and positive reinforcement purposes (Gentile et al., 2011; González-Bueso et al., 2018; J. Hu et al., 2017; Männikkö et al., 2015; Marchica et al., 2020; Maroney et al., 2019; Mehroof & Griffiths, 2010). The personality profiles of hopelessness and anxiety sensitivity map onto the negative reinforcement pathway and are characterized as *internalizing personality traits* (Castellanos-Ryan & Conrod, 2012; Conrod et al., 2000; Pihl & Peterson, 1995). In contrast, the personality profiles of impulsivity and sensation seeking map onto the positive reinforcement pathways and are characterized as *externalizing personality traits*.

Internalizing Traits

Hopelessness. Hopelessness is characterized by depression-proneness. People high in hopelessness experience frequent and intense low mood and engage in ruminative negative thinking about the past and the future. Those high in hopelessness tend to engage in addictive behaviours to numb painful experiences and memories (Castellanos-Ryan & Conrod, 2012; Woicik et al., 2009). Studies prior to COVID-19 show a positive predictive relationships between hopelessness and both excessive gaming and related problems. Previous cross-sectional and longitudinal research shows that depression-proneness is associated with increased risk for excessive gaming and related problems (González-Bueso et al., 2018; King

& Delfabbro, 2016; Chih Hung Ko et al., 2014; Laconi et al., 2017; Maroney et al., 2019; Rapinda et al., 2021). In the early stages of the COVID-19 pandemic, there was excessive news and social media coverage of negative events in the world (i.e., covid-related deaths and issues), which was combined with uncertainty and dire forecasts for the future. Individuals who are high on hopelessness have a limited capacity to expect positive outcomes for the future and have a narrow ability to foster internal hope (Castellanos-Ryan & Condor, 2012; Su et al., 2021; Woicik et al., 2009). The difficult and unique conditions of the early stages of the COVID-19 pandemic may have driven these individuals to game excessively in order to cope with their negative affect and social isolation, especially since most other alternative coping strategies (i.e., socializing, walking in the park, outdoor/indoor sports, etc.) were inaccessible (Lawson et al., 2022).

Anxiety Sensitivity. Anxiety sensitivity is described as an excessive fear that anxiety-related sensations (e.g., increased heart rate) will lead to catastrophic outcomes (e.g., heart attack; Castellanos-Ryan & Conrod, 2012; Reiss et al., 1986). Individuals who are high in anxiety sensitivity are motivated to engage in addictive behaviours to dampen elevated autonomic arousal, which is believed to negatively reinforce these behaviours (Castellanos-Ryan & Conrod, 2012). Studies on the relationships between anxiety sensitivity and excessive gaming and related problems from before COVID-19 shows a positive predictive relationship. A recent systemic review on excessive gaming and related problems co-morbidities by González-Bueso et al. (2018) showed a strong association between anxiety and both excessive gaming and related problems. Additionally, anxiety has been shown to be a positive predictor of excessive gaming and related problems (Cole & Hooley, 2013). During the initial stages of the COVID-19 pandemic, anxiety amongst the general population was reported to be at a record high (CAMH, 2020). People high in anxiety sensitivity were vulnerable to experiencing heightened COVID-19 related fears due to extensive media coverage and the potential negative health outcomes (Su et al., 2021). Individuals who are high on the anxiety sensitivity scale may have engaged in excessive gaming during the initial stages of COVID-19, as a tension reduction strategy, to cope with their psychological and physiological experiences of anxiety (Castellanos-Ryan & Conrod, 2012; Woicik et al., 2009).

Externalizing Personality traits

Impulsivity. Impulsivity refers to a tendency to make rash decisions to fulfill immediate needs for gratification, despite possible longer-term negative outcomes (Baumeister & Vohs, 2004; Castellanos-Ryan & Conrod, 2012; Schalling, 1978; Whiteside & Lynam, 2001). Individuals high in trait impulsivity have problems with inhibiting behaviours and are also believed to be very sensitive to the euphoric or positive mood enhancing effects of engaging in addictive behaviours, like gaming (Castellanos-Ryan & Condor, 2012; Gros et al., 2020; Han et al., 2011).

Research that precedes the COVID-19 outbreak has shown that impulsivity is a strong positive predictor of both excessive gaming and related problem severity and that individuals diagnosed with an Internet Use Disorder, which includes a gaming component, exhibit more impulsive behaviour compared to controls (Billieux et al., 2011; Cao et al., 2007; Gentile et al., 2011; Lee et al., 2012). Moreover, individuals who game excessively and experience related problems tend to have difficulties when performing impulse control and executive functioning tasks (Cao et al., 2007; Dong et al., 2010, 2011, 2013; Dong & Potenza, 2014; Du et al., 2016; C. H. Ko et al., 2012; Zhou et al., 2012). Individuals who are high on impulsivity tend to have a greater tendency to experience boredom, an experience that may be exacerbated by being alone and confined to their home such as during the COVID-19 lockdowns (Castellanos-Ryan & Condor, 2012; Gros et al., 2020; Han et al., 2011; Lawson et al., 2022). These individuals may have turned to excessive gaming to feel positive emotions and to offset boredom.

Sensation Seeking. Sensation seeking is defined as a need for greater stimulation, an inability to withstand boredom, and a willingness to engage in risky behaviours in favour of new and diverse experiences (Arnett, 1994; Castellanos-Ryan & Conrod, 2012; Zuckerman, 1979). Individuals who score highly on sensation seeking measures present with a lower threshold for experiencing euphoria and other hedonic sensations. The low threshold for experiencing pleasure drives these individuals to seek out more opportunities for stimulation, and therefore, puts them at a greater risk of developing behaviours aimed at enhancing psycho-stimulation (i.e., binge drinking, excessive video gaming; Castellanos-Ryan & Conrod, 2012). Studies prior to the COVID-19 outbreak show that sensation seeking has positive predictive relationships with both excessive gaming and related problems. For example, Mehroff and Griffiths (2010) conducted a longitudinal study on the relations between excessive gaming and related problems and several personality factors and found that sensation seeking had significant positive associations with excessive gaming and related problems. Several other studies found that sensation seeking was positively correlated with excessive gaming and related problems (Chiu et al., 2004; J. Hu et al., 2017). Lee et al. (2017) found that novelty seeking, which is an integral part of sensation seeking, was positively correlated with excessive gaming and related problems. It is believed that individuals who score highly on sensation seeking measures game excessively for reasons of mood enhancement (Castellanos-Ryan & Condor, 2012; Gros et al., 2020; Han et al., 2011). During the early stages of the COVID-19 pandemic, lockdown protocols severed peoples' connection to any stimulating activity outside of private residences. The inaccessibility of novel and exciting activities meant that people high in sensation seeking likely could not meet their needs for stimulation. Therefore, people high in sensation seeking may have turned to gaming excessively following the COVID-19 state-of-emergency, considering the ease of access and stimulating nature of video games.

Motivation to Game

Motivational models theorise that addictive behaviours, such as excessive gaming, emerge from a desire to alter one's mood by reducing negative affect (i.e. negative reinforcement) or by inducing positive affect (i.e., positive reinforcement) (Myrseth et al., 2017; Skinner, 1963). The gaming specific model identifies four types of motivations: (1) *coping motivation* to reduce or avoid negative emotions, (2) *enhancement motivation* to increase or introduce positive emotions (i.e., gaming to feel pleasure and gaming for the activity itself) (Cooper et al., 1992) (3) *social motivation*, and (4) *self-gratification motivation* to increase positive emotions by indulging and satisfying cravings (Myrseth et al., 2017; Myrseth & Notelaers, 2017). Research in this area shows that each motive predicts different aspects of gaming behaviours. Enhancement and social motives tend to predict time spent gaming, whereas coping motives relate to loss of control and gaming-related problems (Myrseth et al., 2017). Self-gratification motives have been shown to uniquely relate to gaming problems (Myrseth et al., 2017). Consistent with motivational models of addictive behaviours broadly, specific motivations are believed to mediate the effects of personality traits on gaming involvement. Relevant to the current study, individuals high on internalizing traits may have engaged in excessive gaming and experienced related problems early in the pandemic due to their coping reasons for playing. In contrast, people high in externalizing traits may have gamed excessively and experienced gaming-related problems due to their enhancement and/or self-gratification reasons for playing.

The Current Study

The COVID-19 crisis created an environment that had the potential of both initiating and exacerbating problem gaming in vulnerable individuals (i.e., those with elevated personality risk). To our knowledge, no previous research has examined a comprehensive personality risk model of gaming risk during the initial stages of the COVID-19 state-of-emergency. Accordingly, the goal of this study was to fill this gap in the literature. We predicted that people high in anxiety sensitivity and hopelessness would engage in excessive gaming to cope with increased distress, increasing risk for gaming-related problems. We also predicted that the isolation and boredom resulting from the COVID-19 lockdown would lead those high in IMP and SS to game excessively for mood enhancement and/or self-gratification reasons.

Methods

Participants

A total of 402 participants were recruited from across Canada through Prolific for a larger longitudinal study on addictive behaviours and COVID-19 among Canadians (Baptist-Mohseni, 2022; Wardell et al.,

2020). In this secondary study, we were interested in gaming behaviours; therefore, we only included a subset of 322 participants who reported gaming at least once in the three months prior to the pandemic. No other inclusion or exclusion criteria were imposed. The participants' ages ranged from 18 to 74, with an average age of 30.79 (SD=8.920). The sample consisted of approximately 60.8% female and 39.2% male. An estimated 71.7% of the sample were non-students, 10.5% were part-time students, and 17.8% were full time students. The sample identified as 69.3% White, 17.2% South Asian, 5.4% Black, 3% Hispanic, 1.8% Middle Eastern, 1.5% Aboriginal, and 2.1% reported "other". Under relationship status, 37.7% of the sample reported being single (never married), 1.5% single (divorced), 0.3% single (widowed), 33.4% married, 17.8% living in common-law, and 9.3% long-term relationship but living separately. Lastly, 72.9% reported not having children, and 27.1% reported having children (see Table 1).

Table 1
Participant Demographics

	M (SD) or n (%)
Age	30.79 (8.92)
Sex	
Male	202 (60.84%)
Female	130 (39.16%)
Ethnicity	
East Asian, South-East Asian, Pacific Islander	57 (17.17%)
Middle Eastern, North African, Central Asian	6 (1.81%)
Hispanic or Latino	10 (3.01%)
Caucasian or White	230 (69.28%)
Black	18 (5.42%)
Aboriginal	5 (1.51%)
South Asian	18 (5.42%
Other	7 (2.11%)
Student status	
Full-time	59 (17.77%)
Part-time	35 (10.54%)
Not a student	238 (71.69%)
Education	
Less than high school	1 (0.31%)
High school diploma	18 (5.42%)
One or two year post high school but not college	3 (0.91%)
One- or two-year diploma from a trade or professional school but not college	10 (3.01%)
Some college or university education	
College or university degree (Bachelors)	57 (17.17%)
Post graduate work	174 (52.41%)
Post graduate degree	12 (3.61%)
	57 (17.17%)
What province/ territory are you located in?	
Ontario	168 (50.60%)
Quebec	36 (10.84%)
British Columbia	47 (14.16%)
Alberta	37 (11.14%)
Manitoba	8 (2.41%)
Saskatchewan	7 (2.11%)
Nova Scotia	12 (3.61%)
New Brunswick	6 (1.81%)
Newfoundland and Labrador	7 (2.11%)

Prince Edward Island	3 (0.91%)
Yukon	1 (0.31%)
Relationship status:	
Single, never married	125 (37.65%)
Single, divorced	5 (1.55%)
Single, widowed	1 (0.31%)
Married	111 (33.44%)
Living Common-law	59 (17.78%)
Long-term relationship but living apart	31 (9.34%)
Do you have any children?	
No	242 (72.89%)
Yes	90 (27.11%)

Procedure

Prior to data collection, ethical approval was granted by York University REB (e2020-118). All participants provided informed consent before participating in this research. The study was administered through the online survey platform of Prolific. Individuals were compensated with up to $11.53 Canadian (£6.61). Several online self-report questionnaires were administered. Data collected about addictive behaviours through the use of crowdsourcing sites, like Prolific, have been shown to be reliable (Kim & Hodgins, 2017). In order to avoid any framing influences related to specific addictive behaviours, the study was described to participants as a questionnaire regarding their overall well-being during COVID-19 (Angus et al., 2021). To ensure the data was of high quality, precautions such as attention checks (i.e., we inserted items within the questionnaire such as: "Choose the first option – "strongly disagree" – in answering this question", and "To respond to this question, please choose option number five, "slightly agree""). Additionally, surveys that were completed too quickly (i.e., <20 minutes) were excluded. The survey was administered at a single time point and asked about behaviours one month before and one month after the state of emergency for the COVID 19 outbreak was announced on March 17th, 2020.

Measures

Substance Use Risk Profile Scale

The Substance Use Risk Profile Scale (SURPS; Woicik et al., 2009) is a 23 item scale that measures the four personality risk factors of interest: impulsivity (5-items; "*I usually act without stopping to think*", Cronbach alpha), sensation-seeking (5-items, "*I would like to skydive*", Cronbach alpha), hopelessness (6-items, reverse scoring, "*I am content*", Cronbach alpha), and anxiety sensitivity (5-items, "*It's frightening to feel dizzy or faint*", Cronbach alpha). Participants were asked to respond to 4-point Likert scale items, ranging from 1 ("*strongly disagree*") to 4 ("*strongly agree*"). The SURPS was shown to be highly valid and reliable (Woicik et al., 2009).

Electronic Gaming Motive Questionnaire

The Electronic Gaming Motive Questionnaire (EGMQ; Myrseth et al., 2017) is a 14-item measure that was adapted from the Gambling Motive Questionnaire-Revised (GMQ-R; Myrseth & Notelaers, 2017). It was designed to measure four central motivations for engaging in video gaming: enhancement motives (3 items, i.e., "*because it is exciting*"), social motives (3 items, i.e., "*to be sociable*"), coping motives (4 items, i.e., "*to forget your worries*"), and self-gratification motives (4 items, i.e., "*to get a high feeling*") (Myrseth et al., 2017). Participants were asked to answer self-report questions on a 4-point Likert, ranging from 1 ("*almost never/never*") to 4 ("*almost always*").

Gaming Timeline Follow-Back Scale

The Timeline Follow-Back Scale (TLFB; Sobell & Sobell, 1992) was originally developed to assess self-reported alcohol consumption. However, it has been adapted for measuring a wide variety of other addictive behaviours, including video gaming (Rapinda et al., 2021; Robinson et al., 2014; Linda Carter Sobell & Sobell, 2016; Weinstock et al., 2004). The Gaming TLFB (G-TLFB) technique utilizes a 30-day calendar as a visual aid to help participants quantify the amounts of time spent gaming on average over the past month (i.e., "To help us evaluate your game use, we need to get an idea of what your game use was like in an average week"). TLFB method has been shown to be sensitive to changes in substance use as well as be reliable (Robinson et al., 2014; Linda Carter Sobell & Sobell, 2016; Weinstock et al., 2004). While the TLFB is traditionally an interview, the G-TLFB was administered as an online self-report version of the measure. This measure asked participants about their gaming behaviours one month before and one month after the announcement of state of emergency due to the COVID-19 outbreak on March 17th, 2020. The measure was used to assess excessive gaming.

Internet Gaming Disorder Scale

The Internet Gaming Disorder Scale-Short-Form (IGDS9-SF; Pontes & Griffiths, 2015) was used to assess gaming disorder (GD) symptoms. Participants were asked to answer 9 items (e.g., "*Do you systematically fail when trying to control or cease your gaming activity?*") using a 5-point Likert scale, ranging from 1 ("*never*") to 5 ("*very often*"). Higher sum scores indicate more severe gaming disorder (GD) symptoms (Pontes & Griffiths, 2015). This measure was administered 30 days after the state of emergency for COVID-19 was announced and was used to assess gaming-related problems.

Statistical Plan

Path analysis was used to assess the hypothesized model from SURPS personality factors to gaming behaviours (via gaming motives). Analyses were all performed using IBM SSPS version 25 (IBM Corp.,

2017) and Mplus version 8 (Muthén & Muthén, 2017). In the main path model, hopelessness, anxiety sensitivity, impulsivity, and sensation seeking were entered as predictors; motives for gaming were specified as correlated mediators; and time spent gaming and gaming problems (during the first 30 days of COVID-19) were specified as correlated outcomes (see Fig 1.0). In this model, we controlled for pre-pandemic gaming (30-days prior to the COVID-19 state-of-emergency). Model fit was evaluated using several indices. Model fit was considered adequate if the Comparative Fit Index CFI $\geq$ .95; Root Mean Square Error of Approximation (RMSEA) was $\leq$ .08 (L. T. Hu & Bentler, 1999; Kline, 2010) and the Standardized Root Mean Square Residual (SRMR) was $\leq$ .08. 95% confidence intervals (*CI*s) were used to assess path and indirect effects. The estimates of paths and indirect effects were considered to be supported if the *CI*s did not include zero (Fritz & MacKinnon, 2007).

Figure 1

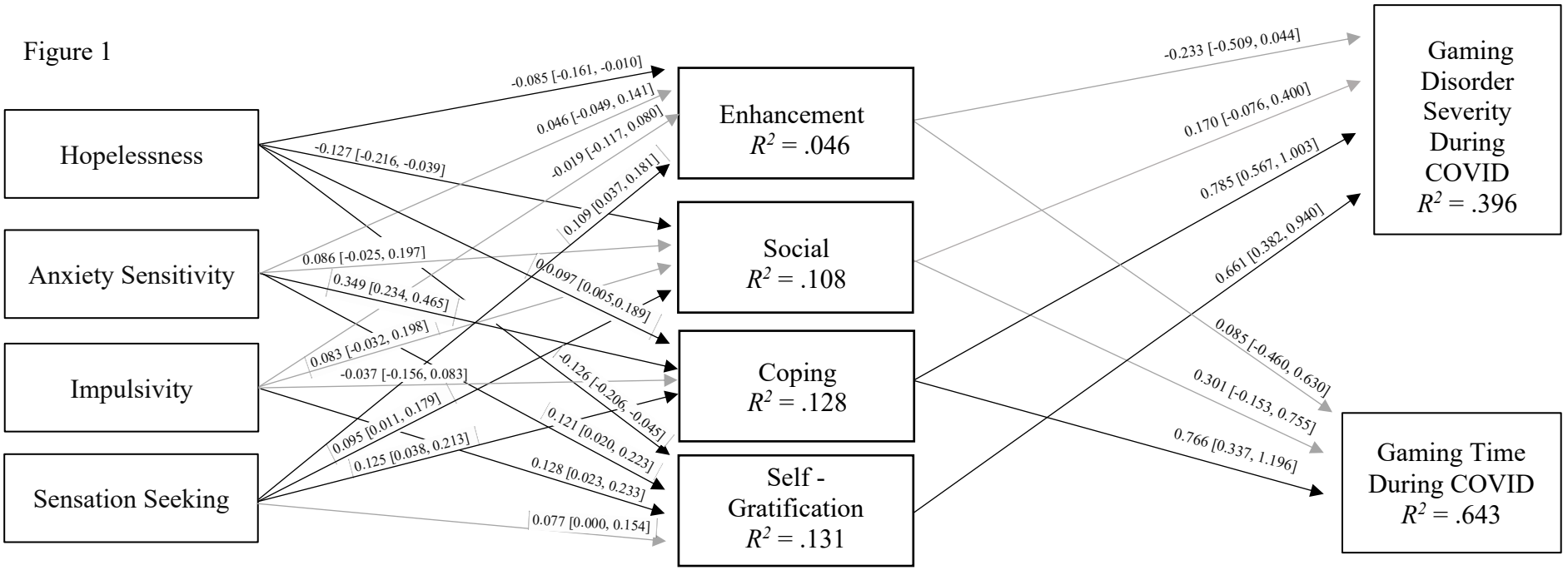

Figure 1. The path model shows the pathways from Substance Use Risk Profile Scale profiles (SURPS, i.e., hopelessness, anxiety sensitivity, impulsivity, and sensation seeking) to gaming disorder severity and time spent gaming during the beginning of the COVID-19 outbreak via motivation to play. Unstandardized parameter estimates are presented with 95% *CIs.* Dark lines are specified paths that were supported (i.e., the 95% *CI* did not include zero) and grey lines are specified paths that were not supported (i.e., the 95% *CI* included zero), time spent gaming pre COVID-19 outbreak was controlled for.

Results

Preliminary Analysis

All variables included in the main path analysis had normal distributions (skew < 3.0, kurtosis < 10; Kline, 2010). Table 2 shows the bivariate correlations and descriptive statistics. Positive significant correlations were found between all four personality traits and gaming-related problems severity. Our sample's total scores on the SURPS personality profiles were similar to other studies (e.g., Long et al., 2018). While the overall mean of GD symptoms (as measured by the IGDS9-SF) was below the clinical cut-off of 32 (Qin et al., 2020), we still observed considerable variability in gaming-related problems as measure by GD symptoms, as well as in time spent gaming (i.e., excessive gaming) as measured by the G-TLFB.

Table 2

Descriptive Statistics and Bivariate Correlations

	1	2	3	4	5	6	7	8	9	10	11
1. Hopelessness	-	.219**	.169**	-.151**	-.139**	-.128*	.154**	-.114*	.059	.093	.136*
2. Anxiety Sensitivity		-	.268**	-.192**	-.012	.058	.317**	.115	.024	.071	.176**
3. Impulsivity			-	.182**	.001	-.108*	.103	.165**	.028	.053	.181**
4. Sensation Seeking				-	.172**	.158**	.067	.145**	.071	.086	.147**
5. Enhancement					-	.367**	.447**	.473**	.227**	.244**	.281**
6. Social						-	.224**	.551**	.303**	.293**	.350**
7. Coping							-	.495**	.217**	.296**	.518**
8. Self-Gratification								-	.361**	.332**	.536**
9. Gaming Timeline Follow Back Pre-COVID									-	.800**	.420**
10. Gaming Timeline Follow Back During COVID										-	.446**
11. IGDSF During COVID											-
M	12.42	12.75	10.36	14.89	8.86	5.86	9.50	6.62	13.30	19.95	15.10
SD	3.27	2.69	2.60	3.48	2.24	2.76	2.85	2.58	12.60	16.10	6.28
Range	6-24	5-20	5-20	6-24	3-12	3-12	4-16	4-16	1-168	1-168	9-45

Note. Internet Gaming Disorder Scale Short Form (IGDSF9). *$p < .05$; **$p < .01$.

Path Analysis: Hypothesis Testing

The initial hypothesized model did not fit the data well ($\chi^2_{(12)}$ = 69.53, p < .001; CFI = 0.943; RMSEA = .120 [90% CI = .094, .149], SRMR = .099 (Hu & Bentler, 1999; Kline, 2010). Modification indices were inspected to determine if there were theoretically permissible paths that could be added to the model to improve overall fit. Paths were added iteratively and differences in χ^2 and CFI were calculated. Improvements in fit were considered substantial if the χ^2 difference test was statistically significant and if the CFI change was .01 or greater (Cheung and Rensvold, 2002). The modification indices suggested adding two paths: the first one was from pre-COVID time spent gaming (TLFB) to post-COVID self-gratification motives and the second one was from pre-COVID time spent gaming (TLFB) to post-COVID social motives. Adding the first path improved model fit ($\mathbf{\Delta}\chi^2$ = 13.75, p < .05; **Δ**CFI = .012); however, the model remained a poor fit for the data ($\chi^2_{(11)}$ = 55.78, p < .001, CFI = 0.955; RMSEA = .111 [90% CI = .083, .141], SRMR = .085). Adding the second path also improved fit ($\mathbf{\Delta}\chi^2$ = 20.37, p < .05; **Δ**CFI = .02). Overall fit of this model was considered adequate ($\chi^2_{(10)}$ = 35.41, p < .001, CFI = 0.975; RMSEA = .088 [90% CI = .057, .120], SRMR = .063) and therefore it was retained (see Figure 1).

As seen in Figure 1, in the front end of the model, hopelessness was negatively associated with enhancement, social, and self-gratification motives, but was positively linked to coping motives. Anxiety sensitivity was positively associated with coping and self-gratification motives. Regarding externalizing traits, impulsivity was positively associated with only self-gratification motives, whereas sensation seeking was associated with all gaming motives. In the back end of the model, coping motives positively predicted both excessive gaming and related problems post-COVID-19. Self-gratification positively predicted gaming-related problems.

According to bias corrected 95% *CI*s (See Table 3), the indirect effect from hopelessness to gaming related problems through coping motives was supported, in line with our hypothesis. Surprisingly, we also observed evidence of a second, lower risk pathway from hopelessness to gaming related problems severity through self-gratification. As hypothesized, the indirect effects from anxiety sensitivity to both excessive gaming and related problems post-COVID through coping were supported. Interestingly, we observed evidence of a second high risk pathway from anxiety sensitivity to gaming-related problems through self-gratification. Moreover, partially as expected, the indirect effect from impulsivity to gaming-related problems severity through self-gratification was supported. Contrary to hypotheses, the indirect effect from sensation seeking to gaming-related problems severity through enhancement was not supported. Rather, the indirect effects from sensation seeking to both excessive gaming

and related problems post-COVID through coping were supported. No other indirect effect in our data was supported.

Table 3

Summary of Indirect Effect from SURPS to IGD through Motivation

Path	Unstandardized Estimate	95% *CI*s
Hopelessness → Enhancement → IGDSF9	0.020	[-0.010, 0.049]
Hopelessness → Social → IGDSF9	-0.022	[-0.055, 0.049]
Hopelessness → Coping → IGDSF9	0.076*	[0.001, 0.152]
Hopelessness → Self-Gratification → IGDSF9	-0.083*	[-0.147, -0.019]
Hopelessness → Enhancement → GTLFBD	-0.001	[-0.011, 0.008]
Hopelessness → Social → GTLFBD	-0.008	[-0.021, 0.003]
Hopelessness → Coping → GTLFB	0.015	[-0.002, 0.032]
Hopelessness → Self-Gratification → GTLFB	0.007	[-0.008, 0.023]
Anxiety Sensitivity → Enhancement → IGDSF9	-0.011	[-0.036, 0.015]
Anxiety Sensitivity → Social → IGDSF9	0.015	[-0.013, 0.042]
Anxiety Sensitivity → Coping → IGDSF9	0.274*	[0.156, 0.392]
Anxiety Sensitivity → Self-Gratification → IGDSF9	0.080*	[0.005, 0.155]
Anxiety Sensitivity → Enhancement → GTLFB	0.004	[-0.004, 0.013]
Anxiety Sensitivity → Social → GTLFB	0.026	[-0.025, 0.077]
Anxiety Sensitivity → Coping → GTLFB	0.267*	[0.093, 0.442]
Anxiety Sensitivity → Self-Gratification → GTLFB	-0.035	[-0.107, 0.038]
Impulsivity → Enhancement → IGDSF9	0.004	[-0.019, 0.024]
Impulsivity → Social → IGDSF9	0.014	[-0.013, 0.041]
Impulsivity → Coping → IGDSF9	-0.029	[-0.123, 0.066]
Impulsivity → Self-Gratification → IGDSF9	0.085*	[0.007, 0.163]
Impulsivity → Enhancement → GTLFB	-0.002	[-0.015, 0.012]
Impulsivity → Social → GTLFB	0.025	[-0.026, 0.076]
Impulsivity → Coping → GTLFB	-0.028	[-0.121, 0.065]
Impulsivity → Self-Gratification → GTLFB	-0.037	[-0.113, 0.040]
Sensation Seeking → Enhancement → IGDSF9	-0.025	[-0.060, 0.009]
Sensation Seeking → Social → IGDSF9	0.016	[-0.010, 0.042]
Sensation Seeking → Coping → IGDSF9	0.098*	[0.024, 0.172]
Sensation Seeking → Self-Gratification → IGDSF9	0.051	[-0.004, 0.106]
Sensation Seeking → Enhancement → GTLFB	0.009	[-0.050, 0.069]
Sensation Seeking → Social → GTLFB	0.029	[-0.021, 0.079]
Sensation Seeking → Coping → GTLFB	0.096*	[0.010, 0.182]
Sensation Seeking → Self-Gratification → GTLFB	-0.002	[-0.070, 0.026]

Note: Internet Gaming Disorder Scale Short Form (IGDSF9), Gaming Timeline Follow Back (GTLFB).

Discussion

To our knowledge, this study is the first to look at problematic gaming during COVID-19, and the first to look for a common experience and explanation as to why personality poses a risk for problematic and excessive gaming. The overarching finding of this study is that all the SURPS personality profiles are predictive of problematic gaming. Prominently, the mediation from personality profiles to gaming related problems severity was evaluated and explained this association.

Research that predates the COVID 19 outbreak posits that both motivations to play and personality can be a risk factor for excessive gaming and related problems (Billieux et al., 2011; González-Bueso et al., 2018; Mehroof & Griffiths, 2010; Myrseth et al., 2017). This study examined how personality risk factors predicted gaming behaviours during the early stages of the COVID 19 outbreak. We also looked at gaming motivations as key explanatory factors. As expected, we found that for people high in anxiety sensitivity and those high in hopelessness, coping motives were a central pathway to greater gaming-related problems. This pathway is supported in other literature relating to problematic gaming. A literature review by Melodia et al. (2022) showed that the motivation to game for coping with dysphoric affect is predictive of the development of problematic gaming. We also observed that hopelessness was associated with lower self-gratification motives, which in turn reduced risk for gaming problems. Thus, for individuals who are high in hopelessness, the higher risk pathway was through coping and not self-gratification. Participants high in sensation seeking had more gaming-related problems and spent more time gaming due to elevated coping (but not enhancement) reasons for gaming. Finally, those high in impulsivity had a higher risk for gaming-related problems due to self-gratification (but not enhancement) motives. Overall, our study showed that all four personality risk factors related to increased gaming risk during the initial COVID-19 state-of-emergency. Though, we observed differential effects via gaming motivations.

We observed some unexpected mediational effects in our study. The first was the negative indirect effect from hopelessness to gaming-related problems severity through self-gratification. This pathway indicated that people high in hopelessness were less likely to endorse self-gratification reasons for gaming, in turn reducing their risk for gaming problems. Despite this modest protective effect, there was still an overall risk for gaming problems through the coping motive to game that offset the protective effect of socializing motives to game. The literature on depression shows that depressed individuals such as those high on the hopelessness scale, are less physiologically activated and are less capable of physically experiencing positive moods (Treadway & Zald, 2011). It is possible that the indirect path is capturing these participants' inability to feel positive moods. The second unexpected mediational effects were from sensation seeking to gaming and

related problems via coping motives. While we initially hypothesized that positive reinforcement motives would be relevant mediators, the role of coping motives might reflect how difficult the COVID-19 situation was for those high in sensation seeking. Sensation seeking individuals are prone to experiencing boredom and have been shown to have a very tough time dealing with it (Dahlen et al., 2004; Rupp & Vodanovich, 1997). In this respect, especially under the social distancing restrictions of the early COVID-19 lockdowns, it is possible that people high in trait sensation seeking were more motivated to game to cope with the unpleasant experience of boredom. Furthermore, the existing literature suggests the individuals who are high on sensation seeking tend to experience heightened distress in situations when they are cooped up and prevented from receiving external stimulation (Hocking & Robertson, 1969; Krpan, 2022; Zuckerman, 1979). These conditions were replicated during the COVID-19 lockdown and could explain the mediating role of coping motives for these individuals (Lawson et al., 2022).

Furthermore, we expected impulsive individuals to game for motives of enhancement, an effect which was not supported. Existing research shows a connection between extraversion (of which impulsivity is a part) and motivation to game for reasons of self-gratification (Lucas & Diener, 2001; Şalvarlı & Griffiths, 2021). The enhancement scale of the Electronic Gaming Motives Questionnaire (EGMQ; Myrseth et al., 2017) utilizes items that closely resemble traditional enhancement motivation and social motivation items on other addictive motives scales, like the Drinking Motive Questionnaire (Cooper et al., 1992). These scales measure a positive reinforcement pathway. For people high in impulsivity, positive reinforcement scales are likely relevant, especially during COVID-19's social distancing and social bubbles guidelines. These individuals may socialize through gaming which could lead them to game excessively. This can explain why the self-gratification motive was endorsed by the model and not the enhancement motive.

Clinical Significance

The importance of this study is that it elucidates the underlying mechanisms related to excessive gaming during the initial COVID-19 state-of-emergency. This study adds to the body of evidence that suggests that excessive gaming motivations and related problems closely relate to other addictive behaviours. In doing so, these finding could inspire new personality-based preventative interventions. Most of the current treatments available for problematic gaming consist of universal behaviour and cognitive modifications. However, there is evidence to suggest that individualized treatment based on personality traits and tools to effectively manage those traits can be more effective (Conrod et al., 2000). In fact, such programs were effective in reducing the risk of alcohol use in adolescents high on the SURPS subscales by an average of 50%. Such programs (i.e., *PreVenture*) have also reduced the odds of binge drinking by 50%, delay

the initiation of alcohol use and binge drinking, delay the initiation and frequency of cannabis use, and have a grade-wide effect on peers who did not participate in the workshops (Conrod et al., 2008, 2010, 2013; Newton et al., 2018). These findings suggest that this kind of approach has the potential of affecting the community in which these individuals exist as well as the individual (Conrod et al., 2013). Like alcohol and substance-use related problems, problematic gaming is predicted by personality traits and explained by the motivation to engage in the behaviour. Therefore, future research should focus on testing whether these kinds of interventions could be beneficial in preventing problematic gaming in individuals who are high on the SURPS personality profiles. Additionally, considering that coping motives were implicated for three out of the four personality traits, it may be worthwhile investigating a treatment that teaches individuals distress tolerance. This approach has support for individuals who seek treatment for substance use disorder under the umbrella of Dialectical Behavioural Therapy and may be helpful for problematic gaming considering the similarities mentioned (CAMH, 2021; McKay et al., 2019). Lastly, this research indicates the need to address vulnerabilities that stem from both personality and motivation to game for young people who face isolation and other anxiety-provoking situations.

Limitations

This study has its limitations. Self-report data carries the risk of being inaccurate and potentially biased. Excessive gaming and related problems may be under reported because of the social desirability effect and the fear of being misperceived by others (Williams et al., 2009). To counteract these potential risks, participants were informed that their responses would be anonymous. Additionally, this study was cross-sectional, which limits predictability due to the lack of a temporal relationships between assessments. Moreover, our findings may not generalize to individuals who meet the criteria for GD or individuals with clinical levels of hopelessness, anxiety-sensitivity, sensation-seeking, or impulsivity. Another limitation is that the larger study from which the data were collected study recruited alcohol drinkers rather than video gamers, specifically. Despite these limitations, this study contributes to the current body of evidence regarding personality risk factor for problematic gaming and motivations to game. Furthermore, this study only captured gaming behaviours in the initial stages of the pandemic when people were struggling the most. This study cannot speak to the longer-term pathways from personality to gaming behaviour throughout the pandemic. It is important for future publications to include long-term research on the broader context of COVID-19 and its differential impact on people who are most at risk for excessive gaming and related problems (i.e., young people).

Declaration of conflict of interest
None declared.

Statement of Competing Interests
The authors declare no competing interests.

Ethics approval

This study was approved by the Review Ethics Board at York University (certificate #e2020-118).

Author's contributions

Ms. Naama Kronstein conceptualized the research project and wrote the final manuscript. Ms. Rapinda and Ms. Ritchie provided expetnsive feedback on manuscript drafts, and helped with data analysis. Dr. Kim contributed to the formulation of the research questions, and provided extensive feedback on manuscript drafts. Drs. Keough and Wardell led the larger project, secured funding for the work, and provided overaching supervision of the work described in this manuscript. They provided direct supervision on all aspects of this work, from conceptualization to the final manuscript.

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