THE RELATIONSHIP BETWEEN GAMING BEHAVIOURS, EMOTIONAL VULNERABILITY, AND COPING DURING THE COVID-19 PANDEMIC

REBECCA E. LEWINSON

A DISSERTATION SUBMITTED TO THE FACULTY OF GRADUATE STUDIES

IN PARTIAL FULFILMENT OF THE REQUIREMENTS

FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

GRADUATE PROGRAM IN PSYCHOLOGY

YORK UNIVERSITY

TORONTO, ONTARIO

MAY 2024

Abstract

The onset of the COVID-19 pandemic led to significant changes in the way people interacted, functioned, and coped with life stressors (Restubog et al., 2020; Rettie & Daniels, 2021). With government guidelines, uncertainty, and isolation, individuals sought new coping methods, including video games (Entertainment Software Association, 2020; King et al., 2020; López-Cabarcos et al., 2020). This coping strategy may have been particularly prevalent among individuals with emotional vulnerabilities (i.e., symptoms of depression and anxiety), or personality traits such as anxiety sensitivity or hopelessness. As such, there is a need to better understand how emotional vulnerability relates to coping-motivated gaming during the pandemic.

This dissertation presents two longitudinal studies exploring emotional vulnerability, gaming behaviours, and coping motivations for gaming during the COVID-19 pandemic. The first study involved 332 Canadian gamers (M_{age}= 33.79, SD_{age}=8.92; 60.8% male, 39.2% female) and examined the influence of emotional vulnerability on coping-motivated gaming and gaming-related problems during the first six months of the pandemic (April – October 2020). The results supported the hypotheses, that higher levels of emotional vulnerability predicted excessive time spent gaming and gaming-related problems, with coping motives playing a mediating role.

The second study, conducted between July 2021 and January 2022, involved 1001 American gamers (M_{age}= 38.43, SD_{age}= 12.11; 46.8% male, 53.2% female) and aimed to understand how internalizing personality traits, namely anxiety sensitivity and hopelessness influenced video gaming engagement. There was an observed predictive relationship between anxiety sensitivity and subsequent time spent gaming, through coping motives.

Overall, these studies provide valuable insights into emotional vulnerability, gaming behaviours, and coping motives during the pandemic. They emphasize the importance of coping motives in these relationships and offer an opportunity to explore how symptoms of depression or anxiety and related personality traits, may influence the use of gaming during the pandemic.

Acknowledgements

Completing this academic journey has been a memorable and profound experience, one that I could not have accomplished without the unwavering support and encouragement from a number of individuals. I am forever grateful for the collective effort that has helped shape my growth academically, professionally, and personally.

First and foremost, I would like to extend my gratitude to my supervisor, Dr. Joel Katz, whose guidance, expertise, and belief in my abilities have been instrumental in shaping my research, writing, and professional career. Joel's insightful feedback and seemingly endless patience and encouragement have pushed me beyond my own expectations of myself. I have been extremely fortunate to have had such an inspiring mentor who has provided me with not only valuable academic and personal mentorship over the years but has also served as a role model in his dedication to his students in their well-being and success.

My sincere appreciation also goes out to Dr. Matthew Keough, without whom this research would not have been possible. Matt's support and guidance played a pivotal role in shaping my research direction, and in providing invaluable feedback throughout the completion of these projects. His profound understanding of gaming, willingness to engage in thought-provoking discussions, and mentorship regarding study design and statistical analyses were invaluable assets throughout this journey. His ability to simplify complex statistical analyses made them approachable, and the collaborative discussions that we had helped to form the backbone of this research, enhancing the studies' overall quality. I am so grateful to have had the opportunity to work with Matt, and I deeply appreciate his contributions to my academic and professional growth.

I would also like to extend my heartfelt thanks to my committee member, Dr. Jeffrey Wardell for generously sharing his time, expertise, and insights at each stage of the dissertation process. Jeff's constructive feedback and thoughtful suggestions have significantly enriched the quality of this dissertation. I am grateful to have had the opportunity to learn from his wealth of knowledge.

I am also very grateful for my other committee members for taking the time out of their busy schedules to be a part of my examining committee, and for their feedback and mentorship on this project.

Finally, to my husband Mitch, my parents, Sharon and Tom, my siblings, Ryan, Eric, Shaun, and Isabelle, my in-laws, Louise, Tom, and Jenny, my grandparents, aunts, uncles, cousins, good friends, and cohort members, I owe you all an immeasurable debt of gratitude. The never-ending support, love, and understanding that I have received throughout these past six years is not able to be properly measured through words and has been a source of strength throughout this journey. I would not be where I am, or who I am, today without you.

Publication Disclosure

The first study of this dissertation has been published under the following citation:

Lewinson, R., Wardell, J., Kronstein, N., Rapinda, K., Kempe, T., Katz, J., Kim, H., & Keough, M. (2023). Gaming as a coping strategy during the COVID-19 pandemic. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace*, 17(3), Article 3. https://doi.org/10.5817/CP2023-3-3

The second study of this dissertation has been accepted for publication (currently in copy-editing) under the following citation:

Lewinson, R., Wardell, J.D., Katz, J., & Keough, M. (2024). Internalizing personality traits and coping motivations for gaming during the COVID-19 pandemic: A cross-lagged panel mediation analysis. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace,* 18(3), Article X. https://doi.org/10.5817/CP2023-3-X

Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction

The novel Coronavirus (COVID-19) pandemic brought with it several drastic changes to the way that individuals interact, function, and cope with life stressors (Restubog et al., 2020; Rettie & Daniels, 2021). Given the numerous public health efforts enacted to reduce the spread of COVID-19, many non-essential businesses were closed to the public, and governmental guidelines such as physical distancing were enforced in both Canada (Detsky & Bogoch, 2020) and the United States (Alexander et al., 2022). Along with these guidelines came an inevitable shift in the way individuals spent their time in an effort to cope with negative affective states; previously used coping strategies may have been inaccessible during the pandemic, such as going to the gym, going out to a restaurant, or even spending time in close proximity to friends (Krause et al., 2022). As a result, many sought new ways to cope with a newfound isolation and the more general uncertainty that accompanied the pandemic. One such coping method that many people turned to was video games (Entertainment Software Association, 2020; King et al., 2020; López-Cabarcos et al., 2020). Video games offered a solution to many of the worries and problems that the pandemic and associated policies caused, and provided a way for many to disconnect from the stress they were experiencing, to socialize with others virtually, and to pass time by engaging in a distracting and otherwise pleasant activity (Barr & Copeland-Stewart, 2022; Caro & Popovac, 2021; Kowal et al., 2021). This may have been especially true for individuals who were more emotionally vulnerable: those who experienced heightened symptoms of depression and anxiety during the pandemic (Pallavicini et al., 2022). Considering that those with emotional vulnerabilities are particularly susceptible to the onset of Gaming Disorder and the corresponding interference that it poses to their daily lives (Mehroof &

Griffiths, 2010), it is important to understand the manner in which gaming was employed by emotionally vulnerable individuals within the framework of the pandemic.

The current dissertation reports two studies that aim to determine the relationships among anxiety, depression, and coping motives for gaming during the first few months of the COVID-19 pandemic in Canada (study 1; April 2020- October 2020), and after the first year of the COVID-19 pandemic in the United States (study 2; July 2021- January 2022).

Video Games and the COVID-19 pandemic

Video games have become integrated into many peoples' lives, with two thirds of Americans currently reporting weekly play (Entertainment Software Association, 2022). Prior to COVID-19, over 23 million Canadians (61% of the population) identified themselves as "gamers" (Entertainment Software Association of Canada, 2018), along with 65% of Americans who self-identified as gamers (Entertainment Software Association, 2019). Additionally, 60% reported playing video games on a daily basis (Entertainment Software Association, 2018). A majority of gamers in both the United States (63%) and Canada (55%) reported often playing video games with others (Entertainment Software Association, 2019; Entertainment Software Association of Canada, 2020).

At the beginning of the pandemic, while there was very little change in the number of gamers in the United States and Canada (Entertainment Software Association, 2020; Entertainment Software Association of Canada, 2020), there was an increase in the amount of time that gamers were reporting playing, with 58% of adult gamers and 80% of teen gamers endorsing gaming more regularly during the COVID-19 pandemic in Canada (Entertainment Software Association of Canada, 2020). Preliminary studies saw an increase in gaming activities

during the pandemic. In America, Verizon reported a 75% increase in online gaming activity that corresponded with stay-at-home directives (King et al., 2020). Live stream gaming such as YouTube Gaming and Twitch also reported a 10% increase in audiences during the first few months of the pandemic (López-Cabarcos et al., 2020), indicating that people had turned not only to gaming during the pandemic, but also to other gaming-related activities.

At the height of the pandemic, Canada saw a rise in the frequency of use of video games (Entertainment Software Association of Canada, 2020), whereas the United States saw a rise in the number of self-reported gamers: from 164 million gamers in 2019 to 215 million gamers in 2022 (Entertainment Software Association, 2019, 2022). Moreover, there was a rise in the amount of time spent playing video games throughout the pandemic, with 29%, 77%, and 51% of gamers reporting 3+ hours, or 7+ hours of gaming per week in 2021 respectively, versus 78%, and 53% in 2022, respectively (Entertainment Software Association, 2021, 2022). Unfortunately, statistical data that compares time spent gaming prior to, and during the pandemic in the general population is sparse.

Gaming on its own is not inherently problematic; in fact, previous research has shown that gaming can be associated with numerous benefits with regard to social (Wiederhold, 2021), emotional, and physical development (Merino-Campos & del Castillo Fernndez, 2016), particularly with moderate game play (Granic et al., 2014). The type of video games played may relate to these benefits. For example, cooperative or team-based video games (e.g., *World of Warcraft*) have been linked to increased prosocial behaviours and social skills in some studies (Gentile et al., 2009; Lenhart et al., 2008). On the other hand, casual or puzzle video games (e.g., *Bejeweled, Angry Birds*) have found to have mood-boosting and relaxing effects (Russoniello, O'brien, et al., 2009). While the current dissertation does not analyze specific game types, it is

crucial to consider that not all video games offer the same benefits, and not all gaming behaviour leads to negative consequences.

While gaming may be associated with benefits for some, for those who engage in excessive gaming, it can lead to problems. However, there is significant variability in how excessive gaming is defined. Discrepancies may arise due to diverse constructs used to measure problematic gaming, with various terms such as “Internet Gaming Addiction”, “dependence”, “problematic gaming” and “excessive play” (Kuss, 2013). Furthermore, research varies in the populations being examined (e.g., children, adults, gamers/non-gamers, different cultures), and in how time spent gaming is measured (e.g., daily, weekly, or monthly). Classifying problematic gaming also poses challenges as researchers may use different terms to refer to different levels of excessive gaming, such as “excessive” gaming being 5+ hours of gaming per day, while defining “dependent” gaming as 10+ hours of gaming per week (King et al., 2013). Despite these differences, most literature agrees that excessive gaming encompasses habits that cause gaming-related problems or functional issues (King et al., 2013), an essential consideration in the assessment of Gaming Disorder, discussed below.

Overall, time spent gaming has been shown to play a crucial role in whether gaming leads to benefits or negative consequences. While moderate video game play has been associated with benefits (Granic et al., 2014), excessive gaming can lead to functional impairment and the possible development of Gaming Disorder (APA, 2022). As such, it is crucial to understand excessive gaming in the context of the pandemic.

Gaming Disorder

Gaming Disorder is a formalized diagnosis found in the International Classification of Diseases, 11th Revision (ICD-11) (World Health Organization, 2019) that is characterized by impaired control over gaming habits, as well as an escalation of gaming despite related problems (Jo et al., 2019). In contrast, "Internet Gaming Disorder" (IGD) has been included in section III of the Diagnostic and Statistical manual - Fifth edition (DSM-5) (American Psychiatric Association, 2013) as a disorder for future consideration by the American Psychiatric Association. In the current dissertation, *"Gaming Disorder"* will be used to encompass the list of symptoms described in the DSM-5 (see Appendix A).

Gaming Disorder is considered to be a form of behavioural addiction, particularly due to some of its core characteristics such as loss of control over time or frequency of playing video games, and its subsequent negative impact on the individual's daily life (Griffiths, 2017; Wang et al., 2019). There are currently only two recognized forms of behavioural addiction: gambling and gaming. Although the addition of behavioural addictions has been associated with some controversy and concern regarding the validity of pathologizing behaviours (Kardefelt-Winther et al., 2017), the inclusion of Gaming Disorder in the DSM-5 as a proposed disorder, and in the ICD-11 as a recognized disorder, shows that there are many researchers who firmly hold that Gaming Disorder is a vital behavioural addiction to take into account and continue to research due to the negative consequences that excessive gaming has on individuals' lives (Griffiths, 2017). This is particularly relevant when considering the rising prevalence of Gaming Disorder during the pandemic.

Prior to the pandemic, Gaming Disorder was found to have a global prevalence of 3.3% (8.5% in males, 3.5% in females), based on a meta-analysis of 61 studies conducted before December 3, 2020, with a total of 227,665 participants across 29 countries (Kim et al., 2022). Oka

et al. (2021) conducted a longitudinal study to understand the pandemic's influence on the prevalence of Gaming Disorder. The researchers initially collected data in December 2019 from 51,246 Japanese adult participants, aiming to examine problematic smartphone use. After the onset of the pandemic, 3,938 of these same participants agreed to participate in a second data collection timepoint. At each timepoint, the participants were asked to complete the Internet Gaming Disorder Scale (IGDS9-SF). Multiple logistic regression indicated that the prevalence of Gaming disorder increased from 3.7% pre-pandemic to 5.9% during the pandemic for adults, and from 7.7% to 13.8% among those under the age of 30. These results have been corroborated from other studies conducted, finding similarly high prevalence rates of Gaming Disorder during the COVID-19 pandemic (e.g. 7.4% among Chinese students (Wang et al., 2023); 8.5% among Nepalese medical students (Shrestha et al., 2020); 10.1% among Saudi Arabian university students (Khrad et al., 2022)). These results indicate that the prevalence of Gaming Disorder during the pandemic has likely increased; though it is notable that the studies listed above were all conducted in Asian countries and therefore may not be generalizable to North America.

Gopali et al. (2023) conducted a systematic review and meta-analysis aiming to determine the prevalence of Gaming Disorder during the pandemic. The researchers searched PubMed, EMBASE, Scopus, CINAHL, and PsycNET for studies published between January 1, 2020, and May 23, 2022. They performed three separate meta-analyses on 9 studies. A total of 24 studies (18 from Asia; two global studies, two multi-country studies including USA, one from Italy, and one from Iran) were included in the systematic review, consisting of 83,903 participants. In one meta-analysis, the researchers found a Gaming Disorder prevalence of 8.0% during the pandemic; however, in another one of their meta-analyses, they found that the pooled mean (M=16.57) of Gaming Disorder symptoms based on the IGDS9-SD was below the clinical cut-off of 36-45.

Finally, a third meta-analysis found no significant difference in the prevalence of Gaming Disorder before and during the COVID-19 pandemic. Although the prevalence rate of 8% in this study is comparable to the previously mentioned studies (Khrad et al., 2022; Kim et al., 2022; Oka et al., 2021; Shrestha et al., 2020; Wang et al., 2023), that the researchers found no difference in prevalence before and during the pandemic is conflicting. This finding may be due to a lack of research post-pandemic on Gaming Disorder prevalence and highlights the need for continued research.

Like substance-related addictions, behavioural addictions such as Gaming Disorder are also highly comorbid with other mental health concerns including anxiety (Wang et al., 2017), depression (Liu et al., 2018), and substance use (Na et al., 2017). This is particularly important to consider, given that anxiety and depression have been previously linked to increases in problematic gaming behaviour (Mannikko et al., 2020). However, this relationship has not been studied extensively in the context of the COVID-19 pandemic- a time when peoples' struggles with anxiety and depression were at an all-time high. It is therefore essential to determine how gaming behaviours may have changed during the COVID-19 pandemic, and how these relationships exist in the context of the pandemic.

COVID-19 mental health and addictions

Given the many changes to public health guidelines and policies (e.g., social distancing, closures, and lockdowns) and the uncertain nature of the COVID-19 pandemic, it is not surprising that there were subsequent increases in the mental health concerns of North Americans. Several studies have shown a continued, negative impact on North Americans' symptoms of anxiety and depression (Kotwal et al., 2022; Rosenberg et al., 2021; Shattuck et al., 2022; Sommerlad et al., 2021).

Anxiety

Anxiety is defined as a future-oriented mood state characterized by physical symptoms such as increased muscle tension, heart rate, dizziness, and/or sweating, along with cognitive symptoms such as recurring or intrusive thoughts or worries (American Psychiatric Association, 2013). Generalized Anxiety Disorder (GAD) is a common mental health disorder, affecting approximately 3-6% of individuals in North America (Mohammadi et al., 2020; Revicki et al., 2012), and is characterized by frequent, and generalized, or diffuse symptoms of anxiety that are difficult to control lasting over a period of six months or more (American Psychiatric Association, 2013; World Health Organization, 2019). Anxiety is highly comorbid with several other mental health disorders, with 67% of individuals diagnosed with GAD meeting criteria for major depressive disorder sometime in their life (Kessler et al., 2004). Moreover, research has shown that diagnosis is likely under-capturing the true prevalence of anxiety, as many more people have symptoms of anxiety but may not meet the formal DSM-5 criteria for an anxiety disorder. For these individuals as well, symptoms of anxiety can still be quite debilitating, and these people may be in need of treatment (Haller et al., 2014).

Given the number of major societal and personal changes precipitated by the pandemic, it is understandable that the pandemic would also affect the prevalence of mental health conditions. Factors contributing to mental health concerns during the pandemic include social isolation and loneliness due to physical distancing or self-isolation guidelines. Physical distancing meant that many individuals were facing newfound isolation, or unable to meet their own needs for social support. Studies throughout the pandemic have found a positive correlation between loneliness and symptoms of depression and anxiety (Lee et al., 2020; Lee et al., 2022; Okruszek et al., 2020; Palgi et al., 2020; Van der Velden et al., 2021; Varga et al., 2021).

Chrikov et al. (2020) conducted a survey of 46,000 undergraduate and graduate students, and used a GAD screening tool, the Generalized Anxiety Disorder-7, and a depression screening tool, the Patient Health Questionnaire-2 (PHQ-2) to establish the rates of American students who screened positive for GAD and depression respectively, in the early months of the pandemic (May-July 2020). The researchers found that approximately 39% and 34% of participants screened positive for GAD and depression, respectively. Furthermore, when compared to a similar study conducted in 2019, the researchers found that the prevalence of positive GAD screening was one and a half times higher than in 2019, and the prevalence of positive depression screening had increased two-fold, possibly reflecting the pandemic's impact on rates of symptoms of anxiety and depression. These findings have been corroborated with other studies that have shown that the incidence of GAD and depression were substantially increased during the pandemic (Choi et al., 2020; Ettman et al., 2020; Turna et al., 2021).

Related to symptoms of anxiety is the concept of anxiety sensitivity. Anxiety sensitivity is a stable and internalizing personality trait that is defined as the fear that physiological or emotional symptoms of anxiety will have harmful consequences. For example, individuals high in anxiety sensitivity may fear a heart attack if they notice an increase in their heart rate. The literature identifies anxiety sensitivity as a trait that contributes to higher risk for virtually all anxiety disorders (Mantar et al., 2011; Olatunji & Wolitzky-Taylor, 2009; Schmidt et al., 2010; Taylor et al., 1992). Preliminary research during the COVID-19 pandemic has suggested a positive relationship between anxiety sensitivity and symptoms of anxiety and depression (Rogers et al., 2021; Warren et al., 2021).

Previous research has established a relationship between anxiety sensitivity and gaming behaviours (Kahraman & Yertutanol, 2021; Mehroof & Griffiths, 2010). Kahraman and Yertutanol

(2021) recruited 438 self-reported adult gamers via social media, and asked participants to complete the Anxiety Sensitivity Index, and the Game Addiction Scale. The researchers found a positive association between anxiety sensitivity and symptoms of Gaming Disorder. Mehroof & Griffiths (2010), described in detail further in this dissertation, similarly found positive associations between anxiety sensitivity and symptoms of Gaming Disorder. Unfortunately, no studies have established this relationship during the COVID-19 pandemic.

To understand how anxiety and anxiety sensitivity may have influenced gaming during the COVID-19 pandemic, it is also crucial to explore the possible explanations for this relationship. The tension reduction hypothesis that may help to explain the relationship between anxiety (or anxiety sensitivity), coping, and excessive gaming.

Tension Reduction Hypothesis

The tension reduction hypothesis posits that individuals turn to addictive substances or behaviours to immediately reduce physical tension or stress, driven by the desire for the pleasant effects or relaxation that the addictive substance or behaviour provides. In other words, the addictive substances or behaviours provide fast-acting and temporary relief from everyday stressors (Kalodner et al., 1989; Kushner et al., 2000; Kushner & Sher, 1993). This in turn can lead to escalating dependence on the coping mechanism and may hinder the development of other diverse and adaptive coping skills. As the individual begins to rely on the negative reinforcement, it can lead to excessive use of the addictive substance or behaviour, interfering with daily functioning and causing further psychological distress.

Regarding gaming, evidence supporting the tension reduction hypothesis has been found in several pre-pandemic studies that explored the ability of video games to reduce stress quickly

and effectively. For example, Russoniello, O'Brien, et al. (2009) conducted a study with 143 participants, recruited through university fliers. Participants were randomly assigned to play one of three casual video games for twenty minutes or surf the internet for the same duration to find health-related articles. Mood states were assessed using the Profile of Mood States questionnaire, and physiological measures such as electroencephalography (EEG) and heart rate variability (HRV) were also collected. The study found that all three casual video games had mood-lifting effects, along with relaxation of the autonomic nervous system and reduced physical stress. The control group did not show these effects, supporting the notion that casual video games can reduce physical tension and improve mood, thus supporting the tension reduction hypothesis.

However, some studies have found that while playing video games may increase positive mood, they may not have an immediate stress-relieving response as previously suggested. Stanhope et al. (2016) recruited 55 casual video gamers and subjected them to a stress-inducing memory task for five minutes. Blood pressure, heart rate, and questionnaires related to stress (Dundee Stress State Questionnaire) and mood (PANAS mood scale) were collected. The participants were then randomly assigned to one of three experimental groups: playing a casual video game for five minutes, watching and participating in a five-minute guided meditation/relaxation video, or sitting quietly for five minutes as a control condition. At the end of the task, blood pressure and heart rate were measured once again. The study found that playing video games for five minutes resulted in a greater increase in positive affect compared to the guided meditation/relaxation video and the control condition. However, there were no significant differences in the reduction of negative affect or physiological measures of stress among the three conditions, suggesting that none of the conditions significantly reduced stress levels of the participants.

While the above study did not demonstrate a physiological reduction in stress, it is possible that the time allocated for the task was not sufficient to allow for such a reduction. Desai et al. (2021) conducted a similar study during the COVID-19 pandemic, involving 80 undergraduate students. The participants completed a questionnaire on psychological stress and had their heart rate and blood pressure measured. They were then randomized to one of two conditions: playing a casual video game for twenty minutes or participating in a twenty-minute mindfulness/body scan exercise. Afterward, they completed the same measure of psychological stress and had their heart rate and blood pressure measured once again. The study found that while mindfulness was slightly more effective, both the video game and mindfulness conditions resulted in a significant reduction in stress. These results demonstrate that casual video games may be an effective medium for the reduction of stress and give weight to the tension reduction hypothesis. It is important to note that the above studies recruited casual gamers and as such, caution should be taken with regards to generalizability in considering the relationship between problem gaming and the tension reduction hypothesis. Further research may benefit from recruiting participants who game excessively to better understand this relationship.

The positive relationship between anxiety/anxiety sensitivity and gaming has been documented prior to the pandemic (Mehroof & Griffiths, 2010). Mehroof and Griffiths (2010) conducted a cross-sectional study with 123 university students in the United Kingdom to examine the roles of various personality traits, including anxiety sensitivity and symptoms of anxiety, in relation to symptoms of Gaming Disorder. Participants completed surveys, including the State-Trait Anxiety Inventory for Adults, and the Game Addiction Scale. It was found that both trait and state anxiety were positively associated with excessive online gaming. Mehroof and Griffiths'

(2010) research offers evidence that both anxiety sensitivity and symptoms of anxiety could be contributing factors to excessive gaming, giving weight to the tension reduction hypothesis.

Based on the above discussion, it is possible that gaming was used during the COVID-19 pandemic to alleviate physical sensations of tension and anxiety. Furthermore, individuals with more symptoms of anxiety may be more likely to engage in regular or excessive gaming as a means of reducing these sensations.

Depression

Depression is highly comorbid with a number of anxiety disorders (Kessler et al., 2004; Pollack, 2005), with 58% of patients diagnosed with major depressive disorder having a comorbid anxiety disorder, and 67% of patients diagnosed with GAD in particular having a lifetime history of major depressive disorder (Kessler et al., 2004; Pollack, 2005). Depression is defined as a negative affective state characterized by feelings of sadness, pessimism, and despondency that also interferes with an individual's ability to function or interferes with their daily life (American Psychiatric Association, 2013). It may include symptoms such as changes in eating and sleeping habits, anhedonia, lack of energy or motivation, difficulty concentrating, withdrawal from others or social activities, low mood, and a sense of worthlessness (American Psychiatric Association, 2013).

Depression affects almost 260 million people worldwide (Liu et al., 2020), representing about 5% of the global adult population (World Health Organization, 2023). In 2019, 18.5% of adults in the United States experienced symptoms of depression (Villarroel & Terlizzi, 2020), while 11.2% of Canadians have been found to have a lifetime prevalence of major depressive disorder (Knoll & MacLennan, 2017). Ettman et al. (2023) conducted a systematic review,

searching MEDLINE, Embase, Cochrane databases, and PsycINFO for articles published between January 2019 and May 16, 2022, aiming to determine the prevalence of depression throughout the pandemic in the United States. 49 articles were included in the review. The researchers found that the average prevalence in the United States was 12.9% for severe depression, 26% for moderate depression, and 36% for mild depression. Moreover, although there was some variation in the prevalence of depression over time, the researchers concluded that the prevalence of depression remained consistently high between all studies.

Related to depression is the concept of hopelessness, a stable internalizing personality trait characterized by an individual's frequent negative thoughts about themselves, others, and the future. Consequently, high levels of hopelessness have been linked to an increased risk for recurrent major depressive episodes (Mac Giollabhui et al., 2018; Soloff et al., 2000; Szanto et al., 1998). Preliminary research during the COVID-19 pandemic has suggested a positive relationship between hopelessness and COVID-19 related depression and loneliness (Akova et al., 2022; Padmanabhanunni & Pretorius, 2021).

It is important to understand the theoretical framework for which the relationship between depression (and hopelessness) and excessive gaming may exist. The self-medication hypothesis is one such explanation that may help to explore this relationship further.

Self-Medication Hypothesis

The self-medication hypothesis suggests that individuals use addictive substances or behaviours to overcome painful and unpleasant affective states that they are experiencing (Khantzian, 1987; Khantzian, 1997; Daria J Kuss et al., 2017). In other words, these addictive substances or behaviours serve as a means for self-soothing and reducing symptoms of mental

health issues such as depression, anxiety, or trauma (Khantzian, 1987; Suh et al., 2008). The central idea of the self-medication hypothesis is that the addictive substance or behaviours are used to alleviate psychological discomfort. The self-medication hypothesis has previously been applied to non-substance addictive behaviours, including gaming (Balhara et al., 2018; González-Bueso et al., 2018; King & Delfabbro, 2016; Liu et al., 2018; Vadlin et al., 2016; Wartberg et al., 2017).

Although there is some overlap between the tension reduction hypothesis and the self-medication hypothesis, the two differ in their primary emphasis. While the self-medication hypothesis focuses on the psychological distress and underlying mental concerns of individuals, the tension reduction hypothesis emphasizes the immediate relief provided by addictive substances or behaviours, regardless of underlying psychological concerns (Kalodner et al., 1989; Kushner et al., 2000; Kushner & Sher, 1993).

Within the context of gaming, the self-medication hypothesis suggests that individuals prone to mental health concerns may turn to gaming as a way of coping with their psychological distress. Several pre-pandemic studies have found that coping motives play a significant role in the relationship between symptoms of anxiety and depression and excessive gaming behaviours (Balhara et al., 2018; González-Bueso et al., 2018; King & Delfabbro, 2016; Liu et al., 2018; Vadlin et al., 2016; Wartberg et al., 2017). Hopelessness in particular has been found to be a significant predictor of time spent gaming during the pandemic (Wilkins et al., 2023).

Very few studies have explored the relationship between emotional vulnerability, gaming, and coping motives during the COVID-19 pandemic. However, a study conducted by Biolcati et al. (2021) provides some needed information in this relationship. The researchers explored the relationship between personality traits and symptoms of Internet Gaming Disorder during the

COVID-19 pandemic. The researchers recruited 627 self-reported video game players and asked them to complete the Internet Gaming Disorder Scale- Short Form, the Substance Use Risk Profile Scale, and the Motives for Online Gaming Questionnaire. The researchers found that hopelessness was a distinguishing trait between individuals who met criteria for Gaming Disorder and those who did not. Specifically, those with higher levels of hopelessness tended to engage in excessive gaming and experience associated functional impairment. As well, higher levels of anxiety sensitivity predicted coping motives for gaming. These results provide some support for the self-medication hypothesis in that those with emotional vulnerabilities seem to be at particular risk for excessive gaming.

Although coping motives during the pandemic have been under-researched, there is some support for the self-medication hypothesis in other ways. As noted above, studies conducted during the COVID-19 pandemic have revealed a positive relationship between loneliness and symptoms of depression and anxiety, along with an increase in the incidence of such symptoms (Lee et al., 2020; Lee et al., 2022; Okruszek et al., 2020; Palgi et al., 2020; Van der Velden et al., 2021; Varga et al., 2021). These findings suggest that individuals may have experienced higher levels of psychological distress during the pandemic, which may have led them to seek coping strategies. Additionally, there has been a significant rise in gaming behaviours during the COVID-19 pandemic (Entertainment Software Association, 2020; Entertainment Software Association of Canada, 2020).

While these pieces of evidence offer some support for the self-medication hypothesis, it is important to note that these studies did not examine the relationship between symptoms of depression and anxiety and excessive gaming, nor did they explore the role of coping motives in this relationship, as is done in the studies included in this dissertation. Few studies have

investigated motivations for gaming during the pandemic, however some preliminary research has indicated that that coping motives (Balhara et al., 2020; Xu et al., 2021), and social motives (Savolainen et al., 2022) may be fruitful areas for future investigation. Given the established link between depression, anxiety, and gaming, it stands to reason that coping motives will likely have been the most central for those with emotional vulnerabilities during the COVID-19 pandemic.

These results together demonstrate that while many people were able to use video games as a positive means of coping during the COVID-19 pandemic, those who experience problematic gaming behaviours or who used gaming as an avoidant coping style tend to be negatively impacted by their video gaming behaviour, possibly leading to the onset of a Gaming Disorder and its associated consequences to a person's overall functioning. However, the role of coping motives for gaming in this relationship between emotional vulnerability and excessive gaming remains unclear. Specifically, the directionality of the relationship between emotional vulnerability and excessive gaming is unclear with regards to coping motives. A primary focus of this dissertation is to better understand the relationships among emotional vulnerability (e.g., symptoms or traits of depression and anxiety), coping motives, time spent gaming and symptoms of Gaming Disorder during the COVID-19 pandemic.

Gaming motivations

Several studies have established a relationship between excessive video gaming and coping motivations for gaming. Coping motivations are one of four primary motivations for gaming that have been identified. Gaming motives are proximal cognitive factors that are believed to mediate the effects of individual differences (e.g., anxiety and depression) on excessive gaming and related harms (Király et al., 2015; Marino et al., 2020). The research on gaming motives is based on much more established literature surrounding motives for drinking alcohol (Cooper et al., 1995; Cox &

Klinger, 1988; Cox & Klinger, 2011; Hasking et al., 2011). Some of the motives described below for gaming have also been found to be relevant for alcohol use, namely social, coping, and enhancement motives (Hasking et al., 2011). This prior research on drinking motives provides a solid foundation for the study of gaming motives.

Myrseth et al. (2017) identified four key motives for gaming, namely: enhancement motives (internal, positive reinforcement; gaming to increase pleasant or positive emotions), coping motives (internal, negative reinforcement; reduction of negative emotions), social motives (external, positive reinforcement motives; increasing social interaction), and self-gratification motives (gaming to satisfy or indulge one's own personal desires). Coping motives seem to be the most central to problematic gaming, particularly among those with emotional vulnerabilities (Myrseth et al., 2017), such as a history of anxiety and/or depression. While enhancement motivations tend to predict greater engagement in gaming activities, coping motivations have been found to predict increased risk for gaming harms. Furthermore, coping motives independently predict a loss of control of gaming behaviours as well as the development of gaming problems (Myrseth et al., 2017). This is particularly relevant given the negative impact that the pandemic had on individuals' mental health, which may have contributed to the aforementioned rise in video game usage. It is possible that this rise may be due to an increased need for coping.

Coping during COVID-19

Given the negative impact of the pandemic on individuals' emotional well-being, it is also important to understand how people were choosing to cope with these changes. Coping is defined as an individual's cognitive and behavioural efforts to manage internal and external stressors (Lazarus & Folkman, 1984). Coping is commonly broken down into 14 coping

strategies across the two domains of "avoidance" and "approach" coping (Carver, 1997). Avoidance coping encompasses strategies that are used to escape confrontation with a stressor, and have been related to negative consequences such as greater risk for suicide (Ambrus et al., 2020), and greater symptoms of depression and anxiety (Blalock & Joiner, 2000; Grant et al., 2013). Avoidance coping strategies include denial, distraction, self-blame, substance use, venting, and behavioural disengagement (Carver, 1997).

In contrast, approach coping encompasses strategies that are used to reduce the effects of the stressor, including active coping (taking active steps to reduce or change the stressor), positive reframing (looking for the positive aspects of a situation or attempting to learn from the situation), acceptance, and using emotional supports (Carver, 1997; Shamblaw et al., 2021). Approach coping strategies tend to predict greater resilience (Langford et al., 2020; Popa-Velea et al., 2017), and increased quality of life (Popa-Velea et al., 2017).

Despite these correlations, it is important to note that in some situations, one coping strategy may be more effective than others, despite the strategy domain's overall correlation with positive or negative consequences (Stephenson & DeLongis, 2020). That is, neither approach nor avoidant coping strategies are a perfect fit for every situation - there are times when one method might be superior to the other. For instance, in situations of high work stress, individuals may choose between an active coping approach such as completing tasks and preparing for the next day, or an avoidant coping approach such as watching TV to reduce stress. The effectiveness of each strategy would depend on the specific cause of the work stress and the implications that the strategy would have on the person's functioning (DeLongis & Holtzman, 2005; Zeidner, 1995). Furthermore, any adaptive coping method can become maladaptive when used in excess, or if it interferes with a person's ability to function (Stephenson & DeLongis, 2020).

In the case of the COVID-19 pandemic, much of the societal implications of the pandemic on coping were unprecedented. Coping strategies that one may have typically turned to may not have been possible; many aspects of the pandemic were entirely out of a person's control, and many activities were limited (Shamblaw et al., 2021). Given this, it stands to reason that many individuals would have had to develop new coping strategies or may have turned to their preferred coping strategies more often than they usually would. As such, it is important to gain some understanding of how approach and avoidant coping might have been used during the pandemic, and how these coping strategies may relate to mental health.

Shamblaw et al. (2021) aimed to determine just this by conducting a longitudinal study, recruiting American and Canadian participants (N=797) online through Mechanical Turk, an online crowdsourcing platform, in April 2020, with a follow-up survey in May 2020 (N= 395). The researchers asked participants to complete the Brief Coping Orientation to Problems Experience (Brief COPE), to determine which coping strategies were being used by the participants at the beginning of the pandemic. Participants also completed scales concerning quality of life, impact of the COVID-19 pandemic, and symptoms of depression and anxiety. The researchers found that consistent with previous research, approach coping strategies were associated with lower anxiety and depression scores, while avoidant coping strategies were associated with higher anxiety and depression scores. Furthermore, approach coping strategies were associated with higher quality of life in comparison to those who primarily used avoidant coping strategies. This gives information as to how coping strategies were being used, and what implications these coping strategies have during the COVID-19 pandemic. Video games are unique in that they may be considered an approach or an avoidant coping technique depending on how they are utilized. This research provides us with valuable information regarding how this

utilization may result in mental health benefits or consequences for the player, depending on if they use gaming as an approach or avoidant coping technique.

Video Games and Coping

Due to the risks associated with excessive gaming and Gaming Disorder, the use of video games has long been debated in terms of whether it would be considered an avoidant, or an approach coping strategy. On the one hand, video games can negatively impact a person's life by providing excessive distraction or disconnection from reality, can be coupled with substance use, and can also be described as a form of behavioural disengagement (Cudo et al., 2022; Fazeli et al., 2020; Stephenson & DeLongis, 2020). When played excessively, gaming can become a Gaming Disorder (American Psychiatric Association, 2013). On the other hand, some types of video games, such as cooperative or team-based games, can also be a welcome form of social connection with others (Marston & Kowert, 2020), providing a form of emotional support in times of stress, or as a form of short-term distraction to reduce acute stress, or simply as a hobby or pastime that brings the person enjoyment (Kuhn et al., 2018; Pine et al., 2020). As mentioned previously, no single coping strategy is universally positive or negative, and often depends on the situational context and frequency in which they are used (Stephenson & DeLongis, 2020). Moreover, each coping strategy can serve several functions at once, for example, providing both distraction from unpleasant feelings along with facilitating social connections (Cox & Ferguson, 1991). Video gaming appears to be no exception to this rule.

Other studies have found a relationship between coping motivations and excessive video game use. Plante et al. (2019) conducted two studies to determine the relationship between avoidant coping and the onset of gaming problems. In the first study, 930 undergraduate participants completed a survey including questions related to frequency of video game play,

trait anxiety, coping strategies, symptoms of gaming addiction, and symptoms of mental health disorders including anxiety and depression. The researchers found a positive association between symptoms of video game addiction and the use of video games as a coping strategy. Moreover, participants seemed to use video games as a means of coping with their anxiety, and this association was related to an increase in symptoms of video game addiction. These results were replicated in a second study consisting of 1001 undergraduate students. The results of the studies conducted by Plante et al. (2019) are particularly relevant to the two studies being conducted as a part of this dissertation, providing support to our hypotheses surrounding the relationship between emotional vulnerability and gaming behaviours through coping motives during the COVID-19 pandemic.

It is no surprise that during the COVID-19 pandemic, video games were used in a multitude of ways, for a variety of reasons. Pearce et al. (2022) examined how video games were used as a coping tool for families during the pandemic. The researchers interviewed 27 families (33 parents, 37 children), and looked specifically at the families' use of the game *Animal Crossing* as a means of familial connection and coping. The researchers found that the families engaged in a form of coping where the family collectively coped with the stress of the pandemic together using the game as an outlet for their stress. Barr and Copeland-Stewart (2022) similarly found positive results when examining survey data from 781 Americans looking at their video game habits and the participants' corresponding well-being during the COVID-19 pandemic. The researchers found that players primarily used video games to cope with the pandemic, or to socialize with others. Moreover, the researchers found that participants overall felt that video games had positively contributed to their well-being during the COVID-19 pandemic. It should be noted that in the above studies, the participants were engaging in moderate or casual gaming.

This raises the possibility that individuals employing gaming in a more adaptive way might allocate less time to playing, potentially deriving benefits from their gaming behaviors.

These studies demonstrate the positive impact that video gaming can, and did, have on many individuals during the COVID-19 pandemic. However, other studies conducted both prior to (Blasi et al., 2019; Loton et al., 2016; Shi et al., 2019) and during the pandemic (Pallavicini et al., 2022; Xu et al., 2021) have also shown the negative consequences of using video games as a coping strategy, particularly when the participants are already in an emotionally vulnerable state (i.e., experiencing symptoms of depression or anxiety), are at-risk for developing a Gaming Disorder, or have used video gaming in excess. It is important to consider the context in which the emotionally vulnerable may be playing video games; many of these individuals spent a significant time alone, and may have begun to game excessively to cope with these negative emotions. Moreover, during the COVID-19 pandemic, there would have been very little external forces to limit these individuals' engagement (e.g., work or school shut-downs, social engagements minimized).

Pallavicini et al. (2022) also found that those who are emotionally vulnerable may be at particular risk of developing a Gaming Disorder in their systematic review conducted to understand the effect of video gaming during the COVID-19 pandemic on stress, anxiety, depression, loneliness, and Gaming Disorder. The researchers used PsychINFO, Web of Science and Medline and included studies published after 2019. 24 studies consisting of sample sizes ranging between 162 - 3,928 were included. The researchers found that video games were beneficial in mitigating symptoms of stress, anxiety, and depression for those who primarily engaged in augmented reality (e.g. Pokémon Go) or online multiplayer games ; however, in individuals who used video games as an avoidant coping style or in those who were at higher

risk for Gaming Disorder (e.g. excessive gamers, young males), although video games had short-term relaxing effects, these individuals also exhibited longer-term increases in symptoms of stress, anxiety, and depression. Furthermore, the researchers found that symptoms of Gaming Disorder were highest among at-risk individuals (defined as male children, adolescents, or adults with a problematic gamer profile or a high level of stress). These results are in line with the results of a systematic review and meta-analysis conducted by Gao et al. (2022), who found that that those who are most at-risk for Gaming Disorder include adolescents and young adults who also experience high symptoms of stress, anxiety, depression, emotional distress, low self-esteem, and longer than average gaming time.

Although it is well-established that those who are emotionally vulnerable are at a higher risk for Gaming Disorder, much is unknown about this relationship in the context of the COVID-19 pandemic. Unanswered questions remain as to how coping motives play into the relationship between emotional vulnerability and excessive gaming.

Current Studies

The two studies presented in this dissertation aim to examine the relationships between emotional vulnerability (measured through a latent variable consisting of symptoms of depression and anxiety (Study 1) or through trait anxiety sensitivity and hopelessness (Study 2), coping motives for gaming, and gaming behaviours during the first few months of, and one year into, the COVID-19 pandemic. The pandemic was novel in that it drastically changed the way that individuals were working, coping, and interacting with one another. Moreover, it brought new stressors, fears, and uncertainties that previously were unprecedented in our society over the last generation. As such, the present studies were conducted to understand how people were using video games as a method of coping, looking specifically at emotional vulnerability as a

predictive variable. The current studies are the only studies to date to have looked at emotional vulnerability and personality factors in relation to coping motives for gaming during the pandemic. Emotional vulnerability is a particularly salient variable in this relationship when considering how symptoms of depression and anxiety have been exacerbated during the pandemic, and the previously noted relationship between emotional vulnerability and excessive gaming. This current dissertation's studies hope to improve our understanding of this relationship, focusing specifically on the role of coping motives in this relationship.

The first study was a secondary analysis of a longitudinal study with data collected early in the pandemic in Canada. It implemented a three timepoint longitudinal design, with a sample of 332 Canadian gamers (M_{age}= 33.79; 60.8% men). Participants completed three surveys on Prolific- an online crowdsourcing platform- with the first occurring in April 2020 (one month after the declared COVID-19 state of emergency), and subsequent surveys being spaced three months apart. The first study examined how emotional vulnerability (i.e., symptoms of depression and anxiety together) early in the pandemic was related to coping-motivated gaming and gaming-related issues in the first six months of the pandemic. This study helps us to understand the immediate relationships between gaming behaviour and emotional vulnerability at the start of the pandemic, and helps to fill a critical gap in the literature to better understand how emotional vulnerability influenced gaming behaviours over the first months of the COVID-19 pandemic. The first study hypothesized that higher levels of emotional vulnerability in the early stages of the pandemic (Time 1) would prospectively predict greater time spent gaming and related problems at six-months into the pandemic (Time 3). It was also hypothesized that coping motives for gaming (Time 2) would explain these effects.

Psychological distress during the COVID-19 pandemic has been proposed to lead to longer-term or enduring impacts on maladaptive substance use for coping purposes (Rehm et al., 2020). As such, the second study served to better understand how gaming behaviours may have a similar long-term effect. The second study took place approximately one year into the pandemic, between July 2021 and January 2022, helping us to understand the long-term effects of the pandemic and how stable traits may have exacerbated the pandemic's influence on gaming behaviours and coping. The second study also implemented a three timepoint longitudinal design and examined the ongoing impact of psychological distress on gaming behaviours during the COVID-19 pandemic, looking specifically at more stable personality traits, hopelessness, and anxiety sensitivity. 1001 American gamers (M_{age}= 38.43, 46.8% male) completed a series of three surveys spaced three months apart through Mechanical Turk, beginning July 2021. The second study aimed to determine how anxiety sensitivity and hopelessness were related to time spent gaming, again using coping motives as a mediator in this relationship. It was hypothesized that baseline anxiety sensitivity and hopelessness would each independently relate to future time spent gaming (Time 3), through coping motives (Time 2). The second study helps us to understand how these two personality traits may influence gaming behaviours, and how coping motives play into this relationship.

Together, these two studies provide valuable insight into the relationships between emotional vulnerability, gaming behaviours, and coping motives for gaming during the COVID-19 pandemic. These studies highlight the importance of understanding the role of coping motives in these relationships, and provide us with an opportunity to explore how transient versus stable symptoms of anxiety and depression might change how gaming is used during the pandemic. The findings of these studies can help to add to the growing literature of gaming behaviour

during the pandemic and help to inform interventions aiming to mitigate the ongoing negative impact of the pandemic on mental health and gaming behaviours.

References

Alexander, M., Unruh, L., Koval, A., & Belanger, W. (2022). United States response to the COVID-19 pandemic, January-November 2020. *Health Econ Policy Law*, *17*(1), 62-75. https://doi.org/10.1017/S1744133121000116

Ambrus, L., Sunnqvist, C., Asp, M., Westling, S., & Westrin, A. (2020). Coping and suicide risk in high risk psychiatric patients. *J Ment Health*, *29*(1), 27-32. https://doi.org/10.1080/09638237.2017.1417547

American Psychiatric, A. (2013). *Diagnostic and Statistical Manual of Mental Disorders* [doi:10.1176/appi.books.9780890425596]. American Psychiatric Publishing, Inc. https://doi.org/10.1176/appi.books.9780890425596

Andreas, J. B., & Brunborg, G. S. (2022). Adolescents' alcohol use and related expectancies before and during the early COVID-19 pandemic: evidence from the nationwide MyLife study. *European Addiction Research*, *28*(6), 467-476.

Balhara, Y. P. S., Garg, H., Kumar, S., & Bhargava, R. (2018). Gaming disorder as a consequence of attempt at self- medication: Empirical support to the hypothesis. *Asian J Psychiatr*, *31*, 98-99. https://doi.org/10.1016/j.ajp.2018.02.013

Barr, M., & Copeland-Stewart, A. (2022). Playing video games during the COVID-19 pandemic and effects on players' well-being. *Games and Culture*, *17*(1), 122-139. https://doi.org/https://doi.org/10.1177/15554120211017036

Baxter, A. J., Scott, K. M., Vos, T., & Whiteford, H. A. (2013). Global prevalence of anxiety disorders: a systematic review and meta-regression. *Psychol Med*, *43*(5), 897-910. https://doi.org/10.1017/S003329171200147X

Baxter, A. J., Vos, T., Scott, K. M., Ferrari, A. J., & Whiteford, H. A. (2014). The global burden of anxiety disorders in 2010. *Psychological Medicine*, *44*(11), 2363-2374.

Blalock, J. A., & Joiner, T. E. (2000). Interaction of cognitive avoidance coping and stress in predicting depression/anxiety. *Cognitive Therapy and Research*, *24*, 47-65.

Cardwell, E., Hoff, R. A., Garakani, A., Krishnan-Sarin, S., Potenza, M. N., & Zhai, Z. W. (2022). An exploratory study of anxiety-motivated gambling in adolescents: Associations with minority status and gambling, health and functioning measures. *J Psychiatr Res*, *151*, 445-453. https://doi.org/10.1016/j.jpsychires.2022.03.052

Caro, C., & Popovac, M. (2021). Gaming when things get tough? Examining how emotion regulation and coping self-efficacy influence gaming during difficult life situations. *Games and Culture*, *16*(5), 611-631. https://doi.org/https://doi.org/10.1177/1555412020944622

Carver, C. S. (1997). You want to measure coping but your protocol'too long: Consider the brief cope. *International journal of behavioral medicine*, *4*(1), 92-100.

Choi, E. P. H., Hui, B. P. H., & Wan, E. Y. F. (2020). Depression and Anxiety in Hong Kong during COVID-19. *Int J Environ Res Public Health*, *17*(10), 3740. https://doi.org/10.3390/ijerph17103740

Chowell, G., & Mizumoto, K. (2020). The COVID-19 pandemic in the USA: what might we expect? *The lancet*, *395*(10230), 1093-1094.

Chrikov, I., Soria, K. M., Horgos, B., & Jones-White, D. (2020). Undergraduate and graduate students' mental health during the COVID-19 pandemic.

Cudo, A., Wojtasiński, M., Tużnik, P., Fudali-Czyż, A., & Griffiths, M. D. (2022). The Relationship between depressive symptoms, loneliness, self-control, and gaming disorder

among Polish male and female gamers: The indirect effects of gaming motives. *International journal of environmental research and public health*, *19*(16), 10438.
Cuijpers, P., Smit, F., Oostenbrink, J., de Graaf, R., Ten Have, M., & Beekman, A. (2007). Economic costs of minor depression: a population-based study. *Acta Psychiatr Scand*, *115*(3), 229-236. https://doi.org/10.1111/j.1600-0447.2006.00851.x
Detsky, A. S., & Bogoch, II. (2020). COVID-19 in Canada: Experience and Response. *Jama*, *324*(8), 743-744. https://doi.org/10.1001/jama.2020.14033
Entertainment Software Association of Canada. (2020). *Real Canadian Gamer Essential Facts 2020*. Retrieved December 10, 2020 from https://theesa.ca/wp-content/uploads/2020/11/RCGEF_en.pdf
ESA. (2019). *2019 Essential facts about the computer and video game industry*.
ESA. (2020). *2020 Essential facts about the video game industry*.
ESA. (2022). *2022 Essential facts about the video game industry*.
Ettman, C. K., Abdalla, S. M., Cohen, G. H., Sampson, L., Vivier, P. M., & Galea, S. (2020). Prevalence of depression symptoms in US adults before and during the COVID-19 pandemic. *JAMA network open*, *3*(9), e2019686-e2019686.
Fazeli, S., Zeidi, I. M., Lin, C.-Y., Namdar, P., Griffiths, M. D., Ahorsu, D. K., & Pakpour, A. H. (2020). Depression, anxiety, and stress mediate the associations between internet gaming disorder, insomnia, and quality of life during the COVID-19 outbreak. *Addictive Behaviors Reports*, *12*, 100307. https://doi.org/https://doi.org/10.1016/j.abrep.2020.100307
Findlay, L. (2017). Depression and suicidal ideation among Canadians aged 15 to 24. In: Statistics Canada.
Gao, Y.-X., Wang, J.-Y., & Dong, G.-H. (2022). The prevalence and possible risk factors of internet gaming disorder among adolescents and young adults: Systematic reviews and meta-analyses. *Journal of Psychiatric Research*.
Giardina, A., Di Blasi, M., Schimmenti, A., King, D. L., Starcevic, V., & Billieux, J. (2021). Online Gaming and Prolonged Self-Isolation: Evidence from Italian Gamers During the Covid-19 Outbreak. *Clin Neuropsychiatry*, *18*(1), 65-74. https://doi.org/10.36131/cnfioritieditore20210106
González-Bueso, V., Santamaría, J. J., Fernández, D., Merino, L., Montero, E., & Ribas, J. (2018). Association between internet gaming disorder or pathological video-game use and comorbid psychopathology: a comprehensive review. *International journal of environmental research and public health*, *15*(4), 668. https://doi.org/https://doi.org/10.3390/ijerph15040668
Grant, D. M., Wingate, L. R., Rasmussen, K. A., Davidson, C. L., Slish, M. L., Rhoades-Kerswill, S., Mills, A. C., & Judah, M. R. (2013). An examination of the reciprocal relationship between avoidance coping and symptoms of anxiety and depression. *Journal of Social and Clinical Psychology*, *32*(8), 878-896.
Haller, H., Cramer, H., Lauche, R., Gass, F., & Dobos, G. J. (2014). The prevalence and burden of subthreshold generalized anxiety disorder: a systematic review. *BMC psychiatry*, *14*(1), 128. https://doi.org/10.1186/1471-244X-14-128
Jo, Y. S., Bhang, S. Y., Choi, J. S., Lee, H. K., Lee, S. Y., & Kweon, Y. S. (2019). Clinical Characteristics of Diagnosis for Internet Gaming Disorder: Comparison of DSM-5 IGD and ICD-11 GD Diagnosis. *Journal of clinical medicine*, *8*(7), 945. https://doi.org/10.3390/jcm8070945

Kalodner, C. R., Delucia, J. L., & Ursprung, A. W. (1989). An examination of the tension reduction hypothesis: The relationship between anxiety and alcohol in college students. *Addictive behaviors*, *14*(6), 649-654.

Kessler, R. C., Berglund, P., Chiu, W. T., Demler, O., Heeringa, S., Hiripi, E., Jin, R., Pennell, B. E., Walters, E. E., Zaslavsky, A., & Zheng, H. (2004). The US National Comorbidity Survey Replication (NCS-R): design and field procedures. *Int J Methods Psychiatr Res*, *13*(2), 69-92. https://doi.org/10.1002/mpr.167

Khantzian, E. J. (1987). *The self-medication hypothesis of addictive disorders: focus on heroin and cocaine dependence*. Springer.

Khantzian, E. J. (1997). The self-medication hypothesis of substance use disorders: a reconsideration and recent applications. *Harv Rev Psychiatry*, *4*(5), 231-244. https://doi.org/10.3109/10673229709030550

King, D. L., & Delfabbro, P. H. (2016). The Cognitive Psychopathology of Internet Gaming Disorder in Adolescence. *J Abnorm Child Psychol*, *44*(8), 1635-1645. https://doi.org/10.1007/s10802-016-0135-y

King, D. L., Delfabbro, P. H., Billieux, J., & Potenza, M. N. (2020). Problematic online gaming and the COVID-19 pandemic. *Journal of Behavioral Addiction*, *9*(2), 184-186. https://doi.org/10.1556/2006.2020.00016

King, D. L., Delfabbro, P. H., Perales, J. C., Deleuze, J., Kiraly, O., Krossbakken, E., & Billieux, J. (2019). Maladaptive player-game relationships in problematic gaming and gaming disorder: A systematic review. *Clinical psychology review*, *73*, 101777. https://doi.org/10.1016/j.cpr.2019.101777

Király, O., Urbán, R., Griffiths, M. D., Ágoston, C., Nagygyörgy, K., Kökönyei, G., & Demetrovics, Z. (2015). The mediating effect of gaming motivation between psychiatric symptoms and problematic online gaming: An online survey. *Journal of medical Internet research*, *17*(4), e3515. https://doi.org/https://doi.org/10.2196/jmir.3515

Knoll, A. D., & MacLennan, R. N. (2017). Prevalence and correlates of depression in Canada: Findings from the Canadian Community Health Survey. *Canadian Psychology/Psychologie canadienne*, *58*(2), 116.

Kotwal, A. A., Batio, S., Wolf, M. S., Covinsky, K. E., Yoshino Benavente, J., Perissinotto, C. M., & O'Conor, R. M. (2022). Persistent loneliness due to COVID-19 over 18 months of the pandemic: a prospective cohort study. *Journal of the American Geriatrics Society*.

Kowal, M., Conroy, E., Ramsbottom, N., Smithies, T., Toth, A., & Campbell, M. (2021). Gaming Your Mental Health: A Narrative Review on Mitigating Symptoms of Depression and Anxiety Using Commercial Video Games. *JMIR serious games*, *9*(2), e26575. https://doi.org/10.2196/26575

Krause, K. H., Verlenden, J. V., Szucs, L. E., Swedo, E. A., Merlo, C. L., Niolon, P. H., Leroy, Z. C., Sims, V. M., Deng, X., & Lee, S. (2022). Disruptions to School and Home Life Among High School Students During the COVID-19 Pandemic—Adolescent Behaviors and Experiences Survey, United States, January–June 2021. *MMWR supplements*, *71*(3), 28. https://doi.org/https://doi.org/10.15585/mmwr.su7103a5

Kuhn, S., Berna, F., Ludtke, T., Gallinat, J., & Moritz, S. (2018). Fighting Depression: Action Video Game Play May Reduce Rumination and Increase Subjective and Objective Cognition in Depressed Patients. *Frontiers in psychology*, *9*, 129. https://doi.org/10.3389/fpsyg.2018.00129

Kushner, M. G., Abrams, K., Thuras, P., & Hanson, K. L. (2000). Individual differences predictive of drinking to manage anxiety among non-problem drinkers with panic disorder. *Alcoholism: Clinical and Experimental Research*, *24*(4), 448-458.

Kushner, M. G., & Sher, K. J. (1993). Comorbidity of alcohol and anxiety disorders among college students: Effects of gender and family history of alcoholism. *Addictive behaviors*, *18*(5), 543-552.

Kuss, D. J., Dunn, T. J., Wölfling, K., Müller, K. W., Hędzelek, M., & Marcinkowski, J. (2017). Excessive Internet use and psychopathology: The role of coping. *Clinical Neuropsychiatry: Journal of Treatment Evaluation*, *14*(1), 73-81.

Langford, D. J., Morgan, S., Cooper, B., Paul, S., Kober, K., Wright, F., Hammer, M. J., Conley, Y. P., Levine, J. D., & Miaskowski, C. (2020). Association of personality profiles with coping and adjustment to cancer among patients undergoing chemotherapy. *Psycho-Oncology*, *29*(6), 1060-1067.

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. Springer publishing company.

Lee, C. M., Cadigan, J. M., & Rhew, I. C. (2020). Increases in loneliness among young adults during the COVID-19 pandemic and association with increases in mental health problems. *Journal of Adolescent Health*, *67*(5), 714-717.

Lee, J. H., Luchetti, M., Aschwanden, D., Sesker, A. A., Strickhouser, J. E., Terracciano, A., & Sutin, A. R. (2022). Perceived changes in social contact during COVID-19 pandemic in the United States. *Pers Relatsh*, *29*(1), 59-76. https://doi.org/10.1111/pere.12413

Liu, L., Yao, Y.-W., Li, C.-s. R., Zhang, J.-T., Xia, C.-C., Lan, J., Ma, S.-S., Zhou, N., & Fang, X.-Y. (2018). The comorbidity between internet gaming disorder and depression: Interrelationship and neural mechanisms. *Frontiers in psychiatry*, *9*, 154. https://doi.org/https://doi.org/10.3389/fpsyt.2018.00154

Liu, Q., He, H., Yang, J., Feng, X., Zhao, F., & Lyu, J. (2020). Changes in the global burden of depression from 1990 to 2017: Findings from the Global Burden of Disease study. *J Psychiatr Res*, *126*, 134-140. https://doi.org/10.1016/j.jpsychires.2019.08.002

López-Cabarcos, M. Á., Ribeiro-Soriano, D., & Piñeiro-Chousa, J. (2020). All that glitters is not gold. The rise of gaming in the COVID-19 pandemic. *Journal of Innovation & Knowledge*, *5*(4), 289-296. https://doi.org/10.1016/j.jik.2020.10.004

Loton, D., Borkoles, E., Lubman, D., & Polman, R. (2016). Video game addiction, engagement and symptoms of stress, depression and anxiety: The mediating role of coping. *International Journal of Mental Health and Addiction*, *14*, 565-578.

Mannikko, N., Ruotsalainen, H., Miettunen, J., Pontes, H. M., & Kaariainen, M. (2020). Problematic gaming behaviour and health-related outcomes: A systematic review and meta-analysis. *J Health Psychol*, *25*(1), 67-81. https://doi.org/10.1177/1359105317740414

Marino, C., Canale, N., Vieno, A., Caselli, G., Scacchi, L., & Spada, M. M. (2020). Social anxiety and Internet gaming disorder: The role of motives and metacognitions. *J Behav Addict*, *9*(3), 617-628. https://doi.org/10.1556/2006.2020.00044

Marston, H. R., & Kowert, R. (2020). What role can videogames play in the COVID-19 pandemic? *Emerald Open Research*, *2*.

McTernan, W. P., Dollard, M. F., & LaMontagne, A. D. (2013). Depression in the workplace: An economic cost analysis of depression-related productivity loss attributable to job strain and bullying. *Work & Stress*, *27*(4), 321-338.

Menendez-Garcia, A., Jimenez-Arroyo, A., Rodrigo-Yanguas, M., Marin-Vila, M., Sanchez-Sanchez, F., Roman-Riechmann, E., & Blasco-Fontecilla, H. (2022). Internet, video game and mobile phone addiction in children and adolescents diagnosed with ADHD: A case-control study. *Adicciones*, *34*(3), 208-217. https://doi.org/10.20882/adicciones.1469 (Adiccion a Internet, videojuegos y telefonos moviles en ninos y adolescentes: Un estudio de casos y controles.)

Mohammadi, M. R., Pourdehghan, P., Mostafavi, S. A., Hooshyari, Z., Ahmadi, N., & Khaleghi, A. (2020). Generalized anxiety disorder: Prevalence, predictors, and comorbidity in children and adolescents. *J Anxiety Disord*, *73*, 102234. https://doi.org/10.1016/j.janxdis.2020.102234

Myrseth, H., Notelaers, G., Strand, L. A., Borud, E. K., & Olsen, O. K. (2017). Introduction of a new instrument to measure motivation for gaming: the electronic gaming motives questionnaire. *Addiction*, *112*(9), 1658-1668. https://doi.org/10.1111/add.13874

Na, E., Lee, H., Choi, I., & Kim, D. J. (2017). Comorbidity of Internet gaming disorder and alcohol use disorder: A focus on clinical characteristics and gaming patterns. *Am J Addict*, *26*(4), 326-334. https://doi.org/10.1111/ajad.12528

Okruszek, L., Aniszewska-Stanczuk, A., Piejka, A., Wisniewska, M., & Zurek, K. (2020). Safe but Lonely? Loneliness, Anxiety, and Depression Symptoms and COVID-19. *Frontiers in psychology*, *11*, 579181. https://doi.org/10.3389/fpsyg.2020.579181

Palgi, Y., Shrira, A., Ring, L., Bodner, E., Avidor, S., Bergman, Y., Cohen-Fridel, S., Keisari, S., & Hoffman, Y. (2020). The loneliness pandemic: Loneliness and other concomitants of depression, anxiety and their comorbidity during the COVID-19 outbreak. *Journal of Affective Disorders*, *275*, 109-111.

Pallavicini, F., Pepe, A., & Mantovani, F. (2022). The Effects of Playing Video Games on Stress, Anxiety, Depression, Loneliness, and Gaming Disorder During the Early Stages of the COVID-19 Pandemic: PRISMA Systematic Review. *Cyberpsychol Behav Soc Netw*, *25*(6), 334-354. https://doi.org/10.1089/cyber.2021.0252

Paquette, D., Lee, L., Whitmore, L., Currie, A., Watkins, K., Bryson, M., Taylor, D., Archibald, C., Tarasuk, J., & Zhang, J. (2020). A retrospective analysis of the start of theCOVID-19 epidemic in Canada, January 15-March 12, 2020. *Canada Communicable Disease Report*, *46*.

Pearce, K. E., Yip, J. C., Lee, J. H., Martinez, J. J., Windleharth, T. W., Bhattacharya, A., & Li, Q. (2022). Families Playing Animal Crossing Together: Coping With Video Games During the COVID-19 Pandemic. *Games Cult*, *17*(5), 773-794. https://doi.org/10.1177/15554120211056125

Petry, N. M., & O'Brien, C. P. (2013). Internet gaming disorder and the DSM-5. *Addiction*, *108*(7), 1186-1187. https://doi.org/10.1111/add.12162

Pine, R., Fleming, T., McCallum, S., & Sutcliffe, K. (2020). The Effects of Casual Videogames on Anxiety, Depression, Stress, and Low Mood: A Systematic Review. *Games Health J*, *9*(4), 255-264. https://doi.org/10.1089/g4h.2019.0132

Plante, C. N., Gentile, D. A., Groves, C. L., Modlin, A., & Blanco-Herrera, J. (2019). Video games as coping mechanisms in the etiology of video game addiction. *Psychology of Popular Media Culture*, *8*(4), 385.

Pollack, M. H. (2005). Comorbid anxiety and depression. *J Clin Psychiatry*, *66 Suppl 8*, 22-29. https://www.ncbi.nlm.nih.gov/pubmed/16336033

Popa-Velea, O., Diaconescu, L., Jidveian Popescu, M., & Trutescu, C. (2017). Resilience and active coping strategy: Effects on the self-reported quality of life in cancer patients. *Int J Psychiatry Med*, *52*(2), 124-136. https://doi.org/10.1177/0091217417720895

Przybylski, A. K., Weinstein, N., & Murayama, K. (2017). Internet Gaming Disorder: Investigating the Clinical Relevance of a New Phenomenon. *Am J Psychiatry*, *174*(3), 230-236. https://doi.org/10.1176/appi.ajp.2016.16020224

Restubog, S. L. D., Ocampo, A. C. G., & Wang, L. (2020). Taking control amidst the chaos: Emotion regulation during the COVID-19 pandemic. *J Vocat Behav*, *119*, 103440. https://doi.org/10.1016/j.jvb.2020.103440

Rettie, H., & Daniels, J. (2021). Coping and tolerance of uncertainty: Predictors and mediators of mental health during the COVID-19 pandemic. *Am Psychol*, *76*(3), 427-437. https://doi.org/10.1037/amp0000710

Revicki, D. A., Travers, K., Wyrwich, K. W., Svedsater, H., Locklear, J., Mattera, M. S., Sheehan, D. V., & Montgomery, S. (2012). Humanistic and economic burden of generalized anxiety disorder in North America and Europe. *J Affect Disord*, *140*(2), 103-112. https://doi.org/10.1016/j.jad.2011.11.014

Rosenberg, M., Luetke, M., Hensel, D., Kianersi, S., Fu, T.-c., & Herbenick, D. (2021). Depression and loneliness during April 2020 COVID-19 restrictions in the United States, and their associations with frequency of social and sexual connections. *Social psychiatry and psychiatric epidemiology*, *56*(7), 1221-1232.

Rozgonjuk, D., Pontes, H. M., Schivinski, B., & Montag, C. (2022). Disordered gaming, loneliness, and family harmony in gamers before and during the COVID-19 pandemic. *Addictive Behaviors Reports*, 100426. https://doi.org/https://doi.org/10.1016/j.abrep.2022.100426

Sallie, S. N., Ritou, V. J. E., Bowden-Jones, H., & Voon, V. (2021). Assessing online gaming and pornography consumption patterns during COVID-19 isolation using an online survey: Highlighting distinct avenues of problematic internet behavior. *Addict Behav*, *123*, 107044. https://doi.org/10.1016/j.addbeh.2021.107044

Sanders, J. L., Williams, R. J., & Damgaard, M. (2017). Video game play and internet gaming disorder among Canadian adults: a national survey. *Canadian Journal of Addiction*, *8*(2), 6-12. https://doi.org/10.1097/CXA.0000000000000006

Shamblaw, A. L., Rumas, R. L., & Best, M. W. (2021). Coping during the COVID-19 pandemic: Relations with mental health and quality of life. *Canadian Psychology/Psychologie canadienne*, *62*(1), 92.

Shattuck, S. M., Kaba, D., Zhou, A. N., & Polenick, C. A. (2022). Social contact, emotional support, and anxiety during the COVID-19 pandemic among older adults with chronic conditions. *Clinical Gerontologist*, *45*(1), 36-44.

Sommerlad, A., Marston, L., Huntley, J., Livingston, G., Lewis, G., Steptoe, A., & Fancourt, D. (2021). Social relationships and depression during the COVID-19 lockdown: longitudinal analysis of the COVID-19 Social Study. *Psychol Med*, 1-10. https://doi.org/10.1017/S0033291721000039

Stephenson, E., & DeLongis, A. (2020). Coping strategies. *The Wiley encyclopedia of health psychology*, 55-60.

Stevens, M. W., Dorstyn, D., Delfabbro, P. H., & King, D. L. (2021). Global prevalence of gaming disorder: A systematic review and meta-analysis. *Aust N Z J Psychiatry*, *55*(6), 553-568. https://doi.org/10.1177/0004867420962851

Suh, J. J., Ruffins, S., Robins, C. E., Albanese, M. J., & Khantzian, E. J. (2008). Self-medication hypothesis: Connecting affective experience and drug choice. *Psychoanalytic psychology*, *25*(3), 518.

Turna, J., Zhang, J., Lamberti, N., Patterson, B., Simpson, W., Francisco, A. P., Bergmann, C. G., & Ameringen, M. V. (2021). Anxiety, depression and stress during the COVID-19 pandemic: Results from a cross-sectional survey. *J Psychiatr Res*, *137*, 96-103. https://doi.org/10.1016/j.jpsychires.2021.02.059

Unruh, L., Allin, S., Marchildon, G., Burke, S., Barry, S., Siersbaek, R., Thomas, S., Rajan, S., Koval, A., Alexander, M., Merkur, S., Webb, E., & Williams, G. A. (2022). A comparison of 2020 health policy responses to the COVID-19 pandemic in Canada, Ireland, the United Kingdom and the United States of America. *Health Policy*, *126*(5), 427-437. https://doi.org/10.1016/j.healthpol.2021.06.012

Vadlin, S., Aslund, C., Hellstrom, C., & Nilsson, K. W. (2016). Associations between problematic gaming and psychiatric symptoms among adolescents in two samples. *Addict Behav*, *61*, 8-15. https://doi.org/10.1016/j.addbeh.2016.05.001

Van der Velden, P. G., Hyland, P., Contino, C., von Gaudecker, H.-M., Muffels, R., & Das, M. (2021). Anxiety and depression symptoms, the recovery from symptoms, and loneliness before and after the COVID-19 outbreak among the general population: Findings from a Dutch population-based longitudinal study. *PloS one*, *16*(1), e0245057.

Varga, T. V., Bu, F., Dissing, A. S., Elsenburg, L. K., Bustamante, J. J. H., Matta, J., van Zon, S. K. R., Brouwer, S., Bultmann, U., Fancourt, D., Hoeyer, K., Goldberg, M., Melchior, M., Strandberg-Larsen, K., Zins, M., Clotworthy, A., & Rod, N. H. (2021). Loneliness, worries, anxiety, and precautionary behaviours in response to the COVID-19 pandemic: A longitudinal analysis of 200,000 Western and Northern Europeans. *Lancet Reg Health Eur*, *2*, 100020. https://doi.org/10.1016/j.lanepe.2020.100020

Velavan, T. P., & Meyer, C. G. (2020). The COVID-19 epidemic. *Trop Med Int Health*, *25*(3), 278-280. https://doi.org/10.1111/tmi.13383

Viana, R. B., & de Lira, C. A. B. (2020). Exergames as coping strategies for anxiety disorders during the COVID-19 quarantine period. *Games for health journal*, *9*(3), 147-149. https://doi.org/10.1089/g4h.2020.0060

Villani, D., Carissoli, C., Triberti, S., Marchetti, A., Gilli, G., & Riva, G. (2018). Videogames for Emotion Regulation: A Systematic Review. *Games Health J*, *7*(2), 85-99. https://doi.org/10.1089/g4h.2017.0108

Villarroel, M. A., & Terlizzi, E. P. (2020). *Symptoms of depression among adults: United States, 2019*. US Department of Health and Human Services, Centers for Disease Control and ….

Wang, C.-Y., Wu, Y.-C., Su, C.-H., Lin, P.-C., Ko, C.-H., & Yen, J.-Y. (2017). Association between Internet gaming disorder and generalized anxiety disorder. *Journal of Behavioral Addictions*, *6*(4), 564-571. https://doi.org/10.1556/2006.6.2017.088

Wang, P. S., Simon, G., & Kessler, R. C. (2003). The economic burden of depression and the cost-effectiveness of treatment. *Int J Methods Psychiatr Res*, *12*(1), 22-33. https://doi.org/10.1002/mpr.139

Wardell, J. D., Kempe, T., Rapinda, K. K., Single, A., Bilevicius, E., Frohlich, J. R., Hendershot, C. S., & Keough, M. T. (2020). Drinking to Cope During COVID-19 Pandemic: The Role of External and Internal Factors in Coping Motive Pathways to Alcohol Use,

Solitary Drinking, and Alcohol Problems. *Alcohol Clin Exp Res*, *44*(10), 2073-2083. https://doi.org/10.1111/acer.14425

Wartberg, L., Kriston, L., Kramer, M., Schwedler, A., Lincoln, T. M., & Kammerl, R. (2017). Internet gaming disorder in early adolescence: Associations with parental and adolescent mental health. *Eur Psychiatry*, *43*, 14-18. https://doi.org/10.1016/j.eurpsy.2016.12.013

Whittaker, F., & Kingston, S. (2022). Stress, social support, and substance use in the COVID-19 pandemic. *Translational Issues in Psychological Science*.

World Health Organization, W. (2019). *International statistical classification of diseases and related health problems (11th ed.)* https://icd.who.int/

World Health Organization, W. (2023, March 31, 2023). *Depressive disorder (depression)*. Retrieved April 12, 2023 from https://www.who.int/news-room/fact-sheets/detail/depression

Xu, S., Park, M., Kang, U. G., Choi, J.-S., & Koo, J. W. (2021). Problematic use of alcohol and online gaming as coping strategies during the COVID-19 pandemic: A mini review. *Frontiers in psychiatry*, 930. https://doi.org/10.3389/fpsyt.2021.685964

Chapter 2: Gaming as a coping strategy during the COVID-19 pandemic

Abstract

Background: Early in the COVID-19 pandemic, social interactions were constrained by physical distancing guidelines. Consequently, some individuals may have turned to video games to cope with isolation and negative emotions. Previous studies have shown that people who struggle with anxiety and depression are at particular risk for developing problem gaming behaviours. However, there is a paucity of longitudinal research testing pathways from emotional vulnerability to problem gaming behaviours, especially during the COVID-19 pandemic. Accordingly, we conducted a multi-wave longitudinal study and predicted that high levels of emotional vulnerability (anxiety and depression) in the first month of the pandemic would prospectively relate to elevated time spent gaming and related problems six months later. We also predicted that elevated coping motives for gaming would mediate these associations. **Methods:** A sample of 332 Canadian gamers (M_{age} = 33.79; 60.8% men) completed three surveys on Prolific, with the first occurring in April 2020 (one-month after the declared COVID-19 state of emergency) and subsequent surveys were spaced three months apart. **Results:** High initial levels of emotional vulnerability predicted excessive time spent gaming, as well as related problems, six months into the pandemic. Elevated coping motives for gaming uniquely mediated these pathways. **Conclusions:** This longitudinal study is the first to show that negative emotionality was a vulnerability factor for coping-related problem gaming during the COVID-19 pandemic. As we continue to cope with the longer-lasting impacts of the pandemic, it will be important for individuals who struggle with mood and anxiety issues to find more effective ways of coping.

Keywords: Gaming, Coping, COVID-19, Pandemic, Problematic Gaming, Anxiety, Depression

Background

The Coronavirus disease of 2019 (COVID-19) pandemic brought with it public health efforts to reduce its spread, including mandated lockdowns and physical distancing, resulting in fewer opportunities for social interaction and for effective coping (Restubog et al., 2020; Rettie & Daniels, 2021). Preliminary data from early stages of the pandemic demonstrated that people from many countries experienced higher levels of distress, anxiety, and depression than they had prior to the pandemic (Alyami et al., 2021; Centers for Disease Control and Prevention, 2020; Fountoulakis et al., 2021; Hyland et al., 2020; Shah et al., 2021; Wang et al., 2020). Given that the COVID-19 pandemic hindered social interactions for the greater part of two years, individuals may have sought solitary coping methods to deal with their isolation and negative emotions. Studies have demonstrated that the ongoing disruptions caused by COVID-19 include reduced social connectedness, along with disruptions to psychological and physical well-being. (Krause et al., 2022; McMahon et al., 2022). Along with the chronicity of these disruptions, new stressors have emerged relating to these disruptions, including the repeated re-opening and closures of businesses and recreational activities, chronic work and family stress, and the emergence of new variants (Calvano et al., 2022; Jain & Jolly, 2021; Mohanty et al., 2022). A study conducted by Gillen et al. (2022) examined cross-sectional data of UK participants at three time points throughout the pandemic (May-July 2020; November 2020-January 2021; May-July 2021) found that overall well-being decreased between the first and second time points. Moreover, the researchers also found that negative coping strategies such as substance use, and behavioural disengagement increased between the first and last time points. These results suggest that individuals may be adopting riskier coping techniques to manage these disruptions and stressors.

Video games are one such coping mechanism that individuals may have turned to during the COVID-19 pandemic. Prior to COVID-19, over 23 million Canadians (61% of Canadians) identified themselves as "gamers" (Entertainment Software Association of Canada, 2018). Though this number did not change at the beginning of the pandemic (Entertainment Software Association of Canada, 2020), 58% of adult gamers and 80% of teen gamers have endorsed gaming more regularly during COVID-19 (Entertainment Software Association of Canada, 2020). A few studies have shown an increase in gaming since the start of the COVID-19 pandemic. In America, Verizon reported a 75% increase in online gaming activity that corresponds with stay-at-home directives, whereas Italy saw a 70% increase in internet traffic related to *Fortnite*, a popular online video game (King et al., 2020). India also saw a 30% increase in online mobile gaming and a 35% increase in multi-player games (Amin et al., 2022). Live stream gaming such as YouTube Gaming and Twitch have also reported a 10% increase in audiences (López-Cabarcos et al., 2020), indicating that people had turned not only to gaming during the pandemic, but also to other gaming-related activities. While gaming is not an inherently problem activity, approximately 3.2% individuals who game go on to develop Gaming Disorder (Petry & O'Brien, 2013; Przybylski et al., 2017; Sanders et al., 2017; Stevens et al., 2021). People with pre-existing vulnerabilities, like mood and anxiety disorders, are particularly susceptible to developing Gaming Disorder (Fazeli et al., 2020; King et al., 2019; Viana & de Lira, 2020).

Gaming Disorder is a formalized diagnosis found in the International Classification of Diseases, 11th Revision (ICD-11) (World Health Organization, 2019) that is characterized by impaired control over gaming habits, as well as an escalation of gaming despite related problems (Jo et al., 2019). In contrast, "Internet Gaming Disorder" (IGD) has been included in section III of the Diagnostic and Statistical manual- Fifth edition (DSM-5) (American Psychiatric Association,

2013) as a disorder for future consideration by the American Psychiatric Association. For the purposes of this paper, the term "*Gaming Disorder"* will be used to encompass the list of symptoms described in the DSM-5. Although its name suggests that it encompasses only internet gaming, IGD encapsulates both internet- and non-internet-based gaming behaviours (American Psychiatric Association, 2013; D. J. Kuss et al., 2017). Finally, excessive gaming is a term used to conceptualize addictive behaviour related to gaming, without a formal diagnosis being attached to the definition (Sanders et al., 2017).

Gaming Disorder has been associated with a number of other mental health concerns including anxiety (Wang et al., 2017), depression (Liu et al., 2018), and substance use (Na et al., 2017). This is particularly important to consider, given that anxiety and depression have been linked to increases in problematic gaming behaviour (Mannikko et al., 2020). During the COVID-19 pandemic, the proportion of Canadians who self-reported high or extremely high anxiety quadrupled (from 5% to 20%), and rates of high depression symptoms more than doubled (from 4% to 10%) (Dozois, 2021). Several studies from outside North America have demonstrated that COVID-19-related increases in mood and anxiety symptoms were positively associated with problematic gaming (Fazeli et al., 2020; Teng et al., 2021). A longitudinal study conducted by Teng et al. (2021) collected self-reported survey data from 1,778 children and adolescents from Southwest China at two time points; one prior to the COVID-19 pandemic (October-November 2019), and one during the COVID-19 pandemic (April-May 2020). Participants reported more time spent video gaming, as well as increases in anxiety and depression from time one to time two. Moreover, cross-lagged modeling showed that pre-pandemic anxiety and depressive symptoms predicted both Internet Gaming Disorder and time spent gaming during the pandemic. The authors also found that there was an uptick in the incidence of Gaming Disorder post-pandemic. Fazeli et

al. (2020) examined the association of the pandemic on adolescents' mental health and gaming behaviours in Iran using a cross-sectional study. In this study, 1,512 Iranian adolescent participants were asked to complete self-report questionnaires between May-August 2020 surrounding symptoms of IGD, depression, anxiety, and stress. The results showed strong positive associations between depression, anxiety, stress, and gaming-related problems.

Motivational theory has been a long-standing framework for understanding addictive behaviours; namely, that motivational types have been studied extensively in relation to alcohol (Cooper et al., 1995; Cox & Klinger, 1988; Miller et al., 2000) and other substance use (Barnett et al., 2012; Cooper et al., 2016; Rohsenow et al., 2004), but also in relation to other addictive behaviours such as gambling (Chantal & Vallerand, 1996; Rodriguez et al., 2015) or gaming (Przybylski & Weinstein, 2019; Weinstein et al., 2017). Similarly, according to motivational models of addiction (Cooper, 1994; Myrseth et al., 2017), people who are emotionally vulnerable are at risk for excessive gaming and related harms (Balhara et al., 2018). These people may have been the ones who increased their gaming in efforts to cope with the pandemic situation, resulting in greater gaming-related problems. While some literature links anxiety and depressive symptoms to the onset of Gaming Disorder during the pandemic (Teng et al., 2021), longer-term longutudinal studies have not been conducted to examine these associations and the underlying mechanisms in the general population of North Americans during the COVID-19 situation.

Gaming motives are proximal cognitive factors that are believed to mediate the effects of individual differences (e.g. anxiety and depression) on excessive gaming and related harms (Király et al., 2015; Marino et al., 2020). Myrseth et al. (2017) identified four key motives for gaming, namely: enhancement motives (internal, positive reinforcement; gaming for the pleasurable experience of gaming itself), coping motives (internal, negative reinforcement; reduction of

negative emotions), social motives (external, positive reinforcement motives; increasing social interaction), and self-gratification motives (gaming to satisfy one's own personal desires). Coping motives seem to be the most central to problematic gaming, particularly among those with emotional vulnerabilities (Myrseth et al., 2017). While enhancement motivations tend to predict greater engagement in gaming activities, coping motivations have been found to predict increased risk for gaming harms. Furthermore, coping motives independently predict a loss of control of gaming behaviours as well as the development of gaming problems (Myrseth et al., 2017).

A more recent systematic review also found that coping motives, along with avoidance motives, not only predict the development of Internet Gaming Disorder, but that these motives also mediate the role between psychological factors (e.g. anxiety, loneliness, or self-esteem) and problematic gaming behaviours (Melodia et al., 2020). A further study conducted by Caro and Popovac (2021) found that individuals who turned to gaming during difficult life experiences also experienced more maladaptive emotional regulation along with lower coping self-efficacy, with coping self-efficacy being a significant predictor of gaming during difficult life circumstances.

These data suggest that coping motives may well be the most salient cognitive mechanism explaining the effects of depression and anxiety on pandemic-related increases in gaming and related harms among emotionally vulnerable individuals. To our knowledge, no previous studies have explored how coping motives for gaming are linked to excessive gaming during the COVID-19 pandemic among emotionally vulnerable people using a longitudinal design.

The Present Study

This three-time point design was used with Canadian participants completing survey measures via Prolific approximately three months apart beginning after the COVID-19 emergency

was declared (on March 17, 2020). Our primary goal was to understand how emotional vulnerability early in the pandemic was prospectively related to coping-motivated gaming and related problems six months into the COVID-19 pandemic. Currently, very little is known about how gaming habits and related problems have changed over the course of the pandemic, and our goal is to fill this critical gap in the literature. Several studies have examined cross-sectional or short-term associations between emotional vulnerability (i.e. depression and anxiety) and problematic gaming during the COVID-19 pandemic (Fazeli et al., 2020; Teng et al., 2021); however, our study is novel in several ways. It is the only study to examine temporal pathways from emotional vulnerability to gaming during the first six months of the COVID-19 pandemic using a multi-wave longitudinal design, giving insight to how these pathways or variables might change over time. Second, previous studies have not focused on coping motives as a primary mediator of emotional vulnerability-gaming associations during the pandemic. Finally, the present study applied a path model to both sexes (male vs. female) and in larger or smaller provinces (e.g., Ontario vs. all other provinces) using invariance testing.

For the current study, we hypothesized that higher levels of emotional vulnerability (i.e., anxiety and depression) in the early stages of the pandemic (Time 1) would prospectively predict greater time spent gaming and related problems at six-months into the pandemic (Time 3). We also hypothesized that increasing coping motives for gaming (Time 2) would explain these effects. Invariance tests were also conducted for location, particularly Ontario versus all other provinces, and for sex (male versus female). A majority of our sample originated from Ontario, and given the regional differences in lockdown procedures across Canada (Plett et al., 2022) including changes in economic activity (McCormack, 2021), freedom of movement, masking and social distancing regulations, and capacity limitations (Cameron-Blake et al., 2021). Previous studies have found

sex differences in the way and amount that men and women game, their preferences for gaming, as well as their confidence in their gaming ability (Lange & Schwab, 2018; Lucas & Sherry, 2004; Terlecki et al., 2011). Furthermore, Gaming Disorders are more prevalent in males (Marraudino et al., 2022). It is therefore important to ensure that the hypothesized pathways do not differ across sex or location so that we are able to ensure that the interpretations of our results are consistent across our sample. We did not have a suitable sample size of participants who identified as non-binary, and as such, these participants were excluded from our analysis.

Methods

Participants and Procedure

The data for this research was derived from a larger longitudinal study on addictive behaviours during the COVID-19 pandemic (Baptist Mohseni et al., 2022; Wardell et al., 2020). This research was reviewed and approved by the York University Research Ethics Board (Human Participants Review Committee certificate #e2020-118). Participants were recruited through Prolific, a web-based survey platform purposefully designed for the scientific community to conduct research (Palan & Schitter, 2018). Participants were Canadian adult gamers who reported gaming within the past three months prior to the time of baseline data collection. It should be noted that all participants who endorsed gaming at baseline were included in the analysis, even if they reported no gaming at the follow up surveys. Participants also needed to have a history of high-quality responses on the Prolific platform. These participants were taken from a larger sample of participants who also self-identified as regular drinkers of alcoholic beverages. The sample consisted of 332 self-reported gamers (M_{age}= 33.79, SD_{age}=8.92, 60.7% male, 39.2% female), with most of the participants (64.5%) identifying as being White. A majority of these participants

(86.2%) reported being employed prior to the COVID-19 pandemic and reported stable or increased income (56.3%) since the start of the pandemic. Approximately 91% of our sample self-identified as being at high-risk for COVID-19, and spent less than one hour (80.4%) per day watching COVID-19 related news. Most of our participants did not live alone (66.6%) and had children (72.9%). Four attention check items (Prolific, 2018) were also included to ensure that the participants were responding conscientiously. Participants were excluded from the analysis if they failed two or more attention check items. Two participants were excluded from the analysis as a result of meeting these criteria. Data collection took place as follows: end of April/beginning of May 2020 (Time 1), July 2020 (Time 2), and October 2020 (Time 3). Participants answered the questionnaires based on the 30-days prior to each survey. The baseline data collection took place 1-2 months after a state of emergency was declared across Canada (occurring between March 12 and March 22, 2020, depending on location) (OHS, 2020). Participants were compensated $13 CAD at each time point.

Measures

Table 1 outlines the timeline of the study as well as which measures were used at each time point.

Table 1. Synopsis of measures used at Time 1, Time 2, and Time 3.

	Time 1 (May 2020)	Time 2 (July 2020)	Time 3 (October 2020)
Measures used	GAD-7 PHQ-9 EGMQ TLFB IGDS-SF9	GAD-7 PHQ-9 EMGQ TLFB	GAD-7 PHQ-9 EMGQ TLFB

Notes: GAD-7: Generalized Anxiety Disorder-7; PHQ-9: Patient Health Questionnaire; EGMQ: Electronic Gaming Motives Questionnaire; TLFB: Timeline Follow-back; IGDS-SF9: Internet Gaming Disorder Scale, Short Form.

General Anxiety Disorder-7 (GAD-7)

The GAD-7 is a 7-item brief self-report measure of anxiety symptoms. It measures anxiety symptoms over the past two weeks (e.g., "Over the last two weeks how often have you been bothered by…feeling nervous, anxious, or on edge"). It has been validated in both clinical and non-clinical populations (Lowe et al., 2008; Spitzer et al., 2006; Williams, 2014). Participants respond to items on a 0 (not at all) to 3 (nearly every day) point Likert Scale. Higher scores are associated with a higher severity of symptoms of GAD. A score of 0-4 is considered "minimal anxiety", 5-9 is considered "mild anxiety", 10-14 is considered "moderate anxiety", and a score of 15-21 is considered "severe anxiety". The GAD-7 has been shown to have good criterion and construct validity, along with excellent internal consistency (α=.92) (Spitzer et al., 2006). The internal consistency of the GAD-7 for the present study was α=.91 at Time 1.

Patient Health Questionnaire (PHQ-9)

The PHQ-9 is a 9-item brief self-report measure of depressive symptoms occurring over the past two weeks (e.g., "Over the last 2 weeks, how often have you been bothered by…feeling tired or having little energy"). It has been validated in both clinical and non-clinical populations (Doi et al., 2018). It utilizes the nine DSM-5 criteria for depression, with each item being rated on a 0 (not at all) to 3 (nearly every day) point Likert scale (Kroenke & Spitzer, 2002; Kroenke et al., 2001). Scores ranging between 1-4 are considered "minimal depression, while scores between 5-9 are reflective of "mild depression", 10-14 are considered "moderate depression", 15-19 are considered "moderately severe depression", and scores between 20-27 are considered to be "severe depression". The PHQ-9 has been shown to have good construct and criterion validity along with excellent internal consistency (α=.89) (Kroenke et al., 2001). The internal consistency of the PHQ-9 for the present study was α=.87 at Time 1.

Electronic Gaming Motives Questionnaire (EGMQ)

The EGMQ is a self-report measure of video gaming motives (Myrseth et al., 2017). It consists of 14 items measuring four motives: *enhancement* (e.g., "because you like the feeling"), *coping* (e.g., "to forget your worries"), *social motives* (e.g., "because it makes a social gathering more enjoyable"), and *self-gratification motives* (e.g., "as a way to celebrate"). Participants respond to the items on a scale ranging from 1 (almost never/never) to 4 (almost always) (Myrseth et al., 2017). The EGMQ has been shown to have good criterion validity, and good internal consistency (α= .67 to .84) (Myrseth et al., 2017). The internal consistency in our sample for baseline coping motives was α=.80 at baseline and α=.81 at Time 2. The internal consistency in our sample for baseline enhancement motives was α=.77 at baseline and α=.80 at Time 2.

Timeline Follow-Back (TLFB)

Though the TLFB method was initially created to assess for alcohol use (Sobell & Sobell, 1992), it has also been successfully used to measure gambling-related behaviours (Weinstock et al., 2004), substance use (Agrawal et al., 2008), and video gaming (Peter et al., 2020) in previous studies. In the current study, participants completed an online, self-report version of the TLFB. Participants used the TLFB method to measure the time spent gaming (in hours) at the three time points of data collection. At each time point, the time spent gaming is based on the week prior to completing the survey (e.g., "To help us evaluate your game use, we need to get an idea of your game use was like in an average week in the past month (30 days). To do this, we would like you to fill out the calendar below"). Participants were asked to fill in the number of hours that they typically spent gaming on each day of the week over the past month. The number of hours spent gaming per day were then summed across the days.

Internet Gaming Disorder Scale- Short Form (IGDS-SF9)

The IGDS-SF9 scale is a 9-item self-report measure that was adapted using the nine core DSM-5 criteria that defines Internet Gaming Disorder (American Psychiatric Association, 2013). Items are rated on a 1 (never) to 5 (very often) Likert-type scale (e.g., "Do you feel more irritability, anxiety, or even sadness when you try to either reduce or stop your gaming activity?"), with higher scores being indicative of higher levels of Internet Gaming Disorder (Lemmens et al., 2015). It has been shown to have good internal consistency (α=.83), along with good criterion and concurrent validity (Lemmens et al., 2015; Pontes & Griffiths, 2015). The internal consistency of the IDGS-SF9 in our sample ranged from α=.90 and α=.91.

Data Analysis Overview

We conducted preliminary analyses prior to hypothesis testing with path modelling. This involved data screening (i.e., winsorizing extreme values to $\pm$ 3.29 standard deviations from the mean and verifying multiple regression assumptions) and conducting a missing data analysis. For the missing data, we used a series of *t*-tests to examine potential baseline differences between participants with complete data versus those with incomplete data (Enders, 2010). This was done to determine the nature of data loss. Next, we used Structural Equation Modeling (SEM) in MPlus V 7.4 to test the hypothesized model (Muthén & Muthén, 2017).

In the main SEM analysis, we modelled emotional vulnerability as a latent predictor, with anxiety and depression as indicator variables. It has been previously demonstrated that excessive gaming is positively associated with symptoms of depression and anxiety (Ballabio et al., 2017; Fazeli et al., 2020; Kim et al., 2016; Teng et al., 2021). Depression and Anxiety have been shown in several studies to be highly comorbid with one another (Gorman, 1996; Hirschfeld,

2001; Pollack, 2005; Sartorius et al., 1996). Given this high comorbidity, the current literature has suggested that anxiety and depression should be conceptualized as one transdiagnostic factor rather than separate entities (Brown & Barlow, 2009; Craske, 2012). Given this association, we captured this underlying dimension of depression and anxiety together by creating a latent predictor, emotional vulnerability, using scores from the Generalized Anxiety Disorder Scale (GAD-7), and the Patient Health Questionnaire (PHQ-9) to calculate the shared variance between the two. Emotional vulnerability at Time 1 was specified as the main predictor; coping and enhancement motives at Time 2 (controlling for Time 1) were entered as correlated mediators; and time spent gaming and related problems at Time 3 (controlling for Time 1) were specified as correlated outcomes. We opted to include only internal motives for gaming in the main SEM analysis based on the literature showing that these motives are generally associated with greater gaming-related harms relative to external motives (Ballabio et al., 2017; Hellstrom et al., 2015; Kuss et al., 2012; Myrseth et al., 2017). Including enhancement motives in the model also allowed us to demonstrate the specificity of coping motives as a hypothesized mediator. Overall, our specified longitudinal SEM analysis allowed us to establish complete temporal precedence among predictors, mediators, and outcomes, which strengthened our interpretation of mediational effects.

Fit of the hypothesized model was evaluated using several indices. Fit was considered excellent if the following guidelines were met: a χ^2/df ratio $\leq$ 3.0 (Kline, 2010); a root mean square error of approximation (RMSEA) $\leq$.06; a comparative fit index (CFI) $\geq$.95; and a standardized root mean square residual (SRMR) $\leq$.08 (Hu & Bentler, 1999) In addition, the precision and reliability of direct and indirect paths were evaluated using a bootstrapped bias-corrected 95% Confidence Interval (CI) approach (Fritz & MacKinnon, 2007). If the 95% CI for a given direct or

indirect path coefficient does not include zero, the effect is considered to be supported (Fritz & Mackinnon, 2007; Hu & Bentler, 1999; Kline, 2013). Full information maximum likelihood (FIML) was used to handle missing data and Maximum Likelihood Ratio (MLR) was used to obtain fit indices, given the non-normality of the gaming outcomes (Muthen and Muthen, 2012). Following the main SEM, the invariance of our model was tested across biological sex (i.e. men vs. women) and Canadian province (Ontario vs. other provinces). Approximately 51% of our sample originated from Ontario, which was a province that had quick and widespread lockdowns, along with other provincial guidelines. In addition, Ontario is the largest province in terms of population size and density. As such, we wanted to ensure that the model was similar in Ontario versus the rest of Canada.

In order to proceed with the path invariance testing, the proposed model was first tested in each sex or provincial group individually to ensure good fit. A configural model was then tested, one that allows the paths to vary freely between groups. Assuming that good model fit was established in these first two steps, a path invariance model was estimated that constrains the direct effects to be equal effects across sex groups or provincial groups, accordingly. If there were no significant differences in model fit between the configural and invariant models, then it was inferred that the overall model applies equally across sex (i.e., to both males and females) or provincial (i.e., to both Ontario and other provinces) groups. Differences in fit between path invariant and configural models were evaluated using the $\Delta\chi^2$ test and the change in CFI value. A significant difference between models is supported if the *p*-value for the $\Delta\chi^2$ test is below .05 and/or the ΔCFI is $\geq$.01 (Cheung & Rensvold, 2002).

Results

Descriptive Statistics

Table 2 shows the descriptive data for the observed variables. The mean score on the IGDS-SF9 suggested that the Gaming Disorder symptoms in our sample were well below the clinical cut-off of 36 (Pontes & Griffiths, 2015) that would be indicative of disordered gaming behaviours. Our participants spent on average approximately 20 hours per week (*SD*=16.08) gaming at the beginning of the study (~2.86 hours per day), and approximately 13 hours per week (*SD*= 14.55) gaming at Time 3 (~1.86 hours per day). The scores for both the PHQ-9 and the GAD-7 were indicative of endorsement of mild symptoms of depression and anxiety, respectively. Despite the mean being low in this sample, we did observe a wide range of gaming activity, and symptoms of anxiety and depression. As such, this gave us variability in order to allow us to analyze our SEM model.

Table 2. Descriptive Statistics for the Observed Variables

Variable	**Mean**	**Median**	**SD**	**Range**
Gaming Problems (T1)	15.13	13	6.38	9-45
Gaming Problems (T3)	14.07	12	6.0	9-37
Time Spent Gaming (T1)	19.95	17	16.08	0-164
Time Spent Gaming (T3)	13.37	9	14.55	0-111
PHQ-9 (T1)	7.81	7	5.32	0-27
GAD-7 (T1)	5.96	6	4.67	0-21
Coping Motives (T1)	9.5	9	2.85	4-16
Coping Motives (T2)	8.90	8	2.94	4-16
Enhancement Motives (T1)	8.86	9	2.24	3-12
Enhancement Motives (T2)	8.69	9	2.37	3-12

Of the original sample, a total of n = 264 completed the second time point, and n = 228 completed the third time point. T-tests examining baseline differences between completers (coded as 1; n = 228) and non-completers (coded as 0; n = 104) did not reveal significant differences on any measures included in the main SEM model: PHQ-9, $t_{(330)}$ = -.13, p= .90, GAD-7, $t_{(330)}$ = -1.07, p= .29, time spent gaming, $t_{(330)}$ = .82, p= .42, gaming problems, $t_{(330)}$ = .31, p= .75, coping motives, $t_{(330)}$ = -1.62, p= .11, or enhancement motives, $t_{(330)}$ = -.91, p= .36.

Mediation Model

Model Results

The fit of our original hypothesized model was excellent: χ^2= 36.65, df= 21, p = .018, χ^2/df= 1.74; CFI= .982, RMSEA = .047 (95% *CI* [.019, .072]), SRMR= .036. The coefficients and 95% CIs for the direct paths are shown in Figure 1. As hypothesized, high levels of emotional vulnerability at baseline predicted elevated coping motives at Time 2, controlling for coping motives at Time 1. The effect of emotional vulnerability on enhancement at Time 2, controlling for enhancement motives at Time 1, was not statistically significant. Coping motives at Time 2 were significant positive predictors of both gaming problems and time spent gaming at Time 3, controlling for baseline gaming behaviours. Enhancement motives at Time 2 were not a significant predictor of gaming problems or time spent gaming at Time 3, after controlling for baseline gaming behaviours. Next, indirect effects were inspected. As hypothesized, there were supported mediational effects from emotional vulnerability (Time 1), via coping motives (Time 2), to both gaming problems (β= 0.018 [95% CI 0.001- 0.055]) and time spent gaming (β= 0.016 [95% CI 0.001 - 0.047] at Time 3. No mediational effects were observed from emotional vulnerability to gaming behaviours via enhancement motives, suggesting specificity through

coping motivations. Overall, our findings show that elevated depression and anxiety early in the pandemic relate to future coping-motivated gaming and associated harms.

Next, the invariance of the proposed model was tested across sex (male vs. female), as well as location (Ontario vs. other provinces). The fit and model values for these invariance tests can be found in Table 2. The model fit the data well for males and for females. As seen in Table 3, there was no significant difference between the configural and path invariant models, suggesting that the effects in our path model did not differ between the sex groups. Similar results were obtained for invariance testing across provinces (see Table 3), suggesting that the hypothesized model was applicable to individuals living across Canada.

Table 3. Invariance Testing by Sex and by Province: Model Fit Information

Model Type	Chi-square	*df*	*p* value	CFI	RMSEA	SRMR	Chi-square difference	*df*	*p* value	CFI difference
					Sex					
Overall	36.65	21	.018	0.982	0.047	0.036				
Male	16.50	21	.741	1.00	0.000	0.026				
Female	37.51	21	.014	0.951	0.060	0.054				
Configural	54.02	44	.143	0.988	0.037	0.040				
Path Invariance	66.27	50	.061	0.981	0.044	0.048	12.25	6	.056	0.007
					Province					
Overall	36.65	21	.018	0.982	0.047	0.036				
Ontario	24.24	21	.281	0.993	0.030	0.044				
Rest of Canada	31.41	21	.067	0.974	0.055	0.049				
Configural	61.61	44	.041	0.980	0.049	0.045				
Path Invariance	66.79	50	.056	0.981	0.045	0.048	5.18	6	.521	0.001

Note. Model cut-offs are as follows: Chi-square (p>.05), CFI ≥.95, RMSEA ≤.06, SRMR ≤ 0.08, chi-squared change ($p < .05$) and CFI difference <.01.

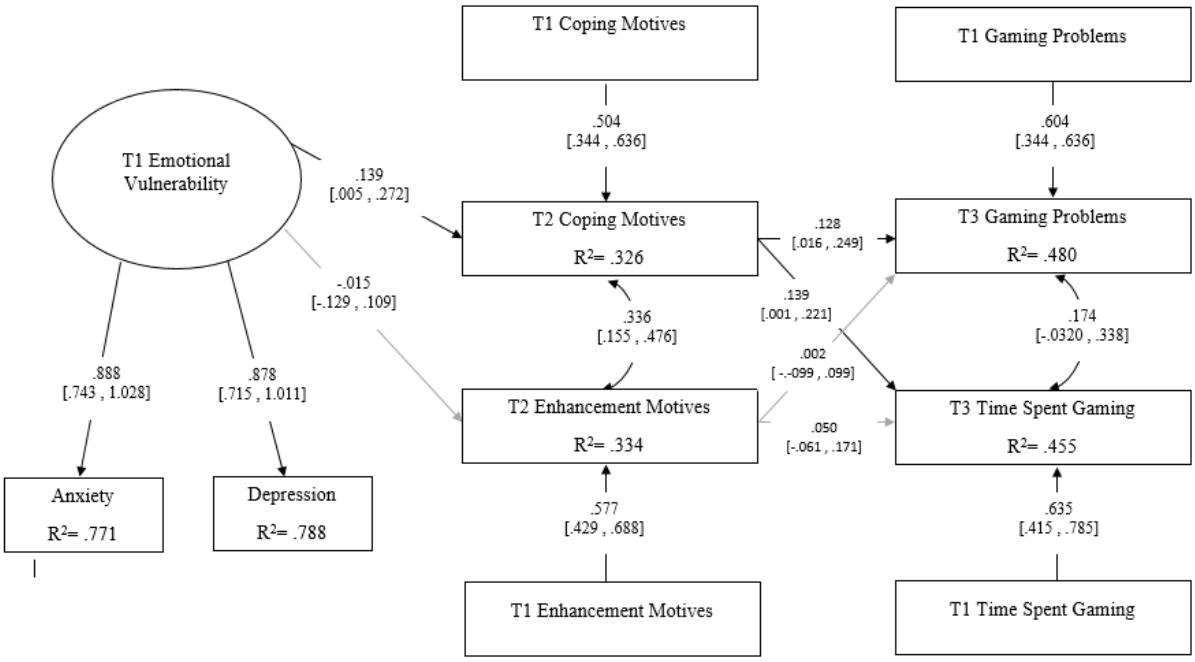

Figure 1. Structural Equation model of emotional vulnerability to gaming behaviours through coping and enhancement gaming motivations.

Note* *Grey arrows represent non-significant pathways, while black arrows denote significant pathways. Standardized estimates are shown with their corresponding 95% confidence intervals. The covariances among all T1 variables were included in the model but omitted from the figure.*

Discussion

This study is the first to longitudinally examine the motivational mechanisms underlying the relationship between emotional vulnerability and gaming-related problems during the COVID-19 pandemic. We found that participants who had higher levels of emotional vulnerability tended to use gaming as a form of coping with that emotional distress.

Moreover, our research demonstrated that those with greater coping motives for gaming at three months into the pandemic also endorsed more gaming problems at six-months into the pandemic along with more time spent gaming. This suggests that during the COVID-19

pandemic, individuals may have been turning to gaming in an attempt to cope with their emotional vulnerability or their newfound social isolation. Furthermore, this suggests that some individuals were not gaming for the simple pleasure of gaming in and of itself and may have been attempting to use gaming as a method of reducing their emotional distress. This model seemed to apply to both males and females, and those across Canada, as evidenced by the invariance testing that was conducted.

These findings are consistent with previous research, showing that those who report higher levels of stress and anxiety also tend to demonstrate an increase in passive coping strategies such as escapism (Fu et al., 2020) and that coping motives are strongly associated with a heightened risk of problematic addictive behaviours (Moitra et al., 2015; Wisener & Khoury, 2021). These findings are particularly important when considering the context of the COVID-19 pandemic. There are established links between emotional vulnerability and problematic gaming (Balhara et al., 2018); however, the motivational mechanisms of this association, particularly during the pandemic, have not been described prior to this study (Fazeli et al., 2020; Teng et al., 2021). Research has shown that those who are emotionally vulnerable were disproportionately affected by the pandemic (Panteli et al., 2022; van der Velden et al., 2020), and these individuals may have used gaming excessively as a way to distract themselves from those negative emotions (King et al., 2020; Teng et al., 2021). Although many individuals use gaming as a positive coping method to mitigate their stress, anxiety, depression, and loneliness (Barr & Copeland-Stewart, 2022; Pallavicini et al., 2022), for individuals who were at-risk for addictive behaviour (e.g. male youths or those with maladaptive or avoidant coping strategies), excessive gaming has been found to have long-term increases in symptoms of anxiety, depression, and overall stress, but short-term relaxing effects to the player (Pallavicini et al., 2022).

This relationship may be further explained by the self-medication hypothesis, which states that individuals who are more emotionally vulnerable and are at risk for gaming excessively do so to cope with their emotional distress (Balhara et al., 2018; González-Bueso et al., 2018; King & Delfabbro, 2016; Liu et al., 2018; Vadlin et al., 2016; Wartberg et al., 2017). Within the context of the COVID-19 pandemic, studies have found that those who experience heightened stress, depression, or anxiety due to social isolation or loneliness, also tend to experience excessive gaming behaviours (Rozgonjuk et al., 2022; Sallie et al., 2021; Xu et al., 2021). Furthermore, previous research has also found higher emotional distress among those who game excessively during the COVID-19 pandemic (Giardina et al., 2021). Therefore, it may be that these individuals are gaming as a means to cope with their emotional distress.

The results of this study may help to determine how gaming is being used during the pandemic as a coping method and may subsequently inform interventions relating to problematic gaming or pandemic-related coping methods. Given that coping motives seem to be associated with increased problematic gaming, it may be beneficial to incorporate coping motives for gaming and emotional vulnerability into interventions designed to curb the incidence or severity of Gaming Disorder, particularly within the context of the COVID-19 pandemic. In particular, it may be beneficial for interventions to focus on establishing or strengthening coping mechanisms or reducing pre-existing emotional vulnerability. This may be an area for future research.

This study had some limitations. Firstly, the participants in this study were Canadian; given that the data came only from one country, the results may not necessarily be generalizable to other countries. Secondly, given the convenience recruitment of the participants through Prolific, an online survey platform, and that we do not have comprehensive pre-pandemic information on the participants' gaming behaviours, we are unable to speak to changes in gaming

from pre- to post-pandemic, and can only interpret the findings of changes during the pandemic. Furthermore, participants all were self-reported regular drinkers of alcoholic beverages. It may be beneficial to repeat this study with a participant pool from the general population that includes people who do not drink as well, to increase generalizability of our findings. The socioeconomic status of our sample is also relatively high, and most of our participants did not live alone which may limit the generalizability of results to more diverse socioeconomic populations or those with higher levels of isolation. In addition, our sample was largely subclinical in their gaming behaviours and emotional vulnerability. As such, while our results are consistent with theories of gaming behaviour, this study should be replicated and extended to populations with more severe emotional vulnerability and gaming problems. Future studies should aim to replicate this study using larger and more diverse samples and may wish to consider COVID-specific contextual factors such as incidence rate in the participants' location and adherence to governmental guidelines regarding physical distancing. Furthermore, future studies should aim to consider using measures that have been validated for COVID-19-specific concerns and behaviours.

Conclusion

These findings aid in our understanding of gaming behaviours and gaming motivations during the COVID-19 pandemic. This longitudinal study provides information not only to how individuals were coping with the extreme changes that have occurred due to the pandemic and governmental guidelines, but also how emotional vulnerability may have influenced their gaming behaviours. Given that since the time of data collection there have been significant changes- most notably, the introduction of COVID-19 vaccines- it will be important to determine how these coping motivations and gaming behaviours are altered as the pandemic continued. It has been suggested that the impacts of the pandemic on addictive behaviours will be long-term given

the increased psychological distress that accompanies the pandemic (Rehm et al., 2020), and it will be important to investigate these long-term impacts.

References

Agrawal, S., Sobell, M. B., & Sobell, L. C. (2008). The Timeline Followback: A scientifically and clinically useful tool for assessing substance use. In *Calendar and time diary methods in life course research* (Vol. 57, pp. 68).

Alyami, H. S., Naser, A. Y., Dahmash, E. Z., Alyami, M. H., & Alyami, M. S. (2021). Depression and anxiety during the COVID-19 pandemic in Saudi Arabia: A cross-sectional study. *Int J Clin Pract*, *75*(7), e14244. https://doi.org/10.1111/ijcp.14244

American Psychiatric, A. (2013). *Diagnostic and Statistical Manual of Mental Disorders* [doi:10.1176/appi.books.9780890425596]. American Psychiatric Publishing, Inc. https://doi.org/10.1176/appi.books.9780890425596

Amin, K. P., Griffiths, M. D., & Dsouza, D. D. (2022). Online Gaming During the COVID-19 Pandemic in India: Strategies for Work-Life Balance. *Int J Ment Health Addict*, *20*(1), 296-302. https://doi.org/10.1007/s11469-020-00358-1

Balhara, Y. P. S., Garg, H., Kumar, S., & Bhargava, R. (2018). Gaming disorder as a consequence of attempt at self- medication: Empirical support to the hypothesis. *Asian J Psychiatr*, *31*, 98-99. https://doi.org/10.1016/j.ajp.2018.02.013

Ballabio, M., Griffiths, M. D., Urbán, R., Quartiroli, A., Demetrovics, Z., & Király, O. (2017). Do gaming motives mediate between psychiatric symptoms and problematic gaming? An empirical survey study. *Addiction Research & Theory*, *25*(5), 397-408. https://doi.org/https://doi.org/10.1080/16066359.2017.1305360

Baptist Mohseni, N., Morris, V., Vedelago, L., Kempe, T., Rapinda, K., Mesmer, E., Bilevicius, E., Wardell, J. D., MacKillop, J., & Keough, M. T. (2022). A longitudinal approach to understanding risk factors for problem alcohol use during the COVID-19 pandemic. *Alcohol Clin Exp Res*, *46*(3), 434-446. https://doi.org/10.1111/acer.14774

Barnett, E., Sussman, S., Smith, C., Rohrbach, L. A., & Spruijt-Metz, D. (2012). Motivational Interviewing for adolescent substance use: a review of the literature. *Addict Behav*, *37*(12), 1325-1334. https://doi.org/10.1016/j.addbeh.2012.07.001

Barr, M., & Copeland-Stewart, A. (2022). Playing video games during the COVID-19 pandemic and effects on players' well-being. *Games and Culture*, *17*(1), 122-139. https://doi.org/https://doi.org/10.1177/15554120211017036

Brown, T. A., & Barlow, D. H. (2009). A proposal for a dimensional classification system based on the shared features of the DSM-IV anxiety and mood disorders: implications for assessment and treatment. *Psychol Assess*, *21*(3), 256-271. https://doi.org/10.1037/a0016608

Calvano, C., Engelke, L., Di Bella, J., Kindermann, J., Renneberg, B., & Winter, S. M. (2022). Families in the COVID-19 pandemic: parental stress, parent mental health and the occurrence of adverse childhood experiences—results of a representative survey in Germany. *European child & adolescent psychiatry*, *31*(7), 1-13. https://doi.org/https://doi.org/10.1007/s00787-021-01739-0

Cameron-Blake, E., Breton, C., Sim, P., Tatlow, H., Hale, T., Wood, A., Smith, J., Sawatsky, J., Parsons, Z., & Tyson, K. (2021). Variation in the Canadian provincial and territorial responses to COVID-19. *Blavatnik School of Government Working Paper Series*(039). https://doi.org/https://doi.org/10.1038/s41562-021-01078-8

Caro, C., & Popovac, M. (2021). Gaming when things get tough? Examining how emotion regulation and coping self-efficacy influence gaming during difficult life situations.

Games and Culture, *16*(5), 611-631. https://doi.org/https://doi.org/10.1177/1555412020944622

Centers for Disease Control and Prevention. (2020). *National center for Health Statistics-Anxiety and Depression* https://www.cdc.gov/nchs/covid19/pulse/mental-health.htm

Chantal, Y., & Vallerand, R. J. (1996). Skill versus luck: A motivational analysis of gambling involvement. *J Gambl Stud*, *12*(4), 407-418. https://doi.org/10.1007/BF01539185

Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural equation modeling*, *9*(2), 233-255. https://doi.org/https://doi.org/10.1207/S15328007SEM0902_5

Cooper, M. L., Frone, M. R., Russell, M., & Mudar, P. (1995). Drinking to regulate positive and negative emotions: a motivational model of alcohol use. *J Pers Soc Psychol*, *69*(5), 990-1005. https://doi.org/10.1037//0022-3514.69.5.990

Cooper, M. L., Kuntsche, E., Levitt, A., Barber, L. L., & Wolf, S. (2016). Motivational models of substance use: A review of theory and research on motives for using alcohol, marijuana, and tobacco. In K. J. Sher (Ed.), *The Oxford Handbook of Substance Use and Substance Use Disorders* (pp. 375-421). Oxford University Press.

Cox, W. M., & Klinger, E. (1988). A motivational model of alcohol use. *J Abnorm Psychol*, *97*(2), 168-180. https://doi.org/10.1037//0021-843x.97.2.168

Craske, M. G. (2012). Transdiagnostic treatment for anxiety and depression. *Depress Anxiety*, *29*(9), 749-753. https://doi.org/10.1002/da.21992

Doi, S., Ito, M., Takebayashi, Y., Muramatsu, K., & Horikoshi, M. (2018). Factorial validity and invariance of the Patient Health Questionnaire (PHQ)-9 among clinical and non-clinical populations. *PloS one*, *13*(7), e0199235. https://doi.org/https://doi.org/101371/journal/pone.0199235

Dozois, D. J. (2021). Anxiety and depression in Canada during the COVID-19 pandemic: A national survey. *Canadian Psychology/Psychologie canadienne*, *62*(1), 136. https://doi.org/https://doi.org/10.1037.cap0000251

Enders, C. K. (2010). *Applied missing data analysis*. Guilford Press.

Entertainment Software Association of Canada. (2018). *Essential Facts about the Candian Game Industry 2018*. Retrieved December 10, 2020 from https://theesa.ca/wp-content/uploads/2018/10/ESAC18_BookletEN.pdf

Entertainment Software Association of Canada. (2020). *Real Canadian Gamer Essential Facts 2020*. Retrieved December 10, 2020 from https://theesa.ca/wp-content/uploads/2020/11/RCGEF_en.pdf

Fazeli, S., Zeidi, I. M., Lin, C.-Y., Namdar, P., Griffiths, M. D., Ahorsu, D. K., & Pakpour, A. H. (2020). Depression, anxiety, and stress mediate the associations between internet gaming disorder, insomnia, and quality of life during the COVID-19 outbreak. *Addictive Behaviors Reports*, *12*, 100307. https://doi.org/https://doi.org/10.1016/j.abrep.2020.100307

Fountoulakis, K. N., Apostolidou, M. K., Atsiova, M. B., Filippidou, A. K., Florou, A. K., Gousiou, D. S., Katsara, A. R., Mantzari, S. N., Padouva-Markoulaki, M., & Papatriantafyllou, E. I. (2021). Self-reported changes in anxiety, depression and suicidality during the COVID-19 lockdown in Greece. *Journal of Affective Disorders*, *279*, 624-629. https://doi.org/https://doi.org/10.1016/j.jad2020.10.061

Fritz, M. S., & Mackinnon, D. P. (2007). Required sample size to detect the mediated effect. *Psychol Sci*, *18*(3), 233-239. https://doi.org/10.1111/j.1467-9280.2007.01882.x

Fu, W., Wang, C., Zou, L., Guo, Y., Lu, Z., Yan, S., & Mao, J. (2020). Psychological health, sleep quality, and coping strategies to stress facing the COVID-19 in Wuhan, China. *Transl Psychiatry*, *10*(1), 225. https://doi.org/10.1038/s41398-020-00913-3

Giardina, A., Di Blasi, M., Schimmenti, A., King, D. L., Starcevic, V., & Billieux, J. (2021). Online Gaming and Prolonged Self-Isolation: Evidence from Italian Gamers During the Covid-19 Outbreak. *Clin Neuropsychiatry*, *18*(1), 65-74. https://doi.org/10.36131/cnfioritieditore20210106

Gillen, P., Neill, R. D., Manthorpe, J., Mallett, J., Schroder, H., Nicholl, P., Currie, D., Moriarty, J., Ravalier, J., McGrory, S., & McFadden, P. (2022). Decreasing Wellbeing and Increasing Use of Negative Coping Strategies: The Effect of the COVID-19 Pandemic on the UK Health and Social Care Workforce. *Epidemiologia (Basel)*, *3*(1), 26-39. https://doi.org/10.3390/epidemiologia3010003

González-Bueso, V., Santamaría, J. J., Fernández, D., Merino, L., Montero, E., & Ribas, J. (2018). Association between internet gaming disorder or pathological video-game use and comorbid psychopathology: a comprehensive review. *International journal of environmental research and public health*, *15*(4), 668. https://doi.org/https://doi.org/10.3390/ijerph15040668

Gorman, J. M. (1996). Comorbid depression and anxiety spectrum disorders. *Depression and anxiety*, *4*(4), 160-168. https://doi.org/10.1002/(SICI)1520-6394(1996)4:4<160::AID-DA2>3.0.CO;2-J

Hellstrom, C., Nilsson, K. W., Leppert, J., & Aslund, C. (2015). Effects of adolescent online gaming time and motives on depressive, musculoskeletal, and psychosomatic symptoms. *Upsala journal of medical sciences*, *120*(4), 263-275. https://doi.org/10.3109/03009734.2015.1049724

Hirschfeld, R. M. (2001). The Comorbidity of Major Depression and Anxiety Disorders: Recognition and Management in Primary Care. *Primary Care Companion Journal of Clinical Psychiatry*, *3*(6), 244-254. https://doi.org/10.4088/pcc.v03n0609

Hu, L. t., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural equation modeling: a multidisciplinary journal*, *6*(1), 1-55. https://doi.org/https://doi.org/10.1080/10705519909540118

Hyland, P., Shevlin, M., McBride, O., Murphy, J., Karatzias, T., Bentall, R. P., Martinez, A., & Vallieres, F. (2020). Anxiety and depression in the Republic of Ireland during the COVID-19 pandemic. *Acta Psychiatrica Scandinavica*, *142*(3), 249-256. https://doi.org/10.1111/acps.13219

Jain, A., & Jolly, T. S. (2021). Omicron (B.1.1.529) COVID-19 Variant: A Mental Health Perspective on Lessons Learned and Future Challenges. *Primary Care Companion CNS Disord*, *23*(6), 38797. https://doi.org/10.4088/PCC.21com03206

Jo, Y. S., Bhang, S. Y., Choi, J. S., Lee, H. K., Lee, S. Y., & Kweon, Y. S. (2019). Clinical Characteristics of Diagnosis for Internet Gaming Disorder: Comparison of DSM-5 IGD and ICD-11 GD Diagnosis. *Journal of clinical medicine*, *8*(7), 945. https://doi.org/10.3390/jcm8070945

Kim, N. R., Hwang, S. S., Choi, J. S., Kim, D. J., Demetrovics, Z., Kiraly, O., Nagygyorgy, K., Griffiths, M. D., Hyun, S. Y., Youn, H. C., & Choi, S. W. (2016). Characteristics and Psychiatric Symptoms of Internet Gaming Disorder among Adults Using Self-Reported

DSM-5 Criteria. *Psychiatry Investigation*, *13*(1), 58-66. https://doi.org/10.4306/pi.2016.13.1.58

King, D. L., & Delfabbro, P. H. (2016). The Cognitive Psychopathology of Internet Gaming Disorder in Adolescence. *J Abnorm Child Psychol*, *44*(8), 1635-1645. https://doi.org/10.1007/s10802-016-0135-y

King, D. L., Delfabbro, P. H., Billieux, J., & Potenza, M. N. (2020). Problematic online gaming and the COVID-19 pandemic. *Journal of Behavioral Addiction*, *9*(2), 184-186. https://doi.org/10.1556/2006.2020.00016

King, D. L., Delfabbro, P. H., Perales, J. C., Deleuze, J., Kiraly, O., Krossbakken, E., & Billieux, J. (2019). Maladaptive player-game relationships in problematic gaming and gaming disorder: A systematic review. *Clinical psychology review*, *73*, 101777. https://doi.org/10.1016/j.cpr.2019.101777

Király, O., Urbán, R., Griffiths, M. D., Ágoston, C., Nagygyörgy, K., Kökönyei, G., & Demetrovics, Z. (2015). The mediating effect of gaming motivation between psychiatric symptoms and problematic online gaming: An online survey. *Journal of medical Internet research*, *17*(4), e3515. https://doi.org/https://doi.org/10.2196/jmir.3515

Kline, R. B. (2013). *Beyond significance testing: Statistics reform in the behavioral sciences*. American Psychological Association.

Krause, K. H., Verlenden, J. V., Szucs, L. E., Swedo, E. A., Merlo, C. L., Niolon, P. H., Leroy, Z. C., Sims, V. M., Deng, X., & Lee, S. (2022). Disruptions to School and Home Life Among High School Students During the COVID-19 Pandemic—Adolescent Behaviors and Experiences Survey, United States, January–June 2021. *MMWR supplements*, *71*(3), 28. https://doi.org/https://doi.org/10.15585/mmwr.su7103a5

Kroenke, K., & Spitzer, R. L. (2002). The PHQ-9: a new depression diagnostic and severity measure. *Psychiatric annals*, *32*(9), 509-515. https://doi.org/https://doi.org/10.3928/0048-5713-20020901-06

Kroenke, K., Spitzer, R. L., & Williams, J. B. (2001). The PHQ-9: validity of a brief depression severity measure. *J Gen Intern Med*, *16*(9), 606-613. https://doi.org/10.1046/j.1525-1497.2001.016009606.x

Kuss, D. J., Griffiths, M. D., & Pontes, H. M. (2017). Chaos and confusion in DSM-5 diagnosis of Internet Gaming Disorder: Issues, concerns, and recommendations for clarity in the field. *J Behav Addict*, *6*(2), 103-109. https://doi.org/10.1556/2006.5.2016.062

Kuss, D. J., Louws, J., & Wiers, R. W. (2012). Online gaming addiction? Motives predict addictive play behavior in massively multiplayer online role-playing games. *Cyberpsychol Behav Soc Netw*, *15*(9), 480-485. https://doi.org/10.1089/cyber.2012.0034

Lange, B. P., & Schwab, F. (2018). Game on: Sex differences in the production and consumption of video games. In D. P. Johannes Breuer, Benny Liebold, Benjamin Lange (Ed.), *Evolutionary Psychology and Digital Games* (pp. 193-204). Routledge. https://doi.org/https://doi.org/10.4324/9781315160825

Lemmens, J. S., Valkenburg, P. M., & Gentile, D. A. (2015). The Internet Gaming Disorder Scale. *Psychol Assess*, *27*(2), 567-582. https://doi.org/10.1037/pas0000062

Liu, L., Yao, Y.-W., Li, C.-s. R., Zhang, J.-T., Xia, C.-C., Lan, J., Ma, S.-S., Zhou, N., & Fang, X.-Y. (2018). The comorbidity between internet gaming disorder and depression: Interrelationship and neural mechanisms. *Frontiers in psychiatry*, *9*, 154. https://doi.org/https://doi.org/10.3389/fpsyt.2018.00154

López-Cabarcos, M. Á., Ribeiro-Soriano, D., & Piñeiro-Chousa, J. (2020). All that glitters is not gold. The rise of gaming in the COVID-19 pandemic. *Journal of Innovation & Knowledge*, *5*(4), 289-296. https://doi.org/10.1016/j.jik.2020.10.004

Lowe, B., Decker, O., Muller, S., Brahler, E., Schellberg, D., Herzog, W., & Herzberg, P. Y. (2008). Validation and standardization of the Generalized Anxiety Disorder Screener (GAD-7) in the general population. *Med Care*, *46*(3), 266-274. https://doi.org/10.1097/MLR.0b013e318160d093

Lucas, K., & Sherry, J. L. (2004). Sex differences in video game play: A communication-based explanation. *Communication research*, *31*(5), 499-523. https://doi.org/10.1177/0093650204267930

Mannikko, N., Ruotsalainen, H., Miettunen, J., Pontes, H. M., & Kaariainen, M. (2020). Problematic gaming behaviour and health-related outcomes: A systematic review and meta-analysis. *J Health Psychol*, *25*(1), 67-81. https://doi.org/10.1177/1359105317740414

Marino, C., Canale, N., Vieno, A., Caselli, G., Scacchi, L., & Spada, M. M. (2020). Social anxiety and Internet gaming disorder: The role of motives and metacognitions. *J Behav Addict*, *9*(3), 617-628. https://doi.org/10.1556/2006.2020.00044

Marraudino, M., Bonaldo, B., Vitiello, B., Bergui, G. C., & Panzica, G. (2022). Sexual Differences in Internet Gaming Disorder (IGD): From Psychological Features to Neuroanatomical Networks. *Journal of clinical medicine*, *11*(4), 1018. https://doi.org/10.3390/jcm11041018

McCormack, C. (2021). *Differences in the economic impacts of COVID-19 across the provinces and territories*. Retrieved August 30 from www150.statcan.gc.ca/n1/pub/36-28-0001/2021006/article/00001-eng.htm

McMahon, G., Douglas, A., Casey, K., & Ahern, E. (2022). Disruption to well-being activities and depressive symptoms during the COVID-19 pandemic: The mediational role of social connectedness and rumination. *J Affect Disord*, *309*, 274-281. https://doi.org/10.1016/j.jad.2022.04.142

Melodia, F., Canale, N., & Griffiths, M. D. (2020). The role of avoidance coping and escape motives in problematic online gaming: A systematic literature review. *International Journal of Mental Health and Addiction*, 1-27. https://doi.org/10.1007/s11469-020-00422-w

Miller, W. R., Toscova, R. T., Miller, J. H., & Sanchez, V. (2000). A theory-based motivational approach for reducing alcohol/drug problems in college. *Health Educ Behav*, *27*(6), 744-759. https://doi.org/10.1177/109019810002700609

Mohanty, J., Chokkanathan, S., & Alberton, A. M. (2022). COVID-19–related stressors, family functioning and mental health in Canada: Test of indirect effects. *Family Relations*, *71*(2), 445-462. https://doi.org/https://doi.org/10.1111/fare.12635

Moitra, E., Christopher, P. P., Anderson, B. J., & Stein, M. D. (2015). Coping-motivated marijuana use correlates with DSM-5 cannabis use disorder and psychological distress among emerging adults. *Psychology of Addictive Behaviors*, *29*(3), 627. https://doi.org/10.1037/adb0000083

Muthén, L. K., & Muthén, B. O. (2017). *Mplus User's Guide* (Vol. 8th). Muthén & Muthén.

Myrseth, H., Notelaers, G., Strand, L. A., Borud, E. K., & Olsen, O. K. (2017). Introduction of a new instrument to measure motivation for gaming: the electronic gaming motives questionnaire. *Addiction*, *112*(9), 1658-1668. https://doi.org/10.1111/add.13874

Na, E., Lee, H., Choi, I., & Kim, D. J. (2017). Comorbidity of Internet gaming disorder and alcohol use disorder: A focus on clinical characteristics and gaming patterns. *Am J Addict*, *26*(4), 326-334. https://doi.org/10.1111/ajad.12528

OHS. (2020). *A provincial guide to what's being done to fight COVID-19*. Retrieved December 14, 2020 from https://www.ohscanada.com/provincial-guide-whats-done-fight-covid-19/

Palan, S., & Schitter, C. (2018). Prolific. ac—A subject pool for online experiments. *Journal of Behavioral and Experimental Finance*, *17*, 22-27. https://doi.org/https://doi.org/10.1016/j.jbef.2017.12.004

Pallavicini, F., Pepe, A., & Mantovani, F. (2022). The Effects of Playing Video Games on Stress, Anxiety, Depression, Loneliness, and Gaming Disorder During the Early Stages of the COVID-19 Pandemic: PRISMA Systematic Review. *Cyberpsychol Behav Soc Netw*, *25*(6), 334-354. https://doi.org/10.1089/cyber.2021.0252

Panteli, M., Papantoniou, A., Vaiouli, P., Leonidou, C., & Panayiotou, G. (2022). Feeling Down in Lockdown: Effects of COVID-19 pandemic on emotionally vulnerable individuals. *The Counseling Psychologist*, *50*(3), 335-358. https://doi.org/https://doi.org/10.1177/00110000211064905

Peter, S. C., Ginley, M. K., & Pfund, R. A. (2020). Assessment and Treatment of Internet Gaming Disorder. *Journal of Health Service Psychology*, *46*(1), 29-36. https://doi.org/10.1007/s42843-020-00005-2

Petry, N. M., & O'Brien, C. P. (2013). Internet gaming disorder and the DSM-5. *Addiction*, *108*(7), 1186-1187. https://doi.org/10.1111/add.12162

Plett, D., Pechlivanoglou, P., & Coyte, P. C. (2022). The impact of provincial lockdown policies and COVID-19 case and mortality rates on anxiety in Canada. *Psychiatry Clin Neurosci*, *76*(9), 468-474. https://doi.org/10.1111/pcn.13437

Pollack, M. H. (2005). Comorbid anxiety and depression. *J Clin Psychiatry*, *66 Suppl 8*, 22-29. https://www.ncbi.nlm.nih.gov/pubmed/16336033

Pontes, H. M., & Griffiths, M. D. (2015). Measuring DSM-5 Internet gaming disorder: Development and validation of a short psychometric scale. *Computers in Human Behavior*, *45*, 137-143. https://doi.org/https://doi.org/10.1016/j.chb.2014.12.006

Prolific. (2018). *Using attention checks as a measure of data quality*. Retrieved May 19, 2020 from https://researcher-help.prolific.co/hc/en-gb/articles/360009223553-Using-attention-checks-as-a-measure-of-data-quality

Przybylski, A. K., & Weinstein, N. (2019). Investigating the motivational and psychosocial dynamics of dysregulated gaming: Evidence from a preregistered cohort study. *Clinical Psychological Science*, *7*(6), 1257-1265. https://doi.org/https://doi.org/10.1177/2167702619859341

Przybylski, A. K., Weinstein, N., & Murayama, K. (2017). Internet Gaming Disorder: Investigating the Clinical Relevance of a New Phenomenon. *Am J Psychiatry*, *174*(3), 230-236. https://doi.org/10.1176/appi.ajp.2016.16020224

Rehm, J., Kilian, C., Ferreira-Borges, C., Jernigan, D., Monteiro, M., Parry, C. D. H., Sanchez, Z. M., & Manthey, J. (2020). Alcohol use in times of the COVID 19: Implications for monitoring and policy. *Drug Alcohol Rev*, *39*(4), 301-304. https://doi.org/10.1111/dar.13074

Restubog, S. L. D., Ocampo, A. C. G., & Wang, L. (2020). Taking control amidst the chaos: Emotion regulation during the COVID-19 pandemic. *J Vocat Behav*, *119*, 103440. https://doi.org/10.1016/j.jvb.2020.103440

Rettie, H., & Daniels, J. (2021). Coping and tolerance of uncertainty: Predictors and mediators of mental health during the COVID-19 pandemic. *Am Psychol*, *76*(3), 427-437. https://doi.org/10.1037/amp0000710

Rodriguez, L. M., Neighbors, C., Rinker, D. V., & Tackett, J. L. (2015). Motivational Profiles of Gambling Behavior: Self-determination Theory, Gambling Motives, and Gambling Behavior. *J Gambl Stud*, *31*(4), 1597-1615. https://doi.org/10.1007/s10899-014-9497-7

Rohsenow, D. J., Monti, P. M., Martin, R. A., Colby, S. M., Myers, M. G., Gulliver, S. B., Brown, R. A., Mueller, T. I., Gordon, A., & Abrams, D. B. (2004). Motivational enhancement and coping skills training for cocaine abusers: effects on substance use outcomes. *Addiction*, *99*(7), 862-874. https://doi.org/10.1111/j.1360-0443.2004.00743.x

Rozgonjuk, D., Pontes, H. M., Schivinski, B., & Montag, C. (2022). Disordered gaming, loneliness, and family harmony in gamers before and during the COVID-19 pandemic. *Addictive Behaviors Reports*, 100426. https://doi.org/https://doi.org/10.1016/j.abrep.2022.100426

Sallie, S. N., Ritou, V. J. E., Bowden-Jones, H., & Voon, V. (2021). Assessing online gaming and pornography consumption patterns during COVID-19 isolation using an online survey: Highlighting distinct avenues of problematic internet behavior. *Addict Behav*, *123*, 107044. https://doi.org/10.1016/j.addbeh.2021.107044

Sanders, J. L., Williams, R. J., & Damgaard, M. (2017). Video game play and internet gaming disorder among Canadian adults: a national survey. *Canadian Journal of Addiction*, *8*(2), 6-12. https://doi.org/10.1097/CXA.0000000000000006

Sartorius, N., Ustun, T. B., Lecrubier, Y., & Wittchen, H. U. (1996). Depression comorbid with anxiety: results from the WHO study on psychological disorders in primary health care. *Br J Psychiatry Suppl*, *168*(30), 38-43. https://www.ncbi.nlm.nih.gov/pubmed/8864147

Shah, S. M. A., Mohammad, D., Qureshi, M. F. H., Abbas, M. Z., & Aleem, S. (2021). Prevalence, Psychological Responses and Associated Correlates of Depression, Anxiety and Stress in a Global Population, During the Coronavirus Disease (COVID-19) Pandemic. *Community Ment Health J*, *57*(1), 101-110. https://doi.org/10.1007/s10597-020-00728-y

Sobell, L. C., & Sobell, M. B. (1992). Timeline follow-back. In *Measuring alcohol consumption* (pp. 41-72). Springer. https://doi.org/10.1007/978-1-4612-0357-5_3

Spitzer, R. L., Kroenke, K., Williams, J. B., & Lowe, B. (2006). A brief measure for assessing generalized anxiety disorder: the GAD-7. *Arch Intern Med*, *166*(10), 1092-1097. https://doi.org/10.1001/archinte.166.10.1092

Stevens, M. W., Dorstyn, D., Delfabbro, P. H., & King, D. L. (2021). Global prevalence of gaming disorder: A systematic review and meta-analysis. *Aust N Z J Psychiatry*, *55*(6), 553-568. https://doi.org/10.1177/0004867420962851

Teng, Z., Pontes, H. M., Nie, Q., Griffiths, M. D., & Guo, C. (2021). Depression and anxiety symptoms associated with internet gaming disorder before and during the COVID-19 pandemic: A longitudinal study. *Journal of Behavioral Addictions*, *10*(1), 169-180. https://doi.org/10.1556/2006.2021.00016

Terlecki, M., Brown, J., Harner-Steciw, L., Irvin-Hannum, J., Marchetto-Ryan, N., Ruhl, L., & Wiggins, J. (2011). Sex differences and similarities in video game experience, preferences, and self-efficacy: Implications for the gaming industry. *Current Psychology*, *30*(1), 22-33. https://doi.org/10.1007/s12144-010-9095-5

Vadlin, S., Aslund, C., Hellstrom, C., & Nilsson, K. W. (2016). Associations between problematic gaming and psychiatric symptoms among adolescents in two samples. *Addict Behav*, *61*, 8-15. https://doi.org/10.1016/j.addbeh.2016.05.001

van der Velden, P. G., Contino, C., Das, M., van Loon, P., & Bosmans, M. W. (2020). Anxiety and depression symptoms, and lack of emotional support among the general population before and during the COVID-19 pandemic. A prospective national study on prevalence and risk factors. *Journal of Affective Disorders*, *277*, 540-548. https://doi.org/10.1016/j.jad.2020.08.026

Viana, R. B., & de Lira, C. A. B. (2020). Exergames as coping strategies for anxiety disorders during the COVID-19 quarantine period. *Games for health journal*, *9*(3), 147-149. https://doi.org/10.1089/g4h.2020.0060

Wang, C.-Y., Wu, Y.-C., Su, C.-H., Lin, P.-C., Ko, C.-H., & Yen, J.-Y. (2017). Association between Internet gaming disorder and generalized anxiety disorder. *Journal of Behavioral Addictions*, *6*(4), 564-571. https://doi.org/10.1556/2006.6.2017.088

Wang, C., Pan, R., Wan, X., Tan, Y., Xu, L., Ho, C. S., & Ho, R. C. (2020). Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. *International journal of environmental research and public health*, *17*(5), 1729. https://doi.org/10.3390/ijerph17051729

Wardell, J. D., Kempe, T., Rapinda, K. K., Single, A., Bilevicius, E., Frohlich, J. R., Hendershot, C. S., & Keough, M. T. (2020). Drinking to Cope During COVID-19 Pandemic: The Role of External and Internal Factors in Coping Motive Pathways to Alcohol Use, Solitary Drinking, and Alcohol Problems. *Alcohol Clin Exp Res*, *44*(10), 2073-2083. https://doi.org/10.1111/acer.14425

Wartberg, L., Kriston, L., Kramer, M., Schwedler, A., Lincoln, T. M., & Kammerl, R. (2017). Internet gaming disorder in early adolescence: Associations with parental and adolescent mental health. *Eur Psychiatry*, *43*, 14-18. https://doi.org/10.1016/j.eurpsy.2016.12.013

Weinstein, N., Przybylski, A. K., & Murayama, K. (2017). A prospective study of the motivational and health dynamics of Internet Gaming Disorder. *PeerJ*, *5*, e3838. https://doi.org/10.7717/peerj.3838

Weinstock, J., Whelan, J. P., & Meyers, A. W. (2004). Behavioral assessment of gambling: an application of the timeline followback method. *Psychol Assess*, *16*(1), 72-80. https://doi.org/10.1037/1040-3590.16.1.72

Williams, N. (2014). The GAD-7 questionnaire. *Occupational Medicine*, *64*(3), 224-224. https://doi.org/https://doi.org/10.1093/occmed/kqt161

Wisener, M., & Khoury, B. (2021). Specific emotion-regulation processes explain the relationship between mindfulness and self-compassion with coping-motivated alcohol and marijuana use. *Addictive behaviors*, *112*, 106590. https://doi.org/https://doi.org/10.1016/j.addbeh.2020.106590

World Health Organization, W. (2019). *International statistical classification of diseases and related health problems (11th ed.)* https://icd.who.int/

Xu, S., Park, M., Kang, U. G., Choi, J.-S., & Koo, J. W. (2021). Problematic use of alcohol and online gaming as coping strategies during the COVID-19 pandemic: A mini review. *Frontiers in psychiatry*, 930. https://doi.org/10.3389/fpsyt.2021.685964

Chapter 3: Internalizing personality traits and coping motivations for gaming during the COVID-19 pandemic: A cross-lagged panel mediation analysis

The two studies presented in this dissertation aimed understand the relationship between emotional vulnerability, coping motives, and excessive gaming during the COVID-19 pandemic. Study 1 focused exclusively on the early stages of the pandemic when physical distancing guidelines were strictly enforced. It was found that higher levels of emotional vulnerability (i.e., symptoms of depression and anxiety) in the first month of the pandemic prospectively predicted elevated time spent gaming and related problems six months later, with coping motives for gaming playing a mediating role in this relationship.

As the situation with COVID-19 evolved and restrictions were lifted in many regions, it became crucial to examine the long-term pathways from emotional vulnerability to gaming behaviours. Study 2 aims to build upon Study 1 by investigating the relationships between anxiety sensitivity, hopelessness, coping motives, and time spent gaming during the post-lockdown period of the pandemic. A larger sample of 1001 American gamers was utilized, allowing for a more diverse and representative population.

Overall, Study 2 extends the knowledge gained from Study 1 by examining the enduring impact of emotional vulnerability on coping-related gaming behaviours during the later stages of the pandemic. In doing so, Study 2 aims to contribute to the growing body of literature on mental health and gaming during the COVID-19 pandemic, offering valuable insights into the potential risks and benefits of coping-motivated gaming. As the situation with the pandemic continues to shift, the knowledge gained from these studies can aid in the development of targeted interventions to support individuals in effectively coping with distressing emotions without resorting to maladaptive gaming behaviours.

Abstract

Background: Anxiety sensitivity and hopelessness are two traits that have been previously linked to increased gaming problems. Research in the early stages of the COVID-19 pandemic showed that emotionally vulnerable individuals were turning to video games as a means of coping with their distress. However, more research is needed on the long-term and enduring pathways from internalizing traits to time spent gaming during COVID-19, after the lockdowns and preventative measures had been lifted. As such, the current study employs a multi-wave longitudinal study that predicted that those participants who experience high levels of anxiety sensitivity or hopelessness would use gaming as a means to cope with their emotional discomfort, resulting in increased gaming behaviours.

Methods: A sample of 1001 American gamers (M_{age}= 38.43, *SD*= 12.11, 53.2% female) completed three surveys through Mechanical Turk, with the first occurring in July 2021, and subsequent surveys spaced three months apart. This study measured participants' baseline anxiety sensitivity and hopelessness using the Substance Use Risk Profile. At each time point, participants were asked to recall their average time spent gaming over the past month using a Timeline Follow-Back method, and answer questions related to their coping motivations for gaming using the Motives for Online Gaming Questionnaire.

Results: Coping motives consistently predicted time spent gaming at the next timepoint. Furthermore, we found evidence that high levels of anxiety sensitivity at baseline predicted greater future time spent gaming at Time 3, through greater coping motives at Time 2. Hopelessness was correlated with coping motives and time spent gaming at baseline, but did not relate to these variables across time.

Conclusions: Anxious individuals who were gaming to cope during the COVID-19 pandemic may be at higher risk for excessive gaming. This may be particularly true for individuals who are higher in anxiety sensitivity. Future research should aim to understand how the relationships between anxiety sensitivity, coping motivations, and time spend gaming exist in the context of symptoms of gaming disorder and functional impairments that exist due to excessive gaming.

Keywords: Anxiety Sensitivity, Coping, COVID-19 Gaming, Hopelessness, Negative Thinking, Pandemic, Problematic Gaming,

Background

The COVID-19 pandemic has been shown to have continued negative impacts on symptoms of depression, anxiety, and overall feelings of loneliness worldwide (Kotwal et al., 2022; Rosenberg et al., 2021; Shattuck et al., 2022; Sommerlad et al., 2021). As a result of the changes imposed by the COVID-19 pandemic and ongoing stressors that persisted well beyond the initial lockdown, many sought new ways to cope with their isolation and negative emotions. One such method is the use of video games. A recent systematic review looked at articles published since December 2019 (Pallavicini et al., 2022). The researchers found that many people turned to video gaming during the pandemic to mitigate their stress, anxiety, depression, and loneliness; however, for those individuals who were at-risk for addictive behaviour, particularly male youths or those with maladaptive or avoidant coping styles, excessive gaming was found to have long-term increases in symptoms of anxiety, depression, and overall stress, but short-term relaxing effects to the player (Pallavicini et al., 2022). This may indicate that these at-risk populations experience greater distress or risk for developing gaming problems as a means of coping with their distress (Pallavicini et al., 2022). This discovery is reinforced by earlier research conducted by Melodia and colleagues (2022) prior to the pandemic. In their systematic review, they examined 26 articles published between 2010 and 2020 that explored avoidance and escape coping strategies for gaming. Their analysis revealed a significant connection between escape or avoidance coping motives and the prevalence of excessive gaming behaviours (Melodia et al., 2022). However, while these studies give information regarding gaming activity and its potential negative effects both prior to and during the pandemic, much still remains unknown regarding the longitudinal pathways of risk for gaming problems in this context, and the mechanisms that would explain that risk.

Gaming activity during COVID-19

The USA has seen significant growth in the number of self-reported video gamers since the beginning of the COVID-19 pandemic, from 164 million in 2019 to 215 million in 2022. (Entertainment Software Association, 2019, 2022). Not only are more Americans playing video games, but the amount of time spent gaming is steadily rising, from an average of 8.3 hours per week in 2019, to 13 hours per week in 2022, representing a nearly 57% increase in time spent gaming. (Entertainment Software Association, 2019, 2022). Moreover, Verizon reported a 75% increase in online gaming activity, corresponding with stay-at-home directives (Pantling, 2020).

Gaming, in itself, is not inherently problematic; in fact, previous research has shown that gaming can be associated with numerous benefits with regard to social (Wiederhold, 2021), emotional, and physical development (Merino-Campos & del Castillo Fernndez, 2016), particularly with moderate game play (Granic et al., 2014). However, it is important to note that there are passionate gamers who do not encounter gaming-related problems or functional impairment. The specific genre or nature of the video games that are played may influence the positive outcomes associated with gaming. For example, cooperative or team-based video games (e.g., *World of Warcraft*) have been linked to increased prosocial behaviours and social skills in some studies (Gentile et al., 2009; Lenhart et al., 2008). On the other hand, casual or puzzle video games (e.g., *Bejeweled, Angry Birds*) have found to have mood-boosting and relaxing effects (Russoniello et al., 2009).

Despite these benefits, there are also times when gaming can lead to functional impairment, distress, or other problems. Though there are some differences throughout the literature in the constructs used to measure problematic gaming (King et al., 2013; Kuss, 2013), most literature agrees that the term “excessive gaming” encompasses problematic gaming habits that also cause

gaming-related problems or functional issues (King et al., 2013). As such, excessive gaming is essentially a term used to conceptualize addiction to gaming, without a formal diagnosis being attached to the definition (Sanders et al., 2017). Excessive gaming has been associated with a number of mental health concerns including anxiety (Wang et al., 2017), depression (Liu et al., 2018), and substance use (Na et al., 2017). A systematic review of 24 articles conducted by González-Bueso et al. (2018) examined the relations between gaming problems, anxiety, and depression. The authors concluded that there were significant positive correlations between gaming problems and emotional disorders, namely anxiety and depression. However, the authors note that the lack of longitudinal studies that examine the directional relations between gaming problems, anxiety, and depression is a significant limitation (González-Bueso et al., 2018).

A further meta-analysis included data collected from 210, 557 participants, aiming to determine risk and protective factors to the development of Gaming Disorder (Ropovik et al., 2023). The researchers included studies published from 2013 onwards. Relevant to the current study, they found that anxiety, stress, gaming time, and escape motives all were risk factors for the development of Gaming Disorder (Ropovik et al., 2023). Collectively, these studies demonstrate an established relationship between anxiety and depression with excessive gaming; however, in the context of the global pandemic where emotional issues have peaked, there is a need for research that is focused on how vulnerable individuals are coping, and if they are gaming more in order to cope.

Anxiety Sensitivity and Hopelessness

Internalizing personality traits, such as anxiety sensitivity and hopelessness, are risk factors that can help us to better understand gaming risk by providing insights into how individuals with these traits may use gaming as a coping mechanism for anxiety or hopelessness. Anxiety sensitivity

is defined as the fear that physiological or emotional symptoms of anxiety will have harmful consequences (Mantar, 2011). For example, an individual high in anxiety sensitivity may fear an impending heart attack if they notice an increase in their heart rate. The literature identifies anxiety sensitivity as an enduring personality trait that contributes to higher risk for virtually all anxiety disorders (Mantar et al., 2011; Olatunji & Wolitzky-Taylor, 2009; Schmidt et al., 2010; Taylor et al., 1992). Hopelessness is conceptualized as a stable trait of depression-proneness. Individuals who are high in hopelessness tend to have frequent negative thoughts about themselves, others, and about the future. Consequently, high levels of trait hopelessness have been associated with increased risk for recurrent major depressive episodes (Mac Giollabhui et al., 2018; Soloff et al., 2000; Szanto et al., 1998). Overall, the literature on personality indicates that both anxiety sensitivity and hopelessness are more than simply experiencing situational or state-level negative emotions. They are enduring traits that give risk to emotional vulnerability.

Within the context of the COVID-19 pandemic, previous research has shown that higher anxiety sensitivity can contribute experiencing high levels of fear related to COVID-19 (Warren et al., 2021), elevated symptoms of anxiety and depression (Rogers et al., 2021; Warren et al., 2021), or post-traumatic stress disorder (Li et al., 2020; Zhao et al., 2022) and significant functional impairment in their daily life (Manning et al., 2021). Studies have also found that individuals who experience higher levels of anxiety sensitivity are also more likely to experience problematic gaming behaviours during the pandemic (Kahraman & Yertutanol, 2021), and are also more likely to report coping motivations for gaming (Biolcati et al., 2021). This is consistent with pre-pandemic literature that found associations between anxiety sensitivity, problematic and excessive internet use (Taş, 2019), gambling and risk-taking behaviours (Broman-Fulks et al., 2014), and video game use (Kahraman & Yertutanol, 2021). Moreover, anxiety symptoms more generally

have been positively associated with problematic or excessive gaming behaviours both before (Mannikko et al., 2015; Wang et al., 2017) and during the COVID-19 pandemic (Fazeli et al., 2020; Teng et al., 2021). Given that individuals higher in anxiety sensitivity seem to have experienced an exacerbated level of emotional distress caused by the COVID-19 pandemic, those same individuals may have gamed excessively in order to manage these symptoms.

Comparatively, there is significantly less research surrounding the association between hopelessness and excessive gaming during the COVID-19 pandemic. Despite this, the available research does suggest a positive association between hopelessness and COVID-19 related depression and loneliness (Akova et al., 2022; Padmanabhanunni & Pretorius, 2021). Teng et al. (2021) conducted a two timepoint study (October/November 2019 and April/May 2020) with 1178 children and adolescents to characterize changes before- and during- the COVID-19 pandemic with regards to excessive video game use, and symptoms of gaming problems, depression, and anxiety. The researchers found that higher symptoms of anxiety and depression at Time 1 each independently positively predicted symptoms of gaming problems and excessive video game use at Time 2 (Teng et al., 2021). It is important to note that this study did not measure trait hopelessness; however, as mentioned, there is a strong association between trait hopelessness and symptoms of depression (Akova et al., 2022; Padmanabhanunni & Pretorius, 2021).

Given that the rates of depression in North America skyrocketed during the COVID-19 pandemic, with moderate to severe depression rates in the USA increasing from 8.5% in 2018 to 27.8% in the first few months of the pandemic (March and April 2020) (Ettman et al., 2020), it stands to reason that these increases in depressive symptoms during the pandemic may be a contributing factor to increased time spent gaming. Other studies conducted during the pandemic have also found a positive association between levels of depression or hopelessness and gaming

problems (Chen et al., 2021; Cudo et al., 2022). Biolcati et al. (2021) recruited 627 self-reported video game players and asked them to complete the Substance Use Risk Profile Scale along with the Internet Gaming Disorder Scale- Short Form and the Motives for Online Gaming Questionnaire during the COVID-19 pandemic. The researchers found that hopelessness was a distinguishing trait between those who met criteria for Gaming Disorder and those who did not, where higher levels of hopelessness were associated with more symptoms of Gaming Disorder. However, while the relationship between anxiety sensitivity or hopelessness and excessive gaming has been previously defined, the motivations for gaming in this relationship are not yet well understood. Biolcati et al (2021) did find that there was a positive association between anxiety sensitivity and coping motives for gaming; however, more research is needed to better understand this association.

Coping Motives

Motivational theory identifies reasons for engaging in addictive behaviours as proximal factors related to risk for problem alcohol and other substance use (Cooper et al., 1995; Cox & Klinger, 1988; Miller et al., 2000), as well as for behavioural addictions, such as gambling (Chantal & Vallerand, 1996; Rodriguez et al., 2015) and gaming (Przybylski & Weinstein, 2019; Weinstein et al., 2017). Coping motives in particular have been found in various forms of addiction. For example, Cooper (1994) introduced a four-factor model of motivations for alcohol use, consisting of social motives, coping motives, enhancement motives, and conformity motives, while Myrseth et al. (2017) suggested a four-dimensional model of motivation for online gaming consisting of social motives, coping motives, enhancement motives, and self-gratification motives. Coping motives have also been found in other addictive behaviours including gambling (Schlagintweit et al., 2017; Stewart & Zack, 2008) and substance use (Hogarth et al., 2019; Votaw & Witkiewitz, 2021). According to these motivational models of addiction, people who are emotionally

vulnerable are at risk for excessive gaming and related harms due to their strong coping motives for playing (Balhara et al., 2018). These people may have been the ones who increased their gaming in efforts to cope with the enduring pandemic situation.

Myrseth et al. (2017) identified four key motives for gaming, namely: enhancement motives (internal, positive reinforcement; gaming for the pleasurable experience of gaming itself), coping motives (internal, negative reinforcement; reduction of negative emotions), social motives (external, positive reinforcement motives; increasing social interaction), and self-gratification motives (gaming to satisfy one's own personal desires). Coping motives seem to be the most central to problematic gaming, particularly among those with emotional vulnerabilities, as they have been found to predict increased risk for gaming harms (Myrseth et al., 2017). Furthermore, coping motives independently predict a loss of control of gaming behaviours as well as the development of gaming problems (Myrseth et al., 2017).

A longitudinal study conducted by Lewinson et al. (2022) examined the relations between emotional vulnerability (i.e. state depression and anxiety symptoms) and video game usage in the first six months of the COVID-19 pandemic. A sample of 332 Canadian gamers were recruited through Prolific to participate in a longitudinal study with three time points spaced three months apart beginning in April 2020 (approximately six weeks after the declared state-of-emergency in several parts of the United States). At each time point, participants were asked to complete surveys assessing their levels of anxiety and depression (collectively called "emotional vulnerability"), time spent gaming, gaming problems, and motivations for gaming. The researchers found that higher initial levels of emotional vulnerability predicted future excessive time spent gaming and gaming problems six months into the pandemic. Moreover, the researchers found that individuals who were higher in emotional vulnerability at the outset of the pandemic were more likely to use

video gaming as a coping method, which in turn related to increased gaming harms. However, it is important to note that the measures of emotional vulnerability in this study were state-like emotions and captured initial reactions to the pandemic situation; as such, the relationship between video game usage and coping is currently unclear in individuals who are higher in trait hopelessness or trait anxiety sensitivity. Furthermore, the aforementioned study occurred during the first year of the pandemic; since that time, much has changed societally with the alleviation of lockdown procedures and mandatory masking, and increased availability of vaccines. As such, it is important to understand this association over time, during a different period of the COVID-19 pandemic.

While previous research acknowledges that gaming has increased during the pandemic, the longitudinal pathways and mechanisms that underlie the relationship between excessive gaming and internalizing traits such as anxiety sensitivity and hopelessness remain unclear. This study will provide insights into how individuals with these internalizing traits may use gaming as a coping mechanism, and how this may be attributed to more time spent gaming.

It is important to note that while the present study was conducted during a specific period of the COVID-19 pandemic, the identified psychological pathways and coping strategies extend beyond the immediate context of the study. By elucidating the relationships between internalizing traits, coping motives, and excessive gaming, this research contributes to a broader understanding of the enduring impact of psychological distress on gaming behaviors. As we explore these pathways, we acknowledge the necessity of considering the study's timeframe and contextualizing the findings within the evolving landscape of the COVID-19 pandemic and its aftermath.

Aims and Hypothesis

Psychological distress during the COVID-19 pandemic has been proposed to lead to longer-term or enduring impacts on maladaptive substance use for coping purposes (Rehm et al., 2020). With regards to gaming behaviours, it is possible that we might see similar enduring distress-related pathways. We examined these pathways later in the pandemic, focusing on trait-level internalizing factors and longer-term excessive gaming. Using a three-timepoint longitudinal survey design beginning in July 2021 (with subsequent timepoints spaced three months apart), we examined how anxiety sensitivity and hopelessness were prospectively positively related to time spent gaming across time. We expect that individuals that are high in hopelessness and anxiety sensitivity will game more frequently due to their coping motivations for gaming. In addition, we tested the mediational role of coping motives as a secondary aim. Invariance tests were also conducted for biological sex (male versus female). Prior research has found variations between sexes in their gaming behaviours, including their gaming preferences and confidence levels in gaming; however, as this information has not been found during the COVID-19 pandemic, this invariance analysis was exploratory in nature (Lange & Schwab, 2018; Lucas & Sherry, 2004; Terlecki et al., 2011). Furthermore, gaming disorders are more prevalent in males (Marraudino et al., 2022), and previous research has shown that male youths in particular are more at-risk for experiencing detrimental effects such as increased anxiety, depression, and loneliness, due to excessive gaming (Pallavicini et al., 2022). As such, it is imperative to assess whether the proposed pathways remain consistent across sex to ensure the validity of our results' interpretation within our sample.

Methods

Participants and Procedure

This research was reviewed and approved by the York University Research Ethics Board (Human Participants Review Committee certificate #e2021-238). Participants residing in the United States were recruited through CloudResearch, a research platform that integrates with Mechanical Turk to allow researchers to more easily conduct longitudinal academic or social research (Litman et al., 2017). Mechanical Turk is a crowdsourcing platform that allows workers to complete "Human Intelligence Tasks" in exchange for money (Buhrmester et al., 2011; Litman et al., 2015). Eligibility to participate was determined using pre-existing screening data available on CloudResearch, with participants being eligible if they were older than 18 years of age, live in the United States of America, and self-report that they regularly play video games (more than one hour per day of gaming). Only n=2 participants endorsed 0 hours of daily gaming at baseline; these participants were included in the analysis as they are individuals who are self-reported gamers, who therefore have motives for their gaming behaviour, and including them allowed us to avoid bias and allow us the full spectrum of gaming in our sample. The conscientious responders scale (Marjanovic et al., 2014), as well as an additional attention-check item created by the researchers ("when asked what your favorite color is, please respond with "coffee""), were included to ensure that the participants were attending to the surveys and responding conscientiously (Marjanovic et al., 2014). Participants were excluded from analysis if they failed more than two attention-check items (six participants at each Time 1 and 2, three participants from Time 3). During data collection at Time 3, a technical error caused nine participant's data to be unable to be connected to their previous responses at Time 1 and Time 2. This data was also excluded from analysis. Data collection took place as follows: July 2021 (Time 1), October 2021 (Time 2), and January 2022 (Time 3). Although many lockdown measures were listed, life at these time points had not fully returned to normal, with remote or hybrid work and travel, and other restrictions still being in place

in a number of locations across the United States. Participants were compensated $1 USD for their participation in Time 1, $2 USD for their participation in Time 2, and $3 USD for their participation in Time 3.

Measures

Table 1 outlines the timeline of the study as well as which measures were used at each time point. Measures were completed online, and hosted through Qualtrics (Qualtrics, 2014). The order of measure presentation was non-randomized.

Table 1. Synopsis of measures used at Time 1, Time 2, and Time 3.

	Time 1 (July 2021)	Time 2 (October 2021)	Time 3 (January 2022)
Measures used	SUDS EGMQ TLFB	EMGQ TLFB	EMGQ TLFB

Notes: SUDS: Substance Use Disorder Scale; EMGQ: Electronic Gaming Motives Questionnaire; TLFB: Timeline Follow-back.

Electronic Gaming Motives Questionnaire (EGMQ)

The EGMQ is a self-report measure of video gaming motives (Myrseth et al., 2017). In the current study, only the coping motives subscale was used. The coping motives subscale consists of four items (e.g. "*to forget your worries")*, with participants responding to the items on a 1 (almost never/never) to 4 (almost always) scale. (Myrseth et al., 2017). In previous studies, the EGMQ has been shown to have good criterion validity (based on measures of gaming behaviours including categories of games played, the typical number of hours played per week, feelings of loss of control over gaming, and symptoms of gaming problems measured by the Gaming Addiction Scale), and good internal consistency (Myrseth et al., 2017). The coping motives

subscale of the EGMQ in the present study had internal consistencies of Ω= .816, Ω =.810, and Ω =.844 at Time 1, Time 2, and Time 3, respectively.

The Substance Use Risk Profile Scale (SURPS)

The SURPS (Woicik et al., 2009) measures personality risk for substance abuse on four dimensions; however, only the two internalizing subscales were used in this study: hopelessness (e.g., seven -items; "I am content"), and anxiety sensitivity (e.g. five items; "It frightens me when I feel my heart beat change"). Each item is rated on a 1 (strongly disagree) to 4 (strongly agree) Likert-type scale (Woicik et al., 2009). The SURPS was collected only at baseline (Time 1) for the current study. This scale was chosen as it efficiently and reliably assesses hopelessness and anxiety sensitivity, minimizing participant burden by capturing both variables in a single instrument. Additionally, the SURPS is commonly employed in gaming research to deliniate personality variables associated with substance use risk, potentially providing valuable insights for future studies in this field. In previous studies, the SURPS has shown strong discriminant and convergent validity, good concurrent, incremental, and construct validity, and good internal consistency (Woicik et al., 2009). In the current study, the SURPS had an internal consistency of Ω =.789 and Ω =.906 for the anxiety sensitivity and hopelessness subscales, respectively.

Time Spent Gaming

At each time point, participants were asked to indicate how much time on average (in hours) they had spent gaming each day over the past month. This number was multiplied by 30 to determine the participants' total time spent gaming over the previous month at each time point. This procedure was based on the Timeline Follow-Back method which has been used in previous

studies to measure gambling-related behaviours (Weinstock et al., 2004), substance use (Agrawal et al., 2008), and video gaming (Peter et al., 2020).

Data Analysis Overview

The data set for this manuscript is available online. We conducted preliminary analyses prior to hypothesis testing with a cross-lagged panel model (CLPM). CLPM is often used in longitudinal research to examine the reciprocal relationships between two or more variables measured at multiple timepoints. Namely, it is designed to explore the direction and strength of relationships between variables over time by analyzing how changes in one variable at an earlier timepoint predicts changes in another variable at a later timepoint (Muthén & Muthén, 2017). It is a widely used framework to test mediation with longitudinal data, such as the data presented in the current study. In the case of the current study, hopelessness and anxiety sensitivity (Time 1) were treated as predictors of coping motives and time spent gaming (Time 2 and Time 3), while also being considered as concurrent correlates of coping motives and time spent gaming at Time 1. Given the temporal nature of the data, reciprocal pathways were also included to examine the presence of mediation as a secondary aim.

The preliminary analysis involved data screening (i.e., winsorizing extreme values to $\pm$ 3.29 standard deviations from the mean and verifying multiple regression assumptions) and conducting a missing data analysis. For the missing data, we used a series of t-tests to examine potential baseline differences between participants with complete data versus those with incomplete data (Enders, 2010). In this analysis, we utilized full information maximum likelihood (FIML) as the specific estimation technique within the CLPM to handle missing data. FIML is commonly used to handle missing data and provides unbiased estimates when data is missing at random. This enhances the robustness of our statistical model.

Next, we used a cross-lagged mediation model in MPlus V 8.4 to test the hypothesized pathways from internalizing traits to gaming via coping motives across the three timepoints (Muthén & Muthén, 2017). In this model, anxiety sensitivity and hopelessness were specified as predictors of the mediator (coping motives) and outcome variable (time spent gaming) at Time 2 and Time 3. Anxiety sensitivity and hopelessness were specified as correlates of the mediator and outcome variable at Time 1, as these variables were measured concurrently. The autoregressive effects and cross-lagged effects were specified among coping motives and time spent gaming across the three time points.

Fit of the hypothesized model was evaluated using several indices. For comparative fit index (CFI), $\geq$.95 was considered excellent, while between .90 and .95 is adequate. A root mean square error of approximation (RMSEA) of .06 or below is considered excellent, while a score between .06 and .10 is considered adequate. A score above .10 is considered poor fit. A standardized root mean square residual (SRMR) below .05 is considered excellent, while a score between .05 and .08 represents adequate fit (Fabrigar et al., 1999; Hu & Bentler, 1999; Kyndt & Onghena, 2014). In addition, the presence and magnitude of direct and indirect paths were evaluated using a bootstrapped bias-corrected 95% Confidence Interval (CI) approach (Fritz & MacKinnon, 2007). If the 95% CI for a given direct or indirect path coefficient does not include zero, the effect is considered to be supported (Fritz & Mackinnon, 2007; Hu & Bentler, 1999; Kline, 2013). The fit of our model is based on the comprehensive set of indices described above.

Following the evaluation of the CLPM in the full sample, the invariance of our model was tested across biological sex (i.e. men vs. women) to ensure that the interpretations of our results are consistent across our sample. In order to proceed with the path invariance testing, the proposed model was first tested in each sex group individually to ensure good fit (Cheung & Rensvold,

2002). A configural model was then tested, one that allows the paths to vary freely between groups. Assuming that good model fit was established in these first two steps, a path invariance model was estimated that constrains the direct effects to be equal effects across sex groups. If there were no significant differences in model fit between the configural and invariant models, then it was inferred that the overall model applies equally across sex (i.e., to both males and females) groups (Cheung & Rensvold, 2002). Differences in fit between path invariant and configural models were evaluated using the $\Delta\chi^2$ test and the change in CFI value. A significant difference between models is supported if the *p*-value for the $\Delta\chi^2$ test is below .05 and/or the ΔCFI is ≥.01 (Cheung & Rensvold, 2002).

Results

Preliminary Analyses

1001 participants (532 females; 469 males) completed the study at Time 1. At Time 2, *n*= 699 (69.8%) of participants participated in the study. At Time 3, *n*= 747 (74.6%) of participants participated in the study. "Completers" (*N*= 435) are those who completed all three time points, while "non completers" (*N*= 566) completed less than three time points. Our variables did not show any substantial skew or kurtosis, based on Kline (2011) who indicates that a skew of <3 and kurtosis of <10 is acceptable for normality. Table 3 outlines the skew and kurtosis of our variables.

There were no significant differences between completers and non-completers with regards to amount of time spent gaming, *t*(999)= .965, *p*=.335, d=.062 hopelessness, *t*(999)= -.579, *p*=.563, d= -.037, or coping motivations, *t*(999)= .525, *p*=.60, d=.033. Effect sizes represent Cohen's d for missingness. There were also no significant differences between completers and non-completers in their sociodemographic factors (see Table 2). However, there was a significant difference

between completers (*M*= 7.66, *SD*=3.039) and non-completers (*M*=8.26, *SD*= 3.063) in anxiety sensitivity, *t*(999) =3.075, *p*= .002, d=.196. This indicates that individuals who were lower in anxiety sensitivity were more likely to complete all three time points of this study.

Sociodemographic variables

Table 2 shows the sociodemographic variables, comparing completers and non-completers.

Table 2. Sociodemographic variables.

	Completers	**Non-Completers**	**χ(df) or *t(df)***	***p***
Age (years) (SD)	40.17 (12.17)	36.17 (11.67)	**-5.25(999)**	**.23**
Sex *n* (%)				
Male	271 (47.9)	198 (45.5)	**.55 (1)**	**.46**
Female	295 (52.1)	237 (54.5)		
Education *n* (%)				
High school or less	58 (10.2)	52 (11.9)	**4.97 (3)**	**.17**
Some post-secondary/trade school	151 (26.7)	120 (27.5)		
Completed post-secondary/trade school	241 (42.6)	197 (45.2)		
Post-graduate work/degree	116 (20.5)	66 (15.1)		
Ethnicity *n* (%)				
BIPOC	140 (24.7)	123 (28.2)	**1.59 (1)**	**.21**
White	426 (75.3)	312 (71.6)		

Descriptive Statistics

Table 3 shows the descriptive data for the observed variables. The values for time spent gaming represent the average number of hours that participants spent gaming over the previous month. Our participants therefore spent an average of 3.02 hours per day gaming at Time 1, 2.83 hours per day gaming at Time 2, and 2.79 hours per day gaming at Time 3. In our sample, we observed a wide range of hopelessness, anxiety sensitivity, coping motives, and time spent gaming.

Table 3. Descriptive Statistics for the Observed Variables

Variable	Mean	Median	SD	Range	Skewness	Kurtosis
Time Spent Gaming (T1)	90.58	60	79.83	0-450	2.35	6.40
Time Spent Gaming (T2)	84.87	60	70.08	0-378	2.18	5.76
Time Spent Gaming (T3)	83.61	60	67.62	0-335.26	1.81	3.48
SURPS Hopelessness (T1)	14.65	14	4.37	7-28	.66	.48
SURPS Anxiety Sensitivity (T1)	12.92	13	3.06	5-20	-.34	-.03
Coping Motives (T1)	10.49	11	2.96	4-16	-.06	-.70
Coping Motives (T2)	10.23	10	2.98	4-16	.03	-.65
Coping Motives (T3)	10.24	10	3.2	4-16	-.16	-.61

Note. *Time spent gaming is measured by average number of hours gamed over the previous month; SURPS: Substance Use Profile Scale; T1: Time 1; T2: Time 2; T3: Time 3.*

Mediation Model

Model Results

Our model supports an adequate-to-excellent fit based on the fit indices described above: χ^2= 38.807, df= 4, p = <.001, χ^2/df= 9.70; CFI= .971, RMSEA = .093 (95% *CI* [.068, .121]), SRMR=

.022. It should be noted that although the χ^2/df ratio is high, this ratio is also sensitive to larger sample sizes (Alavi et al., 2020). Furthermore, it is important to acknowledge that a number of df's in our model are quite low, which is problematic pertaining to RMSEA as low df's will often result in inflated RMSEA (Fabrigar et al., 1999; Hu & Bentler, 1999; Kyndt & Onghena, 2014). Given this, the final model was selected based on the comprehensive results across fit indices, given the detrimental impact of low df on RMSEA estimates. The coefficients and 95% CIs for the cross-lagged panel model are shown in Figure 2.

Cross-lagged effects

Results showed that Time 1 time spent gaming predicted Time 2 coping motives (β=.063 [95% CI 0.007 - .125]), but this prospective association was not supported from Time 2 time spent gaming to Time 3 coping motives (β= .041 [95% CI -.058 - .126]). In contrast, we did find consistent cross-lagged effects from coping motives to time spent gaming across Time 1 to Time 2, and across Time 2 to Time 3. Overall, this suggests that coping motives were a driver of future excessive gaming.

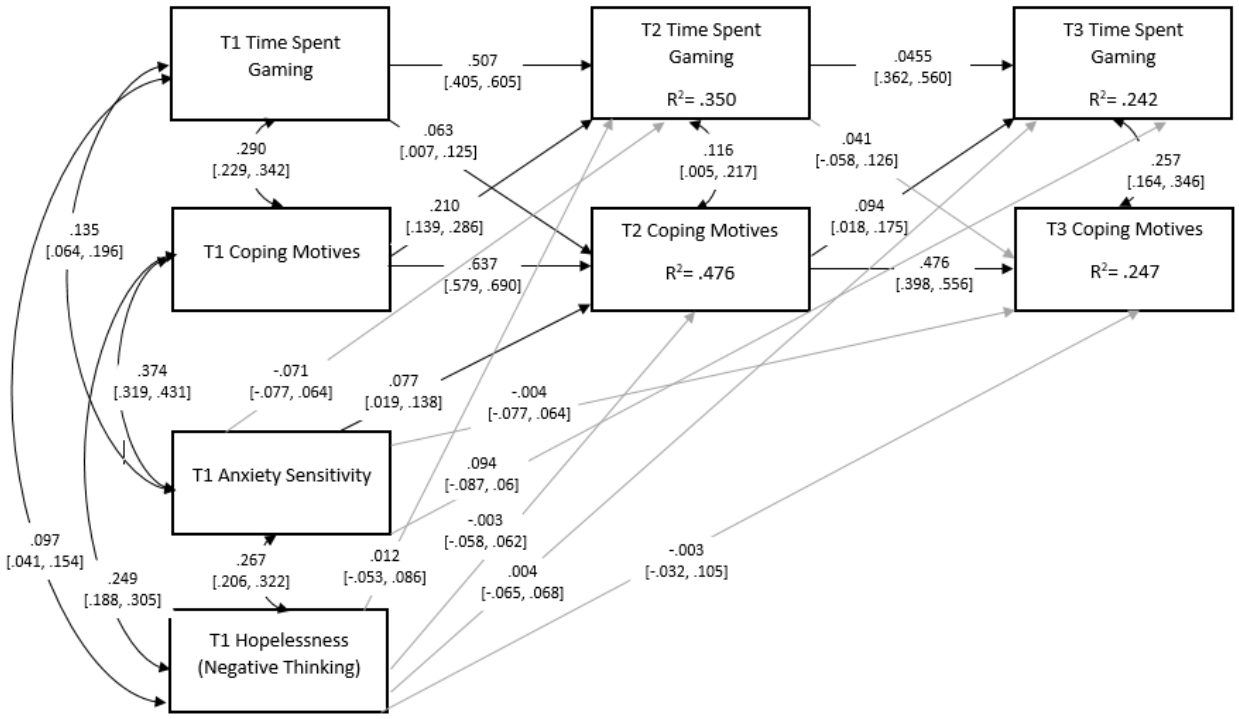

Figure 1. Cross-lagged panel model of hopelessness and anxiety sensitivity to time spent gaming and coping motives.

Note* Grey arrows represent non-significant pathways, while black arrows denote significant pathways. Standardized estimates are shown with their corresponding 95% bias-corrected bootstrapped confidence intervals. 95% confidence intervals are reported between squared brackets.

There were no significant direct effects from Time 1 anxiety sensitivity to Time 3 coping motives or Time 3 time spent gaming. As hypothesized, we observed a mediational effect from Time 1 anxiety sensitivity to Time 3 time spent gaming, via Time 2 coping motives β= .007 [95% CI .001 - .021]). We did not find support that hopelessness was associated with concurrent or future coping motives or time spent gaming.

Invariance Testing

The invariance of the proposed model was tested across sex (male vs. female; see Table 4). The model fit the data well for males and for females.

Table 4. Invariance Testing by Sex: Model Fit Information

Model Type	Chi-square	*df*	*p* value	CFI	RMSEA	SRMR	Chi-square difference	*df*	*p* value	CFI difference
Sex										
Overall	38.807	4	<.001	.971	.093	.022				
Males	32.497	5	<.001	.954	.090	.023				
Females	20.701	5	<.001	.971	.078	.023				
Configural	44.38	8	<.001	.969	.097	.024				
Path Invariance	53.198	20	<.001	.971	.059	.029	8.818	12	0.718	.002

Discussion

This study is the first to longitudinally examine how anxiety sensitivity and hopelessness are prospectively related to time spent gaming during the COVID-19 pandemic, and the coping motivations that underlie that relationship. Overall, we found evidence for the hypothesis that coping motivations for gaming were a predictor of future excessive gaming for those with relatively higher anxiety sensitivity in our sample. Hopelessness was correlated with time spent gaming and coping motivations at baseline, but no longitudinal associations were supported in the data.

These findings are consistent with previous research, showing that those who report higher levels of anxiety sensitivity also tend to demonstrate elevated gaming behaviours (Kahraman & Yertutanol, 2021; Taş, 2019). Furthermore, these findings are consistent with previous literature showing that individuals who are higher in anxiety sensitivity are more likely to report coping

motivations for gaming (Biolcati et al., 2021). Previous research has shown that individuals who experience higher levels of anxiety sensitivity are particularly at-risk for experiencing symptoms of anxiety and were disproportionately affected by the COVID-19 pandemic (Panteli et al., 2022). The current study's findings help to explain this association by providing a directional aspect to the relationship, showing that that higher levels of anxiety sensitivity seem to prompt gamers to use video games as a coping mechanism for their emotional discomfort during the COVID-19 pandemic.

While coping motives were identified as a predictor of future excessive gaming in individuals with elevated anxiety sensitivity, this relationship did not hold longitudinally for the personality trait of hopelessness. Hopelessness has been shown in previous studies to be associated with gaming-related problems (Biolcati et al., 2021; Chen et al., 2021; Yu et al., 2023); however, in the current study, gaming was measured only through time spent gaming. It is possible that this measurement of time spent gaming was not specific enough to capture this relationship. In contrast, those with higher anxiety sensitivity were likely excessively anxious, and therefore may have engaged in more time gaming during the pandemic, whereas those higher in hopelessness may have engaged in gaming more episodically. Unfortunately, as gaming problems were not specifically measured, it is not possible to disentangle this possibility; however, this is an area for future research.

It is also possible that for those higher in hopelessness, gaming was used as a means of escape, rather than a means of coping. A study by Biolcati et al. (2021) examined personality traits, including anxiety sensitivity and hopelessness, in relation to gaming motives and Gaming Disorder. The research included 627 Italian gamers and employed some similar questionnaires (SUDS, IGDS-SF9), along with a different gaming motives questionnaire, the Motives for Online

Gaming Questionnaire (MOGQ). The results revealed that hopelessness predicted escape, recreation, and fantasy motives but not coping motives, whereas anxiety sensitivity predicted coping, escape, and fantasy motives. These results parallel the findings of the current study, where only anxiety sensitivity was linked to coping motives.

It is worth noting that Biolcati et al. (2021) employed the MOGQ, which distinguishes coping and escape motives as separate categories, potentially providing more detailed insights into gaming motives. The lack of significance in predicting coping motives related to hopelessness could be related to the possibility that individuals higher in hopelessness may use gaming as an avoidant coping strategy (escape), rather than actively addressing their negative emotions (coping). It may be that the gaming motive questionnaire used in the current study was not able to capture this important differentiation. Furthermore, given that there was an initial relationship found between hopelessness and time spent gaming at baseline, it may be that individuals higher in hopelessness turned to gaming as a means to cope with their emotional distress in the short term, but may have been motivated to game for other reasons, such as escape, fantasy, or recreation in the long term that our questionnaire was unable to capture (Fazeli et al., 2020; Liu et al., 2018) Future research should delve into this relationship, particularly in the context of escape versus coping motives in individuals with elevated hopelessness.

The results of the present study can be understood through the self-medication hypothesis in which individuals who are higher in anxiety sensitivity may game excessively as a way to cope with those negative emotions and sensations (Balhara et al., 2018; González-Bueso et al., 2018; Hallauer et al., 2021; King & Delfabbro, 2016; Liu et al., 2018; Vadlin et al., 2016; Wartberg et al., 2017). Within the context of the COVID-19 pandemic, studies have found support for this self-medication hypothesis with regards to a number of addictive behaviours including video game

and smart phone use (Menendez-Garcia et al., 2022), alcohol use (Wardell et al., 2020), substance use (Schimmenti et al., 2022), and gambling (Cardwell et al., 2022). This study therefore adds to the wealth of literature supporting the self-medication hypothesis, while also adding to the literature surrounding the COVID-19 pandemic which has previously found that those who experience heightened anxiety are more likely to engage in excessive gaming behaviours (Rozgonjuk et al., 2022; Sallie et al., 2021; Xu et al., 2021). The current study's results are unique in describing the directional nature of this established relationship and the role of coping motivations in this relationship Moreover, the mediating relationship was supported in a fully longitudinal test, overcoming the limits of many past studies that have relied on cross-sectional data.

The study's results can also be understood through the I-PACE (Interaction of Person-Affect-Cognition-Execution) model, which posits that addictive behaviours develop through the interaction of predisposing individual factors, along with specific situational triggers (Brand et al., 2019; Brand et al., 2016). The I-PACE model helps to inform the interpretation of our results; in line with the model's principles, the current study found the coping motivations, particularly in individuals with higher levels of anxiety sensitivity, predict future time spent gaming. This aligns with the I-PACE model's focus on the relationship between affective responses, decision making, and the development of habitual behaviours in addictive contexts. The current study also echoes the model's perspective on the use of changing coping styles based on prior experiences of gratification along with relief from emotional vulnerability (Brand et al., 2019). While hopelessness was not found to be associated with coping motives longitudinally, as mentioned above, hopelessness has been previously associated with escape, recreation, and fantasy motives-

this may also help to reinforce the I-PACE notion that specific behaviours have the possibility to lead to diverse emotional outcomes.

The results of this study aid in our understanding of gaming during the COVID-19 pandemic, and how anxiety sensitivity as a stable personality trait may impact gaming behaviours. This understanding could help guide strategies aimed at identifying individuals at risk for problematic excessive gaming, considering those with elevated anxiety sensitivity. Moreover, given this study's findings that excessive gaming seems to be fueled by coping motivations, future research may wish to explore positive coping methods that could help to mitigate the impact of coping motivations on excessive gaming behaviours.

This study had some limitations. Firstly, given that the data came from only one country, the results may not be generalizable to other countries, particularly countries outside of North America. Secondly, although there was a measure of time spent gaming at each time point, this is not necessarily a measure of problematic gaming in and of itself. Many individuals game on a regular basis, or even on an excessive basis, without accompanying symptoms that would make gaming problematic (e.g. distress, disruptions to functioning, etc.). Future studies measuring symptoms of gaming disorder may provide additional information as to how the participants' time spent gaming is impacting their daily functioning and interpersonal relationships. Given that the current study examined only trait-like factors, it would also be worthwhile to track participants' emotional distress over time with measures that have been shown to be sensitive to capturing short-term changes in mood and anxiety. Other studies may wish to examine factors beyond personality that might affect gaming, such as the social or contextual variables associated with the pandemic (e.g. employment status, remote working, living situation). It is also a limitation that for the current study, inferences surrounding the COVID-19 pandemic were made based on the context and

timing of the study. As such, we are unable to draw firm conclusions about any COVID-19 specific factors, as they were not included in our model. Finally, the reliance on self-reported data in measuring time spent gaming is a noteworthy limitation of the study. Self-report is susceptible to a number of biases and inaccuracies including memory recall issues, social desirability bias, or the possibility of misrepresenting actual gaming time. As such, the results of this study may be influenced by the inherent limitations of self-reported data, and future research may wish to replicate the study using objective measures of time spent gaming (e.g. tracking software).

Conclusion

The current study examined a specific time period during the pandemic in which lockdown and other measures were being lifted. During this time, many changes were still in effect due to the COVID-19 pandemic, and stress levels remained high for many people (Kastalskiy et al., 2021; Manchia et al., 2022).

These findings aid in our understanding of gaming behaviours and gaming motivations during the COVID-19 pandemic. This longitudinal study not only provides information regarding how anxiety sensitivity relates to time spent gaming during the pandemic, but also how these individuals used gaming as a means to cope with their emotional distress. Understanding these patterns may be valuable for mental health professionals or policy makers in order to better address the emotional needs of individuals during challenging situations, such as pandemics or other difficult events. This study underscores the need for continued research in this area, particularly in determining how gaming habits and motivations evolve over time, especially in response to external stressors. Furthermore, future research should aim to understand how the relationships between anxiety sensitivity, coping motivations, and time spend gaming exist in the context of symptoms of gaming disorder and functional impairments that exist due to excessive gaming.

References

Agrawal, S., Sobell, M. B., & Sobell, L. C. (2008). The Timeline Followback: A scientifically and clinically useful tool for assessing substance use. In *Calendar and time diary methods in life course research* (Vol. 57, pp. 68).

Akova, İ., Kiliç, E., & Özdemir, M. E. (2022). Prevalence of Burnout, Depression, Anxiety, Stress, and Hopelessness Among Healthcare Workers in COVID-19 Pandemic in Turkey. *INQUIRY: The Journal of Health Care Organization, Provision, and Financing*, *59*, 00469580221079684.

Alavi, M., Visentin, D. C., Thapa, D. K., Hunt, G. E., Watson, R., & Cleary, M. (2020). Chi-square for model fit in confirmatory factor analysis. *J Adv Nurs*, *76*(9), 2209-2211. https://doi.org/10.1111/jan.14399

Balhara, Y. P. S., Garg, H., Kumar, S., & Bhargava, R. (2018). Gaming disorder as a consequence of attempt at self- medication: Empirical support to the hypothesis. *Asian Journal of Psychiatry*, *31*, 98-99. https://doi.org/10.1016/j.ajp.2018.02.013

Biolcati, R., Passini, S., & Pupi, V. (2021). The role of video gaming motives in the relationship between personality risk traits and Internet Gaming Disorder. *Journal of Gambling Issues*, *46*.

Brand, M., Wegmann, E., Stark, R., Müller, A., Wölfling, K., Robbins, T. W., & Potenza, M. N. (2019). The Interaction of Person-Affect-Cognition-Execution (I-PACE) model for addictive behaviors: Update, generalization to addictive behaviors beyond internet-use disorders, and specification of the process character of addictive behaviors. *Neuroscience & Biobehavioral Reviews*, *104*, 1-10.

Brand, M., Young, K. S., Laier, C., Wölfling, K., & Potenza, M. N. (2016). Integrating psychological and neurobiological considerations regarding the development and maintenance of specific Internet-use disorders: An Interaction of Person-Affect-Cognition-Execution (I-PACE) model. *Neuroscience & Biobehavioral Reviews*, *71*, 252-266.

Broman-Fulks, J. J., Urbaniak, A., Bondy, C. L., & Toomey, K. J. (2014). Anxiety sensitivity and risk-taking behavior. *Anxiety Stress Coping*, *27*(6), 619-632. https://doi.org/10.1080/10615806.2014.896906

Buhrmester, M., Kwang, T., & Gosling, S. D. (2011). Amazon's Mechanical Turk: A New Source of Inexpensive, Yet High-Quality, Data? *Perspect Psychol Sci*, *6*(1), 3-5. https://doi.org/10.1177/1745691610393980

Cardwell, E., Hoff, R. A., Garakani, A., Krishnan-Sarin, S., Potenza, M. N., & Zhai, Z. W. (2022). An exploratory study of anxiety-motivated gambling in adolescents: Associations with minority status and gambling, health and functioning measures. *J Psychiatr Res*, *151*, 445-453. https://doi.org/10.1016/j.jpsychires.2022.03.052

Chantal, Y., & Vallerand, R. J. (1996). Skill versus luck: A motivational analysis of gambling involvement. *Journal of Gambling Studies*, *12*(4), 407-418. https://doi.org/10.1007/BF01539185

Chen, C., Dai, S., Shi, L., Shen, Y., & Ou, J. (2021). Associations Between Attention Deficit/Hyperactivity Disorder and Internet Gaming Disorder Symptoms Mediated by

Depressive Symptoms and Hopelessness Among College Students. *Neuropsychiatric Disease and Treatment*, *17*, 2775.
Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural equation modeling*, *9*(2), 233-255. https://doi.org/https://doi.org/10.1207/S15328007SEM0902_5
Cooper, M. L. (1994). Motivations for alcohol use among adolescents: Development and validation of a four-factor model. *Psychological Assessment*, *6*(2), 117.
Cooper, M. L., Frone, M. R., Russell, M., & Mudar, P. (1995). Drinking to regulate positive and negative emotions: a motivational model of alcohol use. *Journal of personality and social psychology*, *69*(5), 990-1005. https://doi.org/10.1037//0022-3514.69.5.990
Cox, W. M., & Klinger, E. (1988). A motivational model of alcohol use. *Journal of Abnormal Psychology*, *97*(2), 168-180. https://doi.org/10.1037//0021-843x.97.2.168
Cudo, A., Wojtasiński, M., Tużnik, P., Fudali-Czyż, A., & Griffiths, M. D. (2022). The Relationship between depressive symptoms, loneliness, self-control, and gaming disorder among Polish male and female gamers: The indirect effects of gaming motives. *International journal of environmental research and public health*, *19*(16), 10438.
Enders, C. K. (2010). *Applied missing data analysis*. Guilford Press.
Entertainment Software Association. (2019). *2019 Essential facts about the computer and video game industry*.
Entertainment Software Association. (2022). *2022 Essential facts about the video game industry*.
Ettman, C. K., Abdalla, S. M., Cohen, G. H., Sampson, L., Vivier, P. M., & Galea, S. (2020). Prevalence of depression symptoms in US adults before and during the COVID-19 pandemic. *JAMA network open*, *3*(9), e2019686-e2019686.
Fabrigar, L. R., Wegener, D. T., MacCallum, R. C., & Strahan, E. J. (1999). Evaluating the use of exploratory factor analysis in psychological research. *Psychological methods*, *4*(3), 272.
Fazeli, S., Zeidi, I. M., Lin, C.-Y., Namdar, P., Griffiths, M. D., Ahorsu, D. K., & Pakpour, A. H. (2020). Depression, anxiety, and stress mediate the associations between internet gaming disorder, insomnia, and quality of life during the COVID-19 outbreak. *Addictive Behaviors Reports*, *12*, 100307. https://doi.org/https://doi.org/10.1016/j.abrep.2020.100307
Fritz, M. S., & Mackinnon, D. P. (2007). Required sample size to detect the mediated effect. *Psychological Science*, *18*(3), 233-239. https://doi.org/10.1111/j.1467-9280.2007.01882.x
Gentile, D. A., Anderson, C. A., Yukawa, S., Ihori, N., Saleem, M., Ming, L. K., Shibuya, A., Liau, A. K., Khoo, A., & Bushman, B. J. (2009). The effects of prosocial video games on prosocial behaviors: International evidence from correlational, longitudinal, and experimental studies. *Personality and Social Psychology Bulletin*, *35*(6), 752-763.
González-Bueso, V., Santamaría, J. J., Fernández, D., Merino, L., Montero, E., & Ribas, J. (2018). Association between internet gaming disorder or pathological video-game use and comorbid psychopathology: a comprehensive review. *International journal of environmental research and public health*, *15*(4), 668. https://doi.org/https://doi.org/10.3390/ijerph15040668
Granic, I., Lobel, A., & Engels, R. C. (2014). The benefits of playing video games. *American Psychologist*, *69*(1), 66.

Hallauer, C. J., Rooney, E. A., Yang, H., Meng, Q., Montag, C., & Elhai, J. D. (2021). Anxiety sensitivity mediates relations between anxiety (but not depression) and problematic smartphone use severity, adjusting for age and sex, in Chinese adolescents early in the COVID-19 pandemic. *Human Behavior and Emerging Technologies*, *3*(5), 788-797.

Hogarth, L., Martin, L., & Seedat, S. (2019). Relationship between childhood abuse and substance misuse problems is mediated by substance use coping motives, in school attending South African adolescents. *Drug and alcohol dependence*, *194*, 69-74.

Hu, L. t., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural equation modeling: a multidisciplinary journal*, *6*(1), 1-55. https://doi.org/https://doi.org/10.1080/10705519909540118

Kahraman, B., & Yertutanol, F. D. K. (2021). Anxiety Sensitivity in Online Gamers. *Bağımlılık Dergisi*, *22*(3), 305-313.

Kastalskiy, I. A., Pankratova, E. V., Mirkes, E. M., Kazantsev, V. B., & Gorban, A. N. (2021). Social stress drives the multi-wave dynamics of COVID-19 outbreaks. *Sci Rep*, *11*(1), 22497. https://doi.org/10.1038/s41598-021-01317-z

King, D. L., & Delfabbro, P. H. (2016). The Cognitive Psychopathology of Internet Gaming Disorder in Adolescence. *Journal of Abnormal Child Psychology*, *44*(8), 1635-1645. https://doi.org/10.1007/s10802-016-0135-y

King, D. L., Haagsma, M. C., Delfabbro, P. H., Gradisar, M., & Griffiths, M. D. (2013). Toward a consensus definition of pathological video-gaming: A systematic review of psychometric assessment tools. *Clinical Psychology Review*, *33*(3), 331-342.

Kline, R. B. (2011). *Principles and Practice of Structural Equation Modeling* (5th ed.). The Guilford Press.

Kline, R. B. (2013). *Beyond significance testing: Statistics reform in the behavioral sciences*. American Psychological Association.

Kotwal, A. A., Batio, S., Wolf, M. S., Covinsky, K. E., Yoshino Benavente, J., Perissinotto, C. M., & O'Conor, R. M. (2022). Persistent loneliness due to COVID-19 over 18 months of the pandemic: a prospective cohort study. *Journal of the American Geriatrics Society*.

Kuss, D. J. (2013). Internet gaming addiction: current perspectives. *Psychology research and behavior management*, 125-137.

Kyndt, E., & Onghena, P. (2014). The integration of work and learning: Tackling the complexity with structural equation modelling. In *Discourses on professional learning: On the boundary between learning and working* (pp. 255-291). Springer.

Lange, B. P., & Schwab, F. (2018). Game on: Sex differences in the production and consumption of video games. In D. P. Johannes Breuer, Benny Liebold, Benjamin Lange (Ed.), *Evolutionary Psychology and Digital Games* (pp. 193-204). Routledge. https://doi.org/https://doi.org/10.4324/9781315160825

Lenhart, A., Kahne, J., Middaugh, E., Macgill, A. R., Evans, C., & Vitak, J. (2008). Teens, Video Games, and Civics: Teens' Gaming Experiences Are Diverse and Include Significant Social Interaction and Civic Engagement. *Pew internet & American life project*.

Lewinson, R. E., Wardell, J. D., Kronstein, N., Rapinda, K. K., Kempe, T., Katz, J., Kim, H. S., & Keough, M. T. (2022). *Gaming as a coping strategy during the COVID-19 pandemic*.

Li, X., Li, S., Xiang, M., Fang, Y., Qian, K., Xu, J., Li, J., Zhang, Z., & Wang, B. (2020). The prevalence and risk factors of PTSD symptoms among medical assistance workers during the COVID-19 pandemic. *Journal of Psychosomatic Research*, *139*, 110270.

Litman, L., Robinson, J., & Abberbock, T. (2017). TurkPrime.com: A versatile crowdsourcing data acquisition platform for the behavioral sciences. *Behav Res Methods*, *49*(2), 433-442. https://doi.org/10.3758/s13428-016-0727-z

Litman, L., Robinson, J., & Rosenzweig, C. (2015). The relationship between motivation, monetary compensation, and data quality among US- and India-based workers on Mechanical Turk. *Behav Res Methods*, *47*(2), 519-528. https://doi.org/10.3758/s13428-014-0483-x

Liu, L., Yao, Y.-W., Li, C.-s. R., Zhang, J.-T., Xia, C.-C., Lan, J., Ma, S.-S., Zhou, N., & Fang, X.-Y. (2018). The comorbidity between internet gaming disorder and depression: Interrelationship and neural mechanisms. *Frontiers in psychiatry*, *9*, 154. https://doi.org/https://doi.org/10.3389/fpsyt.2018.00154

Lucas, K., & Sherry, J. L. (2004). Sex differences in video game play: A communication-based explanation. *Communication research*, *31*(5), 499-523. https://doi.org/10.1177/0093650204267930

Mac Giollabhui, N., Hamilton, J. L., Nielsen, J., Connolly, S. L., Stange, J. P., Varga, S., Burdette, E., Olino, T. M., Abramson, L. Y., & Alloy, L. B. (2018). Negative cognitive style interacts with negative life events to predict first onset of a major depressive episode in adolescence via hopelessness. *J Abnorm Psychol*, *127*(1), 1-11. https://doi.org/10.1037/abn0000301

Manchia, M., Gathier, A. W., Yapici-Eser, H., Schmidt, M. V., de Quervain, D., van Amelsvoort, T., Bisson, J. I., Cryan, J. F., Howes, O. D., Pinto, L., van der Wee, N. J., Domschke, K., Branchi, I., & Vinkers, C. H. (2022). The impact of the prolonged COVID-19 pandemic on stress resilience and mental health: A critical review across waves. *Eur Neuropsychopharmacol*, *55*, 22-83. https://doi.org/10.1016/j.euroneuro.2021.10.864

Mannikko, N., Billieux, J., & Kaariainen, M. (2015). Problematic digital gaming behavior and its relation to the psychological, social and physical health of Finnish adolescents and young adults. *Journal of Behavioral Addiction*, *4*(4), 281-288. https://doi.org/10.1556/2006.4.2015.040

Manning, K., Eades, N. D., Kauffman, B. Y., Long, L. J., Richardson, A. L., Garey, L., Zvolensky, M. J., & Gallagher, M. W. (2021). Anxiety Sensitivity Moderates the Impact of COVID-19 Perceived Stress on Anxiety and Functional Impairment. *Cognit Ther Res*, *45*(4), 689-696. https://doi.org/10.1007/s10608-021-10207-7

Mantar, A., Yemez, B., & Alkin, T. (2011). Anxiety sensitivity and its importance in psychiatric disorders. *Turk Psikiyatri Derg*, *22*(3), 187-193. https://www.ncbi.nlm.nih.gov/pubmed/21870308

Marjanovic, Z., Struthers, C. W., Cribbie, R., & Greenglass, E. R. (2014). The Conscientious Responders Scale: A new tool for discriminating between conscientious and random responders. *Sage Open*, *4*(3), 2158244014545964.

Marraudino, M., Bonaldo, B., Vitiello, B., Bergui, G. C., & Panzica, G. (2022). Sexual Differences in Internet Gaming Disorder (IGD): From Psychological Features to Neuroanatomical Networks. *J Clin Med*, *11*(4), 1018. https://doi.org/10.3390/jcm11041018

Menendez-Garcia, A., Jimenez-Arroyo, A., Rodrigo-Yanguas, M., Marin-Vila, M., Sanchez-Sanchez, F., Roman-Riechmann, E., & Blasco-Fontecilla, H. (2022). Internet, video game and mobile phone addiction in children and adolescents diagnosed with ADHD: A case-control study. *Adicciones*, *34*(3), 208-217. https://doi.org/10.20882/adicciones.1469 (Adiccion a Internet, videojuegos y telefonos moviles en ninos y adolescentes: Un estudio de casos y controles.)

Merino-Campos, C., & del Castillo Fernndez, H. (2016). The benefits of active video games for educational and physical activity approaches: A systematic review. *Journal of New Approaches in Educational Research (NAER Journal)*, *5*(2), 115-122.

Miller, W. R., Toscova, R. T., Miller, J. H., & Sanchez, V. (2000). A theory-based motivational approach for reducing alcohol/drug problems in college. *Health Education & Behavior*, *27*(6), 744-759. https://doi.org/10.1177/109019810002700609

Muthén, L. K., & Muthén, B. O. (2017). *Mplus User's Guide* (Vol. 8th). Muthén & Muthén.

Myrseth, H., Notelaers, G., Strand, L. A., Borud, E. K., & Olsen, O. K. (2017). Introduction of a new instrument to measure motivation for gaming: the electronic gaming motives questionnaire. *Addiction*, *112*(9), 1658-1668. https://doi.org/10.1111/add.13874

Na, E., Lee, H., Choi, I., & Kim, D. J. (2017). Comorbidity of Internet gaming disorder and alcohol use disorder: A focus on clinical characteristics and gaming patterns. *American Journal of Addiction*, *26*(4), 326-334. https://doi.org/10.1111/ajad.12528

Olatunji, B. O., & Wolitzky-Taylor, K. B. (2009). Anxiety sensitivity and the anxiety disorders: a meta-analytic review and synthesis. *Psychol Bull*, *135*(6), 974-999. https://doi.org/10.1037/a0017428

Padmanabhanunni, A., & Pretorius, T. (2021). The loneliness–life satisfaction relationship: The parallel and serial mediating role of hopelessness, depression and ego-resilience among young adults in south africa during covid-19. *International journal of environmental research and public health*, *18*(7), 3613.

Pallavicini, F., Pepe, A., & Mantovani, F. (2022). The Effects of Playing Video Games on Stress, Anxiety, Depression, Loneliness, and Gaming Disorder During the Early Stages of the COVID-19 Pandemic: PRISMA Systematic Review. *Cyberpsychology, Behavior, and Social Networking*, *25*(6), 334-354. https://doi.org/10.1089/cyber.2021.0252

Panteli, M., Papantoniou, A., Vaiouli, P., Leonidou, C., & Panayiotou, G. (2022). Feeling Down in Lockdown: Effects of COVID-19 pandemic on emotionally vulnerable individuals. *The Counseling Psychologist*, *50*(3), 335-358. https://doi.org/https://doi.org/10.1177/00110000211064905

Peter, S. C., Ginley, M. K., & Pfund, R. A. (2020). Assessment and Treatment of Internet Gaming Disorder. *Journal of Health Service Psychology*, *46*(1), 29-36. https://doi.org/10.1007/s42843-020-00005-2

Przybylski, A. K., & Weinstein, N. (2019). Investigating the motivational and psychosocial dynamics of dysregulated gaming: Evidence from a preregistered cohort study. *Clinical Psychological Science*, *7*(6), 1257-1265. https://doi.org/https://doi.org/10.1177/2167702619859341

Qualtrics, L. J. U., USA: Qualtrics. (2014). Qualtrics [software].

Rehm, J., Kilian, C., Ferreira-Borges, C., Jernigan, D., Monteiro, M., Parry, C. D. H., Sanchez, Z. M., & Manthey, J. (2020). Alcohol use in times of the COVID 19: Implications for monitoring and policy. *Drug Alcohol Rev*, *39*(4), 301-304. https://doi.org/10.1111/dar.13074

Rodriguez, L. M., Neighbors, C., Rinker, D. V., & Tackett, J. L. (2015). Motivational Profiles of Gambling Behavior: Self-determination Theory, Gambling Motives, and Gambling Behavior. *Journal of Gambling Studies*, *31*(4), 1597-1615. https://doi.org/10.1007/s10899-014-9497-7

Rogers, A. H., Bogiaizian, D., Salazar, P. L., Solari, A., Garey, L., Fogle, B. M., Schmidt, N. B., & Zvolensky, M. J. (2021). COVID-19 and Anxiety Sensitivity Across Two Studies in Argentina: Associations with COVID-19 Worry, Symptom Severity, Anxiety, and Functional Impairment. *Cognit Ther Res*, *45*(4), 697-707. https://doi.org/10.1007/s10608-020-10194-1

Ropovik, I., Martončik, M., Babinčák, P., Baník, G., Vargová, L., & Adamkovič, M. (2023). Risk and protective factors for (internet) gaming disorder: A meta-analysis of pre-COVID studies. *Addictive behaviors*, *139*, 107590.

Rosenberg, M., Luetke, M., Hensel, D., Kianersi, S., Fu, T.-c., & Herbenick, D. (2021). Depression and loneliness during April 2020 COVID-19 restrictions in the United States, and their associations with frequency of social and sexual connections. *Social psychiatry and psychiatric epidemiology*, *56*(7), 1221-1232.

Rozgonjuk, D., Pontes, H. M., Schivinski, B., & Montag, C. (2022). Disordered gaming, loneliness, and family harmony in gamers before and during the COVID-19 pandemic. *Addictive Behaviors Reports*, 100426. https://doi.org/https://doi.org/10.1016/j.abrep.2022.100426

Russoniello, C. V., O'brien, K., & Parks, J. M. (2009). EEG, HRV and Psychological Correlates while Playing Bejeweled II: A Randomized Controlled Study. *Annual review of cybertherapy and telemedicine*, *7*(1), 189-192.

Sallie, S. N., Ritou, V. J. E., Bowden-Jones, H., & Voon, V. (2021). Assessing online gaming and pornography consumption patterns during COVID-19 isolation using an online survey: Highlighting distinct avenues of problematic internet behavior. *Addictive behaviors*, *123*, 107044. https://doi.org/10.1016/j.addbeh.2021.107044

Sanders, J. L., Williams, R. J., & Damgaard, M. (2017). Video game play and internet gaming disorder among Canadian adults: a national survey. *Canadian Journal of Addiction*, *8*(2), 6-12. https://doi.org/10.1097/CXA.0000000000000006

Schimmenti, A., Billieux, J., Santoro, G., Casale, S., & Starcevic, V. (2022). A trauma model of substance use: Elaboration and preliminary validation. *Addict Behav*, *134*, 107431. https://doi.org/10.1016/j.addbeh.2022.107431

Schlagintweit, H. E., Thompson, K., Goldstein, A. L., & Stewart, S. H. (2017). An investigation of the association between shame and problem gambling: The mediating role of maladaptive coping motives. *Journal of Gambling Studies*, *33*, 1067-1079.

Schmidt, N. B., Keough, M. E., Mitchell, M. A., Reynolds, E. K., MacPherson, L., Zvolensky, M. J., & Lejuez, C. (2010). Anxiety sensitivity: Prospective prediction of anxiety among early adolescents. *Journal of anxiety disorders*, *24*(5), 503-508.

Shattuck, S. M., Kaba, D., Zhou, A. N., & Polenick, C. A. (2022). Social contact, emotional support, and anxiety during the COVID-19 pandemic among older adults with chronic conditions. *Clinical Gerontologist*, *45*(1), 36-44.

Soloff, P. H., Lynch, K. G., Kelly, T. M., Malone, K. M., & Mann, J. J. (2000). Characteristics of suicide attempts of patients with major depressive episode and borderline personality disorder: a comparative study. *Am J Psychiatry*, *157*(4), 601-608. https://doi.org/10.1176/appi.ajp.157.4.601

Sommerlad, A., Marston, L., Huntley, J., Livingston, G., Lewis, G., Steptoe, A., & Fancourt, D. (2021). Social relationships and depression during the COVID-19 lockdown: longitudinal analysis of the COVID-19 Social Study. *Psychol Med*, 1-10. https://doi.org/10.1017/S0033291721000039

Stewart, S. H., & Zack, M. (2008). Development and psychometric evaluation of a three-dimensional Gambling Motives Questionnaire. *Addiction*, *103*(7), 1110-1117.

Szanto, K., Reynolds, C. F., 3rd, Conwell, Y., Begley, A. E., & Houck, P. (1998). High levels of hopelessness persist in geriatric patients with remitted depression and a history of attempted suicide. *J Am Geriatr Soc*, *46*(11), 1401-1406. https://doi.org/10.1111/j.1532-5415.1998.tb06007.x

Taş, İ. (2019). Self-regulation and anxiety sensitivity as predictors of internet addiction among secondary school 7th-and 8 th-grade students. *International Journal of Education Technology and Scientific Researches (IJETSAR)*.

Taylor, S., Koch, W. J., & McNally, R. J. (1992). How does anxiety sensitivity vary across the anxiety disorders? *Journal of anxiety disorders*, *6*(3), 249-259.

Teng, Z., Pontes, H. M., Nie, Q., Griffiths, M. D., & Guo, C. (2021). Depression and anxiety symptoms associated with internet gaming disorder before and during the COVID-19 pandemic: A longitudinal study. *Journal of behavioral addictions*, *10*(1), 169-180. https://doi.org/10.1556/2006.2021.00016

Terlecki, M., Brown, J., Harner-Steciw, L., Irvin-Hannum, J., Marchetto-Ryan, N., Ruhl, L., & Wiggins, J. (2011). Sex differences and similarities in video game experience, preferences, and self-efficacy: Implications for the gaming industry. *Current Psychology*, *30*(1), 22-33. https://doi.org/10.1007/s12144-010-9095-5

Vadlin, S., Aslund, C., Hellstrom, C., & Nilsson, K. W. (2016). Associations between problematic gaming and psychiatric symptoms among adolescents in two samples. *Addictive behaviors*, *61*, 8-15. https://doi.org/10.1016/j.addbeh.2016.05.001

Votaw, V. R., & Witkiewitz, K. (2021). Motives for substance use in daily life: A systematic review of studies using ecological momentary assessment. *Clinical Psychological Science*, *9*(4), 535-562.

Wang, C.-Y., Wu, Y.-C., Su, C.-H., Lin, P.-C., Ko, C.-H., & Yen, J.-Y. (2017). Association between Internet gaming disorder and generalized anxiety disorder. *Journal of behavioral addictions*, *6*(4), 564-571. https://doi.org/10.1556/2006.6.2017.088

Wardell, J. D., Kempe, T., Rapinda, K. K., Single, A., Bilevicius, E., Frohlich, J. R., Hendershot, C. S., & Keough, M. T. (2020). Drinking to Cope During COVID-19 Pandemic: The Role of External and Internal Factors in Coping Motive Pathways to Alcohol Use, Solitary Drinking, and Alcohol Problems. *Alcohol: Clinical and Experimental Research*, *44*(10), 2073-2083. https://doi.org/10.1111/acer.14425

Warren, A. M., Zolfaghari, K., Fresnedo, M., Bennett, M., Pogue, J., Waddimba, A., Zvolensky, M., Carlbring, P., & Powers, M. B. (2021). Anxiety sensitivity, COVID-19 fear, and mental health: results from a United States population sample. *Cogn Behav Ther*, *50*(3), 204-216. https://doi.org/10.1080/16506073.2021.1874505

Wartberg, L., Kriston, L., Kramer, M., Schwedler, A., Lincoln, T. M., & Kammerl, R. (2017). Internet gaming disorder in early adolescence: Associations with parental and adolescent mental health. *European Psychiatry*, *43*, 14-18. https://doi.org/10.1016/j.eurpsy.2016.12.013

Weinstein, N., Przybylski, A. K., & Murayama, K. (2017). A prospective study of the motivational and health dynamics of Internet Gaming Disorder. *PeerJ*, *5*, e3838. https://doi.org/10.7717/peerj.3838

Weinstock, J., Whelan, J. P., & Meyers, A. W. (2004). Behavioral assessment of gambling: an application of the timeline followback method. *Psychological Assessment*, *16*(1), 72-80. https://doi.org/10.1037/1040-3590.16.1.72

Wiederhold, B. K. (2021). Kids will find a way: The benefits of social video games. In (Vol. 24, pp. 213-214): Mary Ann Liebert, Inc., publishers 140 Huguenot Street, 3rd Floor New ….

Woicik, P. A., Stewart, S. H., Pihl, R. O., & Conrod, P. J. (2009). The Substance Use Risk Profile Scale: a scale measuring traits linked to reinforcement-specific substance use profiles. *Addict Behav*, *34*(12), 1042-1055. https://doi.org/10.1016/j.addbeh.2009.07.001

Xu, S., Park, M., Kang, U. G., Choi, J.-S., & Koo, J. W. (2021). Problematic use of alcohol and online gaming as coping strategies during the COVID-19 pandemic: A mini review. *Frontiers in psychiatry*, 930. https://doi.org/10.3389/fpsyt.2021.685964

Yu, Y., Fong, V. W., Ng, J. H.-Y., Wang, Z., Tian, X., & Lau, J. T. (2023). The Associations between loneliness, hopelessness, and self-control and internet gaming disorder among university students who were men who have sex with men: cross-sectional mediation study. *Journal of medical Internet research*, *25*, e43532.

Zhao, X., Li, W., Li, X., Shi, W., & Li, C. (2022). Autistic traits and COVID-19-related post-traumatic stress disorder symptom: Sex difference and the role of anxiety sensitivity. *Research in Autism Spectrum Disorders*, *98*, 102042.

Chapter 4: General Discussion

General summary

This dissertation consists of two longitudinal studies conducted at the beginning of and one year into the COVID-19 pandemic (Study 1 and Study 2, respectively). Both studies examined the prospective relationship between emotional vulnerability (i.e. symptoms of anxiety and depression), or related personality traits (i.e. anxiety sensitivity and hopelessness), and gaming, looking at coping motivations for gaming as a mediating factor. Before the COVID-19 pandemic, established relationships existed between emotional vulnerability (or anxiety sensitivity), coping motives, and excessive gaming. However, the pandemic's influence on this relationship was unknown. As symptoms of anxiety and depression increased during the pandemic (Choi et al., 2020; Chrikov et al., 2020; Dozois, 2021; Ettman et al., 2020; Turna et al., 2021), along with a surge in gaming behaviours (Entertainment Software Association, 2020; Entertainment Software Association of Canada, 2020), it became crucial to understand how individuals coped with their distress by gaming. Identifying risk factors for excessive or problematic gaming during the pandemic holds long-term implications for health and mental health systems. Additionally, this understanding can offer valuable insights for mental health professionals, policymakers, or society at large, helping them provide appropriate support and resources to those in need.

Study 1

In Study 1, state emotional vulnerability was examined, using symptoms of anxiety and depression together to predict gaming behaviours six months later. Study 1 found that participants who had higher levels of emotional vulnerability tended to use gaming as a form of

coping with that emotional distress. Moreover, Study 1 demonstrated that those with greater coping motives for gaming three months into the pandemic spent more time gaming and endorsed more gaming problems at six-months into the pandemic. Study 1 highlights the importance of considering the psychological factors that contribute to excessive gaming. With the inclusion of coping motivations, the results of Study 1 suggest that gaming may serve as a maladaptive coping mechanism for those with higher emotional vulnerability during the COVID-19 pandemic.

However, Study 1 left some questions unanswered, including how more stable, trait-like variables such as anxiety sensitivity and hopelessness might influence this relationship between coping motives and excessive gaming. Moreover, given the rapidly-evolving nature of the pandemic, the second study also sought to discern how these relationships manifested one year into the COVID-19 pandemic.

Study 2

Study 2 expanded on the findings of Study 1 to better understand how personality traits of anxiety sensitivity and hopelessness related to time spent gaming, and the directional relationship of the role of coping. This investigation also considered the evolving circumstances later in the pandemic. Conducted over a year into the pandemic, the study coincided with the wider availability of vaccines, increased social flexibility, and the reopening of public spaces. The results of Study 2 showed that individuals with higher anxiety sensitivity tended to be motivated to cope with their negative feelings through gaming, and that this coping motivation predicted future excessive time spent gaming. While initial positive correlations were found between hopelessness and coping motivations at baseline, these associations did not hold up

longitudinally. Study 2 adds to our understanding of the relationships between personality traits, coping motives, and excessive gaming.

Integrated discussion

Overall, both studies seem to suggest that there is a relationship between emotional vulnerability and excessive gaming during the COVID-19 pandemic, with coping motivations as a key variable to understanding this relationship. This holds true for both emotional vulnerability (encompassing anxiety and depression together), and the stable trait-factor of anxiety sensitivity. These studies highlight the importance of considering coping motives for gaming as a potential factor contributing to excessive gaming during the pandemic, particularly among the emotionally vulnerable.

The integrated discussion below is organized into sections focusing on anxiety/anxiety sensitivity, and depression/hopelessness. However, it is important to note that in Study 1, a latent variable was created to encompass symptoms of depression and anxiety together. This decision was influenced by the high level of comorbidity observed between the two (Gorman, 1996; Hirschfeld, 2001; Pollack, 2005; Sartorius et al., 1996), along with suggestions advocating for the conceptualization of depression and anxiety as a single transdiagnostic factor ((Brown & Barlow, 2009; Craske, 2012). As such, while the subsequent discussion addresses anxiety and depression separately, it is essential to acknowledge the interconnected nature of these two conditions as they pertain to the latent variable of emotional vulnerability.

Anxiety and anxiety sensitivity

As mentioned, the positive relationship between anxiety and gaming has been established in previous studies (Mehroof & Griffiths, 2010). The findings of Mehroof and

Griffiths (2010) in particular help to establish the long-standing relationship between anxiety and excessive gaming. Furthermore, it is worth noting that anxiety sensitivity has been previously shown to be a predictor of symptoms of anxiety (Berman et al., 2010). Although there is comparatively less existing research on the relationship between anxiety sensitivity and excessive gaming during the pandemic, this existing relationship also strengthens the finding made in this dissertation that anxiety sensitivity as well as emotional vulnerability might put individuals at particular risk for excessive gaming in order to cope with emotional distress.

In the context of the COVID-19 pandemic, gaming may have been used as a means of coping with the emotional consequences of stay-at-home orders, isolation, and uncertainty (Pallavicini et al., 2022). These societal changes have been found in previous research to have been linked to increased symptoms of both general and health-related anxiety, financial worries, and loneliness, as well as reduced sleep quality (Bigalke et al., 2020; Tull et al., 2020). Moreover, these negative consequences have been shown to be exacerbated in individuals with higher levels of anxiety or anxiety sensitivity (Warren et al., 2021).

The current dissertation's results contribute to the existing literature by providing further evidence of the relationship between emotional vulnerability and gaming during the COVID-19 pandemic. It also introduces the key mediating variable of coping to explain this relationship, demonstrating how coping motives are relevant for gaming outcomes both in the short-term acute phase of the pandemic, and longer-term outcomes in the later stages of the pandemic. Previous research conducted before the pandemic has suggested that coping motives could play a significant role in the development of Gaming Disorder, especially among individuals experiencing heightened anxiety (Moge & Romano, 2020; Plante et al., 2019). However, there is

limited research conducted during the pandemic that has explored this relationship with coping motives.

Related to the concept of coping motives is that of escape motives. Escape motives describe an individual's motivation for gaming as a means of escaping reality. They are often paired with coping motives, as they represent two sides of the same coin: escape motives involve an avoidant coping strategy, seeking to evade negative emotions or reality, while coping motives represent an approach coping strategy, using gaming as a means of coping with emotional distress. The Electronic Motives for Gaming Questionnaire (EMGQ) used in this dissertation did not include a subscale for escape motives.

While specific studies on coping motives during the pandemic are lacking, some research has explored escape motives in relation to excessive gaming and symptoms of anxiety and depression during the COVID-19 pandemic. Wischert-Zielke and Barke (2023) conducted a study examining the predictive relationships between perceived social support, gaming motives, and psychological characteristics towards symptoms of Gaming Disorder. The researchers recruited 2909 self-reported gamers of *Animal Crossing: New Horizons* through social media and asked them to complete the Motives for Online Gaming Questionnaire (MOGQ), the Internet Gaming Disorder Questionnaire (IGDQ), a questionnaire on perceived social support, and the Brief Symptom Inventory, which measures symptoms of depression and anxiety. Participants were categorized as recreational gamers or gamers who were at risk for the development of Gaming Disorder (*n*= 273; 10%), based on their responses to the IGDQ. Binary logistic regression revealed that escape, fantasy, and competition motives were significant predictors of Gaming Disorder symptoms. Interestingly, coping motives did not show significant predictive

power in this relationship. Lack of perceived social support and symptoms of depression and anxiety were also unique predictors of Gaming Disorder symptoms.

The above study's findings align with our research regarding emotional vulnerability involving symptoms of anxiety and depression and their predictive relationship to excessive gaming. In the current dissertation, coping motives were identified as a key mediator in this relationship, which differed from the results of the study by Wischert-Zielke and Barke (2023). Notably, the EMGQ scale used in this dissertation framed its coping items positively, as approach coping, while the study conducted by Wischert-Zielke and Barke (2023) used the MOGQ, which frames their questions in an avoidant-coping manner. It may be that the MOGQ allows for more discrimination in how coping is used in this relationship. Consequently, caution should be exercised in the interpretation due to the framing differences.

Depression and hopelessness

Although coping motives were found to be a predictor of future excessive gaming among those with higher anxiety sensitivity, the same was not found longitudinally for the personality trait of hopelessness. The lack of association between hopelessness and coping motives is consistent with previous studies. Biolcati et al. (2021) aimed to understand the relationship between various personality traits, including anxiety sensitivity and hopelessness, and the role of gaming motives in the development of Gaming Disorder. In their study, the researchers recruited 627 self-reported Italian gamers, and used identical questionnaires to ones used in the current dissertation: The Internet Gaming Disorder Scale, the Substance Use Risk Profile Scale, and the Motives for Online Gaming Questionnaire. The researchers found that hopelessness predicted only escape, fantasy, and recreation motives, but not coping motives. However, it was found that anxiety sensitivity predicted coping, escape, and fantasy motives.

These findings are consistent with the present dissertation's findings from Study 2, where only anxiety sensitivity predicted coping motives. However, it should be noted that Biolcati et al. (2021) utilized a different scale than the one used in this dissertation to assess gaming motives. They employed the Motives for Online Gaming Questionnaire (MOGQ), which distinguishes coping and escape motives into separate categories. As mentioned earlier, the scale used in this dissertation solely focuses on coping motives as an approach coping strategy. The MOGQ, on the other hand, may offer more differentiation between types of coping, potentially making it more informative. The lack of significance in predicting coping motives related to hopelessness might be attributed to the possibility that individuals higher in hopelessness might use gaming as an avoidant coping strategy rather than actively dealing with their negative emotions. Further research should explore this relationship, particularly in the context of escape versus coping motives for gaming among individuals with higher levels of hopelessness.

Hopelessness has been found to be a positive predictor of COVID-19 related depression and loneliness (Akova et al., 2022). Given the positive association between depression and excessive gaming, it may be that individuals with higher levels of hopelessness turned to gaming as a means to cope with their emotional distress in the short term, but may have been motivated to game for different reasons, such as escape, fantasy, or recreation, in the long-term (Fazeli et al., 2020; Liu et al., 2018). Individuals higher in hopelessness may have initially used gaming as a means of seeking temporary relief from negative emotions. However, their motivations for gaming may have changed over time. Unlike those higher in anxiety sensitivity, where gaming was used as a coping mechanism for emotional distress, those higher in hopelessness may have shifted towards gaming for other reasons, such as seeking enjoyment, social interaction, or adventure. The current dissertation's studies did not measure gaming motives related to escape,

fantasy, or recreation, presenting a potential avenue for future research to explore the longitudinal relationship between hopelessness and gaming motives more comprehensively.

Though the personality trait of hopelessness was not found to be related to coping-motivated gaming long-term, Study 1 found that the latent variable of emotional vulnerability, measured through symptoms of depression and anxiety together, predicted excessive gaming through coping motives. Depression and Anxiety have been shown in several studies to be highly comorbid with one another (Gorman, 1996; Hirschfeld, 2001; Pollack, 2005; Sartorius et al., 1996). Some researchers have suggested that anxiety and depression should be conceptualized as one transdiagnostic factor rather than separate entities (Brown & Barlow, 2009; Craske, 2012). This was done in Study 1 to create the latent variable of emotional vulnerability. The relationship between coping motives, depression and anxiety, and excessive gaming has been established in several studies. Multiple studies have found that coping motives explain a significant amount of the association seen between Gaming Disorder, and symptoms of depression and anxiety (Balhara et al., 2018; Barr & Copeland-Stewart, 2022; Loton et al., 2016). These results are in line with our studies, demonstrating that those who are more emotionally vulnerable may be more likely to attempt to cope with their emotional distress using gaming. Future studies may wish to further explore the relationship between state and trait factors in coping motives for gaming and how these differ from one another.

Theories and models

The findings of these studies may be explained by the self-medication hypothesis and the tension reduction hypothesis, in that coping motives were found to mediate the relationship between emotional vulnerability and excessive gaming, and anxiety sensitivity and excessive gaming, respectively. The self-medication hypothesis states that individuals who are more

emotionally vulnerable and at risk for gaming excessively do so to cope with their emotional distress (Balhara et al., 2018; González-Bueso et al., 2018; King & Delfabbro, 2016; Liu et al., 2018; Vadlin et al., 2016; Wartberg et al., 2017). In the case of Study 1, coping motives were found to mediate the relationship between emotional vulnerability and excessive gaming, giving weight to the self-medication hypothesis.

Previous studies have found that within the COVID-19 pandemic, those who experience heightened stress, depression, or anxiety due to social isolation or loneliness, also tend to experience excessive gaming behaviours (Rozgonjuk et al., 2022; Sallie et al., 2021; Xu et al., 2021). This is in line with both studies in this dissertation, where those who experienced higher emotional vulnerability or anxiety sensitivity also tended to experience excessive gaming. This was expanded upon in this dissertation by looking at how coping motivations influence this relationship.

The tension reduction hypothesis posits that individuals will use gaming as a means of reducing their physiological arousal, eventually leading to a dependency towards gaming and excessive gaming behaviours (Kalodner et al., 1989; Kushner et al., 2000; Kushner & Sher, 1993). In the case of Study 2, anxiety sensitivity is understood as a fear of the physiological sensations associated with anxiety; given that coping motives were found to mediate the relationship between anxiety sensitivity and time spent gaming, it stands to reason that those individuals higher in anxiety sensitivity may have been gaming to reduce their physiological arousal, thus giving weight to the tension reduction hypothesis.

The tension reduction hypothesis provides a rationale for the inclusion of coping motivations into our model and adds strength to the finding that only anxiety sensitivity played a role in coping motivations for gaming, but not hopelessness. Previous studies have demonstrated

that during the COVID-19 pandemic, those who experience heightened anxiety are more likely to engage in excessive gaming behaviours (Rozgonjuk et al., 2022; Sallie et al., 2021; Xu et al., 2021). The current studies provide support for the tension reduction hypothesis, finding that the use of coping motivations for gaming existed for both those who experience heightened emotional vulnerability, as well as those with higher levels of trait anxiety sensitivity.

One final explanation that may help to better understand the results of these two studies is the biopsychosocial model. The biopsychosocial model has been applied to addiction, including substance abuse, gambling, and video games. The model posits that addiction can be explained through a combination of three factors: the person's biology, psychology, and social environment (Engel, 1981; Skewes & Gonzalez, 2013). The pandemic did have some influence on biological factors, such as medical risk for COVID-19, or medical comorbidities. Moreover, previous research has shown that changes at the psychological, or social levels may influence an individual's biological processes (Kop, 2021; Nürnberger et al., 2022). It is also well-documented that the pandemic had significant psychological and social consequences. The psychological aspects of the model encompass mental health, coping skills, and stress levels. As mentioned earlier, the pandemic worsened existing psychological vulnerabilities leading to increased symptoms of anxiety and depression (Dozois, 2021; Turna et al., 2021; Warren et al., 2021). It also introduced additional stressors (Rettie & Daniels, 2021; Turna et al., 2021), and limited individuals' ability to use their typical coping skills (Gillen et al., 2022; Rettie & Daniels, 2021).

Considering the context of the COVID-19 pandemic, it is essential to acknowledge its negative impact on the social aspect of many peoples' lives (Lee et al., 2022). The social aspect of the biopsychosocial model includes interpersonal relationships, social support, as well as other

variables that were significantly disrupted during the pandemic, such as employment (Li et al., 2023), socioeconomic status (Delardas et al., 2022), and culture (Silberman, 2020). Supportive social relationships in particular have been shown to be a protective factor against the development of gaming disorder (Sugaya et al., 2019). With that social aspect being hindered significantly during the pandemic, it therefore stands to reason that those who were already at a higher psychological risk for the development of Gaming Disorder due to their trait anxiety sensitivity or state emotional vulnerability might therefore search for ways to cope with this change. However, without measuring these variables explicitly, this is purely speculative.

The biopsychosocial model incorporates biological, social, and psychological factors and suggests that an individual's response to a stressor is influenced by an accumulation of these contexts. While this model does provide a possible explanation to this dissertation's results, it is notable that only psychological factors were measured in this dissertation. However, this model is important to consider in the sense that there may have been biological or social factors that were at play that could account for some of the relationship seen between emotional vulnerability and coping-motivated gaming behaviours, or excessive gaming. Future studies may wish to look at specific biopsychosocial variables to determine which aspects might mitigate or exacerbate the relationship between excessive gaming and emotional vulnerabilities, such as social support, connection with others, or negative self-talk.

Implications

The results of these studies may help in understanding how emotional vulnerability, or traits of anxiety sensitivity or hopelessness might influence gaming behaviour during the COVID-19 pandemic through coping motives. The two studies included in this dissertation highlight the importance of considering how those with higher levels of state emotional

vulnerability or trait anxiety sensitivity might be gaming excessively to cope with the changes brought on by the pandemic, or their personal emotional distress. Clinicians should consider gaming habits or coping mechanisms in their assessments or treatment of individuals with high anxiety sensitivity or emotional vulnerability. Furthermore, mental health professionals should be aware of the use of video games as a potential coping mechanism among those who are emotionally vulnerable and be cognizant of the symptoms of Gaming Disorder so that they might tailor their assessments and interventions accordingly. Finally, considering the likelihood of future pandemics, this research provides valuable insights that could be beneficial in forthcoming outbreaks, particularly regarding coping-motivated gaming among individuals who are emotionally vulnerable.

Limitations

The two studies have some limitations that should be considered. First, each study was conducted in a single country and at different time points, with Study 1 being conducted with Canadians at the beginning of the pandemic, and Study 2 being conducted in the United States one year later. This provides some challenge in comparing the results across the two studies and has some implications for how generalizable these results may be. These results may not be generalizable to other countries. This is particularly true when considering the societal norms and cultural differences between countries, specifically with respect to attitudes towards gaming and mental health in each respective country. The specific regions or countries that the participants belonged to could have some influence over the results. Secondly, both studies focused on state and trait anxiety and depression but did not explore other potential variables that might have influenced excessive gaming or coping motivations, such as social support/isolation, stress, or the presence of other mental health conditions. These may be key factors that may have played

an unknown role in the observed relationships; as such, this should be taken into consideration when interpreting the results. Finally, both studies relied on retrospective self-report, asking participants to recount their gaming activities over the prior week. These self-report measures may have been subject to memory recall or social desirability biases and so these results should be interpreted with that in mind. Participants might not accurately remember their gaming behaviours, which could lead to inaccuracies in the data. Moreover, social desirability biases might influence responses, as participants may have provided answers that they perceived as being more socially acceptable, rather than true reflections of their experiences. Finally, an inherent limitation of this research lies in its non-replicability. The unique context that the pandemic provided offered a novel setting for these studies. While replicating these investigations with more diverse samples would be desirable, it is worth noting that the current state of the pandemic makes this a challenging prospect. In subsequent research, a more inclusive approach could involve incorporating diverse samples from various countries, integrating a broader range of potentially relevant variables in this relationship, and utilizing objective measures along with self-reports which would allow for a more comprehensive understanding of these studies' results. However, it is important to acknowledge that this might not be feasible at present, given that the pandemic's influence has largely subsided.

Future Research

There are several avenues for future research based on the results of these studies. First, it will be important to continue to study the relationship between emotional vulnerability and coping-motivated gaming in the post-pandemic era. It may also be worthwhile for future studies to expand on the documented relationship between anxiety, gaming habits, and coping mechanisms, to understand what drew the participants to gaming as a coping mechanism, and

how this relates to their state or trait anxiety. Future studies may also wish to further explore the relationship between hopelessness and gaming habits, particularly in relation to coping mechanisms. It would be interesting to explore other motives for gaming, such as fantasy, escape, and recreation, and how they relate to excessive gaming in those with higher levels of trait hopelessness. Additionally, examining various types of games, such as single-player, multiplayer, or massively multiplayer online/role playing games, and how they relate to coping motives and excessive gaming among individuals with emotional vulnerabilities, would provide valuable insights. Finally, considering that gaming can be used as a positive and adaptive coping mechanism for some individuals who engage in moderate levels of gaming, future studies may explore the positive aspects of gaming such as increased social connectivity and a heightened sense of well being, particularly in the post-pandemic era, and its relation to coping motives for gaming.

Conclusion

This dissertation focused on two longitudinal studies examining the relationship between emotional vulnerability and coping motivations for gaming during the COVID-19 pandemic. The findings from both studies suggest that there is a positive relationship between emotional vulnerability and excessive gaming during the pandemic, and that coping motivations for gaming are a key factor to understanding this relationship. Study 1 showed that individuals who are higher in emotional vulnerability tended to use gaming as a coping mechanism, while Study 2 showed that those with higher levels of anxiety sensitivity predicted excessive time spent gaming through coping motivations for gaming. Although a similar relationship existed for those participants who were higher in trait hopelessness initially, this relationship was not found longitudinally. These two studies together strengthen the previously established relationship

between emotional vulnerability and excessive gaming, providing insight into how this relationship continued at the beginning, and throughout the COVID-19 pandemic, and how coping motives played a central role in this relationship.

References

Agrawal, S., Sobell, M. B., & Sobell, L. C. (2008). The Timeline Followback: A scientifically and clinically useful tool for assessing substance use. In *Calendar and time diary methods in life course research* (Vol. 57, pp. 68).

Akova, İ., Kiliç, E., & Özdemir, M. E. (2022). Prevalence of Burnout, Depression, Anxiety, Stress, and Hopelessness Among Healthcare Workers in COVID-19 Pandemic in Turkey. *INQUIRY: The Journal of Health Care Organization, Provision, and Financing*, *59*, 00469580221079684.

Alexander, M., Unruh, L., Koval, A., & Belanger, W. (2022). United States response to the COVID-19 pandemic, January-November 2020. *Health Econ Policy Law*, *17*(1), 62-75. https://doi.org/10.1017/S1744133121000116

Alyami, H. S., Naser, A. Y., Dahmash, E. Z., Alyami, M. H., & Alyami, M. S. (2021). Depression and anxiety during the COVID-19 pandemic in Saudi Arabia: A cross-sectional study. *International Journal of Clinical Practice*, *75*(7), e14244. https://doi.org/10.1111/ijcp.14244

Ambrus, L., Sunnqvist, C., Asp, M., Westling, S., & Westrin, A. (2020). Coping and suicide risk in high risk psychiatric patients. *J Ment Health*, *29*(1), 27-32. https://doi.org/10.1080/09638237.2017.1417547

American Psychiatric Association. (2013). *Diagnostic and Statistical Manual of Mental Disorders* [doi:10.1176/appi.books.9780890425596]. American Psychiatric Publishing, Inc. https://doi.org/10.1176/appi.books.9780890425596

Amin, K. P., Griffiths, M. D., & Dsouza, D. D. (2022). Online Gaming During the COVID-19 Pandemic in India: Strategies for Work-Life Balance. *International Journal of Mental Health and Addiction*, *20*(1), 296-302. https://doi.org/10.1007/s11469-020-00358-1

APA. (2022). *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, Text Revision (DSM-5-TR®)*. American Psychiatric Association.

Balhara, Y. P. S., Garg, H., Kumar, S., & Bhargava, R. (2018). Gaming disorder as a consequence of attempt at self- medication: Empirical support to the hypothesis. *Asian Journal of Psychiatry*, *31*, 98-99. https://doi.org/10.1016/j.ajp.2018.02.013

Balhara, Y. P. S., Kattula, D., Singh, S., Chukkali, S., & Bhargava, R. (2020). Impact of lockdown following COVID-19 on the gaming behavior of college students. *Indian J Public Health*, *64*(Supplement), S172-S176. https://doi.org/10.4103/ijph.IJPH_465_20

Ballabio, M., Griffiths, M. D., Urbán, R., Quartiroli, A., Demetrovics, Z., & Király, O. (2017). Do gaming motives mediate between psychiatric symptoms and problematic gaming? An empirical survey study. *Addiction Research & Theory*, *25*(5), 397-408. https://doi.org/https://doi.org/10.1080/16066359.2017.1305360

Baptist Mohseni, N., Morris, V., Vedelago, L., Kempe, T., Rapinda, K., Mesmer, E., Bilevicius, E., Wardell, J. D., MacKillop, J., & Keough, M. T. (2022). A longitudinal approach to understanding risk factors for problem alcohol use during the COVID-19 pandemic. *Alcohol: Clinical and Experimental Research*, *46*(3), 434-446. https://doi.org/10.1111/acer.14774

Barnett, E., Sussman, S., Smith, C., Rohrbach, L. A., & Spruijt-Metz, D. (2012). Motivational Interviewing for adolescent substance use: a review of the literature. *Addictive behaviors*, *37*(12), 1325-1334. https://doi.org/10.1016/j.addbeh.2012.07.001

Barr, M., & Copeland-Stewart, A. (2022). Playing video games during the COVID-19 pandemic and effects on players' well-being. *Games and Culture*, *17*(1), 122-139.

Berman, N. C., Wheaton, M. G., McGrath, P., & Abramowitz, J. S. (2010). Predicting anxiety: The role of experiential avoidance and anxiety sensitivity. *Journal of Anxiety Disorders*, *24*(1), 109-113.

Bigalke, J. A., Greenlund, I. M., & Carter, J. R. (2020). Sex differences in self-report anxiety and sleep quality during COVID-19 stay-at-home orders. *Biology of sex Differences*, *11*(1), 1-11.

Biolcati, R., Passini, S., & Pupi, V. (2021). The role of video gaming motives in the relationship between personality risk traits and Internet Gaming Disorder. *Journal of Gambling Issues*, *46*.

Blalock, J. A., & Joiner, T. E. (2000). Interaction of cognitive avoidance coping and stress in predicting depression/anxiety. *Cognitive Therapy and Research*, *24*, 47-65.

Blasi, M. D., Giardina, A., Giordano, C., Coco, G. L., Tosto, C., Billieux, J., & Schimmenti, A. (2019). Problematic video game use as an emotional coping strategy: Evidence from a sample of MMORPG gamers. *Journal of Behavioral Addictions*, *8*(1), 25-34.

Broman-Fulks, J. J., Urbaniak, A., Bondy, C. L., & Toomey, K. J. (2014). Anxiety sensitivity and risk-taking behavior. *Anxiety Stress Coping*, *27*(6), 619-632. https://doi.org/10.1080/10615806.2014.896906

Brown, T. A., & Barlow, D. H. (2009). A proposal for a dimensional classification system based on the shared features of the DSM-IV anxiety and mood disorders: implications for assessment and treatment. *Psychological Assessment*, *21*(3), 256-271. https://doi.org/10.1037/a0016608

Buhrmester, M., Kwang, T., & Gosling, S. D. (2011). Amazon's Mechanical Turk: A New Source of Inexpensive, Yet High-Quality, Data? *Perspect Psychol Sci*, *6*(1), 3-5. https://doi.org/10.1177/1745691610393980

Calvano, C., Engelke, L., Di Bella, J., Kindermann, J., Renneberg, B., & Winter, S. M. (2022). Families in the COVID-19 pandemic: parental stress, parent mental health and the occurrence of adverse childhood experiences—results of a representative survey in Germany. *European child & adolescent psychiatry*, *31*(7), 1-13. https://doi.org/https://doi.org/10.1007/s00787-021-01739-0

Cameron-Blake, E., Breton, C., Sim, P., Tatlow, H., Hale, T., Wood, A., Smith, J., Sawatsky, J., Parsons, Z., & Tyson, K. (2021). Variation in the Canadian provincial and territorial responses to COVID-19. *Blavatnik School of Government Working Paper Series*(039). https://doi.org/https://doi.org/10.1038/s41562-021-01078-8

Cardwell, E., Hoff, R. A., Garakani, A., Krishnan-Sarin, S., Potenza, M. N., & Zhai, Z. W. (2022). An exploratory study of anxiety-motivated gambling in adolescents: Associations with minority status and gambling, health and functioning measures. *J Psychiatr Res*, *151*, 445-453. https://doi.org/10.1016/j.jpsychires.2022.03.052

Caro, C., & Popovac, M. (2021). Gaming when things get tough? Examining how emotion regulation and coping self-efficacy influence gaming during difficult life situations. *Games and Culture*, *16*(5), 611-631. https://doi.org/https://doi.org/10.1177/1555412020944622

Carver, C. S. (1997). You want to measure coping but your protocol'too long: Consider the brief cope. *International journal of behavioral medicine*, *4*(1), 92-100.

Centers for Disease Control and Prevention. (2020). *National center for Health Statistics-Anxiety and Depression* https://www.cdc.gov/nchs/covid19/pulse/mental-health.htm

Chantal, Y., & Vallerand, R. J. (1996). Skill versus luck: A motivational analysis of gambling involvement. *Journal of Gambling Studies*, *12*(4), 407-418. https://doi.org/10.1007/BF01539185

Chen, C., Dai, S., Shi, L., Shen, Y., & Ou, J. (2021). Associations Between Attention Deficit/Hyperactivity Disorder and Internet Gaming Disorder Symptoms Mediated by Depressive Symptoms and Hopelessness Among College Students. *Neuropsychiatric Disease and Treatment*, *17*, 2775.

Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural equation modeling*, *9*(2), 233-255. https://doi.org/https://doi.org/10.1207/S15328007SEM0902_5

Choi, E. P. H., Hui, B. P. H., & Wan, E. Y. F. (2020). Depression and Anxiety in Hong Kong during COVID-19. *Int J Environ Res Public Health*, *17*(10), 3740. https://doi.org/10.3390/ijerph17103740

Chrikov, I., Soria, K. M., Horgos, B., & Jones-White, D. (2020). Undergraduate and graduate students' mental health during the COVID-19 pandemic.

Cooper, M. L., Frone, M. R., Russell, M., & Mudar, P. (1995). Drinking to regulate positive and negative emotions: a motivational model of alcohol use. *Journal of Personality and Social Psychology*, *69*(5), 990-1005. https://doi.org/10.1037//0022-3514.69.5.990

Cooper, M. L., Kuntsche, E., Levitt, A., Barber, L. L., & Wolf, S. (2016). Motivational models of substance use: A review of theory and research on motives for using alcohol, marijuana, and tobacco. In K. J. Sher (Ed.), *The Oxford Handbook of Substance Use and Substance Use Disorders* (pp. 375-421). Oxford University Press.

Cox, T., & Ferguson, E. (1991). Individual differences, stress and coping.

Cox, W. M., & Klinger, E. (1988). A motivational model of alcohol use. *Journal of abnormal psychology*, *97*(2), 168-180. https://doi.org/10.1037//0021-843x.97.2.168

Cox, W. M., & Klinger, E. (2011). A motivational model of alcohol use: Determinants of use and change. *Handbook of motivational counseling: Goal-based approaches to assessment and intervention with addiction and other problems*, 131-158.

Craske, M. G. (2012). Transdiagnostic treatment for anxiety and depression. *Depression and anxiety*, *29*(9), 749-753. https://doi.org/10.1002/da.21992

Cudo, A., Wojtasiński, M., Tużnik, P., Fudali-Czyż, A., & Griffiths, M. D. (2022). The Relationship between depressive symptoms, loneliness, self-control, and gaming disorder among Polish male and female gamers: The indirect effects of gaming motives. *International journal of environmental research and public health*, *19*(16), 10438.

Delardas, O., Kechagias, K. S., Pontikos, P. N., & Giannos, P. (2022). Socio-Economic impacts and challenges of the coronavirus pandemic (COVID-19): an updated review. *Sustainability*, *14*(15), 9699.

DeLongis, A., & Holtzman, S. (2005). Coping in context: The role of stress, social support, and personality in coping. *Journal of personality*, *73*(6), 1633-1656.

Desai, V., Gupta, A., Andersen, L., Ronnestrand, B., & Wong, M. (2021). Stress-reducing effects of playing a casual video game among undergraduate students. *Trends in Psychology*, *29*, 563-579.

Detsky, A. S., & Bogoch, II. (2020). COVID-19 in Canada: Experience and Response. *Jama*, *324*(8), 743-744. https://doi.org/10.1001/jama.2020.14033

Doi, S., Ito, M., Takebayashi, Y., Muramatsu, K., & Horikoshi, M. (2018). Factorial validity and invariance of the Patient Health Questionnaire (PHQ)-9 among clinical and non-clinical populations. *PloS one*, *13*(7), e0199235. https://doi.org/https://doi.org/101371/journal/pone.0199235

Dozois, D. J. (2021). Anxiety and depression in Canada during the COVID-19 pandemic: A national survey. *Canadian Psychology/Psychologie canadienne*, *62*(1), 136. https://doi.org/https://doi.org/10.1037.cap0000251

Enders, C. K. (2010). *Applied missing data analysis*. Guilford Press.

Engel, G. L. (1981). The clinical application of the biopsychosocial model. The Journal of Medicine and Philosophy: A Forum for Bioethics and Philosophy of Medicine,

Entertainment Software Association. (2018). Essential facts about the computer and video game industry. In. https://www.theesa.com/resource/2018-essential-facts-about-the-computer-and-video-game-industry/.

Entertainment Software Association. (2019). *2019 Essential facts about the computer and video game industry*.

Entertainment Software Association. (2020). *2020 Essential facts about the video game industry*.

Entertainment Software Association. (2021). *Essential facts about the video game industry.* https://www.theesa.com/resource/2021-essential-facts-about-the-video-game-industry/#:~:text=Across%20all%20ages%2C%2080%25%20of,with%20different%20abilities%20(89%25).

Entertainment Software Association. (2022). *2022 Essential facts about the video game industry*.

Entertainment Software Association of Canada. (2018). *Essential Facts about the Candian Game Industry 2018*. Retrieved December 10, 2020 from https://theesa.ca/wp-content/uploads/2018/10/ESAC18_BookletEN.pdf

Entertainment Software Association of Canada. (2020). *Real Canadian Gamer Essential Facts 2020*. Retrieved December 10, 2020 from https://theesa.ca/wp-content/uploads/2020/11/RCGEF_en.pdf

Ettman, C. K., Abdalla, S. M., Cohen, G. H., Sampson, L., Vivier, P. M., & Galea, S. (2020). Prevalence of depression symptoms in US adults before and during the COVID-19 pandemic. *JAMA network open*, *3*(9), e2019686-e2019686.

Ettman, C. K., Fan, A. Y., Subramanian, M., Adam, G. P., Goicoechea, E. B., Abdalla, S. M., Stuart, E. A., & Galea, S. (2023). Prevalence of depressive symptoms in US adults during the COVID-19 pandemic: A systematic review. *SSM-Population Health*, 101348.

Fazeli, S., Zeidi, I. M., Lin, C.-Y., Namdar, P., Griffiths, M. D., Ahorsu, D. K., & Pakpour, A. H. (2020). Depression, anxiety, and stress mediate the associations between internet gaming disorder, insomnia, and quality of life during the COVID-19 outbreak. *Addictive Behaviors Reports*, *12*, 100307. https://doi.org/https://doi.org/10.1016/j.abrep.2020.100307

Fountoulakis, K. N., Apostolidou, M. K., Atsiova, M. B., Filippidou, A. K., Florou, A. K., Gousiou, D. S., Katsara, A. R., Mantzari, S. N., Padouva-Markoulaki, M., & Papatriantafyllou, E. I. (2021). Self-reported changes in anxiety, depression and suicidality during the COVID-19 lockdown in Greece. *Journal of Affective Disorders*, *279*, 624-629. https://doi.org/https://doi.org/10.1016/j.jad2020.10.061

Fritz, M. S., & Mackinnon, D. P. (2007). Required sample size to detect the mediated effect. *Psychological science*, *18*(3), 233-239. https://doi.org/10.1111/j.1467-9280.2007.01882.x

Fu, W., Wang, C., Zou, L., Guo, Y., Lu, Z., Yan, S., & Mao, J. (2020). Psychological health, sleep quality, and coping styles to stress facing the COVID-19 in Wuhan, China. *Translational psychiatry*, *10*(1), 225. https://doi.org/10.1038/s41398-020-00913-3

Gao, Y.-X., Wang, J.-Y., & Dong, G.-H. (2022). The prevalence and possible risk factors of internet gaming disorder among adolescents and young adults: Systematic reviews and meta-analyses. *Journal of Psychiatric Research*.

Gentile, D. A., Anderson, C. A., Yukawa, S., Ihori, N., Saleem, M., Ming, L. K., Shibuya, A., Liau, A. K., Khoo, A., & Bushman, B. J. (2009). The effects of prosocial video games on prosocial behaviors: International evidence from correlational, longitudinal, and experimental studies. *Personality and Social Psychology Bulletin*, *35*(6), 752-763.

Giardina, A., Di Blasi, M., Schimmenti, A., King, D. L., Starcevic, V., & Billieux, J. (2021). Online Gaming and Prolonged Self-Isolation: Evidence from Italian Gamers During the Covid-19 Outbreak. *Clinical Neuropsychiatry*, *18*(1), 65-74. https://doi.org/10.36131/cnfioritieditore20210106

Gillen, P., Neill, R. D., Manthorpe, J., Mallett, J., Schroder, H., Nicholl, P., Currie, D., Moriarty, J., Ravalier, J., McGrory, S., & McFadden, P. (2022). Decreasing Wellbeing and Increasing Use of Negative Coping Strategies: The Effect of the COVID-19 Pandemic on the UK Health and Social Care Workforce. *Epidemiologia (Basel)*, *3*(1), 26-39. https://doi.org/10.3390/epidemiologia3010003

González-Bueso, V., Santamaría, J. J., Fernández, D., Merino, L., Montero, E., & Ribas, J. (2018). Association between internet gaming disorder or pathological video-game use and comorbid psychopathology: a comprehensive review. *International journal of environmental research and public health*, *15*(4), 668. https://doi.org/https://doi.org/10.3390/ijerph15040668

Gopali, L., Dhital, R., Koirala, R., Shrestha, T., Bhusal, S., Rimal, R., Shrestha, C., & Shah, R. (2023). Effect of COVID-19 pandemic on internet gaming disorder among general population: A systematic review and meta-analysis. *PLOS Global Public Health*, *3*(4), e0001783.

Gorman, J. M. (1996). Comorbid depression and anxiety spectrum disorders. *Depression and anxiety*, *4*(4), 160-168. https://doi.org/10.1002/(SICI)1520-6394(1996)4:4<160::AID-DA2>3.0.CO;2-J

Granic, I., Lobel, A., & Engels, R. C. (2014). The benefits of playing video games. *American Psychologist*, *69*(1), 66.

Grant, D. M., Wingate, L. R., Rasmussen, K. A., Davidson, C. L., Slish, M. L., Rhoades-Kerswill, S., Mills, A. C., & Judah, M. R. (2013). An examination of the reciprocal relationship between avoidance coping and symptoms of anxiety and depression. *Journal of Social and Clinical Psychology*, *32*(8), 878-896.

Griffiths, M. D. (2017). Behavioural addiction and substance addiction should be defined by their similarities not their dissimilarities. *Addiction*, *112*(10), 1718-1720.

Hallauer, C. J., Rooney, E. A., Yang, H., Meng, Q., Montag, C., & Elhai, J. D. (2021). Anxiety sensitivity mediates relations between anxiety (but not depression) and problematic smartphone use severity, adjusting for age and sex, in Chinese adolescents early in the COVID-19 pandemic. *Human Behavior and Emerging Technologies*, *3*(5), 788-797.

Haller, H., Cramer, H., Lauche, R., Gass, F., & Dobos, G. J. (2014). The prevalence and burden of subthreshold generalized anxiety disorder: a systematic review. *BMC psychiatry*, *14*(1), 128. https://doi.org/10.1186/1471-244X-14-128

Hasking, P., Lyvers, M., & Carlopio, C. (2011). The relationship between coping strategies, alcohol expectancies, drinking motives and drinking behaviour. *Addictive behaviors*, *36*(5), 479-487.

Hellstrom, C., Nilsson, K. W., Leppert, J., & Aslund, C. (2015). Effects of adolescent online gaming time and motives on depressive, musculoskeletal, and psychosomatic symptoms. *Upsala journal of medical sciences*, *120*(4), 263-275. https://doi.org/10.3109/03009734.2015.1049724

Hirschfeld, R. M. (2001). The Comorbidity of Major Depression and Anxiety Disorders: Recognition and Management in Primary Care. *Primary Care Companion Journal of Clinical Psychiatry*, *3*(6), 244-254. https://doi.org/10.4088/pcc.v03n0609

Hu, L. t., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural equation modeling: a multidisciplinary journal*, *6*(1), 1-55. https://doi.org/https://doi.org/10.1080/10705519909540118

Hyland, P., Shevlin, M., McBride, O., Murphy, J., Karatzias, T., Bentall, R. P., Martinez, A., & Vallieres, F. (2020). Anxiety and depression in the Republic of Ireland during the COVID-19 pandemic. *Acta Psychiatrica Scandinavica*, *142*(3), 249-256. https://doi.org/10.1111/acps.13219

Jain, A., & Jolly, T. S. (2021). Omicron (B.1.1.529) COVID-19 Variant: A Mental Health Perspective on Lessons Learned and Future Challenges. *Primary Care Companion CNS Disord*, *23*(6), 38797. https://doi.org/10.4088/PCC.21com03206

Jo, Y. S., Bhang, S. Y., Choi, J. S., Lee, H. K., Lee, S. Y., & Kweon, Y. S. (2019). Clinical Characteristics of Diagnosis for Internet Gaming Disorder: Comparison of DSM-5 IGD and ICD-11 GD Diagnosis. *Journal of clinical medicine*, *8*(7), 945. https://doi.org/10.3390/jcm8070945

Kahraman, B., & Yertutanol, F. D. K. (2021). Anxiety Sensitivity in Online Gamers. *Bağımlılık Dergisi*, *22*(3), 305-313.

Kalodner, C. R., Delucia, J. L., & Ursprung, A. W. (1989). An examination of the tension reduction hypothesis: The relationship between anxiety and alcohol in college students. *Addictive behaviors*, *14*(6), 649-654.

Kardefelt-Winther, D., Heeren, A., Schimmenti, A., Van Rooij, A., Maurage, P., Carras, M., Edman, J., Blaszczynski, A., Khazaal, Y., & Billieux, J. (2017). How can we conceptualize behavioural addiction without pathologizing common behaviours? *Addiction*, *112*(10), 1709-1715.

Kastalskiy, I. A., Pankratova, E. V., Mirkes, E. M., Kazantsev, V. B., & Gorban, A. N. (2021). Social stress drives the multi-wave dynamics of COVID-19 outbreaks. *Sci Rep*, *11*(1), 22497. https://doi.org/10.1038/s41598-021-01317-z

Kessler, R. C., Berglund, P., Chiu, W. T., Demler, O., Heeringa, S., Hiripi, E., Jin, R., Pennell, B. E., Walters, E. E., Zaslavsky, A., & Zheng, H. (2004). The US National Comorbidity Survey Replication (NCS-R): design and field procedures. *Int J Methods Psychiatr Res*, *13*(2), 69-92. https://doi.org/10.1002/mpr.167

Khantzian, E. J. (1987). *The self-medication hypothesis of addictive disorders: focus on heroin and cocaine dependence*. Springer.

Khantzian, E. J. (1997). The self-medication hypothesis of substance use disorders: a reconsideration and recent applications. *Harv Rev Psychiatry*, *4*(5), 231-244. https://doi.org/10.3109/10673229709030550

Khrad, H., Marhoomi, A., Alkhiri, A., Al-Shamrani, A., Bajabir, D., & Mosli, M. (2022). Prevalence of Internet Gaming Disorder among Saudi Arabian university students: relationship with psychological distress. *Heliyon*, *8*(12).

Kim, H. S., Son, G., Roh, E.-B., Ahn, W.-Y., Kim, J., Shin, S.-H., Chey, J., & Choi, K.-H. (2022). Prevalence of gaming disorder: A meta-analysis. *Addictive behaviors*, *126*, 107183.

Kim, N. R., Hwang, S. S., Choi, J. S., Kim, D. J., Demetrovics, Z., Kiraly, O., Nagygyorgy, K., Griffiths, M. D., Hyun, S. Y., Youn, H. C., & Choi, S. W. (2016). Characteristics and Psychiatric Symptoms of Internet Gaming Disorder among Adults Using Self-Reported DSM-5 Criteria. *Psychiatry Investigation*, *13*(1), 58-66. https://doi.org/10.4306/pi.2016.13.1.58

King, D. L., & Delfabbro, P. H. (2016). The Cognitive Psychopathology of Internet Gaming Disorder in Adolescence. *Journal of Abnormal Child Psychology*, *44*(8), 1635-1645. https://doi.org/10.1007/s10802-016-0135-y

King, D. L., Delfabbro, P. H., Billieux, J., & Potenza, M. N. (2020). Problematic online gaming and the COVID-19 pandemic. *Journal of Behavioral Addiction*, *9*(2), 184-186. https://doi.org/10.1556/2006.2020.00016

King, D. L., Delfabbro, P. H., Perales, J. C., Deleuze, J., Kiraly, O., Krossbakken, E., & Billieux, J. (2019). Maladaptive player-game relationships in problematic gaming and gaming disorder: A systematic review. *Clinical psychology review*, *73*, 101777. https://doi.org/10.1016/j.cpr.2019.101777

King, D. L., Haagsma, M. C., Delfabbro, P. H., Gradisar, M., & Griffiths, M. D. (2013). Toward a consensus definition of pathological video-gaming: A systematic review of psychometric assessment tools. *Clinical psychology review*, *33*(3), 331-342.

Király, O., Urbán, R., Griffiths, M. D., Ágoston, C., Nagygyörgy, K., Kökönyei, G., & Demetrovics, Z. (2015). The mediating effect of gaming motivation between psychiatric symptoms and problematic online gaming: An online survey. *Journal of medical Internet research*, *17*(4), e3515. https://doi.org/https://doi.org/10.2196/jmir.3515

Kline, R. B. (2013). *Beyond significance testing: Statistics reform in the behavioral sciences*. American Psychological Association.

Knoll, A. D., & MacLennan, R. N. (2017). Prevalence and correlates of depression in Canada: Findings from the Canadian Community Health Survey. *Canadian Psychology/Psychologie canadienne*, *58*(2), 116.

Kop, W. J. (2021). Biopsychosocial processes of health and disease during the COVID-19 pandemic. *Psychosomatic Medicine*, *83*(4), 304-308.

Kotwal, A. A., Batio, S., Wolf, M. S., Covinsky, K. E., Yoshino Benavente, J., Perissinotto, C. M., & O'Conor, R. M. (2022). Persistent loneliness due to COVID-19 over 18 months of the pandemic: a prospective cohort study. *Journal of the American Geriatrics Society*.

Kowal, M., Conroy, E., Ramsbottom, N., Smithies, T., Toth, A., & Campbell, M. (2021). Gaming Your Mental Health: A Narrative Review on Mitigating Symptoms of Depression and Anxiety Using Commercial Video Games. *JMIR serious games*, *9*(2), e26575. https://doi.org/10.2196/26575

Krause, K. H., Verlenden, J. V., Szucs, L. E., Swedo, E. A., Merlo, C. L., Niolon, P. H., Leroy, Z. C., Sims, V. M., Deng, X., & Lee, S. (2022). Disruptions to School and Home Life Among High School Students During the COVID-19 Pandemic—Adolescent Behaviors

and Experiences Survey, United States, January–June 2021. *MMWR supplements*, *71*(3), 28. https://doi.org/https://doi.org/10.15585/mmwr.su7103a5

Kroenke, K., & Spitzer, R. L. (2002). The PHQ-9: a new depression diagnostic and severity measure. *Psychiatric annals*, *32*(9), 509-515. https://doi.org/https://doi.org/10.3928/0048-5713-20020901-06

Kroenke, K., Spitzer, R. L., & Williams, J. B. (2001). The PHQ-9: validity of a brief depression severity measure. *Journal of General Intern Medicine*, *16*(9), 606-613. https://doi.org/10.1046/j.1525-1497.2001.016009606.x

Kuhn, S., Berna, F., Ludtke, T., Gallinat, J., & Moritz, S. (2018). Fighting Depression: Action Video Game Play May Reduce Rumination and Increase Subjective and Objective Cognition in Depressed Patients. *Frontiers in psychology*, *9*, 129. https://doi.org/10.3389/fpsyg.2018.00129

Kushner, M. G., Abrams, K., Thuras, P., & Hanson, K. L. (2000). Individual differences predictive of drinking to manage anxiety among non-problem drinkers with panic disorder. *Alcoholism: Clinical and Experimental Research*, *24*(4), 448-458.

Kushner, M. G., & Sher, K. J. (1993). Comorbidity of alcohol and anxiety disorders among college students: Effects of gender and family history of alcoholism. *Addictive behaviors*, *18*(5), 543-552.

Kuss, D. J. (2013). Internet gaming addiction: current perspectives. *Psychology research and behavior management*, 125-137.

Kuss, D. J., Dunn, T. J., Wölfling, K., Müller, K. W., Hędzelek, M., & Marcinkowski, J. (2017). Excessive Internet use and psychopathology: The role of coping. *Clinical Neuropsychiatry: Journal of Treatment Evaluation*, *14*(1), 73-81.

Kuss, D. J., Griffiths, M. D., & Pontes, H. M. (2017). Chaos and confusion in DSM-5 diagnosis of Internet Gaming Disorder: Issues, concerns, and recommendations for clarity in the field. *Journal of Behavioral Addiction*, *6*(2), 103-109. https://doi.org/10.1556/2006.5.2016.062

Kuss, D. J., Louws, J., & Wiers, R. W. (2012). Online gaming addiction? Motives predict addictive play behavior in massively multiplayer online role-playing games. *Cyberpsychology, Behavior, and Social Networking*, *15*(9), 480-485. https://doi.org/10.1089/cyber.2012.0034

Lange, B. P., & Schwab, F. (2018). Game on: Sex differences in the production and consumption of video games. In D. P. Johannes Breuer, Benny Liebold, Benjamin Lange (Ed.), *Evolutionary Psychology and Digital Games* (pp. 193-204). Routledge. https://doi.org/https://doi.org/10.4324/9781315160825

Langford, D. J., Morgan, S., Cooper, B., Paul, S., Kober, K., Wright, F., Hammer, M. J., Conley, Y. P., Levine, J. D., & Miaskowski, C. (2020). Association of personality profiles with coping and adjustment to cancer among patients undergoing chemotherapy. *Psycho-Oncology*, *29*(6), 1060-1067.

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. Springer publishing company.

Lee, C. M., Cadigan, J. M., & Rhew, I. C. (2020). Increases in loneliness among young adults during the COVID-19 pandemic and association with increases in mental health problems. *Journal of Adolescent Health*, *67*(5), 714-717.

Lee, J. H., Luchetti, M., Aschwanden, D., Sesker, A. A., Strickhouser, J. E., Terracciano, A., & Sutin, A. R. (2022). Perceived changes in social contact during COVID-19 pandemic in the United States. *Pers Relatsh*, *29*(1), 59-76. https://doi.org/10.1111/pere.12413

Lemmens, J. S., Valkenburg, P. M., & Gentile, D. A. (2015). The Internet Gaming Disorder Scale. *Psychological Assessment*, *27*(2), 567-582. https://doi.org/10.1037/pas0000062

Lenhart, A., Kahne, J., Middaugh, E., Macgill, A. R., Evans, C., & Vitak, J. (2008). Teens, Video Games, and Civics: Teens' Gaming Experiences Are Diverse and Include Significant Social Interaction and Civic Engagement. *Pew internet & American life project*.

Lewinson, R. E., Wardell, J. D., Kronstein, N., Rapinda, K. K., Kempe, T., Katz, J., Kim, H. S., & Keough, M. T. (2022). *Gaming as a coping strategy during the COVID-19 pandemic*.

Li, L., Serido, J., Vosylis, R., Sorgente, A., Lep, Ž., Zhang, Y., Fonseca, G., Crespo, C., Relvas, A. P., & Zupančič, M. (2023). Employment Disruption and Wellbeing Among Young Adults: A Cross-National Study of Perceived Impact of the COVID-19 Lockdown. *Journal of happiness studies*, *24*(3), 991-1012.

Li, X., Li, S., Xiang, M., Fang, Y., Qian, K., Xu, J., Li, J., Zhang, Z., & Wang, B. (2020). The prevalence and risk factors of PTSD symptoms among medical assistance workers during the COVID-19 pandemic. *Journal of Psychosomatic Research*, *139*, 110270.

Litman, L., Robinson, J., & Abberbock, T. (2017). TurkPrime.com: A versatile crowdsourcing data acquisition platform for the behavioral sciences. *Behav Res Methods*, *49*(2), 433-442. https://doi.org/10.3758/s13428-016-0727-z

Litman, L., Robinson, J., & Rosenzweig, C. (2015). The relationship between motivation, monetary compensation, and data quality among US- and India-based workers on Mechanical Turk. *Behav Res Methods*, *47*(2), 519-528. https://doi.org/10.3758/s13428-014-0483-x

Liu, L., Yao, Y.-W., Li, C.-s. R., Zhang, J.-T., Xia, C.-C., Lan, J., Ma, S.-S., Zhou, N., & Fang, X.-Y. (2018). The comorbidity between internet gaming disorder and depression: Interrelationship and neural mechanisms. *Frontiers in psychiatry*, *9*, 154. https://doi.org/https://doi.org/10.3389/fpsyt.2018.00154

Liu, Q., He, H., Yang, J., Feng, X., Zhao, F., & Lyu, J. (2020). Changes in the global burden of depression from 1990 to 2017: Findings from the Global Burden of Disease study. *J Psychiatr Res*, *126*, 134-140. https://doi.org/10.1016/j.jpsychires.2019.08.002

López-Cabarcos, M. Á., Ribeiro-Soriano, D., & Piñeiro-Chousa, J. (2020). All that glitters is not gold. The rise of gaming in the COVID-19 pandemic. *Journal of Innovation & Knowledge*, *5*(4), 289-296. https://doi.org/10.1016/j.jik.2020.10.004

Loton, D., Borkoles, E., Lubman, D., & Polman, R. (2016). Video game addiction, engagement and symptoms of stress, depression and anxiety: The mediating role of coping. *International Journal of Mental Health and Addiction*, *14*, 565-578.

Lowe, B., Decker, O., Muller, S., Brahler, E., Schellberg, D., Herzog, W., & Herzberg, P. Y. (2008). Validation and standardization of the Generalized Anxiety Disorder Screener (GAD-7) in the general population. *Medical care*, *46*(3), 266-274. https://doi.org/10.1097/MLR.0b013e318160d093

Lucas, K., & Sherry, J. L. (2004). Sex differences in video game play: A communication-based explanation. *Communication research*, *31*(5), 499-523. https://doi.org/10.1177/0093650204267930

Mac Giollabhui, N., Hamilton, J. L., Nielsen, J., Connolly, S. L., Stange, J. P., Varga, S., Burdette, E., Olino, T. M., Abramson, L. Y., & Alloy, L. B. (2018). Negative cognitive style interacts with negative life events to predict first onset of a major depressive episode in adolescence via hopelessness. *J Abnorm Psychol*, *127*(1), 1-11. https://doi.org/10.1037/abn0000301

Manchia, M., Gathier, A. W., Yapici-Eser, H., Schmidt, M. V., de Quervain, D., van Amelsvoort, T., Bisson, J. I., Cryan, J. F., Howes, O. D., Pinto, L., van der Wee, N. J., Domschke, K., Branchi, I., & Vinkers, C. H. (2022). The impact of the prolonged COVID-19 pandemic on stress resilience and mental health: A critical review across waves. *Eur Neuropsychopharmacol*, *55*, 22-83. https://doi.org/10.1016/j.euroneuro.2021.10.864

Mannikko, N., Billieux, J., & Kaariainen, M. (2015). Problematic digital gaming behavior and its relation to the psychological, social and physical health of Finnish adolescents and young adults. *Journal of Behavioral Addiction*, *4*(4), 281-288. https://doi.org/10.1556/2006.4.2015.040

Mannikko, N., Ruotsalainen, H., Miettunen, J., Pontes, H. M., & Kaariainen, M. (2020). Problematic gaming behaviour and health-related outcomes: A systematic review and meta-analysis. *Journal of Health Psychology*, *25*(1), 67-81. https://doi.org/10.1177/1359105317740414

Manning, K., Eades, N. D., Kauffman, B. Y., Long, L. J., Richardson, A. L., Garey, L., Zvolensky, M. J., & Gallagher, M. W. (2021). Anxiety Sensitivity Moderates the Impact of COVID-19 Perceived Stress on Anxiety and Functional Impairment. *Cognit Ther Res*, *45*(4), 689-696. https://doi.org/10.1007/s10608-021-10207-7

Mantar, A., Yemez, B., & Alkin, T. (2011). Anxiety sensitivity and its importance in psychiatric disorders. *Turk Psikiyatri Derg*, *22*(3), 187-193. https://www.ncbi.nlm.nih.gov/pubmed/21870308

Marino, C., Canale, N., Vieno, A., Caselli, G., Scacchi, L., & Spada, M. M. (2020). Social anxiety and Internet gaming disorder: The role of motives and metacognitions. *Journal of Behavioral Addiction*, *9*(3), 617-628. https://doi.org/10.1556/2006.2020.00044

Marjanovic, Z., Struthers, C. W., Cribbie, R., & Greenglass, E. R. (2014). The Conscientious Responders Scale: A new tool for discriminating between conscientious and random responders. *SAGE Open*, *4*(3), 2158244014545964.

Marraudino, M., Bonaldo, B., Vitiello, B., Bergui, G. C., & Panzica, G. (2022). Sexual Differences in Internet Gaming Disorder (IGD): From Psychological Features to Neuroanatomical Networks. *Journal of clinical medicine*, *11*(4), 1018. https://doi.org/10.3390/jcm11041018

Marston, H. R., & Kowert, R. (2020). What role can videogames play in the COVID-19 pandemic? *Emerald Open Research*, *2*.

McCormack, C. (2021). *Differences in the economic impacts of COVID-19 across the provinces and territories*. Retrieved August 30 from www150.statcan.gc.ca/n1/pub/36-28-0001/2021006/article/00001-eng.htm

McMahon, G., Douglas, A., Casey, K., & Ahern, E. (2022). Disruption to well-being activities and depressive symptoms during the COVID-19 pandemic: The mediational role of social connectedness and rumination. *Journal of Affective Disorders*, *309*, 274-281. https://doi.org/10.1016/j.jad.2022.04.142

Mehroof, M., & Griffiths, M. D. (2010). Online gaming addiction: The role of sensation seeking, self-control, neuroticism, aggression, state anxiety, and trait anxiety. *Cyberpsychology, Behavior, and Social Networking*, *13*(3), 313-316.

Melodia, F., Canale, N., & Griffiths, M. D. (2020). The role of avoidance coping and escape motives in problematic online gaming: A systematic literature review. *International Journal of Mental Health and Addiction*, 1-27. https://doi.org/10.1007/s11469-020-00422-w

Menendez-Garcia, A., Jimenez-Arroyo, A., Rodrigo-Yanguas, M., Marin-Vila, M., Sanchez-Sanchez, F., Roman-Riechmann, E., & Blasco-Fontecilla, H. (2022). Internet, video game and mobile phone addiction in children and adolescents diagnosed with ADHD: A case-control study. *Adicciones*, *34*(3), 208-217. https://doi.org/10.20882/adicciones.1469 (Adiccion a Internet, videojuegos y telefonos moviles en ninos y adolescentes: Un estudio de casos y controles.)

Merino-Campos, C., & del Castillo Fernndez, H. (2016). The benefits of active video games for educational and physical activity approaches: A systematic review. *Journal of New Approaches in Educational Research (NAER Journal)*, *5*(2), 115-122.

Miller, W. R., Toscova, R. T., Miller, J. H., & Sanchez, V. (2000). A theory-based motivational approach for reducing alcohol/drug problems in college. *Health Education & Behavior*, *27*(6), 744-759. https://doi.org/10.1177/109019810002700609

Moge, C. E., & Romano, D. M. (2020). Contextualising video game engagement and addiction in mental health: the mediating roles of coping and social support. *Heliyon*, *6*(11).

Mohammadi, M. R., Pourdehghan, P., Mostafavi, S. A., Hooshyari, Z., Ahmadi, N., & Khaleghi, A. (2020). Generalized anxiety disorder: Prevalence, predictors, and comorbidity in children and adolescents. *J Anxiety Disord*, *73*, 102234. https://doi.org/10.1016/j.janxdis.2020.102234

Mohanty, J., Chokkanathan, S., & Alberton, A. M. (2022). COVID-19–related stressors, family functioning and mental health in Canada: Test of indirect effects. *Family Relations*, *71*(2), 445-462. https://doi.org/https://doi.org/10.1111/fare.12635

Moitra, E., Christopher, P. P., Anderson, B. J., & Stein, M. D. (2015). Coping-motivated marijuana use correlates with DSM-5 cannabis use disorder and psychological distress among emerging adults. *Psychology of Addictive Behaviors*, *29*(3), 627. https://doi.org/10.1037/adb0000083

Muthén, L. K., & Muthén, B. O. (2017). *Mplus User's Guide* (Vol. 8th). Muthén & Muthén.

Myrseth, H., Notelaers, G., Strand, L. A., Borud, E. K., & Olsen, O. K. (2017). Introduction of a new instrument to measure motivation for gaming: the electronic gaming motives questionnaire. *Addiction*, *112*(9), 1658-1668. https://doi.org/10.1111/add.13874

Na, E., Lee, H., Choi, I., & Kim, D. J. (2017). Comorbidity of Internet gaming disorder and alcohol use disorder: A focus on clinical characteristics and gaming patterns. *American Journal of Addiction*, *26*(4), 326-334. https://doi.org/10.1111/ajad.12528

Nürnberger, P., von Lewinski, D., Rothenhäusler, H.-B., Braun, C., Reinbacher, P., Kolesnik, E., & Baranyi, A. (2022). A biopsychosocial model of severe fear of COVID-19. *PloS one*, *17*(2), e0264357.

OHS. (2020). *A provincial guide to what's being done to fight COVID-19*. Retrieved December 14, 2020 from https://www.ohscanada.com/provincial-guide-whats-done-fight-covid-19/

Oka, T., Hamamura, T., Miyake, Y., Kobayashi, N., Honjo, M., Kawato, M., Kubo, T., & Chiba, T. (2021). Prevalence and risk factors of internet gaming disorder and problematic

internet use before and during the COVID-19 pandemic: A large online survey of Japanese adults. *Journal of Psychiatric Research*, *142*, 218-225.

Okruszek, L., Aniszewska-Stanczuk, A., Piejka, A., Wisniewska, M., & Zurek, K. (2020). Safe but Lonely? Loneliness, Anxiety, and Depression Symptoms and COVID-19. *Frontiers in psychology*, *11*, 579181. https://doi.org/10.3389/fpsyg.2020.579181

Olatunji, B. O., & Wolitzky-Taylor, K. B. (2009). Anxiety sensitivity and the anxiety disorders: a meta-analytic review and synthesis. *Psychol Bull*, *135*(6), 974-999. https://doi.org/10.1037/a0017428

Padmanabhanunni, A., & Pretorius, T. (2021). The loneliness–life satisfaction relationship: The parallel and serial mediating role of hopelessness, depression and ego-resilience among young adults in south africa during covid-19. *International journal of environmental research and public health*, *18*(7), 3613.

Palan, S., & Schitter, C. (2018). Prolific. ac—A subject pool for online experiments. *Journal of Behavioral and Experimental Finance*, *17*, 22-27. https://doi.org/https://doi.org/10.1016/j.jbef.2017.12.004

Palgi, Y., Shrira, A., Ring, L., Bodner, E., Avidor, S., Bergman, Y., Cohen-Fridel, S., Keisari, S., & Hoffman, Y. (2020). The loneliness pandemic: Loneliness and other concomitants of depression, anxiety and their comorbidity during the COVID-19 outbreak. *Journal of Affective Disorders*, *275*, 109-111.

Pallavicini, F., Pepe, A., & Mantovani, F. (2022). The Effects of Playing Video Games on Stress, Anxiety, Depression, Loneliness, and Gaming Disorder During the Early Stages of the COVID-19 Pandemic: PRISMA Systematic Review. *Cyberpsychology, Behavior, and Social Networking*, *25*(6), 334-354. https://doi.org/10.1089/cyber.2021.0252

Panteli, M., Papantoniou, A., Vaiouli, P., Leonidou, C., & Panayiotou, G. (2022). Feeling Down in Lockdown: Effects of COVID-19 pandemic on emotionally vulnerable individuals. *The Counseling Psychologist*, *50*(3), 335-358. https://doi.org/https://doi.org/10.1177/00110000211064905

Pearce, K. E., Yip, J. C., Lee, J. H., Martinez, J. J., Windleharth, T. W., Bhattacharya, A., & Li, Q. (2022). Families Playing Animal Crossing Together: Coping With Video Games During the COVID-19 Pandemic. *Games Cult*, *17*(5), 773-794. https://doi.org/10.1177/15554120211056125

Peter, S. C., Ginley, M. K., & Pfund, R. A. (2020). Assessment and Treatment of Internet Gaming Disorder. *Journal of Health Service Psychology*, *46*(1), 29-36. https://doi.org/10.1007/s42843-020-00005-2

Petry, N. M., & O'Brien, C. P. (2013). Internet gaming disorder and the DSM-5. *Addiction*, *108*(7), 1186-1187. https://doi.org/10.1111/add.12162

Pine, R., Fleming, T., McCallum, S., & Sutcliffe, K. (2020). The Effects of Casual Videogames on Anxiety, Depression, Stress, and Low Mood: A Systematic Review. *Games Health J*, *9*(4), 255-264. https://doi.org/10.1089/g4h.2019.0132

Plante, C. N., Gentile, D. A., Groves, C. L., Modlin, A., & Blanco-Herrera, J. (2019). Video games as coping mechanisms in the etiology of video game addiction. *Psychology of Popular Media Culture*, *8*(4), 385.

Plett, D., Pechlivanoglou, P., & Coyte, P. C. (2022). The impact of provincial lockdown policies and COVID-19 case and mortality rates on anxiety in Canada. *Psychiatry and Clinical Neurosciences*, *76*(9), 468-474. https://doi.org/10.1111/pcn.13437

Pollack, M. H. (2005). Comorbid anxiety and depression. *Journal of Clinical Psychiatry*, *66 Suppl 8*, 22-29. https://www.ncbi.nlm.nih.gov/pubmed/16336033

Pontes, H. M., & Griffiths, M. D. (2015). Measuring DSM-5 Internet gaming disorder: Development and validation of a short psychometric scale. *Computers in Human Behavior*, *45*, 137-143. https://doi.org/https://doi.org/10.1016/j.chb.2014.12.006

Popa-Velea, O., Diaconescu, L., Jidveian Popescu, M., & Trutescu, C. (2017). Resilience and active coping style: Effects on the self-reported quality of life in cancer patients. *Int J Psychiatry Med*, *52*(2), 124-136. https://doi.org/10.1177/0091217417720895

Prolific. (2018). *Using attention checks as a measure of data quality*. Retrieved May 19, 2020 from https://researcher-help.prolific.co/hc/en-gb/articles/360009223553-Using-attention-checks-as-a-measure-of-data-quality

Przybylski, A. K., & Weinstein, N. (2019). Investigating the motivational and psychosocial dynamics of dysregulated gaming: Evidence from a preregistered cohort study. *Clinical Psychological Science*, *7*(6), 1257-1265. https://doi.org/https://doi.org/10.1177/2167702619859341

Przybylski, A. K., Weinstein, N., & Murayama, K. (2017). Internet Gaming Disorder: Investigating the Clinical Relevance of a New Phenomenon. *American Journal of Psychiatry*, *174*(3), 230-236. https://doi.org/10.1176/appi.ajp.2016.16020224

Rehm, J., Kilian, C., Ferreira-Borges, C., Jernigan, D., Monteiro, M., Parry, C. D. H., Sanchez, Z. M., & Manthey, J. (2020). Alcohol use in times of the COVID 19: Implications for monitoring and policy. *Drug Alcohol Rev*, *39*(4), 301-304. https://doi.org/10.1111/dar.13074

Restubog, S. L. D., Ocampo, A. C. G., & Wang, L. (2020). Taking control amidst the chaos: Emotion regulation during the COVID-19 pandemic. *Journal of Vocational Behavior*, *119*, 103440. https://doi.org/10.1016/j.jvb.2020.103440

Rettie, H., & Daniels, J. (2021). Coping and tolerance of uncertainty: Predictors and mediators of mental health during the COVID-19 pandemic. *American Psychologist*, *76*(3), 427-437. https://doi.org/10.1037/amp0000710

Revicki, D. A., Travers, K., Wyrwich, K. W., Svedsater, H., Locklear, J., Mattera, M. S., Sheehan, D. V., & Montgomery, S. (2012). Humanistic and economic burden of generalized anxiety disorder in North America and Europe. *J Affect Disord*, *140*(2), 103-112. https://doi.org/10.1016/j.jad.2011.11.014

Rodriguez, L. M., Neighbors, C., Rinker, D. V., & Tackett, J. L. (2015). Motivational Profiles of Gambling Behavior: Self-determination Theory, Gambling Motives, and Gambling Behavior. *Journal of Gambling Studies*, *31*(4), 1597-1615. https://doi.org/10.1007/s10899-014-9497-7

Rogers, A. H., Bogiaizian, D., Salazar, P. L., Solari, A., Garey, L., Fogle, B. M., Schmidt, N. B., & Zvolensky, M. J. (2021). COVID-19 and Anxiety Sensitivity Across Two Studies in Argentina: Associations with COVID-19 Worry, Symptom Severity, Anxiety, and Functional Impairment. *Cognit Ther Res*, *45*(4), 697-707. https://doi.org/10.1007/s10608-020-10194-1

Rohsenow, D. J., Monti, P. M., Martin, R. A., Colby, S. M., Myers, M. G., Gulliver, S. B., Brown, R. A., Mueller, T. I., Gordon, A., & Abrams, D. B. (2004). Motivational enhancement and coping skills training for cocaine abusers: effects on substance use outcomes. *Addiction*, *99*(7), 862-874. https://doi.org/10.1111/j.1360-0443.2004.00743.x

Rosenberg, M., Luetke, M., Hensel, D., Kianersi, S., Fu, T.-c., & Herbenick, D. (2021). Depression and loneliness during April 2020 COVID-19 restrictions in the United States, and their associations with frequency of social and sexual connections. *Social psychiatry and psychiatric epidemiology*, *56*(7), 1221-1232.

Rozgonjuk, D., Pontes, H. M., Schivinski, B., & Montag, C. (2022). Disordered gaming, loneliness, and family harmony in gamers before and during the COVID-19 pandemic. *Addictive Behaviors Reports*, 100426. https://doi.org/https://doi.org/10.1016/j.abrep.2022.100426

Russoniello, C. V., O'brien, K., & Parks, J. M. (2009). EEG, HRV and Psychological Correlates while Playing Bejeweled II: A Randomized Controlled Study. *Annual review of cybertherapy and telemedicine*, *7*(1), 189-192.

Russoniello, C. V., O'Brien, K., & Parks, J. M. (2009). The effectiveness of casual video games in improving mood and decreasing stress. *Journal of CyberTherapy & Rehabilitation*, *2*(1), 53-66.

Sallie, S. N., Ritou, V. J. E., Bowden-Jones, H., & Voon, V. (2021). Assessing online gaming and pornography consumption patterns during COVID-19 isolation using an online survey: Highlighting distinct avenues of problematic internet behavior. *Addictive behaviors*, *123*, 107044. https://doi.org/10.1016/j.addbeh.2021.107044

Sanders, J. L., Williams, R. J., & Damgaard, M. (2017). Video game play and internet gaming disorder among Canadian adults: a national survey. *Canadian Journal of Addiction*, *8*(2), 6-12. https://doi.org/10.1097/CXA.0000000000000006

Sartorius, N., Ustun, T. B., Lecrubier, Y., & Wittchen, H. U. (1996). Depression comorbid with anxiety: results from the WHO study on psychological disorders in primary health care. *British Journal of Psychiatry Supplement*, *168*(30), 38-43. https://www.ncbi.nlm.nih.gov/pubmed/8864147

Savolainen, I., Vuorinen, I., Sirola, A., & Oksanen, A. (2022). Gambling and gaming during COVID-19: The role of mental health and social motives in gambling and gaming problems. *Comprehensive Psychiatry*, *117*, 152331.

Schimmenti, A., Billieux, J., Santoro, G., Casale, S., & Starcevic, V. (2022). A trauma model of substance use: Elaboration and preliminary validation. *Addict Behav*, *134*, 107431. https://doi.org/10.1016/j.addbeh.2022.107431

Schmidt, N. B., Keough, M. E., Mitchell, M. A., Reynolds, E. K., MacPherson, L., Zvolensky, M. J., & Lejuez, C. (2010). Anxiety sensitivity: Prospective prediction of anxiety among early adolescents. *Journal of Anxiety Disorders*, *24*(5), 503-508.

Shah, S. M. A., Mohammad, D., Qureshi, M. F. H., Abbas, M. Z., & Aleem, S. (2021). Prevalence, Psychological Responses and Associated Correlates of Depression, Anxiety and Stress in a Global Population, During the Coronavirus Disease (COVID-19) Pandemic. *Community mental health journal*, *57*(1), 101-110. https://doi.org/10.1007/s10597-020-00728-y

Shamblaw, A. L., Rumas, R. L., & Best, M. W. (2021). Coping during the COVID-19 pandemic: Relations with mental health and quality of life. *Canadian Psychology/Psychologie canadienne*, *62*(1), 92.

Shattuck, S. M., Kaba, D., Zhou, A. N., & Polenick, C. A. (2022). Social contact, emotional support, and anxiety during the COVID-19 pandemic among older adults with chronic conditions. *Clinical Gerontologist*, *45*(1), 36-44.

Shi, J., Renwick, R., Turner, N. E., & Kirsh, B. (2019). Understanding the lives of problem gamers: The meaning, purpose, and influences of video gaming. *Computers in Human Behavior*, *97*, 291-303.

Shrestha, M., Manandhar, N., Sharma, S., & Joshi, S. (2020). Gaming disorder among medical college students during COVID-19 pandemic lockdown. *Kathmandu University Medical Journal*, *18*(2), 48-52.

Silberman, N. A. (2020). Good-bye to all that: COVID-19 and the transformations of cultural heritage. *International Journal of Cultural Property*, *27*(4), 467-475.

Skewes, M. C., & Gonzalez, V. M. (2013). The biopsychosocial model of addiction. *Principles of addiction*, *1*, 61-70.

Sobell, L. C., & Sobell, M. B. (1992). Timeline follow-back. In *Measuring alcohol consumption* (pp. 41-72). Springer. https://doi.org/10.1007/978-1-4612-0357-5_3

Soloff, P. H., Lynch, K. G., Kelly, T. M., Malone, K. M., & Mann, J. J. (2000). Characteristics of suicide attempts of patients with major depressive episode and borderline personality disorder: a comparative study. *Am J Psychiatry*, *157*(4), 601-608. https://doi.org/10.1176/appi.ajp.157.4.601

Sommerlad, A., Marston, L., Huntley, J., Livingston, G., Lewis, G., Steptoe, A., & Fancourt, D. (2021). Social relationships and depression during the COVID-19 lockdown: longitudinal analysis of the COVID-19 Social Study. *Psychol Med*, 1-10. https://doi.org/10.1017/S0033291721000039

Spitzer, R. L., Kroenke, K., Williams, J. B., & Lowe, B. (2006). A brief measure for assessing generalized anxiety disorder: the GAD-7. *Archives of internal medicine*, *166*(10), 1092-1097. https://doi.org/10.1001/archinte.166.10.1092

Stanhope, J. L., Owens, C., & Elliott, L. J. (2016). Stress reduction: Casual gaming versus guided relaxation.

Stephenson, E., & DeLongis, A. (2020). Coping strategies. *The Wiley encyclopedia of health psychology*, 55-60.

Stevens, M. W., Dorstyn, D., Delfabbro, P. H., & King, D. L. (2021). Global prevalence of gaming disorder: A systematic review and meta-analysis. *Australian & New Zealand Journal of Psychiatry*, *55*(6), 553-568. https://doi.org/10.1177/0004867420962851

Sugaya, N., Shirasaka, T., Takahashi, K., & Kanda, H. (2019). Bio-psychosocial factors of children and adolescents with internet gaming disorder: a systematic review. *BioPsychoSocial medicine*, *13*(1), 1-16.

Suh, J. J., Ruffins, S., Robins, C. E., Albanese, M. J., & Khantzian, E. J. (2008). Self-medication hypothesis: Connecting affective experience and drug choice. *Psychoanalytic psychology*, *25*(3), 518.

Szanto, K., Reynolds, C. F., 3rd, Conwell, Y., Begley, A. E., & Houck, P. (1998). High levels of hopelessness persist in geriatric patients with remitted depression and a history of attempted suicide. *J Am Geriatr Soc*, *46*(11), 1401-1406. https://doi.org/10.1111/j.1532-5415.1998.tb06007.x

Taş, İ. (2019). Self-regulation and anxiety sensitivity as predictors of internet addiction among secondary school 7th-and 8 th-grade students. *International Journal of Education Technology and Scientific Researches (IJETSAR)*.

Taylor, S., Koch, W. J., & McNally, R. J. (1992). How does anxiety sensitivity vary across the anxiety disorders? *Journal of Anxiety Disorders*, *6*(3), 249-259.

Teng, Z., Pontes, H. M., Nie, Q., Griffiths, M. D., & Guo, C. (2021). Depression and anxiety symptoms associated with internet gaming disorder before and during the COVID-19 pandemic: A longitudinal study. *Journal of Behavioral Addictions*, *10*(1), 169-180. https://doi.org/10.1556/2006.2021.00016

Terlecki, M., Brown, J., Harner-Steciw, L., Irvin-Hannum, J., Marchetto-Ryan, N., Ruhl, L., & Wiggins, J. (2011). Sex differences and similarities in video game experience, preferences, and self-efficacy: Implications for the gaming industry. *Current Psychology*, *30*(1), 22-33. https://doi.org/10.1007/s12144-010-9095-5

Tull, M. T., Edmonds, K. A., Scamaldo, K. M., Richmond, J. R., Rose, J. P., & Gratz, K. L. (2020). Psychological outcomes associated with stay-at-home orders and the perceived impact of COVID-19 on daily life. *Psychiatry research*, *289*, 113098.

Turna, J., Zhang, J., Lamberti, N., Patterson, B., Simpson, W., Francisco, A. P., Bergmann, C. G., & Ameringen, M. V. (2021). Anxiety, depression and stress during the COVID-19 pandemic: Results from a cross-sectional survey. *J Psychiatr Res*, *137*, 96-103. https://doi.org/10.1016/j.jpsychires.2021.02.059

Vadlin, S., Aslund, C., Hellstrom, C., & Nilsson, K. W. (2016). Associations between problematic gaming and psychiatric symptoms among adolescents in two samples. *Addictive behaviors*, *61*, 8-15. https://doi.org/10.1016/j.addbeh.2016.05.001

van der Velden, P. G., Contino, C., Das, M., van Loon, P., & Bosmans, M. W. (2020). Anxiety and depression symptoms, and lack of emotional support among the general population before and during the COVID-19 pandemic. A prospective national study on prevalence and risk factors. *Journal of Affective Disorders*, *277*, 540-548. https://doi.org/10.1016/j.jad.2020.08.026

Van der Velden, P. G., Hyland, P., Contino, C., von Gaudecker, H.-M., Muffels, R., & Das, M. (2021). Anxiety and depression symptoms, the recovery from symptoms, and loneliness before and after the COVID-19 outbreak among the general population: Findings from a Dutch population-based longitudinal study. *PloS one*, *16*(1), e0245057.

Varga, T. V., Bu, F., Dissing, A. S., Elsenburg, L. K., Bustamante, J. J. H., Matta, J., van Zon, S. K. R., Brouwer, S., Bultmann, U., Fancourt, D., Hoeyer, K., Goldberg, M., Melchior, M., Strandberg-Larsen, K., Zins, M., Clotworthy, A., & Rod, N. H. (2021). Loneliness, worries, anxiety, and precautionary behaviours in response to the COVID-19 pandemic: A longitudinal analysis of 200,000 Western and Northern Europeans. *Lancet Reg Health Eur*, *2*, 100020. https://doi.org/10.1016/j.lanepe.2020.100020

Viana, R. B., & de Lira, C. A. B. (2020). Exergames as coping strategies for anxiety disorders during the COVID-19 quarantine period. *Games for health journal*, *9*(3), 147-149. https://doi.org/10.1089/g4h.2020.0060

Villarroel, M. A., & Terlizzi, E. P. (2020). *Symptoms of depression among adults: United States, 2019*. US Department of Health and Human Services, Centers for Disease Control and ….

Wang, C.-Y., Wu, Y.-C., Su, C.-H., Lin, P.-C., Ko, C.-H., & Yen, J.-Y. (2017). Association between Internet gaming disorder and generalized anxiety disorder. *Journal of Behavioral Addictions*, *6*(4), 564-571. https://doi.org/10.1556/2006.6.2017.088

Wang, C., Pan, R., Wan, X., Tan, Y., Xu, L., Ho, C. S., & Ho, R. C. (2020). Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China.

International journal of environmental research and public health, *17*(5), 1729. https://doi.org/10.3390/ijerph17051729

Wang, Q., Ren, H., Long, J., Liu, Y., & Liu, T. (2019). Research progress and debates on gaming disorder. *General psychiatry*, *32*(3).

Wang, Y., Liu, M., & Nogueira, O. C. B. L. (2023). Prevalence and Risk Factors of Internet Gaming Disorder Under the COVID-19 Pandemic Among University Students in Macao. *SAGE Open Nursing*, *9*, 23779608231158158.

Wardell, J. D., Kempe, T., Rapinda, K. K., Single, A., Bilevicius, E., Frohlich, J. R., Hendershot, C. S., & Keough, M. T. (2020). Drinking to Cope During COVID-19 Pandemic: The Role of External and Internal Factors in Coping Motive Pathways to Alcohol Use, Solitary Drinking, and Alcohol Problems. *Alcohol: Clinical and Experimental Research*, *44*(10), 2073-2083. https://doi.org/10.1111/acer.14425

Warren, A. M., Zolfaghari, K., Fresnedo, M., Bennett, M., Pogue, J., Waddimba, A., Zvolensky, M., Carlbring, P., & Powers, M. B. (2021). Anxiety sensitivity, COVID-19 fear, and mental health: results from a United States population sample. *Cogn Behav Ther*, *50*(3), 204-216. https://doi.org/10.1080/16506073.2021.1874505

Wartberg, L., Kriston, L., Kramer, M., Schwedler, A., Lincoln, T. M., & Kammerl, R. (2017). Internet gaming disorder in early adolescence: Associations with parental and adolescent mental health. *European Psychiatry*, *43*, 14-18. https://doi.org/10.1016/j.eurpsy.2016.12.013

Weinstein, N., Przybylski, A. K., & Murayama, K. (2017). A prospective study of the motivational and health dynamics of Internet Gaming Disorder. *PeerJ*, *5*, e3838. https://doi.org/10.7717/peerj.3838

Weinstock, J., Whelan, J. P., & Meyers, A. W. (2004). Behavioral assessment of gambling: an application of the timeline followback method. *Psychological Assessment*, *16*(1), 72-80. https://doi.org/10.1037/1040-3590.16.1.72

Wiederhold, B. K. (2021). Kids will find a way: The benefits of social video games. In (Vol. 24, pp. 213-214): Mary Ann Liebert, Inc., publishers 140 Huguenot Street, 3rd Floor New ….

Wilkins, L., Rash, J., Fawcett, J., & Harris, N. (2023). Evaluation of the Substance Use Risk Profile Scale (SURPS) in a Recreational Video Game Playing Population. *International Journal of Mental Health and Addiction*, 1-14.

Williams, N. (2014). The GAD-7 questionnaire. *Occupational Medicine*, *64*(3), 224-224. https://doi.org/https://doi.org/10.1093/occmed/kqt161

Wischert-Zielke, M., & Barke, A. (2023). Differences between recreational gamers and Internet Gaming Disorder candidates in a sample of Animal Crossing: New Horizons players. *Scientific reports*, *13*(1), 5102.

Wisener, M., & Khoury, B. (2021). Specific emotion-regulation processes explain the relationship between mindfulness and self-compassion with coping-motivated alcohol and marijuana use. *Addictive behaviors*, *112*, 106590. https://doi.org/https://doi.org/10.1016/j.addbeh.2020.106590

World Health Organization, W. (2019). *International statistical classification of diseases and related health problems (11th ed.)* https://icd.who.int/

World Health Organization, W. (2023, March 31, 2023). *Depressive disorder (depression)*. Retrieved April 12, 2023 from https://www.who.int/news-room/fact-sheets/detail/depression

Xu, S., Park, M., Kang, U. G., Choi, J.-S., & Koo, J. W. (2021). Problematic use of alcohol and online gaming as coping strategies during the COVID-19 pandemic: A mini review. *Frontiers in psychiatry*, 930. https://doi.org/10.3389/fpsyt.2021.685964

Zeidner, M. (1995). Adaptive coping with test situations: A review of the literature. *Educational psychologist*, *30*(3), 123-133.

Zhao, X., Li, W., Li, X., Shi, W., & Li, C. (2022). Autistic traits and COVID-19-related post-traumatic stress disorder symptom: Sex difference and the role of anxiety sensitivity. *Research in Autism Spectrum Disorders*, *98*, 102042.

Appendix A
DSM-5 Internet Gaming Disorder Diagnostic Criteria

The proposed condition of Internet Gaming Disorder has the following proposed symptoms. Diagnosis would be considered if an individual has experienced five or more of the following symptoms within the past year (APA, 2022):

1. Significant impairment or distress in several aspects of a person's life.
2. Preoccupation with gaming.
3. Withdrawal symptoms when gaming is taken away or not possible.
4. Tolerance: the need to spend more time gaming to satisfy the urge.
5. Inability to reduce playing or unsuccessful attempts to quit gaming.
6. Giving up other activities, loss of interest in previously enjoyed activities due to gaming.
7. Continuing to game despite problems.
8. Deceiving family members or others about the amount of time spent on gaming.
9. The use of gaming to relieve negative moods, such as guilt or hopelessness.
10. Risky behaviours, having jeopardized or lost a job or relationship due to gaming.

Appendix B
Measures used in this dissertation.

Gaming Motives: Electronic Gaming Motives Questionnaire (EGMQ)
SINCE the COVID-19 Emergency (March 2020)
(Myrseth et al., 2017)

Used in Study 1 and Study 2

IN THE PAST MONTH (30 Days), how often do you participate in gaming because of the following reasons?

	Almost never/never	Sometimes	Often	Almost always
1. As a way to celebrate	1	2	3	4
2. To forget your worries	1	2	3	4
3. Because it's what most of your friends do when you get together	1	2	3	4
4. Because you like the feeling	1	2	3	4
5. Because you feel more self-confident or sure of yourself	1	2	3	4
6. Because it helps you when you are feeling nervous or depressed	1	2	3	4
7. To be sociable	1	2	3	4
8. Because it's exciting	1	2	3	4
9. To get a high feeling	1	2	3	4
10. To cheer up when you're in a bad mood	1	2	3	4
11. Because it makes a social gathering more enjoyable	1	2	3	4
12. Because it's fun	1	2	3	4
13. Because it is something you do on special occasions	1	2	3	4
14. Because you are bored	1	2	3	4

Generalized Anxiety Disorder (GAD-7)
(Spitzer et al., 2006)

Used in Study 1

IN THE PAST MONTH (30 Days), how often have you been bothered by the following problems?

	Not at all	Several days	More than half the days	Nearly every day
Feeling nervous, anxious, or on edge	0	1	2	3
Not being able to stop or control worrying	0	1	2	3
Worrying too much about different things	0	1	2	3
Trouble relaxing	0	1	2	3
Being so restless that it is hard to sit still	0	1	2	3
Becoming easily annoyed or irritable	0	1	2	3
Feeling afraid as if something awful might happen	0	1	2	3
Feeling nervous, anxious, or on edge	0	1	2	3

10. If you checked off any problems, how difficult have these made it for you to do your work, take care of things at home, or get along with other people?

Not difficult at all _____
Somewhat difficult _____
Very difficult _____
Extremely difficult _____

Internet Gaming Disorder Scale–Short-Form (IGDS9-SF) (Pontes & Griffiths, 2015)

Used in Study 1 and Study 2

Instructions: These questions will ask you about your gaming activity **during the past 30 days**). By gaming activity, we understand any gaming-related activity that has been played either from a computer/laptop or from a gaming console or any other kind of device (e.g., mobile phone, tablet, etc.) both online and/or offline.

	Never	Rarely	Sometimes	Often	Very Often
1. Do you feel preoccupied with your gaming behavior? (Some examples: Do you think about previous gaming activity or anticipate the next gaming session? Do you think gaming has become the dominant activity in your daily life?)	1	2	3	4	5
2. Do you feel more irritability, anxiety or even sadness when you try to either reduce or stop your gaming activity?	1	2	3	4	5
3. Do you feel the need to spend increasing amount of time engaged gaming in order to achieve satisfaction or pleasure?	1	2	3	4	5
4. Do you systematically fail when trying to control or cease your gaming activity?	1	2	3	4	5
5. Have you lost interests in previous hobbies and other entertainment activities as a result of your engagement with the game?	1	2	3	4	5
6. Have you continued your gaming activity despite knowing it was causing problems between you and other people?	1	2	3	4	5
7. Have you deceived any of your family members, therapists or others because the amount of your gaming activity?	1	2	3	4	5
8. Do you play in order to temporarily escape or relieve a negative mood (e.g., helplessness, guilt, anxiety)?	1	2	3	4	5
9. Have you jeopardized or lost an important relationship, job or an educational or career opportunity because of your gaming activity?	1	2	3	4	5

Patient Health Questionnaire (PHQ-9)
(Kroenke et al., 2001)

Used in Study 1

IN THE PAST MONTH (30 Days), how often have you been bothered by any of the following problems?

	Not at all sure	Several days	Over half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed or hopeless	0	1	2	3
3. Trouble falling asleep, staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself – or that you're a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed. Or, the opposite- being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead or of hurting yourself in some way	0	1	2	3

10. If you checked off any problems, how difficult have these made it for you to do your work, take care of things at home, or get along with other people?

Not difficult at all _____
Somewhat difficult _____
Very difficult _____
Extremely difficult _____

The Substance Abuse Risk Profile (SURPS)
(Woicik et al., 2009)

Used in Study 2

Please indicate the extent to which you agree with the following statements by selecting the appropriate response statement using the following scale:

	Strongly Disagree	Disagree	Agree	Strongly Agree
1. I am content.	1	2	3	4
2. I often don't think things through before I speak.	1	2	3	4
3. I would like to skydive.	1	2	3	4
4. I am happy.	1	2	3	4
5. I often involve myself in situations that I later regret being involved.	1	2	3	4
6. I enjoy new and exciting experiences even if they are unconventional.	1	2	3	4
7. I have faith that my future holds great promise.	1	2	3	4
8. It's frightening to feel dizzy or faint.	1	2	3	4
9. I like doing things that frighten me a little.	1	2	3	4
10. It frightens me when I feel my heart beat change.	1	2	3	4
11. I usually act without stopping to think.	1	2	3	4
12. I would like to learn how to drive a motorcycle.	1	2	3	4
13. I feel proud of my accomplishments.	1	2	3	4
14. I get scared when I'm too nervous.	1	2	3	4
15. Generally, I am an impulsive person.	1	2	3	4
16. I am interested in experience for its own sake even if it is illegal.	1	2	3	4
17. I feel that I'm a failure.	1	2	3	4
18. I get scared when I experience unusual body sensations.	1	2	3	4
19. I would enjoy hiking long distances in wild and uninhabited territory.	1	2	3	4
20. I feel pleasant.	1	2	3	4
21. It scares me when I'm unable to focus on a task.	1	2	3	4
22. I feel I have to be manipulative to get what I want.	1	2	3	4
23. I am very enthusiastic about my future.	1	2	3	4