Examining Cognitive Mediators Between At-Risk Personality and Alcohol Use During the COVID-19 Pandemic

by

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Abstract

The COVID-19 pandemic has brought unprecedented challenges to the global population. Due to pandemic-related difficulties, some individuals are reporting increased alcohol use. The four-factor model suggests that individuals with at-risk personality traits (anxiety sensitivity, hopelessness, sensation seeking and impulsivity) may have exhibited increased alcohol use during the pandemic. Cognitive constructs such as self-efficacy, perceived control, and boredom proneness, which have been linked to alcohol use, have been shown to be negatively impacted during the pandemic. However, the mediational roles these constructs potentially played between at-risk individuals and alcohol used during the pandemic have not been examined. The current study utilized a longitudinal design to examine the mediating roles of perceived control of internal states, generalized self-efficacy, and boredom proneness between at-risk personality traits and binge drinking and alcohol-related problems. A sample of 301 participants (46.2% Female; Age M = 32.3, SD = 9.6) recruited on the crowdsourcing platform Prolific completed extensive surveys at the start of the pandemic (May 2020), and at two three-month intervals after that. Consistent with theory, at-risk personality traits predicted alcohol use and problems. After controlling for known drinking correlates during the pandemic, path modelling revealed that the cognitive processes were not supported to mediate at-risk personality traits and binge drinking or alcohol-related problems. Contrary to predictions, reductions in key cognitive constructs resulting from pandemic-related stressors did not facilitate deleterious alcohol outcomes for at-risk individuals. Results add to the literature on the longitudinal effects of the pandemic and substance use.

Keywords: COVID-19, alcohol use, personality, agentic perceptions, boredom proneness

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Examining Cognitive Mediators Between At-Risk Personality and Alcohol Use During the COVID-19 Pandemic

In March 2020, the World Health Organization declared COVID-19 a global pandemic (World Health Organization, 2020a) and unprecedented international efforts to reduce the disease's spread were implemented. The ensuing quarantine and social distancing resulted in an atomized and dejected society. While these protocols have positively contributed to reducing the spread of the disease, the negative impacts of COVID-19 and related social distancing protocols cannot be understated, given their ubiquity and salience throughout Canada and the world (World Health Organization, 2020b). Canada's economy has been critically impacted, with millions of Canadians experiencing reduced or lost income, and every Canadian has been forced to learn a new way to function in society (Statistics Canada, 2020).

Research indicates that individuals with specific individual characteristics, emergency protocols and their related societal changes have led to a significant increase in alcohol consumption – often as a means to cope. A study by the Canadian Centre on Substance Use and Addiction (2020) found that substance use, including alcohol consumption, showed marked increased levels directly attributable to COVID-19 pandemic-related outcomes. Wardell et al. (2020) found that income loss, low social connectedness, depression, living with a child under 18 and living alone was linked to increased alcohol consumption during the first month of the pandemic in Canada. Similarly, a study by Joyce et al. (2020) found that 39.2% of Canadian mothers reported increased substance consumption during the pandemic's early stages. Dumas et al. (2020) found that the frequency of alcohol and cannabis increased during the pandemic for adolescents due to solitary consumption and fear of being infected with COVID-19. However, other studies indicated that most people reported no change or even a decrease in alcohol

consumption during the pandemic. For instance, in extensive studies that examined cross-country differences, most countries reported a decrease in alcohol consumption, except for the United States (Sohi et al., 2022). Similarly, Schmitz and Glowacz (2022) found that while half of their nearly 3000 participants reported no change in drinking during the pandemic, one-quarter reported an increase, and the remaining participants reported a decrease in consumption habits. The authors, paralleling the findings of Wardell et al. (2020), reported being a parent, depression, anxiety, and working from home as predictors of increased use. Thus, there is variability in the findings of extant research on alcohol use during the pandemic. However, research to date has focused primarily on situational factors. Given the disparate findings, a more nuanced examination of potential pathways to increased use is sorely needed. In other words, while "who" drank more has been examined, an exploration of "why" increased drinking occurred is warranted. Notably, while research consistently implicates certain personality traits as being at-risk for alcohol misuse, studies so far have overlooked examining these essential individual differences. These personality traits may have seen particular exacerbation in drinking due to key cognitive constructs being impaired due to pandemic-related circumstances. Therefore, the current thesis examines how cognitive variables implicated in substance use (e.g., agentic perceptions, boredom) mediate the relationship between at-risk personalities and alcohol use during the COVID-19 pandemic.

At-Risk Personalities

A prominent model for identifying those at risk of alcohol misuse is the four-factor personality vulnerability model to substance misuse, which posits four personality pathways in developing a substance use disorder (Castellanos-Ryan & Conrod, 2012). The model indicates that at-risk personality is first categorized as either disinhibited or inhibited, with two subtypes

for each of these categories. People with inhibited personality traits engage in substance use due to their negative reinforcing properties via aversive/avoidant motivations and are dimensions are further subdivided into *anxiety sensitive* and *hopelessness* personality traits (Castellanos-Ryan & Conrod, 2012). Anxiety sensitivity and hopelessness are sub-facets of neuroticism; a broader personality construct associated with negative emotional states, anxiety, and inhibitions in behaviour (Barlow, 2000; Castellanos-Ryan & Conrod, 2012). Individuals with disinhibited personality traits, on the other hand, tend to use substances through positive reinforcement processes via an appetitive/approach motivation. Disinhibited personality traits are further placed in the model's dimension of impulsive or sensation-seeking subtypes. Disinhibited personality traits reflect difficulties in regulating one's behaviour leading to undesirable consequences, and further exhibit low tolerances for boredom due to a high need for stimulation (Arnett, 1994; Castellanos-Ryan & Conrod, 2012). Despite abundant research supporting these personality traits predicting alcohol misuse, extant research on alcohol consumption during the pandemic has thus far focused on situational, geographic, or demographic factors (Sohi et al., 2022; Wardell et al., 2020; Winstock et al., 2021). Due to supported pathways to substance use, these four personality traits may experience potential exacerbations during the COVID-19 pandemic that would promote alcohol consumption.

Hopelessness

The personality trait of hopelessness contributes to an individual having a propensity to experience negative affect and a vulnerability to depression and low mood (Conrod, 2000). Individuals with this personality trait use substances to self-medicate negative feelings and thoughts, and research suggests this use is generally a means to cope with depression (Grant, 2007; Mackie et al., 2011). Hopelessness is a considerable risk factor for substance use in

general, and this risk is elevated during high-stress circumstances (Bolland et al., 2007; Conrod et al., 2010). Therefore, individuals with the personality trait of hopelessness would be notably at-risk for increased alcohol consumption during the pandemic, given generally heightened stress levels further exacerbated by diminished social interaction and increased isolation. For example, as the pandemic wore on, individuals with the personality trait of hopelessness may have developed pessimistic or apathetic attitudes as their capacity to influence their environment diminished. Research supports pandemic-related outcomes increasing stress, negative affect, and depressive symptoms, especially in individuals with a predisposition for these states, such as those with hopelessness traits (Dozois & Mental Health Research Canada, 2020). Thus, individuals with hopelessness personality traits were especially at-risk for elevated alcohol consumption during the COVID-19 pandemic due to reliance on self-medication as a coping strategy.

Anxiety Sensitivity

The personality trait of anxiety sensitivity contributes to individuals with this trait having sensitivity towards anxiety-related sensations (Reiss, 1991). Individuals with high anxiety sensitivity are fearful of anxiety sensations and are likely to interpret them as indications of an illness, losing control, or other undesirable circumstances (Stewart et al., 1995). Like the trait of hopelessness, individuals with the trait of anxiety sensitivity use substances to self-medicate negative affect, but anxiety-sensitive individuals drink to reduce physical and cognitive symptoms of worry (Stewart & Kushner, 2001). Schmid et al. (2007) found that anxiety sensitivity uniquely predicted the development of alcohol use disorders. Uncertainty, lack of control, and worries over future events are well-known instigators of anxiety and its associated symptoms, and this puts individuals with anxiety sensitivity at-risk for increased alcohol use

during the pandemic. The prolonged nature of this unprecedented situation has led to an epidemic-like prevalence of anxiety, and, likely, those with anxiety sensitivity may have increasingly turned to alcohol to reduce their anxiety symptoms.

Sensation Seeking

As a personality trait, sensation seeking is conceptualized as a tendency for novelty-seeking or thrill-seeking (Castellanos-Ryan & Conrod, 2012). An individual high on this personality trait is very sensitive to rewards and tends to engage in alcohol use for enhancement rather than coping motives (i.e., encourage positive states rather than avoid negative states; Castellanos-Ryan & Conrod, 2012). Sensation seeking is linked to binge drinking and increases in binge drinking over time (Conrod et al., 2006). Notably, individuals high in sensation-seeking find boredom particularly aversive and are motivated to seek stimulation when confronted with situations inducing this affective state (Deng et al., 2020). Indeed, susceptibility to boredom is one of the four primary dimensions of the personality trait of sensation seeking (Zuckerman, 1994). As quarantine or lockdown forces individuals to stay in the same environment and limits the range of new experiences, sensation-seeking personalities may have increasingly turned to alcohol consumption to cope with under stimulating conditions. Similar behaviour patterns have been found in individuals with sensation-seeking traits, wherein boredom contributed to higher levels of consumerism activity in those with sensation-seeking traits (Deng et al., 2020). Thus, those with sensation-seeking personalities were likely to turn to alcohol to as a means to cope with a social distanced society.

Impulsivity

Impulsivity, a personality trait associated with a tendency to make rash decisions without considering undesirable consequences, is the trait most implicated in developing an alcohol use

disorder (Verdejo-Garcia et al., 2008; Moeller et al., 2001; Sher & Thrull, 1994). Impulsivity is associated with higher frequency and quantity of substances consumed and is linked to social and problematic drinking (Stautz & Cooper, 2013). Individuals high on this trait tend to have deficits in their capacity to inhibit responses and fail to regulate their consumption of substances such as alcohol, especially when experiencing high stress levels (Castellanos & Ryan, 2012; Clay & Parker, 2018). Gullo et al. (2010) found that drinking refusal self-efficacy mediated the relationship between impulsivity and alcohol consumption. Further, the relationship between impulsivity and substance use may be bidirectional. Not only does impulsivity promote substance use, but prolonged substance use may reduce behavioural and cognitive control leading to less self-regulatory resources (Koob & LeMoal, 1997; Verdejo-Garcia et al., 2007). As impulsive individuals have difficulty in delaying gratification, and lockdown limits the availability of adaptive reinforcers and promotes stress, impulsive individuals may have experienced increased alcohol consumption during the pandemic.

Cognitive Mediators

Cognitive variables have been found to mediate the relationship between personality and substance use. For instance, expectations that alcohol will lead to specific consequences (e.g., enhancing or reducing positive/negative affect), as well as thoughts and perceptions, are proposed as integral variables in prominent models of alcohol use (Cooper, 1994; Cox & Clinger, 2011). Kearns et al. (2018) reported that individuals with high anxiety sensitivity drank less when their perceived control over anxiety symptoms was high. Agentic perceptions (i.e., feeling in control over one's actions and environment; Wen & Imamizu, 2022) have also been directly implicated in one's capacity to cope effectively during the COVID-19 pandemic as

individuals with higher agentic perceptions report comparably improved well-being (Zheng et al., 2020).

Perceived Control

Perceived control is an individual's belief in the availability of a behavioural response that will alter a given situation or circumstance (Litt, 1988; Thompson, 1981). Few things in psychological research are universally accepted as consistently aversive as the loss of control (Skinner, 1995). Research supports that lowered levels of perceived control are linked to alcohol problems, greater motivations to drink, binge drinking, and stronger expectations for the efficacy of alcohol effects (Child et al., 2016; Nagoshi, 1999).

Research frequently categorizes control as either *primary*, effect on the environment or problem at hand, or *secondary,* altering one's cognitions, evaluations, or emotions towards an event (Rothbaum et al., 1982; Pallant, 2000). Given that previous research has found that control over internal states (e.g., anxiety sensations; Kearns et al., 2018) has demonstratable relations with at-risk personality and alcohol use, it follows that perceived control over internal states may have influenced alcohol use in at-risk individuals during the pandemic. Researchers have found that in prolonged situations where the individual has little control, which arguably includes social-distancing protocols in the COVID-19 pandemic, control over internal states may be more predictive of outcomes than primary control (Thompson et al., 1994). As at-risk personality traits are negatively associated with perceived control (Nagoshi et al., 1999) and these traits are typified in their use to regulate some form of internal state (Castellanos-Ryan & Conrod, 2012), it follows that perceived control would be an essential mediator in alcohol use for at-risk personality traits during the pandemic given its protective effects. Rippe et al. (2021) found that perceived control buffered students from loneliness and isolation during the pandemic. Other

studies have found effects that may be highly relevant to at-risk personalities. For instance, perceived control protects individuals from anxiety (Goodwin et al., 2022). Similarly, Ucar et al. (2022) reported that perceived control reduced perceptions of hopelessness during the pandemic. However, given at-risk personality traits all experience difficulties in regulating internal states (Castellanos-Ryan & Conrod, 2012), and social distancing protocols are enduring conditions wherein an individual has little control; this adaptive cognitive construct may have been impaired and contributed to alcohol consumption for at-risk individuals.

Self-Efficacy

Self-efficacy refers to an individual's confidence in their ability to perform behaviours to effect environmental changes (Bandura, 1997). While often used interchangeably with perceived control, there is a subtle key distinction. While perceived control denotes the belief in the availability of a response originating from the individual, self-efficacy refers to confidence in performing that response. Research has found that self-efficacy and perceived control contribute distinctly to aversive situations such as pain tolerance, and outcomes are most favourable when both are present (Litt, 1998). Self-efficacy is instrumental and highly predictive of positive outcomes across many health and life domains, including alcohol use (Marlatt et al., 1995). Notably, Stevens et al. (2016) found that self-efficacy towards drink refusal mediated the relationship between impulsivity and alcohol problems highlighting recent interest and findings in the mediation between at-risk personality and alcohol misuse. Further, Yilidirn and Guler (2020) found that self-efficacy was predictive of mental health during the COVID-19 pandemic. Similarly, Kasapoglu et al. (2022) reported that increased self-efficacy was associated with reduced hopelessness and anxiety during the lockdown.

A construct related to alcohol use and pandemic coping is generalized self-efficacy, which refers to one's belief in coping with a broad range of stressful situations (Luszczynjsa, 2005). Generalized self-efficacy has been found to predict performance and alcohol use in novel situations (Kim & Park, 2001; Tipton & Worthington, 1984), and individuals low on this construct are more likely to engage in alcohol consumption (Oei et al., 2007). While extant research on generalized self-efficacy during the pandemic is lacking, research indicates a wide variety of domain-specific self-efficacy was negatively impacted by the pandemic highlighting the likelihood of a global negative impact on self-efficacy (Kasapoglu, 2022; Talsma et al., 2021; Rabaglietti et al., 2021). Further, generalized self-efficacy is lowered as an individual shifts their locus of control from internal to external factors - something that may have occurred due to mandated social distancing (Smith, 1989). Taken together, it follows that the protective cognitive construct of generalized self-efficacy may be threatened and thereby reduced due to ongoing pandemic conditions.

Boredom Proneness

A final cognitive mediator relevant to alcohol use and the COVID-19 pandemic is boredom. Boredom is an aversive state that can arise during low levels of stimulation and lack of valued activities and may arise from situations that are perceived to be overly challenging or under-challenging (Csikszentmihalyi, 1975; Fisher, 1993; Pekrun et al., 2010). This latter point is highly relevant to the pandemic, given it is interspersed with novel and overwhelming challenges and long periods of mundane and repetitive activity. As discussed earlier, Canadians cited boredom as a principal reason for increased alcohol use during the pandemic (Canadian Centre on Substance Use and Addiction, 2020). Grossman et al. (2020) found similar findings wherein a third of their sample reported boredom as a primary motivation for increased alcohol

consumption during the COVID-19 lockdown. A construct that has consistently been found to be associated with alcohol use is boredom proneness. Essentially the individual's susceptibility to experiencing states of boredom, boredom-prone individuals more likely to experience alcohol misuse and binge drinking (Biolcaty et al., 2016; Struk et al., 2015). Biolcaty et al. (2018) found that boredom proneness is associated with higher alcohol consumption during free time; something like the COVID-19 pandemic would likely create more of it. Further, Droit-volet et al. (2020) found that some individuals the COVID-19 pandemic increased perceptions of time leading to boredom. Boredom proneness is associated with aversive outcomes in the pandemic, such as social-distancing rule-breaking - even when an individual had previously contracted COVID-19 (Boylan et al., 2021).

Boredom proneness has been supported to be is associated with at-risk personality traits and may be altered by the conditions of the pandemic. Boredom proneness has a strong positive relationship with the personality trait of impulsiveness and sensation seeking (Gordon & Caltabiano, 1996; Watt & Vodanovich, 1992). Similarly, boredom proneness is associated with higher levels of anxiety and depression (Goldberg et al., 2011; Vodanovich et al., 1991). A likely explanation for these associations is that boredom proneness, like at-risk personality traits, is correlated with difficulties in self-regulation (Isacescu et al., 2017). However, unlike at-risk personality traits, boredom proneness originates from difficulties in attentional control (Eastwood et al., 2012). Further, individuals display reductions in boredom proneness across time as a result of increasing self-control, and boredom proneness may be exacerbated as a result of sustained an intense periods of boredom (Isacescu et al., 2017; Vodanovich & Kass, 1990). Individuals with at-risk personality traits may experience boredom from being overwhelmed (e.g., hopelessness, anxiety sensitivity) or under-stimulated (e.g., impulsivity, sensation seeking)

by the stressors and social distancing protocols. Therefore, these enduring states of boredom may shift an at-risk individual's boredom proneness, thereby contributing to alcohol consumption to alleviate negative states or promote positive ones.

The Current Study

The current study utilizes a longitudinal design to examine the pathways from at-risk personality traits to increased alcohol use and related problems during the first six-months of the COVID-19 pandemic. Secondary analysis of a dataset collected from an online-recruited Canadian sample that completed surveys at the start of social distancing protocols (i.e., May 2020) and two three-month intervals after that was used to assess the relationships between the primary variables during social-distancing protocols in 2020. As agentic variables and boredom are implicated and affected by situations an individual has little control over, such as a global pandemic, the current study aims to determine whether already-at-risk individuals experience increased alcohol consumption or problems by way of changes in these cognitive processes.

The present study intends to add to the literature in several novel ways. First, research is limited on individual differences that predict worsening and risky alcohol use throughout the pandemic. In order to inform current and future policy, profiles of at-risk individuals must be available to policymakers and health professionals (Rehm et al., 2020). Second, while numerous studies implicate at-risk personality traits alongside cognitive variables, extant literature has focused on a single personality trait alongside a single cognitive process at a time. Assessing the mediating role of several cognitive processes and personality traits in the same model would add to the literature by developing a more thorough understanding of the relationships between these variables. Finally, further understanding of the cognitive processes that mediate individual differences (e.g., personality traits) and problematic substance use may assist the development of

interventions and preventative measures by understanding not only whom but how the COVID-19 pandemic impacted substance use, effective tailored treatment programs can be developed for those who experienced deleterious outcomes during the pandemic.

Based on the literature, several hypotheses are posited for the current study. First, given the abundance of literature supporting the relationships between at-risk personality traits and alcohol use and problems, it was predicted that elevated at-risk personality traits would predict greater drinking and related problems during the first six-months of the COVID-19 pandemic. Second, given that anxiety sensitivity, hopelessness, and impulsivity are characterized by self-regulatory impairments, these three personality traits were expected to related to increased drinking due to lower perceived control and self-efficacy – which as discussed, are cognitive constructs that are protective of alcohol misuse. Third, all at-risk traits will display pathways to the dependent variables as mediated by boredom proneness, given that boredom can arise from being overwhelmed or under-stimulated.

Method

Participants and Procedure

The University of Manitoba's Research Ethics Board approved the secondary analysis of data from the study initially approved by the Office of Research Ethics at York University (see Appendices for informed consent forms). 400 participants were recruited via Prolific (https://www.prolific.co), an online survey platform that facilitates data collection. Online data collection from paid participants is a growing trend in psychological research. Despite reservations about the validity and quality of the data, research into these concerns consistently shows that participants respond as truthfully and accurately as samples of undergraduates or the general population (Thomas & Clifford, 2017). Amazon's Mechanical Turk has been the most

frequently used platform; however, the decision was made to utilize Prolific as it was explicitly designed for conducting studies (unlike Mechanical Turk), allowed for the collection of an exclusively Canadian sample, and also has a participant pool that is not oversampled (Palan & Schitter, 2018; Peer et al., 2017). Further, research has indicated that data on substance use can be reliably collected from online sample platforms (Kim & Hodgins, 2017).

To participate in the study, participants were required to be 18 years or older (a requirement on Prolific), reside in Canada, and report alcohol use on an internal survey collected by Prolific. To ensure valid responses, only participants with a history of high-quality data, as measured through Prolific's approval rating (e.g., if their responses were accepted or rejected in previous work; > 90%) were eligible to participate. Data was collected at three time points in 2020, beginning at the end of April, early August, and early November. Participants responded to a survey that included a battery of items that measured demographic variables, personality traits, the impacts of COVID-19 on personal lives, psychosocial variables, substance use, as well as other variables not directly related to the current study. Participants received $13.06 CAD for completing the initial time point, and $6.07 for the second and third time points, as well as a $5 CAD bonus for completing all three time points.

As attention check items are supported as a method to screen for random responding (Oppenheimer et al., 2009), several attention check items were included in each survey. In line with Prolific's guidelines, participants who failed 2 or more attention check items were removed from the dataset (Prolific, 2020). Based on the attention check item criteria, two participants were removed from the data set prior to analysis. Consistent with Wardell et al., (2020), only participants who reported alcohol use in the past 30 days at Time 1 were included for analysis resulting in a total sample size of 301 participants, of which 64.8% completed all three time

points. The final sample was 53.8% male with a mean age of 32 (*SD = 9.64, Range = 18 – 74*). Participants reported a predominantly White ethnicity (74%) and 76.1% of the sample indicated they had completed a bachelor's degree or higher. See Table 1 for additional participant demographics.

Measures

At-risk personalities. The Substance Abuse Risk Profile Scale (SURPS; Woicik et al., 2009) is a 23-item scale that assesses four personality traits associated with increased risk for substance use disorders: Anxiety Sensitivity (5 items; e.g., "It's frightening to feel dizzy or faint"; α = .70), Hopelessness (6 items; e.g., "I feel that I'm a failure"; α = .88), Impulsivity (5 items; e.g., "I usually act without stopping to think"; α = .72), and Sensation Seeking (6 items; e.g., "I enjoy new and exciting experiences even if they are unconventional"; α = .74). The scale consists of items from other established scales (e.g., Beck Hopelessness Scale, Anxiety Sensitivity Index) chosen for the predictive validity in substance misuse. Participants indicated their level of agreement with statements (e.g., 1 = *Strongly Disagree* to 4 = *Strongly Agree)* and items from each subscale were then summed. Total risk score was derived from the sum of all sub-scale items, with higher scores representing more presence of the personality trait in an individual and a higher risk for substance misuse. The SURPS has demonstrated excellent validity and reliability across samples of disparate demographics (Jurk et al., 2015; Newton et al., 2016) and was found to have adequate internal-consistency in the present study.

Boredom. The Short Boredom Proneness Scale (SBPS; Struk et al., 2017) consists of 8 items that measure boredom. Participants completed this measure by rating their agreement with statements (e.g., I find it hard to entertain myself; 1 = *Strongly Disagree* to 7 = *Strongly Agree*; α = .92). Items were summed and higher scores represent a greater presence of boredom

proneness. This scale was developed to address inconsistencies in the factor structure of previous boredom scales, and the validity, reliability, and unidimensionality are supported (Struk et al., 2017; Yan et al., 2021).

Perceived control over internal states. The Perceived Control of Internal States Scale (PCOISS; Pallant, 2000) is an 18-item measure that assesses the extent of control people feel that have over internal experiences (α = .94). Participants indicated their level of agreement to statements such as "No matter what happens to me in my life I am confident of my ability to cope emotionally" (1 = *Strongly Disagree* to 5 = *Strongly Agree*). Items were summed, and higher scores represent a greater degree of perceived control over one's emotions, thoughts, and physical reactions. The PCOISS's reliability and validity have been supported (Crawford et al., 2011).

Self-efficacy. The New General Self-Efficacy Scale (Chen et al., 2001; NGSE) is an 8-item measure that assesses non-domain-specific self-efficacy (α = .90). Participants responded to the instrument by rating their agreement to statements including "Even when things are quite tough, I can perform quite well" (1 = *Strongly Disagree* to 5 = *Strongly Agree*). Items were summed, and higher scores indicate a greater presence of self-appraisals to effect change in one's environment. Internal consistency and validity have been well-supported for this highly-used psychological instrument (Chen et al., 2004).

Alcohol consumption. Participants indicated their risky alcohol consumption before the pandemic, both "in the last 30 days" (Time 1-3) and "in the one-month period prior to when the COVID-19 emergency was declared in your area" (Time 1). Participants indicated how frequently they binge drank (e.g., 4+ drinks for female or 5+ for males in a two hour period; 0=

Never to 7 = *Every Day*). These items were derived from National Institute on Alcohol Abuse and Alcoholism's recommended alcohol

Questions (National Institute on Alcohol Abuse and Alcoholism, 2020).

Alcohol problems. The Short Inventory of Problems (SIP2-R) is a subset of 15-items from the Drinker Inventory of Consequences (Miller et al., 1995). Participants responded to the SIP2-R by indicating the frequency they experienced alcohol-related problems in the past 30 days (e.g., "Problems between you and your friends", 0 = *Not at All* to 4 = *Daily or Almost Daily;* α = .95).

Covariates

Depression. The Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001) is a nine-item measure that assesses depressive symptoms. Participants indicated on a 4-point scale the frequency of symptoms of depression they experienced over the last 30 days (e.g., "e.g., "Little interest or pleasure in doing things"; 0 = *Not at all* to 3 = *Nearly Every Day*; α = .86). Greater scores on the summed item total indicate a higher presence of depressive symptoms. The PHQ-9 is widely used to assess depression in research and its validity and reliability are well established (Kroenke et al., 2001)

Social connectedness. The Social Connectedness Scale-Revised (SCS-R; Lee et al., 2001) assessed interpersonal closeness during the past 30 days by having participants rate their agreement with statements (e.g., "I feel close to people"; 1 = *Strongly Disagree* to 6 = *Strongly Agree;* α = .94). The higher the score of the summed item total, the greater a participant's perceived interpersonal closeness. The reliability and validity of the SCS-R is well supported in the literature (Lee et al., 2001).

Living alone. Participants indicated whether they lived alone by responding to a three-response item assessing the number of people in their household "What is your living situation?" (0 = *At home with family*, 1 = *Living on your own*, 2 = *Live with roommates*). A binary variable was then calculated from this response (0 = *Live with others*, 1 = *Live alone*).

Living with a child under 18. Participants responded to display-logic-driven questions on whether they had children, the age range of their children, and whether they lived with them or not. A binary variable was calculated from these responses (0 = *Does not live with child under 18*, 1 = *Lives with a child under 18*).

Income change. Participants responded to the question, "Has your personal income coming directly from your employer been affected by the COVID-19 emergency?". Participants selected from a range of responses (e.g., "It has increased", "It was not affected at all", "Reduced by 25-50%", etc.). Consistent with Wardell et al. (2020) a binary variable on a negative impact on income from the pandemic was calculated (0 = *Income was not reduced*, 1 = *Income was reduced).*

Auxillery Variable

Alcohol Use Disorder. The Alcohol Use Disorders Identification Test (AUDIT; Saunders et al., 1993) is a 10-item questionnaire that to assess problematic levels of alcohol consumption and negative consequences of alcohol consumption (α = .84). Participants indicated the frequency of alcohol-derived problems and drinking levels (e.g., "How often do you have six or more drinks on one occasion?", " How often during the last year have you failed to do what was normally expected of you because of drinking?"; 0 = *Never/No*, 1 = *Daily/Yes*). The AUDIT is a highly utilized instrument in alcohol research and consistently is found to have high reliability and validity (Bradley et al., 1998).

Data Analysis

Overview

Data analysis for the study was conducted using MPlus (v. 7.4) and IBM SPSS. Two path analysis models were conducted to assess the relationship between the primary variables, identical in all but the dependent variable. At-risk personality factors (Time 1) were specified as predictors in the models, while Time 2 cognitive variables (e.g., perceived control, self-efficacy, boredom proneness) were specified as correlated mediators. Finally, in Model 1, Time 3 binge drinking was specified as the outcome variable, while in Model 2, Time 3 drinking problems was specified as the dependent variable. In order to control for pre-existing levels, mediators and outcome variables were controlled for using Time 1 values. Given their supported impact on alcohol use during the pandemic, depression, social connectedness, income change, living alone and living with a child under 18 were included as covariates on the dependent variable in each model (see Wardell et al., 2020). AUDIT scores were utilized as an auxillerary variable and to assess clinical cutoffs of the sample. Given the AUDIT effectively assesses the same outcomes (e.g., binge drinking and alcohol-related problems) as the dependent variables, it was not utilized as a covariate.

Model fit was considered good if the following criteria were met: a comparative fit index (CFI) $\geq$ .95, a root mean square error of approximation (RMSEA) $\leq$ .08, a standardized root mean square residual (SMSR) < .08, and a non-statistically significant model chi-square test (Hu & Bentler, 1999; Kline, 2010). Confidence intervals, rather than significance testing, was utilized to assess support for both path and indirect effects; if the confidence intervals do not contain zero, mediation effects were not considered supported (Fritz & MacKinnon, 2007; Lambdin, 2012). MPlus v. 7.4 (Muthen & Muthen, 2012) was utilized to examine the proposed

path models. Variables entered into the models were assessed for deviations from normality. The distribution of all model variables indicated values of acceptable skewness and kurtosis (i.e., < 1.91 and <3.03, respectively). The full information maximum likelihood estimator (FIML) was utilized to mitigate the impact of any uneveness in distributions.

Prior to analysis, data were assessed for non-normality, and all variables were found to have acceptable skewness and kurtosis. To mitigate the effects of outliers on the estimated model parameters, extreme outliers were recoded as discussed in Tabachnick and Fidell (2007). Outliers exceeding 3.29 standard deviations from the mean were recoded as 1 unit higher than the highest non-outlier value. As a result, Time 1 had three outliers recoded on the drinking problem variable and six outliers recoded on the AUDIT variable. Two outliers were recoded on each of the variables assessing binge drinking, perceived control of internal states, self-efficacy, and the impulsivity and hopeless personality trait variables at the initial time point. Two outliers on self-efficacy and perceived control were also recoded at Time 2 as well as eight outliers on the drinking problems variable at Time 3.

Results

Descriptive Statistics

Descriptive statistics for the study variables are presented in Table 1. Mean scores across personality traits of the SURPS indicate the sample had comparable levels of at-risk personality traits for a Canadian sample of adults (i.e., the current sample was not overly anxious or hopeless). Similarly, the cognitive variables of perceived control of internal states, generalized self-efficacy, and boredom proneness were within one standard deviation of scores reported by other adult samples in North America (Chen et al., 2001; Crawford et al., 2011; Struk et al., 2017). The mean score for the PHQ-9 was 7.7, suggesting that the sample had experienced mild

to moderate depression in the 30 days preceding the initial survey. Finally, the sample's scores on binge drinking, drinking problems, and AUDIT scales were subclinical (e.g., AUDIT < 8; Saunders et al., 1993) , indicating that, on average, problem drinking was not prevalent throughout the sample.

Bivariate correlations between all study variables are depicted in Table 3. As expected, most at-risk personality traits were positively correlated with drinking problems at Time 3 except sensation seeking. Similarly, as hypothesized, all SURPS personality traits, aside from anxiety sensitivity, were positively correlated with Time 3 binge drinking. Hopelessness and impulsivity traits were negatively correlated with perceived control and self-efficacy but positively correlated with boredom proneness. Anxiety sensitivity was positively correlated with boredom proneness and negatively with perceived control but was observed to have no significant correlation with self-efficacy. Sensation seeking was not supported to have any notable correlation with the proposed mediating cognitive variables. Finally, significant correlations were observed between the cognitive mediating variables with the dependent variables. Both perceived control and self-efficacy were negatively correlated with drinking problems and binge drinking. Boredom proneness was positively correlated with drinking problems but not binge drinking.

Next, as attrition is expected within longitudinal studies, a missing data analysis was conducted to determine the presence of attrition bias. Participants who completed all three time points were coded with as 1 on an attrition variable, while participants who failed to complete one or more follow-up surveys were coded with the value of 0 (completers n = 195, non-completers n = 106). Independent sample t-tests and chi-square tests of independence were conducted on demographic, psychosocial, and alcohol-related Time 1 variables (see Table 2).

The missing data analysis indicated that participants who dropped out of the study reported higher initial levels of binge drinking and drinking-related problems and reported more negative impacts on their income by the COVID-19 pandemic. As these variables were intended to be included in the model, their non-random effects on missingness would be accounted for in the analysis, given their function as auxiliary variables (Enders, 2010).

Mediation Models

Model 1: Binge Drinking. The path model assessing the paths from at-risk personalities to binge drinking as mediated by cognitive variables is depicted in Figure 1. This model fit the data well, χ^2 (31) = 54.30, p = 0.006, RMSEA = 0.055, CFI = 0.963, and SRMR = 0.027. As fit was deemed acceptable, no alteration to this model using modification indices was required. The model indicated that hopelessness significantly predicted both generalized self-efficacy and boredom proneness. No other significant direct or indirect paths involving the primary study variables were found in this model.

Model 2: Alcohol-Related Problems. The path model predicting the relationship between at-risk personality traits and alcohol-related problems mediated by cognitive processes is displayed in Figure 2. This model also fit the data well, χ^2 (31) = 44.30, p = 0.059, RMSEA = 0.042, CFI = 0.979, and SRMR = 0.026. As with the previous model, no modifications were necessary as the fit was deemed acceptable. Consistent with Model 1, Model 2 indicated that hopelessness significantly predicted generalized self-efficacy and boredom proneness. However, in this model, perceived control was supported to significantly negatively predict the dependent variable of drinking problems. As with Model 1, no significant indirect paths were found in Model 2 (see Table 3).

Discussion

The present study adds to the literature on the impact of COVID-19 using a longitudinal design by examining the pathways from at-risk personality traits, alcohol use and problems. Two pathway models were conducted with their structure informed by extant literature and prominent models and theory on at-risk personality, cognitive processes, and substance use. The cognitive variables were not supported to mediate the relationship between at-risk personality traits and alcohol use and outcomes.

Consistent with theory and extant research, at-risk personality traits mostly correlated with binge drinking and alcohol problems at Time 3 during the pandemic. Two exceptions were evident: anxiety sensitivity displayed no relationship to binge drinking, and sensation seeking was unrelated to alcohol problems. One possible explanation is that research has found that anxiety sensitivity's association with alcohol is inconsistent. Individuals high in this personaltiy trait are sensitive to adverse outcomes; they may abstain from alcohol consumption due to concerns that something terrible may happen to them (Keough et al., 2015; Keough et al., 2016). However, the lack of a relationship between sensation seeking and alcohol problems is unexpected. Research postulates four primary dimensions of sensation seeking with *disinhibition* the most predictive of alcohol use and problems as it is associated with reckless behaviour that would likely cause problems (Hittner & Swicket, 2006). One possible explanation for sensation seeking being related to binge drinking but not problems is that, for this sample, its possible the dimensions of *experience seeking* would have been the catalyst for binge levels of alcohol consumption which would be less likely to cause the alcohol-related problems the SIP2-R assesses.

The observed relationships between at-risk personality traits and the cognitive variables mainly corresponded to theory but notably contrasted the study's prediction that these protective

constructs would diminish due to the pandemic. However, both models did indicate that individuals with hopeless personality traits experienced reductions in self-efficacy and increases in boredom proneness. A reasonable interpretation of this would be that these individuals experienced an exacerbation of depression during social distancing protocols as hypothesized, given the World Health Organization has reported a 25% global increased prevalence of depression since the pandemic was declared (World Health Organization, 2022). While bivariate correlations between the traits of hopelessness, anxiety sensitivity, and impulsivity were consistent with the literature and predictions, sensation seeking again proved to be an anomaly. Despite *boredom susceptibility* being one of the dimensions of sensation seeking (Hittner & Swicket, 2006), no correlation was found between sensation seeking and boredom proneness. One possible explanation would be the item content in the SURPS questionnaire. A review sensation seeking items suggests they predominantly assess the dimensions of *thrill and adventure seeking*, *experiencing seeking*, and *disinhibition* but not *boredom susceptibility* (Hittner & Swicket, 2006). Therefore, it seems this dimension was not included in the final instrument contingent on the factor analysis of the original authors.

Only one direct path was observed in the path analysis models between the cognitive variables and the dependent variables. Perceived control of inner states was found to predict drinking problems negatively. In other words, as individuals increased their self perceptions of controlling their thoughts and emotions, alcohol-related problems reduced. However, when taking both models into full consideration, these results conclude that individuals with at-risk personality traits did not experience exacerbations in alcohol use or problems due to reductions in protective cognitive constructs.

The study's results add to the literature by examining potential pathways to alcohol misuse during the pandemic. As discussed, research has thus far focused on situational and demographic factors. While self-efficacy and perceived control have been supported as protective factors during the pandemic, this study's results indicate that their deterioration was not a pathway to misuse for at-risk personality traits. This is notable given that both theory and research on these personality traits, and what is known about the protective effects of the cognitive mediators during the COVID-19 lockdown, would have suggested otherwise. However, these findings are consistent with other recently published studies on similar cognitive constructs in other domains wherein agentic and self-control perceptions were not negatively impacted by the pandemic, contrary to the researchers' predictions (Talsma et al., 2021). While from a research point of view, these results are disappointing, given that they defy hypotheses and highlight a ray of hope for those of us who persisted through the pandemic.

Limitations and Future Directions

Two primary limitations impact the outcome of the present study. First, the mediating cognitive processes in the model were global cognitive constructs rather than alcohol context-specific. Literature examining agentic perceptions of alcohol consumption typically uses alcohol-related constructs such as Drink Refusal Self Efficacy (Oei et al., 2005). However, the choice was made during the initial study design to use a more global construct, Generalized Self-Efficacy, given that several substances and gaming were of interest at the time. Generalized self-efficacy is a more resilient construct than context-specific self-efficacy and comprised of agentic beliefs across several domains (Chen et al., 2001). As such, while efficacy beliefs were reduced in some domains, others remained intact, contributing to stable levels of the measured construct. Nonetheless, the findings are interesting as they suggest that global agentic perceptions were

resilient to deterioration – at least for the Canadian sample of Prolific workers utilized. Further, research has indicated that while general self-efficacy is prective of alcohol use in clinical samples, the domain specific drinking-refusal efficacy is predictive of alcohol consumption in non-clinical community samples (Oei et al., 2007). Therefore, had drinking refusal-efficacy been used rather than generalized self-efficacy, it is likely that more direct and indirect paths to and from the mediating efficacy construct would have been observed.

Second, and relatedly, the sample used in the study was subclinical, as indicated by PHQ-9 scores and AUDIT scores. While a portion of the sample exhibited mild-moderate depression, the sample also exhibited above-average income and employment levels. This suggests that more adaptive coping strategies and resilience were available to the sample reducing the likelihood that alcohol consumption was a utilized coping mechanism. However, these findings also highlight the importance that generally well-off and independently employed at-home workers were not driven to drinking by the stressors from the pandemic.

Finally, the results of this study highlight potential future directions for studies. First, future research in the area should be vigilant in using context-specific constructs to exhibit variance across short periods. Relatedly, it may be prudent for a future study to examine the SURPS scale in order to assess whether the dimensions in this instrument appropriately capture the properties of these dimensions as discussed in extant literature of the dimensions – especially that of sensation seeking. Similarly, conducting a similar study using context-specific cognitive variables in a clinical sample may help elucidate pathways from at-risk personality traits to substance-related outcomes.

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Table 1
Demographics

Province	n	%
Ontario	152	50.5
Quebec	30	10.0
British Columbia	41	13.6
Alberta	32	10.6
Manitoba	11	3.7
Saskatchewan	7	2.3
Nova Scotia	10	3.3
New Brunswick	6	2.0
Newfoundland and Labrador	9	3.0
Prince Edward Island	2	.7
Yukon	1	.3
Ethnicity		
East Asian, South-East Asian, Pacific Islander	39	13
Middle Eastern, North African, Central Asian	6	2
Hispanic, Latino	12	4
White	226	75.1
Black	14	4.7
Aboriginal	4	1.3
South Asian	13	4.3
Other	4	1.3
Student Status		
Non-student	228	75.7
Part-Time	29	9.6
Full-Time	44	14.6
Relationship Status		
Single	109	36.2
Live Seperately	28	9.3
Common-law / Married	164	54.5
Annual Household Income		
Less than $20,000	22	7.3
$20,000 - $39,999	40	13.3
$40,000 - $59,999	43	14.3
$60,000 - $79,999	42	14.0
$80,000 - $99,999	55	18.3
$100,000 - $149,999	64	21.3
$150,000 - $199,999	19	6.3
Over $200,000	14	4.7
Lives with a Child Under 18	51	16.9
Live Alone	37	12.3

Table 2
Missing Data Analysis

	Non-Completers		Completers				
	M	*SD*	*M*	*SD*	*t*	*χ2*	*p*
Age	31.05	10.08	32.96	9.37	-1.59		.111
Sex	1.4	2.36	1.5	2.25		2.83	.093
Province	2.56	2.36	2.67	2.25	-0.417		.677
Income	4.42	1.94	4.32	1.88	0.41		.682
Hopelessness	12.37	3.26	12.33	3.17	0.103		.918
Anxiety Sensitivity	12.95	2.63	12.67	2.72	0.867		.387
Impulsivity	10.72	2.67	9.96	2.55	2.42		.016
Sensation Seeking	15.29	3.73	14.54	3.53	1.73		.084
Perceived Control of Internal States	59.66	12.23	59.35	11.76	0.213		.831
Generalized Self Efficacy	30.61	4.92	30.65	4.5	-0.068		.946
Boredom Proneness	28.84	9.93	27.59	10.35	1.02		.311
Drinking Problems	4.5	5.92	2.97	4.36	2.42		.000
Binge Drinking	1.46	2.03	0.97		2.21		.013
Social Connectedness	80.61	16.08	78.58	17.84	0.975		.330
AUDIT	6.98	5.36	6.08	4.81	1.48		.141
PHQ-9	7.86	5.07	7.61	5.31	0.408		.684
Live with Child under 18	0.217	0.414	0.145	0.352		2.62	.105
Live Alone	0.113	0.318	0.128	0.335		0.143	.705
Income Change	0.547	0.5	0.339	0.474		15.6	.000

Table 3

Correlations and Descriptive Statistics

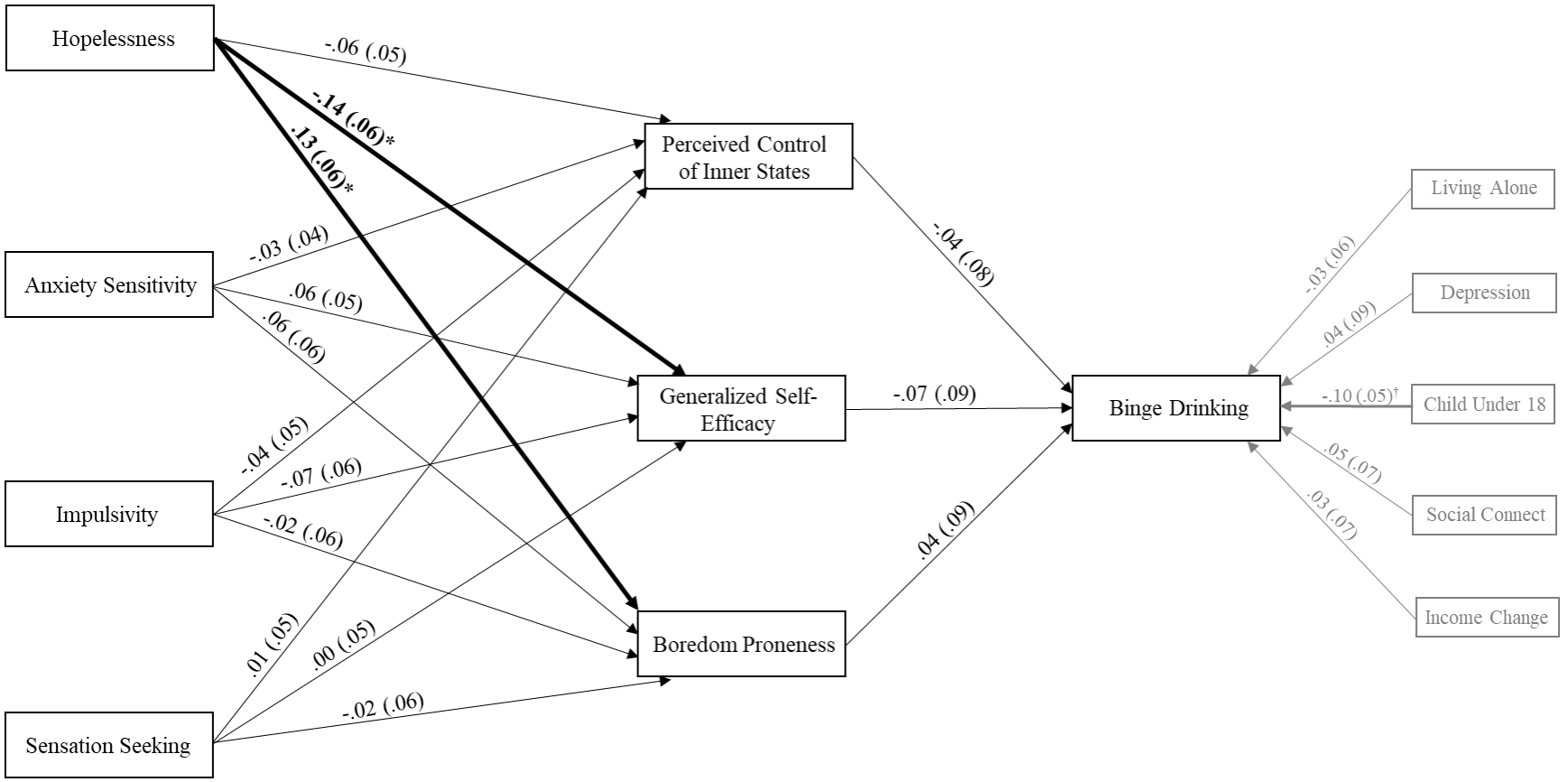
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	Hopelessness 1	-																			
2	Anxiety Sensitivity 1	.15**	-																		
3	Impulsivity 1	.22**	.27**	-																	
4	Sensation Seeking 1	-.06	-.11*	.24**	-																
5	Perceived Control 2	-.41**	-.33**	-.27**	.03	-															
6	Self-Efficacy 2	-.59**	-.08	-.22**	.00	.44**	-														
7	Boredom Proneness 2	.43**	.27**	.25**	.08	-.62**	-.44**	-													
8	Drinking Problems 3	.20**	.19*	.34**	.03	-.27**	-.22**	.20**	-												
9	Binge Drinking 3	.16*	.06	.31**	.19**	-.18*	-.22**	.14	.54**	-											
10	Social Connect 1	-.57**	-.20**	-.18**	.10	.40**	.44**	-.49**	-.13	-.11	-										
11	Child Under 18	-.09	.03	.11	.00	.21**	.10	-.14*	-.04	-.16*	.05	-									
12	Living Alone	.15*	.00	.05	-.04	-.11	-.18**	.10	-.03	.08	-.11	-.17**	-								
13	Income Change	-.04	.00	.04	-.04	.01	-.01	-.04	.07	.01	.04	.06	.05	-							
14	AUDIT 1	.11	.12*	.30**	.17**	-.21**	-.10	.14*	.59**	.61**	-.14*	-.02	-.05	.02	-						
15	Depression 1	.50**	.32**	.31**	.13*	-.49**	-.34**	.56**	.40**	.28**	-.40**	-.08	.06	.01	.26**	-					
16	Drinking Problems 1	.12*	.12*	.37**	.13*	-.18**	-.09	.21**	.64**	.58**	-.16**	.01	.00	-.04	.63**	.28**	-				
17	Binge Drinking 1	.11	.10	.28**	.14*	-.15*	-.11	.13*	.44**	.57**	-.13*	.05	.06	-.01	.58**	.22**	.55**	-			
18	Perceived Control 1	-.50**	-.41**	-.32**	.07	.78**	.36**	-.48**	-.27**	-.21**	.49**	.10	-.03	.01	-.24**	-.54**	-.24**	-.18**	-		
19	Self-Efficacy 1	-.68**	-.18**	-.17**	.09	.38**	.71**	-.34**	-.24**	-.14	.45**	.10	-.11	.02	-.13*	-.39**	-.13*	-.11	.48**	-	
20	Boredom Proneness 1	.48**	.34**	.40**	.14*	-.52**	-.42**	.69**	.28**	.36**	-.47**	-.06	.15*	-.01	.23**	.66**	.30**	.20**	-.53**	-.39**	-
	M	12.34	12.77	10.23	14.80	59.79	30.68	27.58	2.17	1.26	79.30	0.17	0.12	-1.57	6.40	7.70	3.48	1.14	59.46	30.64	28.00
	SD	3.20	2.69	2.61	3.61	12.03	4.72	10.93	4.52	1.90	17.24	0.38	0.33	13.93	5.02	5.23	4.98	1.86	11.91	4.64	10.20
	Range	16	15	14	18	66	25	45	20	7	81	1	1	1	21	27	20	7	64	25	48
	Minimum	6	5	5	6	24	15	8	0	0	37	0	0	0	1	0	0	0	25	15	8
	Maximum	22	20	19	24	90	40	53	20	7	118	1	1	1	22	27	20	7	89	40	56
	n	301	301	301	301	239	239	239	188	187	301	301	301	301	301	301	301	301	301	301	298

Table 4
Model Indirect Pathways

Model 1: Binge Drinking	Standardized Estimate	Confidence Intervals
Hopelessness → Perceived Control → Binge Drinking	0.002	[-0.008, 0.012]
Hopelessness → Self-Efficacy → Binge Drinking	0.009	[-0.014, 0.032]
Hopelessness → Boredom Proneness → Binge Drinking	0.005	[-0.018, 0.027]
Anxiety Sensitivity → Perceived Control → Binge Drinking	0.001	[-0.005, 0.007]
Anxiety Sensitivity → Self-Efficacy → Binge Drinking	-0.004	[-0.015, 0.007]
Anxiety Sensitivity → Boredom Proneness → Binge Drinking	0.002	[-0.009, 0.014]
Impulsivity → Perceived Control → Binge Drinking	0.001	[-0.014, 0.022]
Impulsivity → Self-Efficacy → Binge Drinking	0.005	[-0.006, 0.009]
Impulsivity → Boredom Proneness → Binge Drinking	-0.001	[-0.009, 0.018]
Sensation Seeking → Perceived Control → Binge Drinking	0	[-0.004, 0.003]
Sensation Seeking → Self-Efficacy → Binge Drinking	0	[-0.006, 0.007]
Sensation Seeking → Boredom Proneness → Binge Drinking	-0.001	[-0.006, 0.005]
Model 2: Drinking Problems		
Hopelessness → Perceived Control → Drinking Problems	0.015	[-0.012, 0.042]
Hopelessness → Self-Efficacy → Drinking Problems	0.009	[-0.019, 0.038]
Hopelessness → Boredom Proneness → Drinking Problems	-0.027	[-0.065, 0.011]
Anxiety Sensitivity → Perceived Control → Drinking Problems	0.012	[-0.018, 0.042]
Anxiety Sensitivity → Self-Efficacy → Drinking Problems	-0.003	[-0.016, 0.009]
Anxiety Sensitivity → Boredom Proneness → Drinking Problems	-0.017	[-0.049, 0.015]
Impulsivity → Perceived Control → Drinking Problems	0.008	[-0.014, 0.022]
Impulsivity → Self-Efficacy → Drinking Problems	0.005	[-0.022, 0.038]
Impulsivity → Boredom Proneness → Drinking Problems	0.005	[-0.012, 0.021]
Sensation Seeking → Perceived Control → Drinking Problems	-0.002	[-0.023, 0.019]
Sensation Seeking → Self-Efficacy → Drinking Problems	0.001	[-0.006, 0.008]
Sensation Seeking → Boredom Proneness → Drinking Problems	0.002	[-0.018, 0.022]

F igure 1

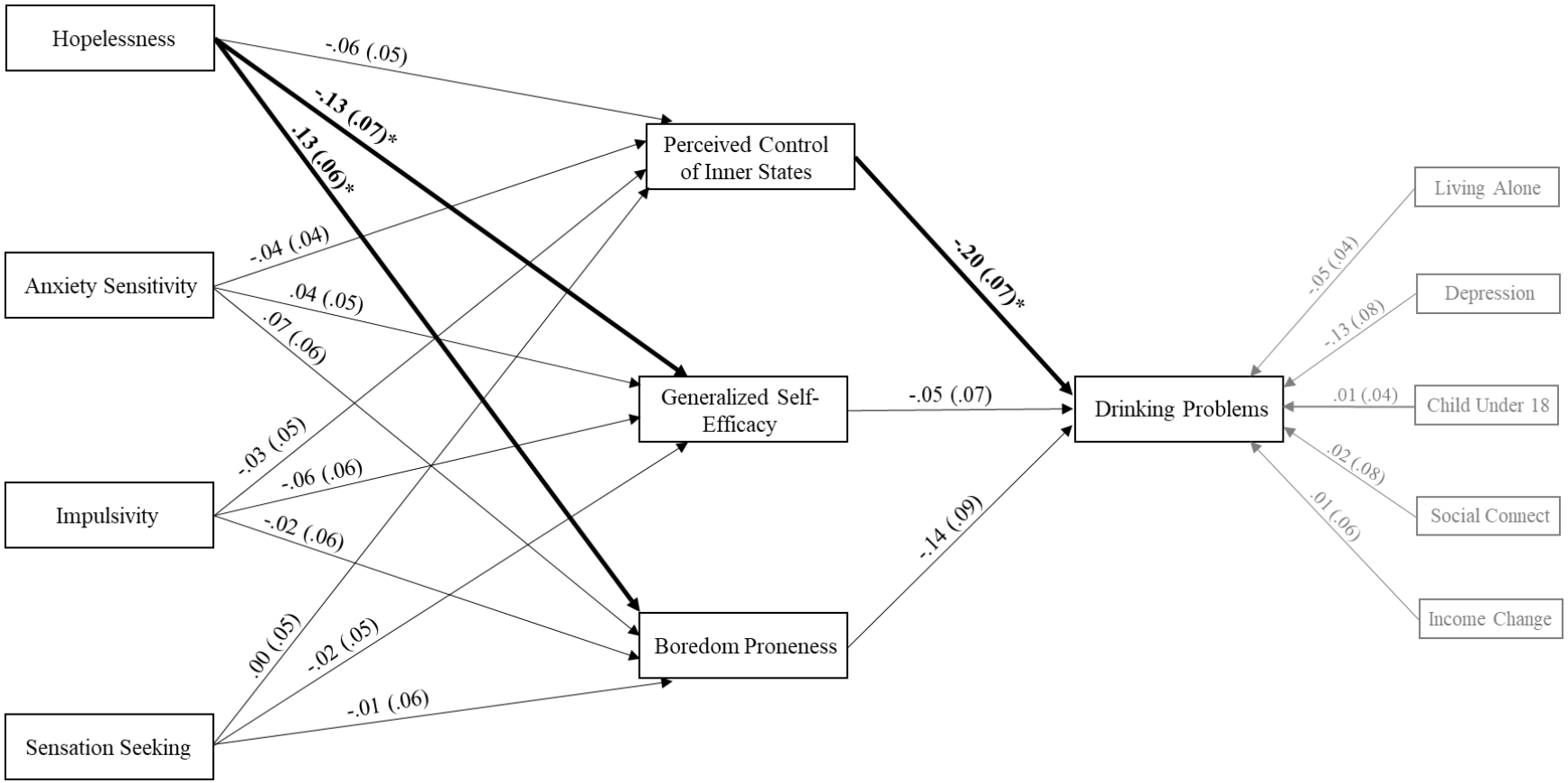
Path model from at-risk personality traits to binge drinking via cognitive variables



Note: Hypothesized paths are depicted with solid arrows while bolded arrows indicate paths that were found to be statistically significant. Values represent standardized estimates, while the standard errors are in parentheses. Gray boxes on the right of the figure depict the paths from covariates to the dependent variable. †p < 0.10, *p < 0.05, **p < 0.001

Figure 2

Path model from at-risk personality traits to drinking problems via cognitive variables



Note: Hypothesized paths are depicted with solid arrows while bolded arrows indicate paths that were found to be statistically significant. Values represent standardized estimates, while the standard errors are in parentheses. Gray boxes on the right of the figure depict the paths from covariates to the dependent variable. †$p < 0.10$, *$p < 0.05$, **$p < 0.001$

Appendix A: Time 1 Prolific Informed Consent

Date:

Study Name: Examining the Impact of COVID-19 on Addictive Behaviours and Well-Being

Researchers:

1. Dr. Matthew Keough – Principal Investigator. York University, Department of Psychology, Faculty of Health. 4700 Keele St., North York, Ontario, M3J 1P3. Email: keoughmt@yorku.ca
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5. Elena Bilvicius - Co-Investigator. University of Manitoba, Department of Psychology, Faculty of Arts. P404 Duff Roblin Building, 190 Dysart Road, Winnipeg, Manitoba, R3T 2N2. Email: bilevice@myumanitoba.ca
6. Alanna Single - Co-Investigator. University of Manitoba, Department of Psychology, Faculty of Arts. P404 Duff Roblin Building, 190 Dysart Road, Winnipeg, Manitoba, R3T 2N2. Email: single@myumanitoba.ca
7. Lindsey McCullough – Co-Investigator. University of Victoria, Faculty of Social Sciences. Business & Economics Bldg 4th Floor, Reception Room 456, 3800 Finnerty Road, Victoria, British Columbia, V8P 5C2.
8. Natasha-Baptists-Mohensi, Principal Investigator. York University, Department of Psychology, Faculty of Health. 4700 Keele St., North York, Ontario, M3J 1P3.
9. Lana Vedelago, Co-Investigator. York University, Department of Psychology, Faculty of Health. 4700 Keele St., North York, Ontario, M3J 1P3.
10. Emma Ritchie, Co-Investigator. York University, Department of Psychology, Faculty of Health. 4700 Keele St., North York, Ontario, M3J 1P3.

Purpose of the Research:
The primary purpose of this research is to better understand how the COVID-19 pandemic is affecting your life, mood, well-being, and addictive behaviours including alcohol and cannabis use, gaming, and other substances. Whether you choose to participate or not is entirely your decision.

Should you choose to participate, there will be three time-points of the study (now, and in three months from now, and six months from now). You will be asked during the survey if you wish to be contact for the second and third surveys.

This initial survey should take approximately 60 minutes and you will receive $13.06 CAD (£7.50) for your participation. For this survey you will have up to 140 minutes to complete the measures as this is the maximum allotted time Prolific allows. The follow-up surveys distributed three and six months from now will take 30 minutes each and you will receive $6.53 CAD (£3.75) for completing each of those, with an additional bonus of $5.00 CAD (£2.86) for completing all three time points. There are attention check items throughout the surveys. Should you exceed the time allotted or fail 80% of the attention check items, you will be asked to complete the survey again or payment may be withheld through Prolific. Any questions or difficulties in completion of the surveys should be directed to the 1st co-investigator at kempet@myumanitoba.ca .

What You Will be Asked to Do in the Research:
At each time-point you will be asked to fill out several surveys related to COVID-19's impact on your life, behaviour, personality, and involvement in various addictive behaviours (e.g., cannabis, alcohol, illegal drugs, videogames, etc.). You will be also asked to complete a number of questions related to your demographic information.

Risks and Discomforts:
As with any study, there are risks with this research. The study contains surveys which ask about COVID-19's impact on you and your daily-functioning, employment, thoughts, emotions, across a variety of situations. Some participants may find thinking about these situations leads to experiencing discomfort or stress. Other surveys ask about levels of

use of certain substances. Reflecting on levels of substance or behavioural addiction use may cause participants to conclude that their usage of these substances is problematic. Additionally, use of some drugs is still illegal in Canada. You may choose not to answer questions if you are uncomfortable giving information about illegal drug use.

If at any time you become concerned with your thoughts or behaviours about substance use, gaming behaviour, or well-being, please seek help. Here are some resources to get you started:
An online treatment program:
https://lastdoor.org/treatment/biopsychosocial-supports/

Resources for Canadian provinces:
https://www.canada.ca/en/health-canada/services/substance-use/get-help/get-help-problematic-substance-use.html

Benefits of the Research and Benefits to You:
By participating in this survey, your responses may provide important information on how the COVID-19 pandemic is affecting individuals. This information may be used to help mitigate unforeseen consequences of social distancing protocols in the future. Further, as you complete the survey measures you may enjoy learning about yourself. The survey measures may make you more aware of your patterns of substance use and gaming behaviours.

Voluntary Participation and Withdrawal:
Your participation in the study is completely voluntary and you may choose to stop participating at any time. Your decision not to volunteer, to stop participating, or to refuse to answer particular questions will not influence the nature of your relationship with York University either now, or in the future. If you stop participating, you will still be eligible to receive the promised pay/compensation for agreeing to be in the project. In the event you withdraw from the study, all associated data collected will be immediately destroyed wherever possible.

Confidentiality: All information you supply during the research will be held in confidence and unless you specifically indicate your consent, your name will not appear in any report or publication of the research. Responses provided by the participants are collected via Qualtrics™. Your Prolific ID will be used to connect responses from the first, second, third, and fourth surveys. Your data will be safely stored in a locked facility on password-protected computers at York University and only research staff/research team members will have access to this information. Your responses from this study will be kept indefinitely, but your Prolific ID will be deleted after the fourth timepoint completion. Confidentiality will be provided to the fullest extent possible by law.

The data collected in this research project may be used – in an anonymized form - by members of the research team in subsequent research investigations exploring similar lines of inquiry. Such projects will still undergo ethics review by the HPRC, our institutional REB. Any secondary use of anonymized data by the research team will be treated with the same degree of confidentiality and anonymity as in the original research project.

The researcher(s) acknowledge that the host of the online survey (e.g., Qualtrics, Survey Monkey etc.) may automatically collect participant data without their knowledge (i.e., IP addresses.) Although this information may be provided or made accessible to the researchers, it will not be used or saved without participant's consent on the researcher's system. Further, because this project employs e-based collection techniques, data may be subject to access by third parties as a result of various security legislation now in place in many countries and thus the confidentiality and privacy of data cannot be guaranteed during web-based transmission.

Questions About the Research? If you have questions about the research in general or about your role in the study, please feel free to contact Dr. Matthew Keough either by telephone at (416) 736-2100 Ext. 33415 or by e-mail (keoughmt@yorku.ca). This research has received ethics review and approval by the Human Participants Review Sub-Committee, York University's Ethics Review Board and conforms to the standards of the Canadian Tri-Council Research Ethics guidelines. If you have any questions about this process, or about your rights as a participant in the study, please contact the Sr. Manager & Policy Advisor for the Office of Research Ethics, 5th Floor, Kaneff Tower, York University (telephone 416-736-5914 or e-mail ore@yorku.ca).

Legal Rights and Signatures:

I consent to participate in Examining the Impact of COVID-19 on Addictive Behaviours and Well-Being conducted by Dr. Matthew Keough. I have understood the nature of this project and wish to participate. I am not waiving any of my legal rights by signing this form. My signature below indicates my consent.

Agree_____
Disagree_____

Appendix B: Time 2 Prolific Informed Consent

Date:

Study Name: Examining the Impact of COVID-19 on Addictive Behaviours and Well-Being, Time 2

Researchers:

1. Dr. Matthew Keough – Principal Investigator. York University, Department of Psychology, Faculty of Health. 4700 Keele St., North York, Ontario, M3J 1P3. Email: keoughmt@yorku.ca
2. Tyler Kempe – Co-Investigator. University of Manitoba, Department of Psychology, Faculty of Arts. P404 Duff Roblin Building, 190 Dysart Road, Winnipeg, Manitoba, R3T 2N2. Email: kempet@myumanitoba.ca
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4. Alanna Single - Co-Investigator. University of Manitoba, Department of Psychology, Faculty of Arts. P404 Duff Roblin Building, 190 Dysart Road, Winnipeg, Manitoba, R3T 2N2. Email: single@myumanitoba.ca
5. Lindsey McCullough – Co-Investigator. University of Victoria, Faculty of Social Sciences. Business & Economics Bldg 4th Floor, Reception Room 456, 3800 Finnerty Road, Victoria, British Columbia, V8P 5C2.
6. Natasha-Baptists-Mohensi, Principal Investigator. York University, Department of Psychology, Faculty of Health. 4700 Keele St., North York, Ontario, M3J 1P3.
7. Lana Vedelago, Co-Investigator. York University, Department of Psychology, Faculty of Health. 4700 Keele St., North York, Ontario, M3J 1P3.
8. Emma Ritchie, Co-Investigator. York University, Department of Psychology, Faculty of Health. 4700 Keele St., North York, Ontario, M3J 1P3.

Purpose of the Research:
You are receiving this consent form for time 2, as you have completed the first time-point of this study. As a reminder, the primary purpose of this research is to better understand how the COVID-19 pandemic is affecting your life, mood, well-being, and addictive behaviours including alcohol and cannabis use, gaming, and other substances. Whether you choose to participate or not is entirely your decision.

This time 2 survey should take approximately 30 minutes and you will receive $6.53 CAD (£3.75) for your participation. For this survey you will have up to 70 minutes to complete the measures as this is the maximum allotted time Prolific allows. As a reminder, there is one more study (time 3) in 3 months from now. If you complete all three study time-points, you will receive an additional bonus of $5.00 CAD (£2.86). There are attention check items throughout the surveys. Should you exceed the time allotted or fail 80% of the attention check items, you will be asked to complete the survey again or payment may be withheld through Prolific. Any questions or difficulties in completion of the surveys should be directed to the 1st co-investigator at kempet@myumanitoba.ca .

What You Will be Asked to Do in the Research:
Should you participate in this time 2 study, you will be asked to fill out several surveys related to COVID-19's impact on your life, behaviour, personality, and involvement in various addictive behaviours (e.g., cannabis, alcohol, illegal drugs, videogames, etc.). You will be also asked to complete a number of questions related to your demographic information.

Risks and Discomforts:
As with any study, there are risks with this research. The study contains surveys which ask about COVID-19's impact on you and your daily-functioning, employment, thoughts, emotions, across a variety of situations. Some participants may find thinking about these situations leads to experiencing discomfort or stress. Other surveys ask about levels of use of certain substances. Reflecting on levels of substance or behavioural addiction use may cause participants to

conclude that their usage of these substances is problematic. Additionally, use of some drugs is still illegal in Canada. You may choose not to answer questions if you are uncomfortable giving information about illegal drug use.

If at any time you become concerned with your thoughts or behaviours about substance use, gaming behaviour, or well-being, please seek help. Here are some resources to get you started:

An online treatment program:
https://lastdoor.org/treatment/biopsychosocial-supports/

Resources for Canadian provinces:
https://www.canada.ca/en/health-canada/services/substance-use/get-help/get-help-problematic-substance-use.html

Benefits of the Research and Benefits to You:
By participating in this survey, your responses may provide important information on how the COVID-19 pandemic is affecting individuals. This information may be used to help mitigate unforeseen consequences of social distancing protocols in the future. Further, as you complete the survey measures you may enjoy learning about yourself. The survey measures may make you more aware of your patterns of substance use and gaming behaviours.

Voluntary Participation and Withdrawal:
Your participation in the study is completely voluntary and you may choose to stop participating at any time. Your decision not to volunteer, to stop participating, or to refuse to answer particular questions will not influence the nature of your relationship with York University either now, or in the future. If you stop participating, you will still be eligible to receive the promised pay/compensation for agreeing to be in the project. In the event you withdraw from the study, all associated data collected will be immediately destroyed wherever possible.

Confidentiality: All information you supply during the research will be held in confidence and unless you specifically indicate your consent, your name will not appear in any report or publication of the research. Responses provided by the participants are collected via Qualtrics™. Your Prolific ID will be used to connect responses from the first, second, third, and fourth surveys. Your data will be safely stored in a locked facility on password-protected computers at York University and only research staff/research team members will have access to this information. Your responses from this study will be kept indefinitely, but your Prolific ID will be deleted after the fourth timepoint completion. Confidentiality will be provided to the fullest extent possible by law.

The data collected in this research project may be used – in an anonymized form - by members of the research team in subsequent research investigations exploring similar lines of inquiry. Such projects will still undergo ethics review by the HPRC, our institutional REB. Any secondary use of anonymized data by the research team will be treated with the same degree of confidentiality and anonymity as in the original research project.

The researcher(s) acknowledge that the host of the online survey (e.g., Qualtrics, Survey Monkey etc.) may automatically collect participant data without their knowledge (i.e., IP addresses.) Although this information may be provided or made accessible to the researchers, it will not be used or saved without participant's consent on the researcher's system. Further, because this project employs e-based collection techniques, data may be subject to access by third parties as a result of various security legislation now in place in many countries and thus the confidentiality and privacy of data cannot be guaranteed during web-based transmission.

Questions About the Research? If you have questions about the research in general or about your role in the study, please feel free to contact Dr. Matthew Keough either by telephone at (416) 736-2100 Ext. 33415 or by e-mail (keoughmt@yorku.ca). This research has received ethics review and approval by the Human Participants Review Sub-Committee, York University's Ethics Review Board and conforms to the standards of the Canadian Tri-Council Research Ethics guidelines. If you have any questions about this process, or about your rights as a participant in the study, please contact the Sr. Manager & Policy Advisor for the Office of Research Ethics, 5th Floor, Kaneff Tower, York University (telephone 416-736-5914 or e-mail ore@yorku.ca).

Legal Rights and Signatures:

I consent to participate in Examining the Impact of COVID-19 on Addictive Behaviours and Well-Being conducted by Dr. Matthew Keough. I have understood the nature of this project and wish to participate. I am not waiving any of my legal rights by signing this form. My signature below indicates my consent.

Agree_____
Disagree_____

Appendix C: Time 3 Prolific Informed Consent

Date:

Study Name: Examining the Impact of COVID-19 on Addictive Behaviours and Well-Being, Time 3

Researchers:

1. Dr. Matthew Keough – Principal Investigator. York University, Department of Psychology, Faculty of Health. 4700 Keele St., North York, Ontario, M3J 1P3. Email: keoughmt@yorku.ca
2. Tyler Kempe – Co-Investigator. University of Manitoba, Department of Psychology, Faculty of Arts. P404 Duff Roblin Building, 190 Dysart Road, Winnipeg, Manitoba, R3T 2N2. Email: kempet@myumanitoba.ca
3. Jeffrey Wardell - Co-Investigator. University of Toronto, Centre for Addiction & Mental Health, Institute for Mental Health Policy Research. 33 Russell St., 3rd Floor, Toronto, ON, M5S 2S. Email: Jeffrey.Wardell@utoronto.ca
4. Karli Rapinda – Co-Investigator. University of Manitoba, Department of Psychology, Faculty of Arts. P404 Duff Roblin Building, 190 Dysart Road, Winnipeg, Manitoba, R3T 2N2. Email: rapindak@myumanitoba.ca
1. Elena Bilvicius - Co-Investigator. University of Manitoba, Department of Psychology, Faculty of Arts. P404 Duff Roblin Building, 190 Dysart Road, Winnipeg, Manitoba, R3T 2N2. Email: bilevice@myumanitoba.ca
2. Alanna Single - Co-Investigator. University of Manitoba, Department of Psychology, Faculty of Arts. P404 Duff Roblin Building, 190 Dysart Road, Winnipeg, Manitoba, R3T 2N2. Email: single@myumanitoba.ca
3. Lindsey McCullough – Co-Investigator. University of Victoria, Faculty of Social Sciences. Business & Economics Bldg 4th Floor, Reception Room 456, 3800 Finnerty Road, Victoria, British Columbia, V8P 5C2.
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6. Emma Ritchie, Co-Investigator. York University, Department of Psychology, Faculty of Health. 4700 Keele St., North York, Ontario, M3J 1P3

Purpose of the Research:

You are receiving this consent form for time 3, as you have completed the first and second time-points of this study. As a reminder, the primary purpose of this research is to better understand how the COVID-19 pandemic is affecting your life, mood, well-being, and addictive behaviours including alcohol and cannabis use, gaming, and other substances. Whether you choose to participate or not is entirely your decision.

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The data collected in this research project may be used – in an anonymized form - by members of the research team in subsequent research investigations exploring similar lines of inquiry. Such projects will still undergo ethics review by the HPRC, our institutional REB. Any secondary use of anonymized data by the research team will be treated with the same degree of confidentiality and anonymity as in the original research project.

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Agree _____

Disagree____