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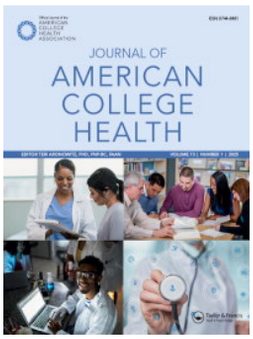

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Young adult drinking during the COVID-19 pandemic: Examining the role of anxiety sensitivity, perceived stress, and drinking motives

Charlotte Corran, MA[a], Paul Norman, PhD[b] and Roisin M. O'Connor, PhD[a]

[a]Department of Psychology, Concordia University, Montreal, Canada; [b]School of Psychology, University of Sheffield, Sheffield, UK

ABSTRACT

Studies have shown that those high in anxiety were at increased risk for alcohol use during the COVID-19 pandemic. Tension reduction theory points to anxiety sensitivity (AS) as a potential risk factor. Drinking to cope may further increase this risk. During the pandemic, those high in AS may have experienced increased stress and drank to cope, which may have put them at risk for misusing alcohol. **Objective:** The current study tested the association between AS and alcohol outcomes, mediated by perceived stress and drinking motives, among young adults during the COVID-19 pandemic. **Participants and Methods:** Young adults ($N = 143$) self-reported on AS, perceived stress, drinking motives, and alcohol outcomes (i.e., use and problems). **Results:** A mediation analysis revealed that AS positively predicted alcohol problems, *via* coping motives, and positively predicted alcohol use, *via* perceived stress and enhancement/sociability motives. **Conclusion:** These results confirm AS-risk for young adult alcohol use during the pandemic and highlight perceived stress and drinking motives as mechanisms of risk.

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anxiety sensitivity; perceived stress; drinking motives; alcohol use; young adults

Introduction

The start of the COVID-19 pandemic in December 2019 led to abrupt and significant changes across the world.[1,2] Public health measures aimed at curbing the spread of the virus (e.g., stay-at-home orders) led to financial and social hardship for everyone, regardless of age. However, young adults were particularly impacted by the restrictions, given their unique financial and social situations.[3–5] Indeed, young adults often have student loan debt, a lack of investments, and unsecure or entry level jobs.[6–8] Moreover, social restrictions were especially challenging for young adults, given the importance of peer relationships in this demographic.[9,10] The public health emergency unfolded rapidly and posed a significant threat to young adults' mental health.[11] Empirical data revealed elevated distress, anxiety, and depression, particularly among young adults.[11,12] Additionally, the social isolation limited available coping strategies, such as seeking social support or engaging in recreational activities.[13,14]

Beyond impacts on mental health and wellbeing, several reports suggest that the COVID-19 pandemic had an impact on young adult *alcohol use and related problems*.[11,15] Pre-pandemic, it was widely accepted that alcohol consumption was at its highest during young adulthood[16] and heavy consumption in this age group was linked to a range of alcohol related problems and outcomes (e.g., poor academic performance, risky sexual encounters, physical injury, and the development of alcohol use disorder).[17–19] However, research on young adult alcohol consumption during the pandemic has produced mixed results, with some studies showing increased alcohol use and related problems among this demographic during the pandemic,[20] but others showing reductions in alcohol use.[21] Thus, perhaps only certain groups of young adults are at risk for increased alcohol use during the pandemic. The aim of this study was to identify some of the risk factors for alcohol use, and related-problems, among young adults during the COVID-19 pandemic. Findings may also be relevant to the anxiety/stress and alcohol literature outside of the pandemic context and add to or solidify what is already known about alcohol use etiology in young adults.

Anxiety sensitivity and drinking motives

Pre-pandemic, anxiety has been linked with alcohol misuse among young adults[22,23] and anxiety disorders and alcohol use disorders have been shown to be highly comorbid.[24] The high comorbidity rates suggest a transdiagnostic factor of anxiety disorders that links them with alcohol use disorders. One such transdiagnostic factor is *anxiety sensitivity* (AS), which empirical research has shown links anxiety to alcohol misuse.[25] AS is characterized as the fear of experiencing anxious symptoms and the belief that they will lead to negative physical (e.g., heart attack), social (e.g., humiliation), and cognitive (e.g., insanity) consequences.[26] Tension reduction

CONTACT Roisin M. O'Connor Roisin.OConnor@Concordia.ca Department of Psychology, Concordia University, Montreal, Quebec, Canada.

theory[27] suggests that those high in AS drink to reduce tension and symptoms of social/emotional distress. Previous research indicates that those high in AS are more likely to drink to cope,[28–31] and that drinking to cope predicts alcohol misuse, including the development of alcohol use disorder.[31,32] Similarly, AS has been positively associated with sociability motives[33] and both enhancement and sociability motives has been found to mediate the association between AS and alcohol use.[34,35] Thus, *both* coping *and* enhancement/sociability drinking motives have been consistently linked to a number of measures of alcohol consumption, including risky use and related consequences.[29,36–39] This is problematic given that coping and enhancement/sociability drinking motives have been consistently identified as the riskier motives.[37,40]

AS-risk has been linked to drinking to cope and alcohol misuse during the COVID-19 pandemic (for a review see Zvolensky et al., 2022)[41] and during other outbreaks/pandemics (for a review see McKay & Asmundson, 2020).[42] Recent data suggest that high AS in the context of the COVID-19 pandemic leads to drinking to cope and, in turn, risk for alcohol use. For example, one study found that AS positively predicted alcohol use, mediated by drinking to cope, in a sample of high school students,[43] and another found that AS positively predicted drinking to cope among young adults during the COVID-19 pandemic, mediated by internalizing symptoms (anxiety, depression, COVID-19 distress).[44] However, previous studies have only focused on alcohol use, and not problems; thus, testing subsequent risk for alcohol problems would build on this work. Moreover, the effects of positively reinforced drinking motives (i.e., sociability, enhancement) have not been tested during the COVID-19 pandemic. Yet, social enhancement motives have been linked to increased solitary drinking during the COVID-19 pandemic,[45] which is a known risk factor for alcohol misuse and problems (for a review see Skrzynski & Creswell, 2021).[46]

Perceived stress

Individuals high in AS are known to have a predisposition for hypervigilance and fearing and/or overinterpreting symptoms of anxiety, and may therefore be particularly sensitized or primed to stress in their environment. There are a plethora of stressors inherent to the pandemic, including health, occupational, academic, financial, and social stressors.[47] As such, *perceptions of stress* – or one's thoughts pertaining to the amount and characteristics (e.g., predictability, controllability) of stressors experienced[48] – may help further explain how AS leads to drinking to cope and, in turn, increased alcohol use and problems during the COVID-19 pandemic. Indeed, recent work has shown that high levels of AS were related to increased perceived stress and anxious arousal during the COVID-19 pandemic.[49] Moreover, stress has been found to be a major contributing factor to increased drinking during the pandemic in order to cope with social and financial stressors.[50] Given that those high in AS are especially sensitive to anxious thoughts and sensations, added stress in the pandemic context may exacerbate symptoms. Thus, *perceived stress* may be a cognitive mechanism that helps explain AS-risk for drinking to cope with negative/increase positive affect among young adults during the pandemic.

Current study

The aim of the current study was to test the effect of AS on alcohol use and problems *via* its influence on perceived stress and drinking motives (i.e., drinking to cope, for enhancement/sociability) among young adults during the COVID-19 pandemic. We hypothesized that high AS would lead to elevated alcohol use and problems, and that perceived stress and affective drinking motives (coping, enhancement/sociability) would mediate this pathway (see Figure 1). Findings from this study could also add to the broader, non-pandemic, literature on these variables.

Material and methods

Participants

Data were collected between May 2020 and April 2021. Participants ($N = 143$, $M_{age} = 21.86$ $SD_{age} = 2.375$) were young adults recruited from local Montreal universities and by snowball method (e.g., *via* advertisements shared on social media). Inclusion criteria required participants to be 18-to-29 years old (i.e., young adults above the legal drinking age in the study's host Canadian province) and fluent in English. Of the total sample, 121 (84.6%) participants identified as women, 17 (11.9%) as men, three (2.1%) as gender fluid/bigender/2-spirit, and two (1.4%) as "unsure." Ninety-three (65%) identified as White, 18 (12.6%) as Asian, 14 (9.8%) as Arab, six (4.2%) as Black, six (4.2%) as multiracial, five (3.5%) as Latin American, and one as Indigenous (0.7%).

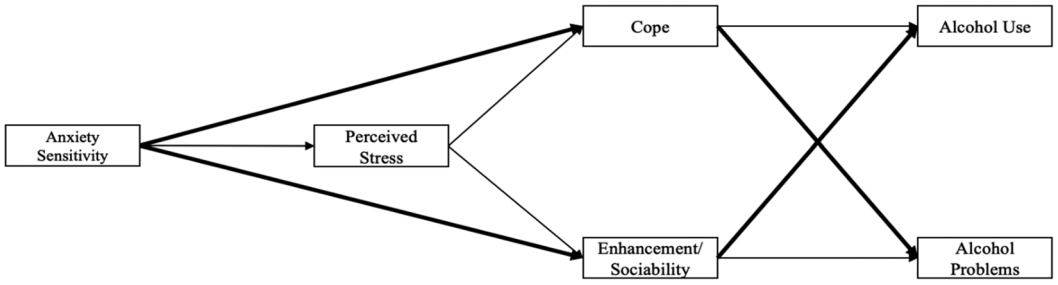

Figure 1. Hypothesized partial mediation model for alcohol use and problems regressed on drinking to cope and for enhancement/sociability motives, perceived stress, and anxiety sensitivity. Paths statistically supported by 95% CI are bolded.

Procedure

Participants accessed the online study *via* a university-based Participant Pool website or directly *via* a link on our advertisements. Participants gave informed consent and completed self-report questionnaires, which took approximately 35 min. At study completion, participants were provided with a list of mental health resources and those in the Participant Pool were compensated with course credit, while community members were entered into a $50 draw. This study was approved by the research ethics committee of the last author's institution prior to data collection (certificate # 30013024).

Measures

The *Anxiety Sensitivity Index* (ASI)[51] is a 16-item self-report questionnaire assessing sensitivity to anxious symptoms and fear of negative consequences (e.g., "It scares me when I feel faint"). Participants rated items on a five-point scale (0 = not at all to 4 = very much). A composite mean score was derived. The ASI has shown adequate internal consistency (α = .86-.88)[52] and retest reliability (r = .71-.75).[52] In the current study, the ASI demonstrated excellent scale score reliability (see Table 1).

The *Perceived Stress Scale-4* (PPS-4)[48] is a four-item self-report questionnaire assessing subjective stress (e.g., "In the last month, how often have you felt that things were going your way"). Items were rated on a five-point scale (0 = never to 4 = very often). A sum score was derived. The PPS-4 has demonstrated good reliability and convergent validity, and adequate internal reliability and validity.[48,53] In the current study, the PPS-4 demonstrated acceptable scale score reliability (see Table 1).

The *Modified Drinking Motives Questionnaire-Revised* (MDMQ-R)[54] was adapted for the current study to capture COVID-19-specific drinking motives. The MDMQ-R is a 28-item measure of drinking motives in undergraduates that comprises five subscales: coping-anxiety (e.g., "You drink because it helps you when you feel nervous"), coping-depression (e.g., "You drink because it helps you when you feel depressed"), enhancement (e.g., "You drink because you like the feeling"), sociability (e.g., "You drink to be sociable") and conformity (e.g., "You drink to fit in with a group you like"). The measure was modified to fit the context of the COVID-19 pandemic to ensure that we captured motives relevant to alcohol use during this unique period. This was achieved through a consultation process that involved a series of three focus groups with undergraduate and graduate students in our research lab (roughly 4-5 undergraduate and 3-4 graduate students per focus group). Using an iterative approach comprising two cycles, focus group members were asked to review all MDMQ-R items and identify those that were *not relevant* to the COVID-19 pandemic. They were also asked to seek feedback from friends and family in the community who were within the targeted age range (18-29 years). Focus group members were also invited to generate *new items* that better reflected reasons for drinking during the pandemic, which were then reviewed by a group of lab members. Altogether, items that were unanimously identified as irrelevant were removed, and votes were cast on items with mixed feedback and the proposed items to be added.

Through this consultation process, 15 items were removed from the MDMQ-R as they were deemed irrelevant to the pandemic context. Specifically, one item was removed from the coping-anxiety subscale ("You drink because you feel more self-confident and sure of yourself"), two items were removed from the coping-depression subscale (e.g., "You drink to forget painful memories"), three items were removed from the enhancement subscale (e.g., "You drink because it's fun"), four items were removed from the sociability subscale (e.g., "You drink because it helps you enjoy a party"), and all five items were removed from the conformity subscale (e.g., "You drink so you won't feel left out"). In addition, three items were added: [You drink] "because you are lonely," "because it is difficult to distinguish weekdays from weekends," and "because there is no structure to the days." Thus, the final scale used in the current study consisted of 16 items comprising 10 coping items, two enhancement items, one sociability item, and three COVID-19-specific items. For each item, participants were asked to indicate on a 5-point scale (1 = almost never/never to 5 = almost always/always) how often their drinking in a typical week during the COVID-19 pandemic (i.e., since March, 2020) was motivated by that reason. Exploratory factor analyses, reported below, resulted in two drinking motives subscales: Coping and Enhancement/Sociability. Both subscales demonstrated excellent scale score reliability (see Table 1).

The *Alcohol Use Questionnaire* (AUQ)[55,56] was adapted for the current study to assess alcohol use since the start of the COVID-19 pandemic (i.e., since March 2020). Participants were asked to self-report the number of drinks they consume during a typical week since the start of the pandemic. A composite score summing the quantity of drinks consumed on

Table 1. Descriptive statistics and correlations for hypothesized model variables.

Variable	M	*SD*	Skew	Kurt	α	1	2	3	4	5	6
1. AS	1.562	0.759	0.313	−0.666	.900	–					
2. PS	2.212	0.410	−0.292	0.145	.734	.164	–				
3. Cope	2.144	1.236	1.305	0.980	.987	.373**	.167*	–			
4. EnhSo	3.035	1.212	0.208	−0.645	.907	.178*	.170	.512**	–		
5. Use	4.664	5.598	2.958	13.215	–	.012	.092	.172*	.266**	–	
6. Probs	2.285	3.618	2.070	4.464	.891	.182*	.044	.337**	.248**	.552**	–

Note. AS = anxiety sensitivity (possible range of scores 0 = not at all to 4 = very much, PS = perceived stress (possible range of scores 0 = never to 4 = very often; Cope = drinking to cope motives (possible range of scores 1 = almost never/never to 5 = almost always/always; EnhSo = enhancement/sociability motives (possible range of scores 1 = almost never/never to 5 = almost always/always); Use = alcohol use (number of drinks they consume during a typical week since the start of the pandemic); Probs = number of alcohol-related problems (0 = no, 1 = yes). M = mean; *SD* = standard deviation; Skew = skewness; Kurt = kurtosis; α = Cronbach's alpha; *p < .05, ** p < .01.

each day of a typical week (i.e., quantity-by-frequency) provided a measure of total weekly alcohol use. Similar quantity-by-frequency variables have been widely used in alcohol research and demonstrate good convergent validity and reliability.[57]

The *Brief Young Adult Alcohol Consequences Questionnaire* (B-YAACQ)[58] is a 24-item self-report questionnaire assessing alcohol problem severity in young adults. Using a dichotomous yes/no response format, participants indicated whether they had experienced a particular alcohol-related problem (e.g., "I passed out from drinking") in a typical week since the start of COVID-19 pandemic (i.e., since March 2020). A sum score was derived. The B-YAACQ has shown good internal consistency (α = .83-.89) and retest reliability (r = .95).[59] In the current study, the B-YAACQ demonstrated good scale score reliability (see Table 1).

Results

Preliminary exploratory factor analyses

EFAs were conducted on the 16-item COVID-19 adapted MDMQ-R to examine the factor structure. Using the unstandardized residual scores, factors were extracted using principal axis factoring with an oblique rotation (i.e., Promax with Kaiser Normalization). First, eigenvalues and scree plots were examined to identify the optimum number of factors to be retained in the final solution. We also examined the percentage of variance criteria to identify the percentage of variance that can be attributed to each specific factor relative to the total variance in all the factors. Typically, factors that have an eigenvalue greater than one and, together, explain over 60% of the variance are included in the final measurement model.[60,61]

The Kaiser criterion indicated a one-factor solution for our drinking motives measure, as only one factor had an eigenvalue larger than one (13.328). This one-factor solution was also supported by visually inspecting the elbow of the scree plot which defined the point where the eigenvalues form a liner descending trend. Thus, the single factor included all of the coping (10 items), enhancement (two items), sociability (one item), and COVID-19 specific items (three items). The identified factor accounted for 83.3% of the variance, with factor loadings ranging from .760 to .966, and communalities from .578 to .932. However, given that we were developing a revised measure of drinking motives during a unique and unprecedented pandemic context, we also tested alternative factor structures that better aligned with the current study's theoretical model (i.e., grounded in motivation and tension reduction theories). Such theoretically informed decisions to explore alternative factor structures are common in the literature (e.g., see Ahmad, 2010; Brown, 2015; Youngblut, 1993).[62–64]

We contrasted the original one-factor solution with two- (coping, enhancement/sociability) and three- (coping, enhancement/sociability, COVID-19) factor solutions, by fixing the number of factors to two and three, respectively. This comparison process revealed that the two-factor solution was optimal, wherein the first factor (coping subscale) included the original MDMQ-R coping items that were retained *in addition to* the COVID-19-specific items that were added, and the second factor combined items that were retained from the enhancement and sociability subscales. Despite being highly correlated (r = .850), the two-factor solution had well-defined factor loadings above .400.[65] Factor loadings ranged from .636 to 1.077 for the drinking to cope subscale (13 items), and from .637 to .969 for the enhancement/sociability subscale (three items), and communalities ranged from .677 to .947. See Table 2 for factor loadings and communalities of the two-factor structure for our 16-item drinking motives measure.

Table 2. Factor analysis results of the drinking motives measure adapted from the Modified drinking motives Questionnaire-Revised (MDMQ-R).

	Factor loading		Communalities
MDMQ-R item	1	2	
Factor 1: Drinking to Cope			
1. To relax.	**.637**	.183	.637
3. To forget your worries.	**.966**	−0.016	.908
5. Because it helps you when you feel nervous.	**.750**	.199	.855
7. To cheer up when you are in a bad mood.	**.879**	.077	.893
8. Because it helps when you feel depressed.	**1.077**	−0.110	.959
9. To reduce your anxiety.	**.914**	.033	.888
10. To stop from dwelling on things.	**1.077**	−0.084	.937
11. To turn off negative thoughts about yourself/family/friends.	**1.039**	−0.084	.939
12. To help feel more positive about things in your life.	**.883**	.083	.911
13. To stop from feeling so hopeless about the future.	**.974**	−0.010	.934
14. *Because you are lonely.*	**.891**	.064	.894
15. *Because it is difficult to distinguish weekdays from weekends.*	**.636**	.278	.782
16. *Because there is no structure to the days.*	**.724**	.207	.823
Factor 2: Drinking for Enhancement/Sociability			
2. Because you like the feeling.	.189	**.696**	.743
4. To be sociable.	.192	**.637**	.652
6. Because it's fun/exciting.	−0.034	**.969**	.884

Note. Factor loadings above .40 are in bold. Items in italics were generated for this study and therefore not from the original MDMQ-R. Adapted from "Psychometric evaluation of the five-factor Modified Drinking Motives Questionnaire—Revised in undergraduates" by V. V. Grant, S. H. Stewart, R. M. O'Connor, E. Blackwell, and P. J. Conrod, 2007, Addictive Behaviors, 32, pp. 2611-2631.

Data screening

Data were cleaned and screened for violations of regression assumptions according to the procedures outlined in Kline (2010).[66] Collinearity diagnostics were in the normal range (i.e., no evidence of multicollinearity). Histograms were examined to determine whether variables were continuous and normally distributed. Variables were indeed continuous and relatively normally distributed, except for alcohol outcomes which had a slight positive skew. Based on a priori power analysis (conducted in G*Power), a sample size of 85 or more had sufficient power (>.80) to detect a medium effect size of f^2 = .15 (with α = .05) for our hypothesized model. Similar effect sizes are common in the anxiety and alcohol use literature.[57,67,68]

Next, descriptive statistics and correlations were inspected for all variables (see Table 1). Only participants who self-reported as drinkers were retained for analyses (N = 143). This resulted in the exclusion of data from 17 participants. No outliers (z-score ±3.33)[67] were identified for the AS, perceived stress, coping, or enhancement/sociability variables. However, the alcohol use and problems variables had two and four outliers (z-score >3.33), respectively. These values were not excluded because this observation is consistent with prior research, such that a small proportion of students drink heavily and experience elevated problems compared to peers.[69,70]

Hypothesis testing

Mediation analyses were conducted within a structural equation modeling framework, using robust maximum likelihood procedures in Mplus 8.4.[71] Partial mediation was tested using indirect effects *via* bias-corrected bootstrapped confidence intervals. While controlling for gender, we tested the indirect effects of AS on alcohol use and problems, *via* perceived stress and drinking motives (i.e., coping, enhancement/sociability), as well as direct effects of AS on drinking motives. Model fit for our statistical model was excellent (CFI = 1.000, TLI = 1.000, RMSEA = 0.000).

Results from preliminary correlation analyses are reported in Table 1. AS was positively correlated with drinking to cope and for enhancement/sociability motives, as well as alcohol problems. Perceived stress was also positively correlated with drinking to cope. Moreover, coping and enhancement/sociability drinking motives were positively correlated with use and problems, and use and problems were positively correlated with one another. Model results are reported in Table 3. As hypothesized, AS positively predicted drinking to cope and drinking for enhancement/sociability motives. Drinking to cope also positively predicted alcohol problems, and enhancement/sociability motives positively predicted alcohol use. All other direct paths were not statistically significant. Drinking motives were also correlated with one another, as were alcohol use and problems. Consistent with hypotheses, AS positively predicted alcohol problems, mediated by drinking to cope, and positively predicted alcohol use, mediated by enhancement/sociability motives. Moreover, AS positively predicted drinking for enhancement/sociability motives, mediated by perceived stress. Contrary to hypotheses, perceived stress did not mediate the association between AS and drinking to cope. Consistent with hypotheses, AS positively predicted alcohol use, partially mediated by enhancement/sociability motives *and* perceived stress. All other indirect effects were not statistically significant.

Table 3. Regression paths and correlations for the hypothesized model.

Parameter	Unstandardized estimate	Confidence intervals (CI)
Direct paths		
AS_PS	0.008	95% CI (-0.028, 0.179)
AS_Cope	**0.578**	**95% CI (0.247, 0.890)**
AS_EnhSo	**0.247**	**90% CI (0.015, 0.510)**
PS_Cope	0.329	95% CI (-0.204, 0.768)
PS_EnhSo	0.428	95% CI (-0.070, 0.953)
Cope_Use	0.216	95% CI (-1.030, 1.065)
Cope_Probs	**0.836**	**95% CI (0.114, 1.681)**
EnhSo_Use	**1.084**	**95% CI (0.215, 2.232)**
EnhSo_Probs	0.332	95% CI (-0.274, 0.933)
Indirect paths		
AS_Cope_Use	0.125	95% CI (-0.647, 0.604)
AS_Cope_Probs	**0.484**	**95% CI (0.078, 1.220)**
AS_EnhSo_Use	**0.267**	**95% CI (0.002, 0.966)**
AS_EnhSo_Probs	0.082	95% CI (-0.035, 0.428)
AS_PS_Cope_Use	0.006	95% CI (-0.015, 0.089)
AS_PS_Cope_Probs	0.027	95% CI (-0.011, 0.136)
AS_PS_EnhSo_Use	**0.041**	**90% CI (0.001, 0.216)**
AS_PS_EnhSo_Probs	0.082	95% CI (-0.035, 0.428)
Covariances (Correlations)		
Cope_EnhSo	**0.640 (0.480)**	**95% CI (0.392, 1.002)**
Use_Probs	**10.455 (0.527)**	**95% CI (6.032, 16.504)**
R- Square	Standardized Estimate	*p*-value
PS	0.027	0.448
Cope	**0.151**	**0.013**
EnhSo	0.052	0.192
Use	0.073	0.058
Probs	0.121	0.059

Note. Paths statistically supported by 95% CI are bolded. AS = anxiety sensitivity; PS = perceived stress; Cope = drinking to cope motives; EnhSo = enhancement/sociability motives; Use = alcohol use; Probs = alcohol-related problems.

Discussion

The goal of this study was to test young adult AS-risk for alcohol use and problems, as mediated by perceived stress and drinking to cope and for enhancement/sociability motives, during the COVID-19 pandemic. A better understanding of young adult AS risk trajectories for alcohol use and problems in this unprecedented context may help inform targeted intervention strategies in the aftermath of the pandemic, as well as mitigation strategies to prevent *long-term* risk post-pandemic, and during future pandemics.

Anxiety sensitivity risk for alcohol use

Consistent with hypotheses, AS positively predicted alcohol-related problems, *via* drinking to cope. This finding is consistent with theoretical and empirical evidence, which shows a robust link between AS and alcohol problems, as explained by negatively-reinforced drinking motives.[28,30,72] The direct associations between AS and drinking to cope, drinking to cope and alcohol problems, and AS and alcohol problems were also all positive, which supports tension reduction[27] and negative reinforcement theories,[73,74] and are consistent with pre-pandemic[32] and recent[75] young adult alcohol misuse research. Contrary to hypotheses, AS was not associated with alcohol use *via* drinking to cope. However, this is not necessarily surprising given that AS is often linked with problems – but *not* use – in the anxiety and alcohol literature.[76–78]

Moreover, perceived stress did not help explain the association between AS and drinking to cope, and subsequent alcohol use or problems. This finding was unexpected given the literature linking AS to a heightened perception of stress[49,79,80] and the literature linking stress, AS and anxiety more generally with drinking to cope[28,50,81] and, in turn, alcohol use.[82,83] This null finding may suggest that those high in AS are at increased risk for drinking to cope and subsequent problematic drinking *regardless* of how they perceive stress, perhaps due to the pandemic and/or a baseline hypervigilance/sensitivity to stress. Future studies should continue examining the role of perceived stress in negative-reinforcement drinking to clarify the AS-alcohol outcome pathway.

Consistent with hypotheses, AS positively predicted alcohol use, *via* drinking for enhancement/sociability. This finding is consistent with pre-pandemic literature which supports the link between AS and drinking for enhancement and, in turn, increased risk for alcohol use.[38] Specifically, our findings are consistent with extant empirical research suggesting that the association between AS and alcohol use may be partially or fully mediated by drinking to increase positive affect.[34,35] In the context of the pandemic, our results may suggest that young adults high in AS used alcohol as a way to increase positive affect, perhaps due to decreased opportunities to engage in other mood-enhancing activities. The direct effects from AS to enhancement/sociability motives, and the latter to alcohol use. were also positive, which is consistent with pre-pandemic literature linking AS with enhancement and sociability motives,[33] and linking enhancement and sociability motives with alcohol use.[84–86] This is the first study to our knowledge that supports enhancement-motivated drinking among those high in AS during the COVID-19 pandemic. Interestingly, perceived stress also helped explain the association between AS, enhancement/sociability motives, and alcohol use. Indeed, AS predicted increased in perceived stress during the pandemic which, in turn, led to drinking to increase positive affect. Thus, perceived stress may be an additional mechanism of risk for enhancement/sociability motivated drinking during the COVID-19 pandemic.

Taken together, the current study supports distinct AS-risk pathways for alcohol use and problems, such that those high in AS may be at risk for alcohol use and problems, and this risk may play out *via* a cognitive process involving reasons for drinking (i.e., motives for use). Specifically, drinking to cope may help explain how risk for alcohol-related problems unfolds among those high in AS, while drinking to enhancement/sociability motives may help explain how risk for alcohol use unfolds. AS is typically understood as a relatively stable personality trait and transdiagnostic factor of anxiety disorders.[87,88] Tension reduction theory[27] and a large body of empirical evidence[28,89] suggest that drinking to cope helps explain how AS-risk for alcohol-related problems unfolds. However, the current study adds to the literature by highlighting that drinking to cope and for enhancement/sociability motives differentially explain risk for distinct alcohol outcomes (alcohol problems versus alcohol use, respectively). The current study suggests that those high in AS are at risk coping-motivated problematic drinking, but when stress is perceived in the context of the pandemic, attention may shift from drinking to cope to using alcohol to *distract and enhance* one's mood, thus posing risk for increased alcohol use, but not problems.

Strengths, limitations, and future directions

Despite the novelty of our study, we recognize several limitations. First, our sample of women was disproportionately large (compared to men) and consisted primarily of white university students. Although our findings may not generalize to men, other racial backgrounds, or young adults who are not in university, they still contribute meaningfully to our understanding of alcohol use risk in university students, who typically drink more than age-matched peers and are therefore a critical at-risk group. Nonetheless, future research should consider recruiting a gender-balanced, more diverse (race/ethnicity, occupationally/academically) sample of young adults. Second, this study was conducted during the COVID-19 pandemic and may therefore limit generalizability of findings outside of the pandemic context. However, findings could still be relevant to the more general alcohol risk literature as risk factors pre-pandemic were also found during the pandemic.[30] Similarly, because this study was conducted during the *earlier months* of the pandemic, results may not generalize to other periods of the pandemic. However, while early months of the pandemic may have been different from later months, this may be in terms of the *type* of stress (e.g., related to its novelty and unpredictability), but not necessarily the *intensity* of stress, making our results informative. Third, the current study was

cross-sectional, therefore future research should consider a prospective design to capture *change* in young adult AS-risk for alcohol outcomes as the pandemic evolves. Nevertheless, our results showcase a snapshot of young adult risk for alcohol use during a *distinct* period of the pandemic. Finally, there are limitations to examining mediators in a cross-sectional study, as one of the assumptions of mediation is that the temporal ordering of the variables that make up the causal chain are accurate.[90] Given that we cannot test how the process unfolds over time with cross-sectional data, findings are therefore correlational and not causal. As such, interpretations of results should consider this caveat.

Conclusion

The current study tested AS risk for alcohol use and problems, *via* perceived stress and drinking motives, among young adults during the COVID-19 pandemic. This study contributes to the anxiety and alcohol use literatures by clarifying AS-risk for young adult alcohol use/problems during the unique pandemic context. Our results support negative reinforcement drinking pathways during the pandemic, and the role of perceived stress in explaining different alcohol-risk trajectories. The study findings contribute to our understanding of risk factors for young adult alcohol use during this unique time, thereby adding to the etiological empirical literature and informing clinical interventions for alcohol use and problems in young adults. For example, targeting *specific* drinking motives in cognitive-behavioral therapy, such as by teaching skills to cope with anxiety in a more adaptive way (e.g., mindfulness and distress tolerance skills), or helping people achieve a sense of enhancement through behavioral activation, could help mitigate problematic alcohol use. Similarly, helping young adults better manage stress and cope with anxiety during pandemics or other stressful events (e.g., by using skills, cognitive restructuring, and behavioral experiments) may also prevent the development of more long-term drinking problems. These targeted interventions may be particularly useful among those high in AS.

Conflict of interest disclosure

The authors have no conflicts of interest to report. The authors confirm that the research presented in this article met the ethical guidelines, including adherence to the legal requirements, of Canada and received approval from the Concordia University Human Research Ethics Committee.

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