Intolerance of Uncertainty and Coping Motives for Drinking: Examining the Mediating Role of Perceived Stress

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A Thesis

In

The Department

Of

Psychology

Presented in Partial Fulfillment of the Requirements

For the Degree of Master of Arts (Psychology) at

Concordia University

Montreal, Quebec, Canada

August 2023

CONCORDIA UNIVERSITY

School of Graduate Studies

This is to certify that the thesis prepared

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Entitled: Intolerance of Uncertainty and Coping Motives for Drinking: Examining the Mediating Role of Perceived Stress

and submitted in partial fulfillment of the requirements for the degree of

Master of Arts (Psychology)

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Abstract

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Alcohol use tends to peak in early adulthood, often coinciding with university attendance—a period linked with increased alcohol consumption. During this period, using alcohol to cope with negative emotions (coping motives) is associated with alcohol-related problems. The stress-response dampening hypothesis and empirical evidence suggest that those who are high in intolerance of uncertainty (IU) are at a greater risk of coping motives, and that stress perception may explain part of this association. The goal of the current study was to examine the mediating role of perceived stress (PSS) in the association between IU and coping motives across time in university students. We hypothesized that IU would predict PSS and coping motives, that PSS would predict coping motives, and that PSS would mediate the association between IU and coping motives. In our study, (N = 379 at baseline) first-year undergraduate students completed four online questionnaires at 1-month intervals. Using Confirmatory Factor Analyses and Latent Curve Models with Structured Residuals, we found a positive correlation between IU, PSS, and coping motives at the trait level, consistent with our hypotheses. However, at the state level, there were no cross-lagged effects between these constructs except for IU negatively predicting PSS, contradicting our initial hypotheses. Our results suggest that while IU, PSS, and coping motives are related to each other at a trait level, their association is more nuanced at the state level. This indicates a distinction in the dynamics of these constructs between and within individuals.

Acknowledgements

I would like to extend my deepest gratitude to my supervisor, Dr. Roisin O'Connor, whose expertise, guidance, and support have been invaluable throughout this journey. Her relentless mentorship and persistent help have made this project possible. Thank you for providing me with a supportive learning environment. It has greatly fostered my development as a researcher and writer. To my committee members, Dr. Alexandre J. S. Morin and Dr. Adam Radomsky, I express my sincere thanks. Dr. Morin, your patience, advice, and expertise during the statistical analysis were essential. I am truly grateful. A special note of appreciation goes to my lab mates in the Young Adult and Alcohol Research Laboratory. Your encouragement and insights have been critical to the completion of this project. I also want to extend my deepest thanks to Charlotte Corran. Your help during the data collection phase and your guidance throughout our research in the lab have been invaluable and have been instrumental in my learning and understanding of research in our field. Last, I would like to acknowledge my family. To my mother, Lisa, your love has been my cornerstone. To my brother and best friend, Joe, your support has been invaluable. Thank you for being there for me, for lending a listening ear during challenging times, and for your unwavering assistance when I needed it. This study was supported by a grant from the Social Sciences and Humanities Research Council of Canada (SSHRC # 435-2020-1329) awarded to Dr. Roisin O'Connor.

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Heavy alcohol use is a known risk factor for disease and disability-adjusted life years worldwide (Griswold et al., 2018; Room et al., 2005). Alcohol use tends to increase throughout late adolescence and peaks towards early adulthood (Hingson et al., 2005; O'Malley, 2004). With one in three young Canadian adults attending university (Statistics Canada, 2021), a setting often associated with increased alcohol use (Borsari et al., 2007; O'Malley, 2004), this trend takes on added significance. The American College Health Association (2016) surveyed over 40,000 Canadian post-secondary students and found that 70% consumed alcohol and 35% engaged in binge drinking (5 or more drinks for men and 4 or more drinks for women on one occasion; CDC, 2022). Additionally, more than half of those who use alcohol reported experiencing alcohol-related problems. Indeed, university students' excessive alcohol use is linked with negative outcomes including injury, unsafe sex, assault, drunk driving, blackouts, overdoses, academic underperformance, and higher drop-out rates (Hingson et al., 2009; White & Hingson, 2014). Further, frequent and excessive alcohol use in early adulthood is a risk factor for later alcohol dependence (Tavolacci et al., 2019). A deeper understanding of motivations and risk factors underlying drinking during this period is paramount to tailoring effective intervention strategies and treatments.

Alcohol Use Motives

According to motivational models, reasons or motives for drinking are the most proximal determinant of alcohol use, and these mediate the influence of a variety of interindividual and intraindividual risk factors (Cox & Klinger, 1988). A person's decision to drink is influenced by

the positive and/or negative affective consequences that are anticipated (Cooper, 1994; Cox & Klinger, 1988). Drinking motives can be understood along two underlying dimensions indicating the valence (positive/negative) and source (internal/external) of the expected outcome of drinking (Cox & Klinger, 1988). That is, an individual's motive to drink, which can be positively or negatively reinforced, might stem from the direct, internal, chemical effects of alcohol (e.g., regulating one's emotional state) or from indirect external rewards (e.g., seeking social acceptance; Cooper, 1994; Cox & Klinger, 1988). Drawing on this dimensional framework, Cooper (1994) established four drinking motives: social (positive/external), enhancement (positive/internal), coping (negative/internal), and conformity (negative/external) motives. Social motives involve drinking for social reasons such as celebrations, enhancement motives involve drinking to increase positive emotions, coping motives involve drinking to mitigate or deal with negative emotions, and conformity motives involve drinking to fit in (Cooper, 1994).

The internal drinking motives (i.e., coping and enhancement) are more reliably predictive of alcohol use across various situations than external motives (Cooper, 1994; Goldstein & Flett, 2009; Kairouz et al., 2002; Mohr et al., 2018) and are associated with risky drinking and alcohol-related negative consequences (Bergagna & Tartaglia, 2019; Merrill et al., 2014; Mezquita et al., 2010). Further, internal drinking motives have been identified as mechanisms that help to explain personality-related risk for problem alcohol use (Mezquita et al., 2010; Stewart et al., 2001). Empirical evidence points to drinking to cope motives as particularly detrimental for young adults, as using alcohol to alleviate negative internal states has been associated with a host of negative consequences and changes in coping motives predict changes in alcohol-related problems (Goldstein & Flett, 2009; Kuntsche et al., 2005; Littlefield et al., 2010; Merrill et al., 2014; Mezquita et al., 2010; Mohr et al., 2018). Even more, coping motives are associated with

increased solitary drinking—a risk marker for alcohol use disorder (Kuntsche et al., 2005; Skrzynski & Creswell, 2020). Evidence also suggests that coping motives are a predictor of alcohol dependence later in life (Kuntsche et al., 2005; Park & Levenson, 2002). Given this, understanding the factors that promote this emotionally avoidant drinking style in young adults presents a critical area of study.

Intolerance of Uncertainty Risk for Coping Motives

There is a well-established association between anxiety and coping-motivated alcohol use (Kushner, Abrams, & Borchardt, 2000; Stewart & Conrod, 2008; Turner et al., 2018). This relationship is underscored by findings indicating that individuals with anxiety disorders, such as panic disorder or generalized anxiety disorder (GAD), often consume alcohol as a means of self-medication to alleviate their distressing symptoms (Kushner, Abrams, & Borchardt, 2000). In particular, Stewart and Conrod (2008) found that the presence of anxiety symptoms can significantly predict the adoption of drinking as a coping strategy. Moreover, a recent literature review by Turner and colleagues (2018) found that approximately one-fifth of people who suffer from an anxiety disorder use alcohol to self-medicate or cope with anxiety-related symptoms. Among the anxiety disorders, people with GAD most frequently endorsed using alcohol to cope with their anxiety symptoms with over one-third endorsing such motives (Bolton et al., 2006; Robinson et al., 2009).

Intolerance of uncertainty (IU) is the proclivity to react negatively to uncertainty due to perceptions that uncertainty is unjust, should be avoided, and will result in undesirable repercussions (Dugas et al., 2001). IU is a construct that is fundamentally associated with the development and subsequent maintenance of chronic worry—the hallmark feature of GAD (Buhr & Dugas, 2006; Dugas et al., 2001; Ladouceur et al., 2000). Those who are higher on the IU

dimension tend to experience elevated worry and associated symptoms such as negative affect (Buhr & Dugas, 2006; Ladouceur et al., 2000). Recent evidence suggests that IU may be a transdiagnostic risk factor that is prevalent across emotional disorders (Rosser, 2019; Shihata et al., 2016). IU has been linked with disorders such as GAD, obsessive-compulsive disorder, social anxiety disorder, panic disorder with and without agoraphobia, posttraumatic stress disorder, and depression (Boswell et al., 2013; Carleton, 2012; Carleton et al., 2012; Mahoney & McEvoy, 2012; McEvoy & Mahoney, 2012; Shihata et al., 2016).

The stress-response dampening hypothesis puts forward the idea that alcohol may be used for its anxiolytic effects, that is, as a way to reduce reactivity to stressful situations or events (Sher & Levenson, 1982). While the literature has shown mixed results, a recent meta-analysis supported the conclusion that consuming alcohol reduces both self-reported and physiologically measured response to stressors (Bresin, 2019). Moreover, multiple studies have shown that alcohol has an even stronger stress-response dampening effect in response to uncertain threat (e.g., administration of an unpredictable electric shock) compared to certain imminent threat (Bradford et al., 2013; Hefner et al., 2013; Hefner & Curtin, 2012; Moberg & Curtin, 2009). This would suggest that individuals high in IU may use alcohol as a coping tool to reduce their reactivity to stress in the face of uncertainty.

While the literature testing the association between IU and alcohol use has revealed mixed support, the link between IU and drinking motives is much clearer. For instance, a study by Schmits and Glowacz (2021) found no association between IU and quantity of alcohol use, and a small, albeit statistically significant negative correlation between IU and frequency of alcohol use. In another study, Venanzi and colleagues (2022) found that lower IU at baseline predicted higher alcohol use severity at the 3-month follow-up when alcohol use at the previous

assessment was controlled for. However, a different study found that a greater startle potentiation to uncertain threat was linked with greater binge drinking episodes, suggesting that those who are more aversive to uncertainty may be more likely to use alcohol excessively (Gorka et al., 2016). Conversely, while four separate studies looking at IU and drinking motives found little support for an association between IU and drinking quantity, they all found a direct effect of IU on coping motives (Bimstein et al., 2023; Kraemer et al., 2015; Oglesby et al., 2015; Paltell et al., 2022). Indeed, IU was significantly and positively associated with drinking to cope motives, among trauma-exposed university students (Paltell et al., 2022) and univeristy students with clinically elevated levels of worry (Bimstein et al., 2023). Moreover, two earlier studies found that IU was associated with drinking for coping motives in healthy university student samples (Kraemer et al., 2015; Oglesby et al., 2015). Thus, while it is unclear whether individuals high in IU consume more alcohol in general, evidence suggests that, when they do drink, they are more likely to drink for coping reasons. This maladaptive pattern of alcohol use, rather than quantity of alcohol use, may be associated with alcohol-related problems in individuals high in IU.

Perceived Stress as a Mediator

Stress is not exclusively the result of objectively stressful situations; it is also contingent on an individual's level of perceived stress—the extent to which a situation is appraised as stressful by an individual (Cohen et al., 1983; Lazarus, 1966). Indeed, according to some theoretical perspectives, a situation must also be appraised as threatening in order to result in a stressor effect (Cohen et al., 1983, 2016; Lazarus, 1966). Accordingly, perceived stress may constitute an accurate measure of stress that takes into account both objective events and the subjective appraisal of threat (Cohen et al., 1983). In a similar fashion, Einstein (2014) proposed an extended transdiagnostic model of IU whereby uncertainty on its own does not produce an

aversive emotional reaction. Rather, uncertain events or situations produce such reactions because they are appraised as threatening (Einstein, 2014). Under this framework, a mechanism underlying IU may be an increased tendency to perceive threat. This increased threat perception may also lead to higher levels of perceived stress, especially in uncertain situations. In support of this, Palma and colleagues (2022) found that during the COVID-19 pandemic, IU positively predicted levels of perceived stress. Another study found that higher levels of IU are associated with higher levels of subjective daily stress (Zlomke & Jeter, 2014). Further, a recent study by Demirtas (2020) found that not only was IU positively correlated with perceived stress, but that IU had a statistically significant direct effect on perceived stress. This suggests that individuals high in IU are more likely to appraise daily stressors as threatening and consequently experience higher levels of stress in response to such events.

In turn, stress has been linked with coping motives. Indeed, interpersonal and occupational stress is associated with drinking to cope motives (Armeli et al., 2021; Temmen & Crockett, 2020). Specific to perceived stress, in a study by Böke and colleagues (2019) elevated perceived stress among undergraduate students was related to their increased substance use coping. Moreover, perceived stress has been linked with using alcohol to cope with the negative feelings associated with stress (Abbey et al., 1993). Coping motives for alcohol use appear to mediate the effect that perceived stress has on alcohol-related problems, such that higher levels of perceived stress lead to increases in alcohol-related problems through coping motives (Corbin et al., 2013; Rice & Van Arsdale, 2010). Thus, individuals with higher levels of perceived stress are at risk of using alcohol to try coping with this stress.

The Current Study

While IU has been linked to perceived stress (Palma et al., 2022; Demirtas, 2020; Zlomke & Jeter, 2014) and coping motives (Bimstein et al., 2023; Kraemer et al., 2015; Oglesby et al., 2015; Paltell et al., 2022), and perceived stress has been linked to coping motives (Abbey et al., 1993; Böke et al., 2019; Corbin et al., 2013; Rice & Van Arsdale, 2010), no studies to date have investigated the role of perceived stress in mediating the association between IU and coping motives longitudinally, during the period of early adulthood. Investigating whether IU is related to coping motives indirectly via shifts in perceived stress could help us better understand factors that put individuals with high levels of IU at risk for coping-motivated alcohol use.

The present study employed a longitudinal design with four online assessments (internet-based surveys inquiring about the previous week) separated by approximately 1-month intervals. The aim of the current study was to examine the mediating role of perceived stress in the association between IU and coping motives in university students. We first tested measurement invariance of all three constructs across time and investigated the association between the constructs at the trait and state level. It was hypothesized that: (1) IU would be positively associated with higher levels of perceived stress, (2) IU would be positively associated with elevated coping motives for drinking, (3) higher levels of perceived stress would be associated with elevated coping motives for drinking, and (4) the association between IU and coping motives would be mediated by levels of perceived stress, such that IU would positively predict increased levels of perceived stress which in turn would lead to elevated coping motives for drinking.

Method

Participants

Three hundred and seventy-nine students (M_{age}=19.85, SD_{age}=1.73) were recruited from Concordia University—an English-language public research University located in the cosmopolitan city of Montreal, Quebec. Attrition rates relative to baseline were 0% at T2, 19.8% at T3, and 25.9% at T4. At baseline, 260 (68.8%) participants identified as women, 94 (24.9%) identified as men, and 24 (6.4%) identified as either gender non-binary, two spirit, trans, unsure, or other. Regarding ethnicity, 146 (38.9%) reported being of multiethnic origin, 66 (17.7%) as Asian or Middle Eastern origins, 61 (16.2%) as European origins, 40 (10.7%) as North American origins, 38 (10.1%) as Latin, Central, or South American origins, 21 (5.5%) as African origins, and 3 (0.8%) as either Aboriginal or "Other" origins. In addition, 175 (46.6%) participants reported having been diagnosed with, treated for, or sought help for one or more mental health problems in their lifetime.

Procedure

Participants were recruited as part of a larger four-year longitudinal study looking at social drinking norms and undergraduate alcohol use. Recruitment efforts included posting online advertisements and flyers around campus. A weblink to a preliminary survey was included in the advertisements to determine eligibility and to screen for bots. To be eligible, participants had to be between 18 and 25 years old, fluent in English, enrolled in their first year of an undergraduate degree at Concordia University, and consume alcohol at least monthly. Eligible participants were contacted and emailed the link to the full baseline survey. In the consent form, participants were asked if they were interested in participating in a separate 3-month study (current study). Those that were interested were contacted on a rolling basis and

completed a second, third, and fourth assessment, each approximately one month apart from the previous time point. Participants received a $15 gift card as compensation for the baseline survey, and a $25 gift card for each subsequent time point. Participants that completed all time points received a $15 bonus gift card.

Measures

Intolerance of Uncertainty (T1 to T4)

The Intolerance of Uncertainty Scale—Short Form (IUS-12; Carleton et al., 2007) is a shortened 12-item scale adapted from the original IUS (Freeston et al., 1994). The IUS-12 assesses an individual's cognitive, emotional, and behavioural reaction to uncertainties in life. Item responses range from 1 "*Not at all characteristic of me*" to 5 "*Entirely characteristic of me*". The scale was adapted to weekly use, such that participants were asked to base their responses on the past week. The IUS-12 was completed at each of the four timepoints. Latent IU (12 indicators) scores were saved from the most invariant measurement model for each timepoint. Higher scores were indicative of higher intolerance to uncertainty. Previous research has supported the scale score reliability of global scores on the IUS-12 (α = .91; Carleton et al., 2007). In the current study, the IUS-12 demonstrated excellent score reliability (see Table 1).

Drinking Motives (T1 to T4)

The Modified Drinking Motives Questionnaire-Revised (MDMQ-R; Grant et al., 2007) is a 28-item scale adapted from the DMQ-R (Cooper, 1994). The response scale was adapted to be in line with more recent publications (Mackinnon et al., 2019). Namely, participants rated the degree to which each item represents a reason that has motivated them to consume alcohol on a 4-point response scale ranging from 1 "*Strongly Disagree*" to 4 "*Strongly agree*". The MDMQ-R includes 2 coping motive subscales: coping-anxiety motives (e.g., "*To reduce my anxiety*") and

coping-depression motives (e.g., "*To numb my pain*"). The scale was adapted to weekly use, such that participants were asked to base their responses on instances when they consumed alcohol during the past week. In addition, we merged the coping-anxiety and coping-depression motives into a global coping motive to be in line with research on IU and drinking motives (Bimstein et al., 2023; Kraemer et al., 2015; Oglesby et al., 2015; Paltell et al., 2022). The MDMQ-R was completed at each of the four timepoints. Latent Coping Motive (13 indicators) scores were saved from the most invariant measurement model for each timepoint. Higher scores were indicative of a greater tendency to use alcohol to cope with negative emotions. The MDMQ-R has been shown to be a valid and reliable measure of the four primary drinking motives. Cronbach's alphas for the coping subscales ranged from .73 to .91 in prior research (Grant et al., 2007; Kuntsche & Kuntsche, 2009). In the current study, the MDMQ-R coping motive subscale demonstrated excellent score reliability (see Table 1).

Perceived Stress (T1 to T4)

The Perceived Stress Scale-10 (PSS-10; Cohen et al., 1983; Cohen & Williamson, 1988) is a 10-item measure that assesses stress levels perceived by an individual. The items are scored on a 5-point response scale ranging from 1 "*Never*" to 5 "*Very frequent*". The scale was adapted to weekly use, such that participants were asked to base their responses on instances where they perceived stress during the past week as has been done in previous studies (Şahin & Çetin, 2017). The PSS-10 was completed at each of the four timepoints. Latent PSS (10 indicators) scores were saved from the most invariant measurement model for each timepoint. Higher scores were indicative of higher levels of perceived stress. The PSS-10 has adequate to excellent scale score reliability with Cronbach's αs ranging from .74 to .91 across studies (Lee, 2012; Smith et al., 2014). In the current study, the PSS demonstrated good score reliability (see Table 1).

Analyses

Preliminary Tests of Measurement and Measurement Invariance

Confirmatory factor analyses were all conducted in Mplus 8.7 (Muthén & Muthén, 1998-2021) using weighted least square mean and variance adjusted (WLSMV) estimator (theta parameterization) to test the longitudinal measurement invariance of the latent factors of intolerance of uncertainty (IU), perceived stress (PSS), and coping motives for alcohol use (Coping Motives). Model fit was evaluated using Comparative Fit Index (CFI), Tucker Lewis Index (TLI), and Root Mean Square Error of Approximation (RMSEA) as goodness of fit indices. Models were retained if they had adequate fit (RMSEA ≤ .08, CFI/TLI ≥ .90) or excellent fit (RMSEA ≤ .06, CFI/TLI ≥ .95; Hu & Bentler, 1999; Marsh et al., 2005). We used Chen's (2007) recommendations to support measurement invariance. These propose that the invariance of a measurement model is supported when the model does not lead to an increase in RMSEA exceeding .015 or a drop in CFI/TLI exceeding .01 in comparison to the preceding model estimated in the series.

First, CFAs were estimated for the three latent factors of IU, PSS, and Coping Motives to ensure invariance of factor structure across the four time points. For each latent factor, measurement invariance across time points was tested using the referent indicator approach (Millsap, 2011). We included a priori correlated uniquenesses to account for the use of indicators over time to avoid inflated estimates of stability. The sequence was as follows: (1) configural invariance (all loadings were freely estimated, factor variances were fixed to 1 across all time points, factor means were fixed to 0 at the first time point and freely estimated in the other time points, the first threshold for all indicators was fixed to equality across time, the second threshold for the referent indicator was also fixed to equality across time, and all other thresholds were

freely estimated, uniquenesses were fixed to 1 for all indicators at the first time point and was freely estimated for the other time points, and correlated uniquenesses were freely estimated), (2) weak invariance (all loadings were constrained to invariance across time and factor variances were fixed to 1 at the first time point and freely estimated at all other time points), (3) strong invariance (all thresholds were fixed to equality across time), (4) strict invariance (uniquenesses were fixed to 1 across all time points), (5) latent variance invariance (factor variances were fixed to 1 across all time points), and (6) latent mean invariance (factor means were fixed to 0 across all time points). Latent factors scores were extracted from our most invariant measurement model for the purposes of hypothesis testing.

Main Model Estimation and Missing Data.

Main analyses were all conducted in Mplus 8.7 (Muthén & Muthén, 1998-2021) using the Maximum Likelihood Robust (MLR) estimator full Information Maximum Likelihood (FIML) to handle missing data. FIML leverages all available data without relying on the suboptimal deletion of participants who failed to complete more than one time point (Enders, 2001; Enders & Bandalos, 2001). Out of our total sample of 379 participants who participated at T1, all participated at T2, 304 participated at T3, and 281 participated at T4. Of those who participated at each time point, 27.44% had some missing responses at T1, 36.68% had some missing responses at T2, 44.26% had some missing responses at T3, and 44.49% had some missing responses at T4. Two groups were created to represent participants who completed all four timepoints and those who did not. T-tests were conducted on baseline variables to compare means across groups. Results suggest that those who completed all timepoints did not differ statistically significantly from those who did not in terms of baseline measures of perceived stress ($t_{(320)} = -1.740$, $p = .083$), intolerance of uncertainty ($t_{(317)} = -.851$, $p = .395$), biological sex

($t_{(377)}$ = -.074, p = .941), gender ($t_{(376)}$ = -.159, p = .874), or age ($t_{(375)}$ = -.143, p = .886). However, those who completed all timepoints did differ statistically significantly from those who did not in terms of baseline measures of coping motives ($t_{(283)}$ = -2.373, p = .018), such that those with incomplete data had higher levels of baseline coping motives.

Latent Curve Models with Structured Residuals

Our predictive model was estimated using the Latent Curve Model with Structured Residuals (LCM-SR) proposed by Curran and colleagues (2014). The LCM-SR is a type of structural equation model (SEM) that describes the trajectory of change over time and allows for the estimation of both between-person and within-person effects (Curran et al., 2014). Similar to the traditional Latent Curve Model (LCM), LCM-SR captures the difference between individuals in terms of change and stability of a construct over time as. However, unlike LCM, LCM-SR disentangles the person-specific (trait) and the time-specific (state) components of change from one another. This means that the time-specific changes within a person do not influence the estimation of the person-specific differences between individuals. This separation makes it easier to understand the distinct effects of person-level and time-level influences on the association between variables of interest over time (Curran et al., 2014).

In the present study, LCM-SR was used to analyze the stable trait-like between-person differences in the latent variables of IU, PSS, and Coping Motives as well as the state-like within-person trajectory of change of these latent variables across four measurement points (T1-T4). In addition, the LCM-SR model was used to explore the autoregressive and cross-lagged associations among the within-person centered variables of IU, PSS, and Coping Motives. This allowed us to investigate not only the self-influence of each variable over time but also the reciprocal influence that these variables had on each other across the four measurement points

(T1-T4). To estimate a fully LCM-SR model that would best summarize and approximate the data obtained from the repeated measures of IU, PSS, and Coping Motives across the four time points, we estimated and compared four possible LCM-SR models: (Model 1) LCM-SR with autoregressive parameters, cross-lagged parameters, and residuals fixed to equality across time, (Model 2) LCM-SR with autoregressive parameters and cross-lagged parameters fixed to equality and residuals freely estimated across time, (Model 3) LCM-SR with autoregressive parameters fixed to equality and both cross-lagged parameters and residuals freely estimated across time, and (Model 4) LCM-SR with cross-lagged parameters fixed to equality and both autoregressive parameters and residuals freely estimated across time.

Results

Measurement Models

Table 2 contains the model fit indices for each model tested for the three latent factors of IU, PSS, and Coping Motives. Our results indicated that the models of configural invariance for IU and PSS showed adequate fit and the model for Coping Motives showed excellent fit. Next, the models of weak invariance for IU and PSS had slight increases in fit and the model for Coping Motives had no change in fit, thus the weak invariance models were retained. The models of strong invariance for IU had a negligible change in fit ($\Delta CFI < .01$; $\Delta TLI < .01$; $\Delta RMSEA < .015$) and was retained. The models of strong invariance for PSS had an increase in fit and for Coping Motives had no change in fit; both models were thus retained. Compared to the models of strong invariance, the strict invariance models for IU, PSS, and Coping Motives all showed an increase in fit. The latent variance invariance models for all 3 latent factors showed small decreases in fit that were below cut-off levels ($\Delta CFI < .01$; $\Delta TLI < .01$; $\Delta RMSEA < .015$)

and were accordingly retained. Last, the models of latent mean invariance for IU and PSS had small decreases in fit but were still below cut-off levels and the model for Coping Motives had a small increase in fit. The latent mean invariance model fit was adequate-to-excellent for all 3 latent factors. Thus, the latent mean invariance models were retained as the most invariant model.

McDonald Omega reliability coefficients were calculated from the standardized parameters (See Table 3 for standardized factor loadings and standardized uniquenesses). Results indicated excellent reliability for the latent factors IU (ω = 0.95), PSS (ω = 0.91), and Coping Motives (ω = 0.97). This suggests that for all 3 factors, a significant proportion of the variance in observed scores can be attributed to the underlying latent construct, rather than error or other unrelated factors. Accordingly, latent factor scores were extracted from our most invariant models and were used for hypothesis testing.

Hypothesis Testing: Latent Curve Model with Structured Residuals

The LCM-SR model (see Figure 1) was specified with three latent variables: Intolerance of Uncertainty (IU), Perceived Stress (PSS), Coping Motives for alcohol use. The model included first-order autoregressive paths (i.e., T1 IU to T2 IU to T3 IU to T4 IU; T1 PSS to T2 PSS to T3 PSS to T4 PSS; T1 Coping Motives to T2 Coping Motives to T3 Coping Motives to T4 Coping Motives) as well as directional cross-lagged paths that were central to hypothesis testing (i.e., T1 IU to T2 PSS; T1 IU to T2 Coping Motives; T1 PSS to T2 Coping Motives; T2 IU to T3 PSS; T2 IU to T3 Coping Motives; T2 PSS to T3 Coping Motives; T3 IU to T4 PSS; T3 IU to T4 Coping Motives; T3 PSS to T4 Coping Motives). In our model, intercept factors and slope factors were created for each of the three variables of interest. The loadings on the factors were set to indicate the linear passage of time (i.e., 0, 1, 2, 3) with the first loading serving to

locate the intercept. Within-person centered variables were created for each construct at each time point to represent state-like characteristics. We estimated and compared the four LCM-SR models sequentially (See Table 2 for model fit indices). When looking at fit indices, model 1 showed poor fit. Compared to model 1, there was an increase in fit for model 2 such that model 2 had adequate fit. Model 3 and model 4 resulted in decreased fit compared to model 2. Thus, model 2 was retained as the LCM-SR model that best summarized and approximated the data. Accordingly, autoregressive parameters and cross-lagged parameters were fixed to equality across time and the residuals were freely estimated (Model 2).

Characteristics of Growth Factors and Time-Specific Residuals

Table 4 contains estimates for the unstandardized mean and variance of the growth factors (intercept and slope) and the time-specific residuals. The slope factors for IU, PSS, and Coping Motives were all negative and statistically significant (p<.001) indicating that, on average, participants tended to decrease on IU, PSS, and Coping Motives over the 3-month study period. In addition, the variances associated with these growth parameters are especially revealing. Both the intercepts and slopes of each construct exhibited significant variance, indicating individual differences in initial levels and rates of change over time. The exception being the variance of the PSS slope, which, although positive, was not statistically significant (p=.145), suggesting that the rate of change in perceived stress was relatively consistent across individuals. Finally, the time-specific residuals at each time point underscored the unique state-like variances associated with the observations at a given time, independent of the overall trajectory defined by the intercept and slope. Particularly, at Time 1, all constructs displayed significant residual variances (all p-values < 0.001). Notably, by Time 3, the residual variances

for IU, PSS, and Coping Motives reached minimal values, whereas, by Time 4, an increase in residual variance was evident across all constructs.

Trait Associations

As expected, the latent trait factors of IU, PSS, and Coping Motives were all positively correlated with one another. Indeed, the intercept of IU was positively correlated with the intercept of PSS (r = .648, p < .001) and Coping Motives (r = .336, p < .001). In addition, the intercept of PSS was positively correlated with the intercept of Coping Motives (r = .359, p < .001). This suggests that having higher trait levels on one variable was associated with having higher trait levels on the other variables.

Rate of Change Associations

While the average rates of change per timepoint of IU (β = -.136, p =.012), PSS (β = -.319, p =.006), and Coping Motives (β = -.176, p =.001) were all negative, they did not correlate with one another. That is, the slope of IU did not correlate with the slope of PSS (r = .102, p = .823) or Coping Motives (r = -.230, p = .807). In addition, the slope of PSS did not correlate with the slope of Coping Motives (r = -.385, p = .489). This suggests that the average rate of change on one variable was not associated with the average rate of change on the other variables throughout the study.

Trait Effect on Rate of Change

The intercept of IU did not have a statistically significant direct effect on the slope of PSS (β = -.139, p =.112) or the slope of Coping Motives (β = -.178, p =.171). In addition, the intercept of PSS did not have a statistically significant direct effect on the slope of IU (β = .153, p =.219) or the slope of Coping Motives (β = .179, p =.149). Conversely, while the intercept of Coping Motives did not have a statistically significant direct effect on the slope of IU (β = .038,

p =.737), it did have a statistically significant direct effect on the slope of PSS (β = .290, p =.016). This suggests that trait levels of Coping Motives predicted change in PSS over time.

Time-Lagged Effects

For details on the standardized and unstandardized regression coefficients, standard errors, and significance values see Table 5.

Autoregressive Associations. Autoregressive paths were fully supported for IU, PSS, and Coping Motives. That is, IU at a given time point negatively predicted IU at the subsequent time point (B = -.199). PSS at a given time point positively predicted PSS at the subsequent time point *(*B = .408). Last, Coping Motives at a given time point positively predicted Coping Motives at the subsequent time point (B = .331).

Cross-Lagged Associations between IU and PSS. Throughout the study, IU negatively predicted PSS (B = -.145), but in the direction opposite to our hypothesis. Notably, when looking at the standardized coefficients, the autoregressive effect of IU on PSS is considerably smaller from T3 to T4 compared to earlier time points.

Cross-Lagged Associations between IU and Coping Motives. None of the cross-lagged effects of IU on Coping Motives were supported.

Cross-Lagged Associations between PSS and Coping Motives. None of the cross-lagged effects of PSS on Coping Motives (for T1-T4) were supported.

Discussion

The objective of the current study was to investigate perceived stress as a potential mechanism that helps to explain IU risk for coping motivated alcohol use. The present study uncovered both unexpected and hypothesized findings. Consistent with our hypotheses, global

levels of IU were associated with global levels of perceived stress and coping motives, and global levels of perceived stress were associated with global levels of coping motives. Unexpectedly, however, increases in IU were associated with corresponding decreases in perceived stress and were not associated with corresponding increases in coping motives. Similarly, increases in perceived stress were not associated with corresponding increases in coping motives. As such, our study did not support perceived stress as a mediator of the effect of IU on coping motives. Altogether, our findings suggest that the associations between IU, perceived stress, and coping motives can be seen when comparing overall scores between individuals, but different patterns emerge when looking at monthly fluctuations within individuals. This adds to our understanding of the intricate dynamics between IU, perceived stress, and coping motives in young adults across time.

Trait Level

The results of the current study suggest that IU, coping motives, and perceived stress are all positively associated with one another. Indeed, consistent with our hypotheses, at baseline those who were relatively higher on IU tended to have elevated levels of perceived stress and coping motives, likewise, those who were relatively higher on perceived stress tended to have elevated levels of coping motives. These findings are consistent with the literature linking IU with elevated levels of stress (Barzut et al., 2023; Demirtas, 2020; Sorid et al., 2023; Zlomke & Jeter, 2014) and with theories suggesting that both IU and stress function as a response to perceived threat (Cohen et al., 1983; Einstein, 2014; Lazarus, 1966). These theories suggest the possibility of a common psychological mechanism where higher IU and perceived stress may reflect an amplified threat appraisal process. Our findings are also consistent with cross-sectional studies linking IU with higher levels of coping motives (Bimstein et al., 2023; Kraemer et al.,

2015; Oglesby et al., 2015; Paltell et al., 2022). Last, our findings are consistent with prior research establishing a positive association between various forms of stress (i.e., occupational stress, interpersonal stress, and perceived stress) and coping motives for alcohol use (Abbey et al., 1993; Armeli et al., 2021; Corbin et al., 2013; Rice & Van Arsdale, 2010; Temmen & Crockett, 2020).

Rate of Change

In the present study, the slopes of IU, perceived stress, and coping motives were all negative. This means that, on average, IU, perceived stress, and drinking for coping motives decreased over the course of the 3-month study. Given that the first time point coincided with the beginning of the semester and the final time point coincided with the winter break, relative decreases in these variables are not surprising. Indeed, university students tend to drink more at the start of the semester with this consumption typically decreasing towards the exam period at the semester's end (Tremblay et al., 2010). Moreover, it is consistent with findings revealing that, despite relative stability of these constructs, small decreases in average scores over periods of less than 6 months have been observed in student samples (Boyle et al., 2022; Lauriola et al., 2023; Lee, 2012).

Relatedly, the slopes for IU, perceived stress, and coping motives were not correlated with each other suggesting that the trajectory of these decreases were independent of one another. In other words, on average, shifts in IU were not associated with shifts in perceived stress or coping motives over the 3-month study, similarly, shifts in perceived stress were not associated with shifts in coping motives over the 3-month study. While we had no a priori hypotheses regarding associations between rates of change, it is consistent with literature demonstrating different temporal stability for these constructs. Indeed, research shows that IU

remains fairly stable over time when the testing periods are separated by 2-weeks to 3-months (Bottesi et al., 2019; Khawaja & Yu, 2010; Lauriola et al., 2023; Wilson et al., 2020). Conversely, evidence for the temporal stability of perceived stress has been mixed with one review paper (Lee, 2012) showing satisfactory stability over smaller time periods (i.e., less than 4-weeks) and unsatisfactory stability over larger ones (i.e., 6-weeks) and a more recent study showing satisfactory stability over larger time periods (i.e., 8-weeks; Miller et al., 2021). Last, while coping motives demonstrates relative stability over time across various samples (Crutzen et al., 2013; Crutzen & Kuntsche, 2013; Grant et al., 2007; Schelleman-Offermans et al., 2011), when looking at a sample of first year undergraduates who are heavy drinkers, coping motives significantly decreased over a 6-month period (Boyle et al., 2022).

Baseline levels of coping motives predicted the average level of change for perceived stress across the 3-month study period. This suggests that individuals who had higher levels of coping motives at the trait-level tended to have smaller decreases in perceived stress on average throughout the study. This finding is consistent with literature proposing a bi-directional association between alcohol misuse and stress whereby stress increases alcohol misuse and alcohol misuse increases stress (Cole et al., 1990; Temmen and Crockett, 2020). Indeed, it may be that those who endorse more coping motives experience more alcohol-related consequences as demonstrated in previous research (Goldstein & Flett, 2009; Littlefield et al., 2010; Merrill et al., 2014; Mezquita et al., 2010; Mohr et al., 2018) which may subsequently lead to increased and more sustained levels of stress.

State Level

The autoregressive paths in our model revealed notable patterns in the temporal dynamics of IU, perceived stress, and coping motives. Namely, IU at a given time point consistently

predicted IU at subsequent time points, demonstrating its relative stability as a trait-like construct. This aligns with prior research highlighting the temporal stability of IU (Bottesi et al., 2019; Khawaja & Yu, 2010; Lauriola et al., 2023; Wilson et al., 2020). Moreover, perceived stress and coping motives at a given time point predicted perceived stress and coping motives at the subsequent time point respectively. These patterns of prediction are in line with previous findings regarding the temporal stability of perceived stress and coping motives (Boyle et al., 2022; Crutzen et al., 2013; Crutzen & Kuntsche, 2013; Grant et al., 2007; Lee, 2012; Miller et al., 2021; Schelleman-Offermans et al., 2011). Notably, an examination of the standardized coefficients (See Table 5) reveals a marked decline in effect sizes for the autoregressive paths from third to fourth time point for IU, perceived stress, and coping motives. These relative reductions in effect size may reflect the influence of contextual factors. Specifically, the third measurement point coincided with a period of high academic stress (i.e., end-of-term examinations), while the fourth measurement point occurred during a period of relative relaxation (i.e., winter break). This temporal context could have contributed to the observed drop in mean scores for IU, perceived stress, and coping motives during these periods. To be sure, these findings highlight the importance of considering temporal and contextual factors in longitudinal research on these constructs.

The state-level cross-lagged associations in our model provide a nuanced view of the associations between IU, perceived stress, and coping motives over time. Partially consistent with our hypothesis, IU predicted perceived stress but in the direction opposite to what was expected, suggesting that higher levels of IU were associated with subsequent decreases in perceived stress. This is in sharp contrast with a recent paper that found that, in the first few weeks of the COVID-19 pandemic, increases in IU led to subsequent increases in perceived

stress (Godara et al., 2023). The divergence in our findings could be attributed to contextual differences and temporal scales. Namely, Godara et al.'s study's data collection points were separated by weekly intervals, while our study utilized a monthly data collection schedule. This temporal distinction is crucial; immediate reactions to fluctuating IU might be more discernible on a weekly basis, whereas over a month-long period, individuals might deploy adaptive strategies or become desensitized to persisting uncertainties, leading to diminished perceived stress. Moreover, Godara et al.'s research was conducted during the beginning of a global pandemic—a period characterized by extraordinary uncertainty and stress. As such, it may be that the impact of IU on perceived stress is more direct in situations marked by pervasive uncertainty and stress.

While our results indicate that changes in IU negatively predicts changes in perceived stress, a closer inspection of the standardized coefficients uncovers a nuanced trend. Namely, the effect sizes between the initial three time points are considerably larger than that from the third to the fourth time point (see Table 5). This suggests the possibility of a weakening autoregressive effect of IU on perceived stress with time. The negative and diminishing effect of IU on perceived stress could be explained by the influence of an unmeasured moderator. One such moderator could be the availability of a social support network, which has consistently been shown to buffer against stress (Jun et al., 2018; McLean et al., 2022; Mishra, 2020). It may be that, since the study's onset coincided with the start of participants' first year of undergraduate studies, these social support systems were not yet established (Cage et al., 2021; Gale & Parker, 2014). However, as time progressed, these networks may have formed, providing stress-buffering benefits. This effect might be especially pronounced for those high in IU, who may have initially experienced the highest levels of stress and, consequently, the largest reductions in

stress levels as their social support systems strengthened. Moreover, the transition into university involves navigating a novel and inherently uncertain environment (Gall et al., 2000; Tett et al., 2017). Individuals particularly high in IU at the start of the semester may have noticed the largest reductions in perceived stress as they gradually acclimated to university life and their environment became less uncertain and, as a result, less stressful. Thus, it may be that the development of social support networks and the acclimation to university life led those with high levels of IU to experience the largest reductions in stress.

Similarly, IU did not appear to have an effect on coping motives. Indeed, contrary to our hypothesis, changes in IU did not predict subsequent changes in coping motives. While this finding appears to be inconsistent with previous research supporting a direct effect of IU on coping motives (Bimstein et al., 2023; Kraemer et al., 2015; Oglesby et al., 2015; Paltell et al., 2022), it is worth noting that these previous studies employed cross-sectional designs. Indeed, the static nature of cross-sectional design fails to capture the influence of time on within-person differences (Caruana et al., 2015). It may be that IU predicts coping motives when looking at between-person differences, but not when looking at within-person differences. This finding mirrors a recent study on the relation between personality and drinking motives (Freichel et al., 2023). In this study, a cross-sectional association was observed between neuroticism and coping motives, but this association was not maintained in longitudinal analysis. That is, over time, neuroticism failed to predict distinct drinking motives consistently.

Last, contrary to our hypotheses, perceived stress did not predict coping motives at subsequent timepoints. As such, perceived stress did not mediate an indirect effect of IU on coping motives. The null effect of perceived stress on coping motives is inconsistent with related research demonstrating that daily negative mood was associated with subsequent drinking

(Flynn, 2000; O'Hara et al., 2015). However, it is more consistent with other findings establishing an association between daily negative affect and increased drinking for coping purposes, but only in individuals with high global coping motives (Arbeau et al., 2011). Indeed, our study found that participants who failed to complete all timepoints had significantly higher levels of baseline coping motives, which may explain the lack of expected impact in our results. Future work is needed to clarify the role that global coping motives play in the association between perceived stress and coping motives at the state-level.

Another potential explanation lies in the inclusion of participants who did not consume alcohol in the previous week in our analyses. Indeed, descriptive analyses revealed that 20-36% of participants did not consume alcohol in the previous week at any given time point. This is particularly relevant given that participants were instructed to rate their coping motives in relation to their alcohol use in the previous week. Thus, given the high proportion of participants who reported not drinking in the previous week, it may be that the inclusion of these participants diluted the effects seen in those who did drink, contributing to our unexpected findings. As such, the discrepancy in our results might underscore the need for further analyses on our data, focusing more on active drinkers for an accurate understanding of the association between IU, perceived stress, and drinking motives.

Summary

The current study's findings provide additional support for the global associations between IU, perceived stress, and coping motives. However, occasion-specific effects of IU on coping motives and occasion-specific effects of perceived stress on coping motives across time were not supported. Notably, occasion-specific effects for IU on perceived stress were observed, albeit in a negative direction across successive time points. Indeed, IU at a given time point

negatively influenced perceived stress at future time points but did not influence coping motives at future time points. Likewise, perceived stress at a given time point did not influence coping motives at future time points. While our results only partially support our hypotheses, they nonetheless accurately reflect the variability seen in the existing body of literature.

In interpreting the null findings of the present study, it is important to consider the distinction between within-person and between-person effects. This distinction has been highlighted in recent research as critical for understanding the dynamics of psychological phenomena (Stavrova & Denissen, 2020). For instance, Stavrova and Denissen (2020) found that while social media use was associated with lower well-being between individuals, changes in social media use within individuals over time were not associated with changes in well-being. Similarly, Hagland et al. (2021) reported a positive between-person effect for symptom severity on task performance in patients with obsessive-compulsive disorder, but no significant within-person relations. These findings underscore the possibility that the association between IU, perceived stress, and coping motives in our study may operate differently at the within-person and between-person levels. Altogether, while we found a significant correlation between these variables at the trait level (i.e., between-person), we found that at the state level (i.e., within-person), IU predicted a decrease in perceived stress over time. However, no such predictive relationship was observed for IU and coping motives or for perceived stress and coping motives. This highlights the complexity of these constructs and the potential for different dynamics at different levels of analysis.

Limitations and Future Directions

While our study has significant strengths, there are also some notable limitations. Namely, numerous participants lacked complete data for certain time points, and several did not

participate throughout the entire duration with a high attrition rate. Given that participants who dropped out were significantly higher on coping motives than those who did not, this may have influenced our findings. However, we used FIML for data analyses which is robust to issues due to missing data. Moreover, the attrition rate recorded in our study is consistent with a study by Radtke and colleagues (2017) on attrition rates in web-based alcohol surveys. This study also mirrors our findings that non-completers had higher levels of coping motives compared to participants who completed all time points. Still, future studies should devise strategies to combat high attrition rates and incomplete data collection to address this concern in research design.

Another limitation of our study pertains to the reliance on self-report measures. While these tools are widely used and offer valuable insights into the perspectives and experiences of participants, they are inherently subject to potential biases, such as social desirability bias or recall bias (Latkin et al., 2017). Furthermore, self-report measures rely heavily on the respondent's introspective capabilities, which may vary across individuals. Nonetheless, our study's methodology mitigated potential biases by employing strategies to reduce measurement error. Namely, we used repeated assessments, reliable and well-validated measures, and extracted factor scores from tests of measurement invariance across time. Future studies might still consider supplementing self-report methods with other objective measures, such as observational data or physiological measures, to obtain a more comprehensive picture.

Last, a possible limitation to our study is the inclusion of participants in our analyses who reported no alcohol consumption at specific time points, despite all being drinkers. This practice may have reduced levels of coping motives in our study leading to the observed lack of effects of IU and perceived stress on coping motives. Had we excluded these time points of non-drinking,

IU and perceived stress may have predicted coping motives in our study. Despite this, including these non-drinking periods provides a more comprehensive and realistic view of drinking behaviour, as periods of abstinence are a common feature in real-world drinking patterns (Niemelä et al., 2022). Future research may benefit from limiting analyses to periods of active drinking to provide a more targeted view of how IU and perceived stress impact drinking motives when alcohol consumption is taking place.

While our study partially revealed significant within-person effects at a monthly level, it is possible that the dynamics of IU, perceived stress, and drinking motives are more fluid and change on a day-to-day basis. As such, future research might consider adopting a daily diary approach. This would allow for a more nuanced observation of the daily interplay between IU, perceived stress, and coping motives, even on days where drinking does not occur. Indeed, it could capture both the reactive nature of drinking motivations as well as the effect of fluctuating daily moods, as some research suggests that mood may have an immediate impact on same-day drinking behaviour (Mohr et al., 2005). This fine-grained approach would complement the broader perspective offered by the current study.

Implications and Conclusion

Overall, the findings from our present study contribute to the existing literature exploring the associations between IU, perceived stress, and coping motives in young adults by clarifying how changes in these variables influence one another. While some research has examined the association between some of these variables over time, most studies have adopted a cross-sectional approach, and none have looked at the mediator role of perceived stress. To the best of our knowledge, this study is the first to longitudinally investigate the association between IU and coping motives with perceived stress as a mediator, while considering both the trait and state

aspects of these variables. Altogether, our results provide support for the association between IU, perceived stress, and coping motives at the trait-level and reveal nuanced associations at the state-level.

In addition to contributing to our understanding on the aetiology of young adult alcohol use, the present findings have treatment implications for maladaptive alcohol use in young adults. Indeed, continued work in this area may benefit prevention and intervention strategies by focusing less on changes in IU and more on managing it at a trait level. Furthermore, it may be more pertinent to target one's general tendency to perceive stress or appraise situations as threatening, rather than focusing on episodic changes in perceived stress, for effective treatment. Although further research is warranted, these insights could pave the way for refining current cognitive-behavioural therapy approaches and ensure they target what is most relevant.

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Table 1

Descriptive Statistics and Zero-Order Correlations for all Variables in the Model

Latent Variables	1	2	3	4	5	6	7	8	9	10	11	12	*N*	*Mean*	*SD*	*α*
1. IU_T1	-												319	33.984	10.153	.909
2. IU_T2	.801	-											379	34.749	10.617	.921
3. IU_T3	.852	.873	-										304	33.819	11.049	.937
4. IU_T4	.855	.877	.926	-									281	32.673	10.820	.940
5. PSS_T1	.535	.475	.539	.530	-								322	20.880	7.450	.885
6. PSS_T2	.525	.559	.565	.550	.804	-							378	21.915	6.662	.872
7. PSS_T3	.487	.437	.540	.514	.660	.817	-						303	21.443	6.726	.866
8. PSS_T4	.489	.439	.528	.558	.708	.738	.808	-					279	18.994	7.698	.905
9. Cope_T1	.340	.275	.277	.321	.408	.347	.330	.424	-				285	1.921	.894	.942
10. Cope_T2	.280	.251	.250	.287	.305	.337	.308	.399	.806	-			240	1.884	1.000	.962
11. Cope_T3	.290	.238	.275	.296	.306	.313	.317	.421	.816	.920	-		169	1.910	.971	.956
12. Cope_T4	.283	.225	.259	.305	.322	.308	.315	.443	.837	.873	.959	-	156	1.800	.938	.960

Note. *N* = sample size; *SD* = Standard Deviation; *α* = Cronbach's alpha; T1 = baseline; T2 = 1-month follow-up; T3 = 2-month follow-up; T4 = 3-month follow-up. All correlations were statistically significant at $p < .001$. While Means and Standard Deviations are reported, our main analyses relied on factor scores with a $M = 0$ and a $SD = 0$.

Table 2

Model Fit Indices for Tests of Measurement Invariance Across Time of Factors of Interest (i.e., Intolerance of Uncertainty, Perceived Stress, and Coping Motives) and for the 4 LCM-SR Models.

	Chi Squared	df	RMSEA	CFI	TLI
Intolerance of Uncertainty					
Configural	2737.465	1002	0.068	0.925	0.915
Weak	2771.513	1035	0.067	0.925	0.918
Strong	2901.594	1140	0.064	0.924	0.924
Strict	2729.646	1176	0.059	0.933	0.935
Latent Variance	2723.402	1179	0.059	0.933	0.936
Latent Means	**2738.434**	**1182**	**0.059**	**0.932**	**0.936**
Perceived Stress					
Configural	1618.509	660	0.062	0.922	0.908
Weak	1628.809	687	0.060	0.924	0.913
Strong	1695.375	774	0.056	0.925	0.925
Strict	1641.284	822	0.051	0.934	0.937
Latent Variance	1660.222	825	0.052	0.932	0.936
Latent Means	**1783.250**	**828**	**0.055**	**0.923**	**0.927**
Coping Motives					
Configural	1624.183	1190	0.032	0.990	0.989
Weak	1669.660	1226	0.032	0.990	0.989
Strong	1800.838	1340	0.032	0.989	0.989
Strict	1779.724	1379	0.029	0.991	0.991
Latent Variance	1812.001	1382	0.030	0.990	0.990
Latent Means	**1794.575**	**1385**	**0.029**	**0.990**	**0.991**
LCM-SR Models					
Model 1	486.665	30	.200	.883	.742
Model 2	**108.275**	**24**	**.096**	**.978**	**.941**
Model 3	72.902	12	.116	.984	.914
Model 4	103.563	18	.112	.978	.919

Note. Bold indicates the models that were retained for factor extraction and used for hypothesis testing. df = degrees of freedom; RMSEA = Root Mean Square Error of Approximation; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index.

Table 3

Standardized Factor Loadings and Standardized Uniquenesses of the Latent Factors from the Latent Mean Invariant Measurement Model.

	IU λ	IU δ	PSS λ	PSS δ	COPE λ	COPE δ
Item 1	0.820	0.327	0.727	0.472	0.642	0.587
Item 2	0.756	0.429	0.846	0.284	0.928	0.139
Item 3	0.688	0.527	0.716	0.487	0.693	0.520
Item 4	0.812	0.341	0.520	0.729	0.844	0.288
Item 5	0.698	0.513	0.646	0.582	0.872	0.240
Item 6	0.759	0.424	0.745	0.445	0.952	0.095
Item 7	0.707	0.500	0.532	0.717	0.963	0.072
Item 8	0.828	0.314	0.593	0.649	0.882	0.221
Item 9	0.809	0.346	0.641	0.589	0.946	0.106
Item 10	0.836	0.300	0.865	0.252	0.926	0.143
Item 11	0.795	0.368	-	-	0.909	0.173
Item 12	0.826	0.318	-	-	0.952	0.094
Item 13	-	-	-	-	0.935	0.125

Note. λ = factor loading; δ = item uniqueness. All factor loadings and item uniquenesses were statistically significant at $p<.001$ and equivalent across Time 1, 2, 3, and 4.

Table 4

Unstandardized Mean and Variance of the Growth Factors (Intercept and Slope) and Time-Specific Residuals from the LCM-SR Model.

	Mean	Variance	Residual Variance
Intercepts			
IU	0.039	0.670	-
PSS	0.065	0.552	-
COPE	0.101	0.565	-
Slopes			
IU	-0.024	0.030	-
PSS	-0.061	0.033	-
COPE	-0.031	0.031	-
Time-Specific Residuals			
IU_T1	-	-	0.124
IU_T2	-	-	0.137
IU_T3	-	-	0.010
IU_T4	-	-	0.216
PSS_T1	-	-	0.316
PSS_T2	-	-	0.207
PSS_T3	-	-	0.122
PSS_T4	-	-	0.403
COPE_T1	-	-	0.139
COPE_T2	-	-	0.185
COPE_T3	-	-	0.010
COPE_T4	-	-	0.117

Note. IU = intolerance of uncertainty; PSS = perceived stress; COPE = coping motives; T1 = baseline; T2 = 1-month follow-up; T3 = 2-month follow-up; T4 = 3-month follow-up.

Table 5

All Estimated Autoregressive and Cross-Lagged Regression Paths for Intolerance of Uncertainty, Perceived Stress, and Coping Motives.

		Standardized Estimate			Unstandardized Estimate	Standard Error	*p*-value
		T1-T2	T2-T3	T3-T4			
Autoregressive paths							
IU	⟶ IU	-0.185	-0.580	-0.056	- 0.199	0.048	0.000
PSS	⟶ PSS	0.450	0.520	0.249	0.408	0.169	0.016
COPE	⟶ COPE	0.274	0.811	0.174	0.331	0.133	0.013
Cross-Lagged paths							
Intolerance of Uncertainty							
IU	⟶ PSS	-0.100	-0.138	-0.029	- 0.145	0.072	0.045
IU	⟶ COPE	0.027	0.071	0.013	0.034	0.195	0.861
Perceived Stress							
PSS	⟶ IU	0.094	0.249	0.055	0.064	0.192	0.740
PSS	⟶ COPE	0.019	0.042	0.017	0.015	0.117	0.897
Coping Motives							
COPE	⟶ IU	0.119	0.419	0.048	0.122	0.415	0.769
COPE	⟶ PSS	0.016	0.025	0.006	0.022	0.315	0.944

Note. IU = intolerance of uncertainty; PSS = perceived stress; COPE = coping motives; T1 = baseline; T2 = 1-month follow-up; T3 = 2-month follow-up; T4 = 3-month follow-up. All unstandardized estimates were equivalent across Time 1, 2, 3, and 4.

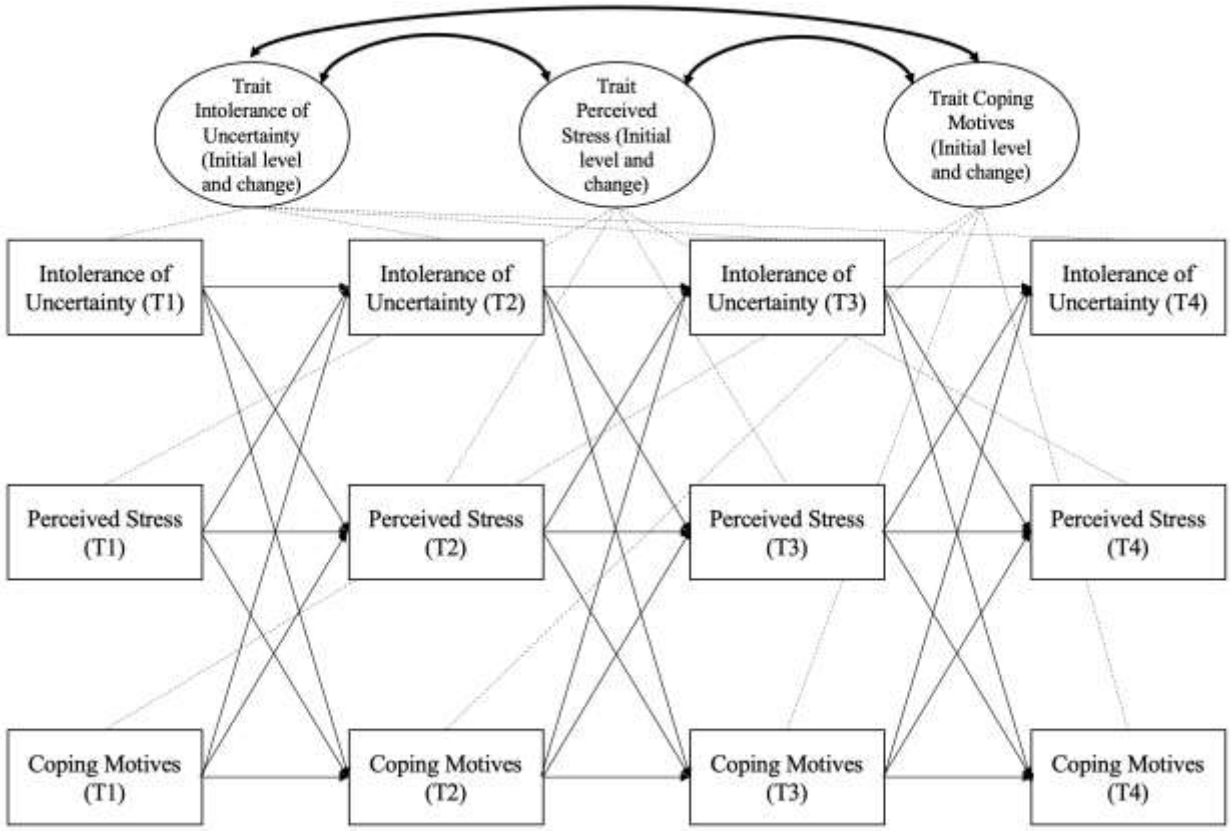

Figure 1. Hypothesized state-trait model relating intolerance of uncertainty (T1-T4), perceived stress (T1-T4), and coping motives (T1-T4). T1 = baseline; T2 = 1-month follow-up; T3 = 2-month follow-up; T4 = 3-month follow-up. Note that this is a simplified theoretical representation of the statistical model.