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## **Childhood Traumatic Experiences and Negative Alcohol-Related Consequences in Adulthood: A Cross-Cultural Examination of Distress Tolerance and Drinking to Cope**

### **Abstract**

**Background/Objectives:** Prior research has established that Adverse Childhood Experiences (ACEs) predict harmful alcohol use outcomes. However, underlying mechanisms that could explain these associations are less clear. The present study examined if ACEs are indirectly related to alcohol negative consequences through their associations with distress tolerance and drinking to cope. **Method:** A sample of 3,763 (71.9% female) college students who drink alcohol from seven countries (U.S., Argentina, Canada, Uruguay, Spain, South Africa, and England) completed online surveys. Path analysis was performed within the whole sample testing the serial unique associations between ACEs→distress tolerance→drinking to cope→negative alcohol-related consequences. Multi-group analysis was performed to determine if the proposed pathways were invariant across gender and countries. **Results:** Both distress tolerance and drinking to cope uniquely accounted for the relationship between ACEs and negative alcohol-related consequences. Moreover, a significant double-mediation effect was found illustrating that a higher endorsement of ACEs was associated with lower distress tolerance, which in turn was associated with higher drinking to cope, which in turn was associated with more negative alcohol-related consequences. These effects were invariant across

countries and gender groups. **Conclusions:** These findings provide support for the relevance of distress tolerance and coping motives as potential factors in linking ACEs to problematic alcohol use across nations. Our data are consistent with the idea that intervening on distress tolerance and drinking motives could mitigate downstream alcohol-related consequences related to ACEs in college student populations around the world.

*Keywords:* distress tolerance; adverse childhood experiences; alcohol use; cross-cultural; alcohol-related consequences

## **Introduction**

Heavy alcohol use is prevalent, with alcohol use disorder affecting 8.6% of men and 1.7% of women globally (World Health Organization, 2018a). Notably, childhood trauma is common among individuals with alcohol use disorders, with 70% of individuals with alcohol use disorder reporting having experienced a childhood trauma (Schwandt et al., 2013). Indeed, research documents that adverse childhood experiences (ACEs, which include events that are commonly defined as traumatic stressors and maltreatment experiences) predict a variety of substance use outcomes, including future tobacco, alcohol, and illicit drug use (Felitti et al., 1998). Much of this work has concentrated on risk for harmful drug and alcohol use in young adulthood, a period of peak vulnerability (Carliner et al., 2016; Elliot et al., 2014; Enoch, 2011). Despite a strong link between ACEs and alcohol misuse, much remains unknown about the risk and protective mechanisms that account for ACEs' effects on alcohol use into adulthood.

### **Distress Tolerance as Proposed Mechanism**

Distress tolerance (DT) is the ability to withstand internal discomforts, such as negative emotions, intrusive thoughts, or uncomfortable physical sensations, which often arise in the wake

of stressful experiences (Zvolensky et al., 2010). DT can be conceptualized as the capacity to resist negative reinforcement, to the extent that expressing DT involves prioritizing a long-term goal over the prospect of short-term relief from some aversive experience. For instance, for someone who is trying to quit using alcohol, the act of resisting cravings requires DT because one must prioritize a long-term goal (i.e., quitting, sobriety) over escaping the short-term discomfort (i.e., craving).

High DT implies a more deliberate, calculated emotion-regulation profile. Specifically, people with high DT are theorized to rely less on maladaptive emotion-regulation strategies that are associated with avoiding, or else quickly escaping, negative emotion (Veilleux, 2022). Indeed, research shows that high DT is linked to adaptive emotion-regulation strategies, such as acceptance and reappraisal, on both within- and between-person levels (Larrazabal et al., 2022; Naragon-Gainey et al., 2017). To the extent that ACEs, such as physical, emotional, mental, and sexual abuse and neglect, disrupt the development of DT, emotion regulation abilities would be expected to be diminished as well (Arens et al., 2014; Bartlett et al., 2021; Robinson et al., 2021). This can create negative repercussions into adulthood, such as lower DT being associated with increased likelihood of experiencing symptoms of anxiety, depression, PTSD, and alcohol use (Leyro et al., 2010; Robinson et al., 2019). Indeed, there is evidence that low DT is specifically linked to problematic alcohol use in the face of negative affect (Jeffries et al., 2015; Leyro et al., 2010; Howell et al., 2010), and that DT mediates the prospective association between adolescent violence exposure and problematic alcohol use in adulthood (Heleniak et al., 2021). Taken together, existing theory and evidence point to DT as a critical factor for determining risk of harmful alcohol use among stress-exposed young people.

### **Drinking to Cope as Proposed Mechanism**

ACEs arguably confer vulnerability to exhibit maladaptive responses to stress (Elsley et al., 2015). Specifically, it has been suggested that experiencing ACEs may disrupt the individual's ability to tolerate distress, increasing the likelihood of engaging in maladaptive responses to reduce negative affect (Arens et al., 2014). One such maladaptive response is drinking alcohol to cope, which has been shown to be a primary alcohol motivation related to reducing negative affect (Cooper et al., 2016; Kuntsche et al., 2006). Drug and alcohol use coping motives have been shown to significantly mediate the relationship between childhood emotional, physical, and sexual abuse and alcohol problems (Hogarth et al., 2019; Mezquita et al., 2014; Shin et al. 2019, 2020). Additionally, drinking to cope has been found to mediate the association between lower DT and increased alcohol-related problems (Khan et al., 2018; Pilatti et al., 2022), and be a primary reason as to why individuals with ACEs drink (Rothman et al., 2008). The current literature highlights the potential of low DT and drinking to cope as mechanisms serially linking ACEs to alcohol-related problems in adulthood. However, limited research has tested this serial risk pathway directly, especially cross-nationally.

### **Cross-National Research**

A majority of published psychological results infer generalizability, yet do not contain a sample outside of North America and Western Europe (Muthukrishna et al., 2020). Cross-national studies expand past research into diverse samples and, hence, allow testing of whether the proposed associations or mechanisms are invariant (i.e., similar) across groups/countries. The variance between groups/countries can be used to develop treatments and interventions specifically tailored to each stratum, whereas invariance supports the replicability and generality of the risk pathways and hence the potential broad utility of interventions targeting the mediators common to stratum. Relevant to the present study, cross-national studies help elucidate how

cross-national differences in drinking behaviors or ACEs-related variables, if any, impact the proposed associations (e.g., ACEs → DT → drinking to cope → alcohol-related problems) of the present study. Drinking behaviors (Sudhinaraset et al., 2016) and ACEs (Alhowaymel et al., 2021) are influenced by cultural, social, and economic factors. For example, countries and societies have different minimum legal drinking ages (World Health Organization, 2004), and differ in the percentage of individuals who do not drink (Room et al., 2019) or engage in heavy episodic drinking (Room et al., 2019). Specific to college drinking, college life greatly varies (e.g., living on/off campuses, living with or close to family) across countries (Bravo et al., 2017).

There are also cross-national variations in the prevalence of ACEs (Basto-Pereira et al., 2022; Hughes et al., 2021; Kaminer et al., 2022) that may be affected by financial hardship (Crouch et al., 2019). Moreover, past research has identified cultural differences regarding which behaviors are perceived as abusive (Fontes & Plummer, 2010) and in parenting practices (Bornstein, 2013). Parenting style seems to be influenced by socioeconomic conditions (e.g., a more punitive parenting style tends to be more prevalent at low socioeconomic levels; Roubinov & Boyce, 2017), and this, in turn, may impact the experience or report of ACEs. However, research examining whether these cross-national and cross-cultural factors impact (beyond just mean levels of these constructs) the associations between ACEs, DT, drinking to cope motives, and alcohol outcomes in cross-cultural diverse samples is limited.

### **Purpose of Present Study**

There is an established relationship between childhood trauma and drinking to cope, however, these models do not include DT, which has been revealed to be an important predictor of coping styles in later adulthood (Berenz et al., 2018). The present study aimed to examine relationships among ACEs, DT, drinking to cope, and negative alcohol-related consequences

among college student drinkers from seven countries (U.S., Argentina, Canada, Uruguay, Spain, South Africa, and England) in order to assess the ubiquity of the model across different cultures. We specifically tested a mediation model in which the relationships between ACEs and negative alcohol-related consequences would be indirectly associated via DT and drinking to cope. We hypothesized that higher reports of ACEs would be associated with lower DT, which in turn would be related to higher drinking to cope motives, which in turn would be associated with higher reports of negative alcohol-related consequences. Exploratory (i.e., *no a priori* hypotheses) multi-group models were tested to determine if the proposed model (ACEs → DT → drinking to cope → negative alcohol-related consequences) is invariant across gender and different countries.

## Methods

### Participants and Procedures

Participants were college students recruited to participate in an online survey from seven countries focusing on mental health and substance use (U.S., Argentina, Spain, Uruguay, England, Canada, and South Africa) (see [blinded for review] for a detailed description of the sample and research protocol). For the purpose of this study the analytic sample was limited to participants ( $n = 3,763$ ; 71.9% female) who consumed alcohol at least once within the last 30 days and completed measures of ACEs, alcohol use, and negative alcohol-related consequences (U.S., [ $n = 1719$ ; 68.9% female], Canada [ $n = 710$ ; 68.5% female], South Africa [ $n = 300$ ; 82.6% female], Spain [ $n = 321$ ; 73.1% female], Argentina [ $n = 375$ ; 75.4% female], Uruguay [ $n = 61$ ; 88.5% female], England [ $n = 277$ ; 82.2% female]).

Participants in the U.S., Canada, England, and South Africa were recruited from Psychology Department pools and received research participation credit. Participants in

Argentina and Uruguay were recruited via an invitation disseminated through online social networks, e-mail listings, and flyers (only in Argentina), and several prizes were raffled among those participants who completed the survey (Uruguay: 10 cash prizes [each of  $\approx$ US\$ 20 at the time]; Argentina: 10 vouchers for a bookstore and 15 cash prizes [each of  $\approx$ US\$ 10 at the time]). In Spain, all the students at the university received an e-mail invitation and participants received 5 euros for completing the survey (available until the funds ran out). The institutional review boards (or their international equivalent) at the participating universities approved the study procedures.

### **Measures**

It is important to highlight that measurement invariance testing of all appropriate measures demonstrated metric invariance across the countries, which is necessary when examining associations between study constructs across different groups (analytic outputs available at OSF project website).

### ***ACEs***

ACEs were assessed using the Adverse Childhood Experiences International Questionnaire (ACE-IQ) (World Health Organization, 2018b) for English-speaking students. This measure consists of questions assessing 13 ACEs experienced before age 18, including relationship with parents or guardians, family environment, peer violence, and community violence. Members of the research team independently translated this version into Spanish then discussed and agreed to a final version that was used for the Spanish-speaking students (see [blinded for review] for more detail on the validation of the measure across countries). For the present study, exposure to collective violence (e.g., war, terrorism, or militia violence) was excluded as its occurrence over the past 25 years has been rare in the countries sampled. The

present study utilized the binary scoring method, in which any level of exposure to an ACE (whether single or multiple exposures) is coded dichotomously to reflect experiencing that ACE (0 = *no*, 1 = *yes*). Thus, higher scores on the total score indicate more unique ACEs endorsed (range = 0 – 12).

### ***Distress Tolerance***

Distress tolerance was assessed using the English (Simons & Gaher, 2005) and Spanish (Sandín et al., 2017) versions of the Distress Tolerance Scale (DTS). The DTS is a 15-items self-report scale where participants rated each item on a 5-point Likert scale (1=*strongly agree*, 5=*strongly disagree*) to questions asking participants about their ability to tolerate psychological distress. An example item is, “Other people seem to be able to tolerate feeling distressed or upset better than I can”. A higher total score indicates higher distress tolerance ( $\alpha=.93$ ).

### ***Drinking to Cope***

Drinking to cope was assessed using the English (Kuntsche & Kuntsche, 2009) and Spanish (Mezquita et al., 2018) versions of the Drinking Motives Questionnaire-Revised Short Form (DMQ-R-SF). Participants were instructed to use a 5-point scale (1=*almost never/never*, 5=*almost always/always*) to reflect on the motives which influenced their alcohol consumption over the past month. Although the measure assesses four distinct drinking motives (social, enhancement, conformity, coping), based on study aims, we only utilized the drinking to cope subscale (3 items;  $\alpha=.87$ ) as it has a unique direct association, above and beyond alcohol consumption, with alcohol problems (Cooper et al., 2016; Shuai et al., 2022).

### ***Alcohol-related Consequences***

Negative alcohol-related consequences were assessed using the English (Kahler et al., 2005) and Spanish (Pilatti et al., 2014) versions of the Brief-Young Adult Alcohol Consequences



Questionnaire (B-YAACQ). The B-YAACQ is a 24-item questionnaire that measures alcohol-related negative experiences within the past 30 days. Each item was scored dichotomously to reflect the presence/absence of the alcohol-related problem (0=no, 1=yes). A total score is created by summing all endorsed experiences ( $\alpha=.86$ ).

### ***Alcohol Use Quantity***

Participants were first presented with a visual guide about typical drinks (specific to each country) to help orient them to Standard Drink Units (SDUs). We assessed typical alcohol use quantity using a grid such that each day of the week was broken down into six 4-hour blocks of time (12a-4a, 4a-8a, 8a-12p, etc.) and participants were asked to report at which times they consumed alcohol during a “typical week” in the past 30 days, as well as the number of standard drinks consumed during that time block. The measure was translated into Spanish for students in Argentina, Spain, and Uruguay. We calculated typical quantity of alcohol use by summing the total number of standard drinks consumed across time blocks during the week. To make accurate comparisons across countries, the total number of Standard Drink Units (SDUs) consumed (summed) were transformed into grams of alcohol taking into account country specific SDU rates based how many grams of alcohol is classified as an SDU in that country (quantity estimates  $>3SDs$  above the mean were Winsorized). Typical alcohol use quantity was entered as a covariate within the model to isolate direct effects on alcohol problems independent of consumption levels.

### **Data Analysis Plan**

To test the proposed model, path analysis using *Mplus* 8.3 (Muthén & Muthén 1998-2019) was conducted among the total sample, concurrently examining indirect effects of ACEs to negative alcohol-related consequences via DT and drinking to cope. Missing data were

handled using full information maximum likelihood. Statistical significance for all associations (direct and indirect) was determined by 99% bias-corrected bootstrapped confidence intervals (based on 10,000 bootstrapped samples) that do not contain zero.

To test whether our model was invariant or non-invariant across gender and country, we conducted  $\chi^2$  difference tests comparing a freely estimated multi-group model to a constrained multi-group model (i.e., constraining the paths of the mediation model) to determine whether constraining the paths to be equivalent across groups resulted in a worse fitting model. Given the small sample size in Uruguay, we combined that sample with the Argentinian sample to create a “South American” sample, as done in prior research (Pilatti et al., 2021). Given that the  $\chi^2$  test statistic is sensitive to sample size (Brown, 2015), we relied on a more stringent alpha level (.01) as well as any decrements in CFI ( $\Delta$ CFI should be  $\leq 0.01$  to consider a model invariant, Cheung & Rensvold, 2002) to test model invariance.

## Results

Bivariate correlations and descriptive statistics among study variables are reported in Table 1. Briefly, ACEs was significantly negatively correlated with DT (small effect:  $r = -.15$ ) and positively correlated with both drinking to cope (small effect:  $r = .15$ ) and negative alcohol-related consequences (small effect:  $r = .15$ ). DT was significantly negatively correlated with both drinking to cope (small-medium effect:  $r = -.23$ ) and negative alcohol-related consequences (small effect:  $r = -.15$ ). Drinking to cope and negative alcohol-related consequences were significantly positively correlated (medium effect:  $r = .37$ ). The total, indirect, and direct effects for the model are summarized in Table 2 (indirect effects) and Figure 1 (direct effects). Constrained multi-group models compared to the freely estimated model indicated model invariance across countries [ $\Delta\chi^2[30]=47.93, p=0.02, \Delta$ CFI= -0.010] and gender [ $\Delta\chi^2[6]=13.20,$

$p=0.04$ ,  $\Delta CFI=-0.004$ ]. Taken together, we present the results of our model within the total sample.

Within our model, we found a significant total effect of ACEs on alcohol-related consequences ( $\beta=.14$ , 99% CI [0.10, 0.18]) and total indirect effect via the collected (i.e., combination of all indirect effects together) unique indirect effects ( $\beta=.05$ , 99% CI [0.04, 0.07]); with 35% of the variance of total effect explained by the mediators. In examining specific indirect effects, we found that both DT (7.82% of the variance of total effect) and drinking to cope (21.81% of the variance of total effect) uniquely indirectly influenced the relationship between ACEs and negative alcohol-related consequences. Specifically, higher endorsement of ACEs was associated with more alcohol-related negative consequences via lower DT and higher endorsement of drinking to cope motives. Moreover, a significant double-mediation effect was found such that higher endorsement of ACEs was associated with lower DT, which in turn was associated with higher endorsement of drinking to cope, which in turn was associated with more negative alcohol-related consequences (5.76% of the variance of total effect). It is important to note that above and beyond the effects of other predictors, we found a significant direct effect of ACEs on negative alcohol-related consequences ( $\beta=.089$ , 99% CI [0.05, 0.13]).

## **Discussion**

Past research suggests that ACEs exposure confers risk for harmful alcohol use, possibly by disrupting young people's ability to effectively manage stressors and associated internal discomforts (Carliner et al., 2016; Elliot et al., 2014; Enoch, 2011; Hughes et al., 2017, 2021; Schwandt et al., 2013). The present study found, in college student drinkers from seven countries, that DT and drinking to cope acted as mechanisms linking ACEs to alcohol-related problems in adulthood. The nature of these indirect effects was invariant across gender and

country.

Past research highlights the use of maladaptive emotion regulation strategies as a key mediator in the association between exposure to adversity and the subsequent development of psychopathology (McLaughlin & Hatzenbuehler, 2009). While there are established relationships between childhood trauma and maladaptive coping styles in the research literature (Elsey et al., 2015; Hogarth et al., 2019; Mezquita et al., 2014), these models do not include DT. The latter construct has received growing attention as a marker for a wide array of psychological disorders (Zvolensky et al., 2010). The present research has revealed how DT plays a significant role in the relationship between ACEs, drinking to cope, and negative alcohol-related consequences. The development of DT is sensitive to environmental experiences in childhood, with multiple traumatic ACEs known to predict less DT later in life (Arens et al., 2014). The present research suggests that low DT is a risk factor for problematic alcohol use, as the model suggests that lower DT may be associated with higher maladaptive coping styles, such as using alcohol to cope, and therefore increases in alcohol-related consequences. Specifically, the present findings suggest DT as a potential key protective element of emotion regulation. That is, higher levels of DT could protect vulnerable individuals (e.g., those exposed to ACEs) from engaging in maladaptive responses to distress, such as seeking alcohol (Khan et al., 2018).

### **Clinical Implications**

In line with prior research, our findings suggest that interventions targeting drinking to cope motivations may be effective in reducing problematic alcohol use among university students with a history of ACEs (e.g., Anker et al., 2016; Kushner et al., 2013). Our findings also suggest that interventions to enhance DT may be effective. Emerging from Dialectical Behavior Therapy (DBT; Linehan, 1993), DT interventions include mindfulness practices, cognitive

strategies, and other techniques to develop the capacity to tolerate, accept and cope with uncomfortable feelings, rather than trying to avoid or escape from them (McKay et al., 2019). DT has been found to improve during intervention among patients with drug and alcohol use disorders (Bornovalova et al., 2012; Reese et al., 2019), to be effective in smoking cessation (Brown et al., 2013), and to improve treatment outcomes for alcohol dependence when combined with CBT (Stasiewicz et al., 2013). Although DT intervention studies with substance users have mainly been based in the United States, our findings suggest that these interventions may be useful in reducing problematic alcohol use amongst student populations across different countries. Piloting a DT intervention with a cross-national sample of university students with cumulative ACEs and problematic alcohol use would provide further insights into this potential intervention mechanism.

### **Limitations and Future Directions**

Our study also has several limitations. First, our cross-sectional study prevents any definitive conclusions about the temporal sequencing of the relationships between ACEs, DT, drinking to cope, and negative alcohol-related consequences. Although longitudinal studies have demonstrated the prospective link between ACEs and alcohol problems, future longitudinal studies are needed to examine temporal order of the mediators in the proposed model. Moreover, it would be important to measure DT over time during childhood, especially after experiencing ACEs. Additionally, it could be that the predictor variables measured within this study preceded the experiences of ACEs in childhood, therefore not reflecting the current proposed mechanism between ACEs and alcohol consequences. Further, our measure of ACEs relies on retrospective self-report data, which could be exposed to inaccurate recall and reporting bias (Hughes et al., 2017). It is also important to note that above and beyond the effects of other predictors, we did

find a significant direct effect of ACEs on negative alcohol-related consequences, suggesting that additional mediating variables could help to better understand the mechanisms linking ACEs to alcohol problems (e.g., personality, Mezquita et al., 2014). Finally, although we collected data across numerous countries, we utilized a convenient sample at each site, and thus results may not generalize to other college students in those regions/countries. Moreover, given small sample sizes within countries, examining gender differences within countries was not feasible and future research should examine the impact of gender and other sociodemographic variables on these relationships both within and between countries.

## **Conclusions**

Overall, although the associations between ACEs and alcohol use and negative alcohol-related consequences are well established, there is a gap in our understanding of the underlying mechanisms that can explain this association. Although further longitudinal and experimental research is needed, the present research highlights the role of DT and coping motives as potential mediators linking ACEs to alcohol-related consequences. Moreover, the fact that the model was invariant across gender and countries supports the model as a general theoretical account of the harms arising from exposure to ACEs. Ultimately, strengthening calls for trials to determine whether targeting the mediator variables is efficacious in mitigating these harms.

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**Table 1***Standardized Correlations for Study Variables*

Variable	1	2	3	4	5	<i>M</i>	<i>SD</i>
1. ACEs	---					4.14	2.46
2. Distress Tolerance	<b>-.15</b>	---				3.14	0.83
3. Drinking to Cope	<b>.15</b>	<b>-.23</b>	---			1.84	0.94
4. Alcohol-Related Consequences	<b>.15</b>	<b>-.15</b>	<b>.37</b>	---		4.85	4.36
5. Alcohol Quantity	.02	-.01	<b>.18</b>	<b>.44</b>	---	124.74	113.28

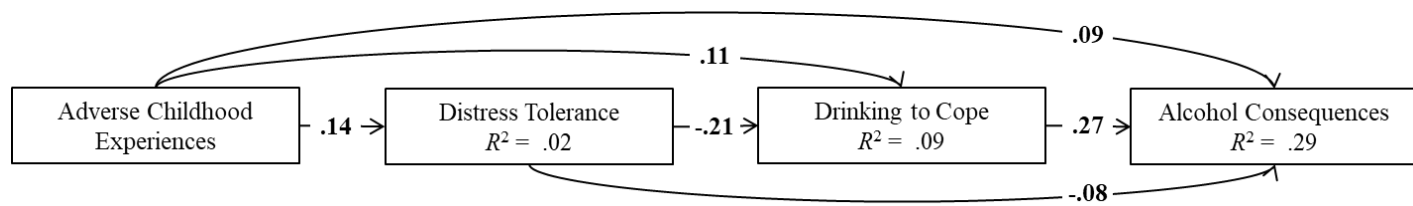
Note: Significant correlations are bolded and based on 99% confidence intervals that do not contain zero. ACEs = adverse childhood experiences.

**Table 2***Summary of standardized total, indirect, and direct effects of the mediation model*

Predictor Variable: <i>ACES</i>	<i>Drinking to Cope</i>		<i>Alcohol Consequences</i>	
	$\beta$	99% CI	$\beta$	99% CI
Total	<b>0.142</b>	<b>0.10, 0.19</b>	<b>0.137</b>	<b>0.10, 0.18</b>
Total Indirect <sup>a</sup>	<b>0.030</b>	<b>0.02, 0.04</b>	<b>0.049</b>	<b>0.04, 0.07</b>
Distress Tolerance	<b>0.030</b>	<b>0.02, 0.04</b>	<b>0.011</b>	<b>0.004, 0.02</b>
Drinking to Cope	---	---	<b>0.030</b>	<b>0.02, 0.04</b>
Distress Tolerance → Drinking to Cope	---	---	<b>0.008</b>	<b>0.01, 0.01</b>
Direct	<b>0.112</b>	<b>0.07, 0.16</b>	<b>0.089</b>	<b>0.05, 0.13</b>
Predictor Variable: <i>Distress Tolerance</i>	$\beta$	99% CI	$\beta$	99% CI
Total	<b>-0.209</b>	<b>-0.26, -0.16</b>	<b>-0.130</b>	<b>-0.18, -0.08</b>
Total Indirect <sup>a</sup>	---	---	<b>-0.056</b>	<b>-0.07, -0.04</b>
Distress Tolerance	---	---	---	---
Drinking to Cope	---	---	<b>-0.056</b>	<b>-0.07, -0.04</b>
Distress Tolerance → Drinking to Cope	---	---	---	---
Direct	<b>-0.209</b>	<b>-0.26, -0.16</b>	<b>-0.075</b>	<b>-0.12, -0.03</b>

Note: Significant associations are in bold typeface for emphasis and were determined by a 99% standardized bootstrapped confidence interval (10,000 bootstraps) that do not contain zero.

<sup>a</sup>Reflects the combined indirect associations within the model.



**Figure 1.** Reports the standardized effects from our proposed model. Significant associations are in bold typeface for emphasis and were determined by a 99% standardized bootstrapped confidence interval (10,000 bootstraps) that do not contain zero.