Drinking motives as a predictor of readiness to change alcohol use

Ahmed A. Moustafa[1,2] · Nadia P. Alvinia[3] · Liquan Liu[3] · Yuliya Richard[4] · Ali A. Hanafy[5] · Nizar H. Bagadood[5] ·
Eid Abo Hamza[6,7]

Abstract

Drinking motives have been identified as important predictors of alcohol consumption. Similarly, the degree of readiness to change (RTC) can predict behavioral changes when drinking alcohol. However, the link between drinking motives and RTC has not been explored in previous research. The aim of this study is to investigate whether the four drinking motives (coping, enhancement, social, conformity) can predict the three stages of RTC (precontemplation, contemplation and action) in relation to alcohol consumption. Two hundred and fifty-two undergraduates' students completed an online self-assessment survey on Qualtrics that assessed motives for alcohol use, drinking behavior, and RTC. Hierarchical regressions showed that among the four specific drinking motives, coping motives significantly predicted all three stages of RTC; conformity motives positively predicted the action stage of change; social motives negatively predicted the precontemplation and action stages of change; enhancement motives were not significant in predicting RTC stages. These results indicate that the three RTC levels can be predicted by coping, social, and conformity motives, but not by enhancement motives. Additionally, given the importance of coping motives, it might be useful to address and include healthier coping mechanisms as part of clinical interventions and prevention methods to circumvent unsafe drinking behaviors independent of a single RTC stage.

Keywords Alcohol misuse · Alcohol use disorder · Drinking motives · Readiness to change

Introduction

Reducing drinking behavior has been the focus of health research for decades (Moustafa, 2020) as such behaviour can be linked to adverse experiences such as increased motor vehicle accidents, increased depression in students. Drinking motivation has been found to predict drinking behavior across short-term and long-term outcomes (Merrill et al., 2014; Cooper, 1994). Drinking motivation is defined as reasons or factors underlying some behaviors, and drinking motives are reasons underlying alcohol use (Cooper, 1994). Such motivation is modulated by individual willingness to change (Abo Hamza, 2018). The varying degrees of willingness to change has been associated with successful treatment outcomes for problematic alcohol use (Abo Hamza, 2018). As positive treatment outcomes can be achieved by facilitating movement between stages of change (DiClemente, 1999; Abo Hamza, 2018), this study examined the relationship between different drinking motives and readiness to change in the context of alcohol use. In this study, we aim to improve the current understanding of how specific drinking motives can influence stages of change. In other words, our research aims to shed light on the impact of drinking motives on readiness to change and drinking behaviors.

Drinking behavior is defined as behaviors associated with thinking of, obtaining and drinking alcohol as well as maladaptive behaviors related to overuse of alcohol.

✉ Ahmed A. Moustafa
ahmed.a.moustafa@gmail.com

1 Department of Human Anatomy and Physiology, The Faculty of Health Sciences, University of Johannesburg, Johannesburg, South Africa

2 School of Psychology, Faculty of Society and Design, Bond University, Gold Coast, QLD, Australia

3 School of Psychology, Western Sydney University, Sydney, NSW, Australia

4 Blue Horizon Counseling Services, Sydney, Australia

5 Department of Special Education, College of Education, Umm Al-Qura University, Makkah, Saudi Arabia

6 Faculty of Education, Department of Mental Health, Tanta University, Tanta, Egypt

7 College of Education, Humanities & Social Sciences, Al Ain University, Al Ain, UAE

Accordingly, research on drinking behaviors have investigated reasons and factors underlying heavy alcohol use, such as binge drinking, often in college students and adolescents (Conegundes et al., 2020; Hernández-Vásquez et al., 2022; Herrero-Montes et al., 2019; Lines et al., 2022). Another line of research investigates changes in brain and behavior due to heavy alcohol use, including the development of physical, psychiatric, and neurological disorders such as Korsakoff syndrome (Duckworth et al., 2022; El Haj et al., 2018, 2019; El Haj & Moustafa, 2020; Zamboanga et al., 2022). However, researchers have yet to connect underlying reasons for drinking behaviors to readiness to change. Below, we first discuss prior studies on drinking motives in relation to drinking behaviors, relevant models, and readiness to change, respectively. In doing so, we will highlight the gap in the literature and the goal of our study.

Drinking motives, alcohol-related problems, and drinking behaviors

Drinking motives are defined as factors and antecedents that impact drinking behaviors (Grant et al., 2007). Drinking motives are pertinent to drinking behavior and ultimately drinking behavior change. Although numerous social and individual predictors of alcohol consumption, such as public health policies, broader cultural attitudes towards alcohol, age and gender, have been identified (Alley et al., 2018; Bergagna & Tartaglia, 2019; Grossbard et al., 2016; Jiang et al., 2020; Lyvers et al., 2010; Van Damme et al., 2017), drinking motives are identified as the most proximal factors underlying alcohol-related cognitions and drinking behaviors (Hasking et al., 2011), and their relationship to amount of drinking alcohol can vary every day even in the same person (Patrick & Terry-McElrath, 2021).

Under the motivational model (Cooper, 1994; Cooper et al., 2016), the desire to meet specific needs predicts consistent drinking behavior. In Cooper's motivational model, the basic premises are (1) drinking to achieve a specific worthwhile outcome and (2) assuming that drinking behavior performs a function that depends on the context of the history and episode of alcohol use. For example, maladaptive coping strategies that increase a person's dependence on alcohol likely causes using alcohol as a coping mechanism to manage negative emotions.

Understanding the motivating factors underlying substance misuse may provide better guidance for tailored interventions.

Cox and Klinger (1988) discuss two dimensions that drive drinking: motivation (internal, external) and consequence (positive, negative). The Drinking Motives Questionnaire (DMQ; Cooper, 1994) considers these two-by-two dimensional indices: (1) drinking as a form of coping (internal, negative), (2) drinking for enhancement (internal, positive), (3) drinking for sociability (external, positive), and (4) drinking for adjustment or conformity (external, negative).

Among all drinking motives, coping motives are the most concerning as it is directly linked to problematic alcohol drinking (Merrill et al., 2014). Coping motives relate to drinking to reduce or cope with negative affect. Motives for enhancement are associated with drinking to reinforce positive moods. Social motives are defined as drinking for social rewards within social settings. Conformity motives include drinking to avoid social rejection among peers. It is hypothesized that these drinking motives act as predictors of alcohol consumption, independent of other factors influencing a person's decision to drink, thereby strongly predicting alcohol consumption behavior (Cox & Klinger, 1988).

Internal drinking motives (including coping and enhancement) are often linked with higher alcohol consumption and alcohol-related issues. Alcohol-related problems is defined as alcohol dependence or tolerance including difficulty controlling alcohol use as well as adverse harms related to alcohol use (Keyes et al., 2019; Scheer et al., 2022). Coping motives are typically related to heavy alcohol consumption (Bresin & Mekawi, 2021; Kuntsche et al., 2005; Lyvers et al., 2010, 2018). They are directly linked to maladaptive coping strategies that lead to higher life dissatisfaction and long-term negative outcomes (Matwin & Chang, 2011; Segrin & Bowers, 2019; Wicki et al., 2017). Addressing factors involving drinking as a maladaptive coping strategy predicts a reduction in extreme alcohol use over six months (White et al., 2016).

Enhancement motives predict unsafe levels of drinking, although the relationship between alcohol-related problems and these motives remains unclear. Although some studies report a strong relationship between alcohol-related problems and enhancement motives (Bergagna & Tartaglia, 2019; Kuntsche et al., 2005), others have found that after adjusting for coping motives, enhancement motives were no longer linked with alcohol-related issues after (Cooper et al., 1995).

In contrast to internal motives, which appear to predict higher alcohol consumption, evidence suggests that the influence of external motives (social and conform) is less strongly associated with alcohol-related problems and varies more with alcohol consumption. Variance in relationships is observed in social motives (external and positive) that appear to influence the average number of drinks consumed (moderating factor; Bergagna & Tartaglia, 2019; Kuntsche et al., 2005) or are associated with heavier alcohol consumption (Bresin & Mekawi, 2021; Lyvers et al., 2010; White et al., 2016). Results from these studies as to whether there is a strong link between social motives and alcohol-related problems are also mixed.

Regarding compliance motives (external and negative), research shows either a non-significant (Lyvers et al., 2010; White et al., 2016) or a negative association between compliance-motivated drinking and alcohol consumption. The latter studies assume that people drink enough to adapt and avoid social rejection (Bergagna & Tartaglia, 2019; Bresin & Mekawi, 2021). Despite lower alcohol consumption, Bresin and Mekawi (2021) argue that compliance may be associated with alcohol-related issues. In summary, the four motives suggest significant associations between differential alcohol consumption and alcohol-related issues with the possibility of alcohol-related behavior change if these motives can be addressed.

The transtheoretical model

In Prochaska and DiClemente (1982) Transtheoretical Model, four stages of change are identified: (1) contemplation, (2) termination, (3) action, and (4) maintenance. It is argued that individuals progress go through these stages, using cognitive and behavioral processes while changing their health behaviors (Marcus & Simkin, 1994). The model does not view the change process as linear, but focuses on the individual change process instead. The model has also developed to Readiness to Change (RTC) Model (DiClemente, 1999) with five stages of change: (1) pre-contemplation, (2) contemplation, (3) preparation, (4) action, and (5) maintenance. Each stage is associated with different levels of motivation and different steps to achieve change. Note that different from the Trantheoretical Model, the RTC Model refers to the willingness or psychological preparedness for accepting the treatment of alcohol use disorder and changing alcohol use (Miller et al., 1996). It includes the recognition of drinking problems, ambivalence about drinking and taking steps towards changing alcohol use (Miller et al., 1996; Chang et al., 2021).

Although placed in the RTC model, in the precontemplation stage, an individual is not ready to change as she/he is not aware of a need to change, and starts to recognise the problematic behaviors in the contemplation stage, although no action is taken. However, in the action stage, she/he is ready to engage. And finally in the maintenance stage, she/he is working on avoiding relapse.

Utilising data from a national alcohol treatment study, Carbonari and DiClemente (2000) use the Transtheoretical Model to categorize profiles of outpatients determined by their individual alcohol consumption level one year after engaging in interventions. Among totally abstinent, moderate, and heavy drinking groups, profiles differ significantly between those that maintain abstinence and those that continue to engage in heavy drinking. Higher scores at the action stage at baseline pre-treatment may predict adherence and success of treatments whereas lower scores at follow-up are indicative of the success of the treatment outcome (Carbonari & DiClemente, 2000).

The RTC model has proven useful in understanding the segmented process of change influenced by the dynamic factors at work in an individual related to substance misuse (DiClemente, 1999). Individuals begin in the pre-contemplation stage typically unaware of the information about the possible consequences of the behavior. They do not see their drinking as a problem and generally are not likely to change. The contemplation stage consists of thoughts of change weighed against the costs and benefits of continued drinking or exercise. The process of defining and planning the change stage is termed the preparation stage. When there is enough motivation to implement the changed behavior, people move on to the action stage. Finally, sustained change and active efforts to prevent relapse are considered the maintenance stage (DiClemente, 1999; Friman et al., 2017). Changes within the model are further dependent on aspects of the motivations related to change, facilitating movement between stages, and accounting for complications in an individual's life that may affect change (DiClemente, 1999).

Readiness to change and drinking behaviors

According to the RTC model, alcohol consumption levels are generally positively and reciprocally related to thought and action periods (Chang et al., 2021; Collins et al., 2010; Harris et al., 2008; Shealy et al., 2007). In particular, factors such as perceived importance of reducing alcohol consumption, age, higher self-stigma, major depression, and self-efficacy abstinence correlate with higher RTC scores (Chang et al., 2021; Harris et al., 2008; Watakakosol et al., 2021).

The relationship between alcohol use and RTC can also be transactional, where it can serve as a proxy for a person's awareness of problem drinking. For example, individuals who drink heavily will likely agree with the realization that they need to drink less, and so individuals can take steps to reduce drinking such as avoiding drinking situations (Collins et al., 2010).

Despite evidence of a strong association between immediate treatment outcomes and RTC, follow-up studies have reported that RTC does not predict long-term behavioral changes. Two longitudinal studies found that RTC, measured at baseline and assessed in terms of frequency of drinking, did not provide a significant prediction of reduction in alcohol consumption when assessed in the context of interventions and with medically vulnerable participants (Grossbard et al., 2016; Matwin & Chang, 2011). In Merrill et al. (2015), RTC can vary weekly, influenced by social and personal factors, and appears to be a reliable measure of short-term changes in alcohol consumption. Similarly, the importance of the long-term predicted change in alcohol use disorder outpatients over 12 months is demonstrated when they are reassessed every three months (Gaume et al., 2017). Overall, the RTC prediction of long-term treatment

outcomes was mixed. However, the process of change is known to be dynamic and RTC can be a significant predictor of short-term behavioral changes.

Prior investigations have studied RTC in relation to drinking behaviors. For example, Collins et al. (2010) found that the RTC questionnaire cannot reliably predict the amount of alcohol drinking in the future (i.e., after 2 years). Grossbard et al. (2016) found that higher pre-contemplation (first stage of RTC) is associated with lower alcohol drinking in students. Along these lines, Kaysen et al. (2009) found that RTC is inversely correlated with alcohol drinking intentions. More recently, Knuppenburg (2021) found that RTC is related to the sense of coherence, which is related to having a positive view of life events to manage stress. Furthermore, recent studies investigating RTC in relation to alcohol use have found the relationship between RTC and cognitive effort (Schwebel et al., 2021). Both constructs are associated with the treatment efficacy of alcohol addiction (Abo Hamza, 2011; Richards et al., 2021) found that problem drinking is associated with low scores in precontemplation and high scores in contemplation and action of the RTC questionnaire. Another recent study investigated the relationship between demographic and clinical factors and RTC (Chang et al., 2021). They found that RTC is positively correlated with age, the severity of alcohol drinking, the severity of depressive symptoms, and stigma.

While drinking behavior and RTC have been widely discussed (e.g., Chang et al., 2021), the relationship between various drinking motives and RTC stages is less unclear. Borsari et al. (2009) found that readiness to change was not a mechanism of behavior change in a study of college student drinkers. Similarly, no associations between client motivation at the beginning of treatment and change talk in counseling sessions has been reported (Hallgren & Moyers, 2011). Having said that, social motives such as alcohol consumption in a group rather than individually affect the action stage significantly higher than the precontemplation and contemplation stages (LeBerre et al., 2012).

Because drinking motives and RTC were separately studied in relation to drinking behaviors in a multitude of studies, we found it imperative to investigate the relationship between the two constructs. Furthermore, because addressing drinking motives can facilitate progress, sustain change, and reduce the specific challenges of risky alcohol use, the current study aims to examine the extent to which drinking motives might predict RTC after accounting for drinking behavior. Previous literature suggests that drinking behavior is associated with intrinsic motives (coping and enhancement) (Bergagna & Tartaglia, 2019; Bresin & Mekawi, 2021; Hasking et al., 2011; Lyvers et al., 2010; Wahesh et al., 2020) and (contemplation and action) RTC stages (Collins et al., 2010; Hile & Adkins, 1998; Merril et al., 2015; Shealy et al., 2007). We assume that enhancement and coping motives positively predict contemplation and acting even after taking drinking behavior into account. Given the mixed findings on external motives (social and conformity) and lower RTC (precontemplation) stage with inconsistent drinking relationships (Bergagna & Tartaglia, 2019; Kuntsche et al., 2005; Lyvers et al., 2010; White et al., 2016), we leave the predictive readiness to change alcohol use from social and conformity drinking motives open for exploration.

Lastly, the Readiness to Change Questionnaire (Rollnick et al., 1992) was adopted over other assessments (e.g., Stages of Change Readiness and Treatment Eagerness Scale, Vik et al., 2000; the University of Rhode Island Change Assessment scale, Dozois et al., 2004).

Methods

Participants

Participants were undergraduate students aged from 18 to 39 years from Western Sydney University recruited using the university's research participation system. Fifty-five additional participants were excluded from the study due to substantial missing data (26), non-consent (4) or having no history of drinking (25). The remaining 252 participants were further checked for missing data, which were dealt with using the expectation-maximization algorithm. Participants were compensated through course credit upon completion. All participants could read, write, and speak English, and their demographic backgrounds are listed in Table 1.

Study design

In this cross-sectional study, three hierarchical regression analyzes were performed using the approach of Howard et al. (2019) carried out. The regression analyzes evaluated the predicted values of significant variables from the bivariate correlation analysis. To control for demographic characteristics, age and gender were entered in the first step and significant AUDIT indices in the second step, since alcohol consumption is probably responsible for a large variance in the prediction of the RTCQ indices. Finally, in the final step, significant DMQ-R indices were entered to assess whether the variables predict subsequent RTCQ indices.

Measures

Demographic variables

Demographic data were collected, including age, gender, educational level, English speaking ability, ethnicity, self-reported clinical diagnoses, age of first alcohol consumption, total years of drinking, days per week of alcohol consumption, and type(s) of alcohol consumed.

Table 1 Participants' demographic backgrounds

Gender	Female	Male	Other				
	194	53	5				
Education	High School	Diploma	Other				
	169	60	23				
Identity	European	Middle Eastern	Mixed	Oceanian	Americas	African	Other
	91	35	35	10	8	3	55
Disorder	No	Present	Past				
	189	47	16				
Drinking	Past	Present					
	68	184					
Age of onset (years old)	< 18 years	> 18 years					
	169	103					
Treatment	Not seeking	Seeking					
	202	50					
Frequency (per week)	< 1–2 days	1–2 days	3–4 days	5–6 days	7 days		
	109	124	15	3	1		
Beverage choices	Mix	Spirits only	Wine only	Beer only	Other		
	151	40	20	5	36		

Education indicates participants' highest level of education. Identity indicates participants' self-ethnic-cultural identification. Disorder indicates whether participants were clinically diagnosed of a psychological disorder, head trauma or neurological illness in the past or present. Drinking indicates whether participants engaged in drinking behavior in the past or continued to the testing day. Age of onset indicates the starting age of alcohol consumption. Treatment indicates whether participants were seeking therapeutic and/or medical treatment. Frequency indicates how many numbers of days per week on average participants engaged in drinking behavior. Beverage choices indicate the types of alcohol participants consume

Drinking motives questionnaire-revised

The 20-item Drinking Motives Questionnaire-Revised (DMQ-R, Cooper, 1994) was used to assess the four drinking motives: coping, enhancement, social and conformity. Coping motives related to drinking to reduce negative moods (e.g., "to forget your worries"). Enhancement motives involved drinking to enhance positive moods (e.g., "because you like the feeling"). Social motives included drinking for positive social rewards (e.g., "because it improves parties and celebration"), and conformity motives reflected drinking to avoid social rejection (e.g., "to be liked"). Items are rated on a 5-point Likert scale (1 = almost never/never and 5 = almost always/always) and higher scores reflect higher motivation. The scale has excellent psychometric properties, with strong test-retest reliability and criterion validity (Grant et al., 2007; Sjödin et al., 2021).

Readiness to change questionnaire

The Readiness to Change Questionnaire (RTCQ) was developed by Rollnick et al. (1992) to assess stages of change: pre-contemplation which involves no intentions to change (e.g., "I don't think I drink too much"), contemplation reflecting a consideration of change (e.g., "Sometimes I think I should cut down on my drinking") and action as taking measures to change (e.g., "I am trying to drink less than I used to"). These

items are assessed on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). The questionnaire has good internal consistency and satisfactory test-retest reliability (Heather et al., 1993; Richards et al., 2021; Schwebel et al., 2021).

Alcohol use disorders identification test

The Alcohol Use Disorders Identification Test (AUDIT) is a 10-item screening tool to assess alcohol consumption, alcohol dependence and alcohol-related problems. Questions 1–8 are assessed on a 5-point Likert scale ranging from 0 to 4 and questions 9 and 10 are scored on a scale of 0, 2 and 4. A total score of ≥ 8 is generally considered to be indicative of risky drinking (Watt & Roche, 1999). The AUDIT consists of three indexes: alcohol consumption that reflects consumption levels, alcohol dependency involving the need to drink, and alcohol-related problems relating to the consequences of drinking (Babor & Higgins-Biddle, 2001). Factor analyzes of the three-factor structure suggest a good fit, internal consistency, and test-retest reliability (Maisto et al., 2000).

Procedure

The survey was live from 27th July to 1st September 2021 under the title "An exploration of drinking habits". Participants that clicked on the participation link were redirected onto Qualtrics

where the online survey was hosted. The total time of completion was about 15 min. Participants were taken to an information sheet outlining the study, with a mandatory informed consent agreement for their data to be used in the study before commencing the survey. Participants who would like to be contacted further for participation in a larger study had the option of leaving their email, which the primary researcher will contact at their discretion. Otherwise, data and participation were anonymous. The study was approved by the Western Sydney University Human Research and Ethics Committee (H13702) and consents were obtained prior to the survey.

Data screening and assumption testing

Analyzes were conducted on SPSS version 27. Data screening for univariate and multivariate outliers was performed. Fifteen univariate outliers exceeding $z \pm 3.29$ ($p \leq .001$) were dealt with by reducing the extreme raw scores to the next highest raw score (Tabachnick & Fidell, 2013). Four multivariate outliers were found exceeding $x^2 = 27.88$ ($p \leq .001$) using Mahalanobis distance scores and were removed from the dataset. Descriptive statistics are presented in Table 2. Assumptions of normality, linearity and homoscedasticity were assessed for the Pearson correlation analysis and checks for multicollinearity and singularity were conducted for the regression analyzes. The Shapiro-Wilk test suggested that normality was violated for all the variables ($p < .001$). However, linear regression models were robust to violations of assumptions given the large sample size of this study ($N = 252$) and exceeded both Stevens's (2012) and Tabachnick and Fidell's (2013) sample size recommendations for multiple regression (Schmidt & Finan, 2018). Observations of scatterplots suggested that assumptions of linearity and homoscedasticity were met. The intercorrelation of variables was assessed using the correlation matrix displayed in Table 2. Some of the variables such as Enhancement and Social were highly correlated ($p = .792$), raising a question about the separability of the domains; however, none exceeded the 0.90 threshold for multicollinearity or singularity. In all results below, an alpha of 0.05 was used (Hills, 2011).

Results

Correlation

The correlation matrix displayed in Table 3 shows that RTCQ indexes are correlated with age, DMQ-R and AUDIT. Results show that coping and problems were positively correlated with precontemplation; although significant, the relationship was weak. Additionally, social was found to negatively correlate with precontemplation. Similarly, this relationship was significant but weak, suggesting that scores for social index

Table 2 Means, standard deviations and ranges for Age, RTCQ, DMQ-R and AUDIT indexes

	M	*SD*	Minimum	Maximum
Age (years)	21.79	4.77	18	39
RTCQ[a]				
Precontemplation	-2.54	3.28	-8	6
Contemplation	-2.91	3.82	-8	8
Action	-1.13	4.54	-8	8
DMQ-R[b]				
Coping	2.38	1.16	1	5
Enhancement	2.87	1.14	1	5
Social	3.25	1.14	1	5
Conformity	1.88	0.97	1	5
AUDIT[c]				
Consumption	3.67	2.43	0	10
Dependence	1.77	1.77	0	8
Problems	2.70	3.13	0	14

$N = 252$

[a] Readiness to Change Questionnaire index scores; [b] Drinking Motives Questionnaire-Revised index scores; [c] Alcohol Use Disorders Identification Test index scores

increase as scores for precontemplation decrease. Contemplation was positively correlated with all the DMQ-R indexes indicating that as coping, enhancement, social and conformity scores increase, so do contemplation scores. Similarly, the AUDIT indexes positively correlated with contemplation. However, only coping, dependence and problems scores had a strong relationship with contemplation scores, with enhancement, social, conformity and consumption suggesting moderate relationships to contemplation.

Lastly, action was positively correlated with all the DMQ-R indexes, and dependence and problem for the AUDIT indexes, thus suggesting that as coping, enhancement, social conformity, dependence, and problem scores increase so do action scores. However, only coping and problems displayed a moderate relationship, whereas the relationship was weak for enhancement, social, conformity, consumption, and dependence. Interestingly, action was positively correlated with age albeit weakly, suggesting that an increase in age correlates positively with higher action scores. Furthermore, gender failed to be significantly correlated with any of the variables.

Hierarchical regression

Three hierarchical regressions assessed whether the three AUDIT and four DMQ-R indexes predicted each of the three RTCQ indexes. In each regression, the steps were entered in an order from natural disposition to participants' experiences. Table 4 displays the regression statistics.

Table 3 Intercorrelations between variables of Age, Gender, RTCQ (3–5), DMQ-R (6–9) and AUDIT (10–12) indexes

Variables	1	2	3	4	5	6	7	8	9	10	11
1. Age											
2. Gender	−0.13*										
3. Precontemplation[a]	−0.02	0.04									
4. Contemplation[a]	0.06	−0.01	0.31**								
5. Action[a]	0.14*	0.07	0.20**	0.66**							
6. Social[b]	0.00	0.04	−0.14*	0.30**	0.14*						
7. Coping[b]	0.02	0.07	0.15*	0.57**	0.38**	0.57**					
8. Enhancement[b]	0.00	−0.04	−0.01	0.41**	0.22**	0.79**	0.66**				
9. Conformity[b]	−0.09	0.02	−0.05	0.30**	0.26**	0.52**	0.49**	0.44**			
10. Consumption[c]	−0.02	−0.08	−0.04	0.43**	0.10	0.48**	0.39**	0.48**	0.16*		
11. Dependence[c]	−0.03	0.01	0.09	0.56**	0.30**	0.36**	0.49**	0.45**	0.37**	0.53**	
12. Problems[c]	0.02	0.02	0.20**	0.58**	0.42**	0.34**	0.50**	0.46**	0.33**	0.42**	0.71**

*$p < .05$ ** $p < .01$

[a] Readiness to Change Questionnaire; [b] Drinking Motives Questionnaire-Revised; [c] Alcohol Use Disorders Identification Test

With precontemplation as the outcome variable, gender and age were entered into the first step, problems in the second step and social and coping in the last step. Results of the analysis suggest that age and gender were not significant in predicting precontemplation, accounting for a 0.02% variance. The inclusion of problems significantly predicted precontemplation and accounted for 4% of the variance. Similarly, social and coping were significant in predicting precontemplation with a 12% variance in the overall model.

With contemplation as the outcome variable, gender and age entered into the first step, consumption, dependence, problems entered into the second step, and coping, enhancement, social and conformity into the last step, results suggest that age and gender were not significant in predicting contemplation (0.03% variance). All three AUDIT indexes (consumption, dependence, and problem) in the second step were significant in predicting contemplation with a 40% variance in the model. Furthermore, the addition of the DMQ-R indexes (enhancement, coping social and conformity) contributed to an 8% increase in variance and was significant in predicting contemplation; however, only coping remained a significant predictor.

With action as the outcome variable, gender, and age as the first step, dependence, and problems as the second step, and the DMQ-R indexes (enhancement, coping, social and conformity) as the last step, results found that gender and age in the first step were significant in predicting action, with a 3% variance. However, only age was significant as a predictor in this step. The addition of dependence and problems in the second step was found to be significant, with an increase of 18% variance in predicting action. Individually, however, dependence failed to be a significant predictor and only problems were significant along with age. Lastly, the addition of the DMQ-R indexes (enhancement, coping,

social and conformity) was significant to the overall model, accounting for 26% of the variance in predicting action; however, enhancement failed to be a significant predictor.

Discussion

Extending on the Transtheoretical Model of change (Prochaska & DiClemente, 1982), the present study examined the relationship between drinking motives and RTC stages (DiClemente, 1999). It is important to note that while prior studies have suggested that motivating patients with substance use disorder is key for treatment and recovery, these studies did not measure factors underlying drinking behaviors (Opsal et al., 2019; Ryder et al., 2018). The relationship between each drinking motive and the RTC model is also discussed below.

Coping motives predicted values in the contemplation and acting stages of change and unexpectedly predicted the outcomes of the pre-contemplation stage. Motives for enhancement were not significant when predicting values for the contemplation and action stages of change. Furthermore, social motives were found to negatively predict pre-contemplation and action-stage evaluation, and conformity motives were significant in predicting action-stage evaluation. Each of these motives is discussed individually below.

Drinking motives predicting readiness to change

In the current study, coping motives were found to strongly predict contemplation and action stage scores but also predict precontemplation stage scores. Interestingly, all three stages of change were strongly associated with alcohol-related problems, but alcohol use and alcohol dependence

Table 4 Hierarchical regression of Age, Gender, AUDIT and DMQ-R indexes predicting RTCQ indexes (Precontemplation, Contemplation and Action)

	Precontemplation						Contemplation						Action					
	β	t	R	R^2	ΔR^2	F (df)	β	t	R	R^2	ΔR^2	F (df)	β	t	R	R^2	ΔR^2	F (df)
Step 1			0.04	0.00	0.00	0.24 (2, 241)			0.06	0.00	0.00	0.40 (2, 249)			0.16	0.03***	0.03***	3.32 (2, 249)
Age	−0.01	−0.17					0.06	0.89					0.15*	2.35				
Gender	0.04	0.65					0.00	0.03					0.09	1.35				
Step 2			0.20	0.04*	0.04**	3.59 (3, 248)			0.64	0.41***	0.40***	33.70 (5, 246)			0.45	0.20***	0.18***	15.29 (4, 247)
Consumption[a]							0.17**	2.86										
Dependence[a]							0.22**	2.97					0.01	0.08				
Problems[a]	0.20**	3.21					0.36***	5.07					0.42***	5.13				
Step 3			0.35	0.12***	0.08***	6.83 (5, 246)			0.70	0.48***	0.08***	25.15 (9, 242)			0.52	0.27***	0.06***	11.00 (8, 243)
Coping[b]	0.24**	3.01					0.36***	5.31					0.26***	3.24				
Enhancement[b]							0.00	−0.00					0.01	0.06				
Social[b]	−0.34***	−4.67					−0.15	−1.74					−0.19*	−2.01				
Conformity[b]							0.03	0.57					0.15*	2.18				

*$p < .05$ **$p < .01$ ***$p < .001$

[a] Alcohol Use Disorders Identification Test indexes; [b] Drinking Motives Questionnaire-Revised indexes

were only strongly correlated with results from the contemplation stage. The importance of coping motives at each stage of change underscores previous findings emphasizing the importance of coping motives in relation to alcohol use (Capron et al., 2017; Gilson et al., 2013). In particular, coping motives have been found to drive alcohol-related problems and alcohol use disorders directly and indirectly over other alcohol motives (e.g., Gilson et al., 2013). This is consistent with our findings that when all three RTC scores were predicted, coping motives were found to correlate with alcohol-related problems.

Additionally, coping motives were found to be the only significant drinking motive predicting outcomes of the contemplation stage. Furthermore, in the current study, concentrations in the contemplation stage were also associated with significant alcohol consumption, alcohol dependence, and alcohol-related problems, supporting previous literature that found associations with increased alcohol consumption and negative outcomes during this stage (Hile & Adkins, 1998; Shealy et al., 2007). However, the results that coping motives are strong predictors of precontemplation and action stage scores with no significant association with alcohol consumption emphasize that these motives are not always associated with higher alcohol consumption (Bergagna & Tartaglia, 2019; Cooper et al., 1995; Kuntsche et al., 2005).

Finally, the importance of alcohol-related problems in predicting outcomes for the precontemplation stage of change suggests that individuals in this stage can identify their alcohol problems, which are likely driven by coping motives. However, individuals at this stage may be reluctant to change their drinking behavior as alcohol is used as a maladaptive coping strategy to deal with negative affect (Grossbard et al., 2016; Matwin & Chang, 2011; Segrin & Bowers, 2019; Wicki et al., 2017). Given the likelihood that maladaptive coping strategies can result in a long-term inability to control alcohol use if left untreated (Bresin & Mekawi, 2021), it is likely that individuals who are already making changes to their alcohol use (during the action stage of RTC model) will continue to have alcohol-related problems because they cannot find better coping strategies. Therefore, the negative effects of alcohol use and risky alcohol use can be reduced by addressing coping motives in intervention and prevention measures and by providing better alternative coping strategies.

On the other hand, in the current study, enhancement motives did not predict higher RTC (contemplation and action) scores, contradicting our predictions. The lack of evidence linking enhancement motives to RTC stages may suggest that drinking to enhance positive moods may not affect RTC. However, based on the current state of knowledge, this conclusion cannot be drawn.

Social motives were found to negatively predict the precontemplation and action stage scores. The negative relationship with social motive found in this study is unusual given that literature related to social motives tends to suggest a moderate to strong positive relationship with factors of alcohol use (Bresin & Mekawi, 2021; Kuntsche et al., 2005; Lyvers et al., 2010, 2018; White et al., 2016). It is possible that this finding is reflective of a recent attitudinal shift related to alcohol use, highlighted by the negative social motives predicting readiness to change alcohol use at precontemplation and action stages. Recent studies report that more and more individuals are developing a self-confident identity and are less reliant on gaining social recognition by engaging in drinking for social reward (Cronce et al., 2020; Törrönen et al., 2019). More notably, there is a sharp decrease in drinking activity among the younger population in Australia, with an increase in abstention rates reportedly influenced by various cultural factors and the ageing of these abstaining cohorts into adulthood (Livingston, 2015). Thus, this overall social trend may reduce the effects of social motives in addressing drinking behavior – at least in relation to the precontemplation stage scores.

However, it could also be that the negative relationship is related to concepts of identity self-preservation. Specifically, Foster and Neighbors (2013) found that public self-perceptions of the social stigma surrounding intoxication and its association with an unfavourable identity can lead to less socially motivated drinking and that individuals are less likely to participate in public drinking sprees. Therefore, these individuals might then perceive that their decreased motivation to drink for social rewards would indicate that they have little motivation to change their drinking behavior. Prior studies found that problem drinking is associated with motivation to change (Shealy et al., 2007). However, this hypothesis does not effectively account for the importance of alcohol-related problems in the precontemplation stage. Further research would be needed to test this hypothesis. On the other hand, individuals in the action stage may have experienced elements of alcohol-related problems, social stigma, unfavourable identity, and health-related issues, thereby reducing their drinking behavior. Overall, the negative association found in this study between social motives and the precontemplation and action stage is unique and requires further investigation to establish the hypotheses discussed.

Conformity was found to significantly predict action stage scores, suggesting that individuals who change their drinking behavior choose to drink to conform to social pressures. However, future research should explore which social contexts impact drinking behaviors as well as RTC stages. In addition, the current study found that alcohol-related problems also predicted action stage ratings, which had previously been associated with higher perceived severity of alcohol-related consequences and awareness of potential long-term side effects (DiClemente et al., 2009). The finding

that compliance motives were significant in predicting action stage scores supports that these motives are associated with alcohol-related problems (Bresin & Mekawi, 2021; White et al., 2016) and that individuals in this stage recognize the need to change their drinking behavior. In addition, it is also possible that individuals who have experienced alcohol-related problems have switched from more obvious drinking motives that lead to excessive drinking (coping, enhancement, and social behavior) to drinking only in social situations to avoid social exclusion (Conformity). This is consistent with previous literature suggesting changes in drinking motives over time (Halim et al., 2012), but rather as a shift from external (social) to internal (coping) motives as the individual-controlled transitions between drinking motives can be dynamic and interchangeable depending on the context and stage of change.

Finally, age was found to positively predict action scores, suggesting that older individuals are likely to have higher motivation to change their drinking behavior. This finding supports previous literature suggesting that age is a significant factor in motivation for change (DiClemente et al., 2009; Gilson et al., 2013). However, age also appears to contribute to overcoming the problem of alcohol use in young adults, particularly in relation to coping motives (Adams et al., 2012; Littlefield et al., 2010), thus suggesting that age may be an important and significant factor in progressing through the stages of change, especially with hazardous alcohol users.

Implication

Building on the Transtheoretical Model as well as the RTC model, this study examined the predictive drinking motives on RTC stages. These results offer opportunities to examine how drinking motives can be leveraged to effectively support the progression of alcohol use change. In particular, the emphasis on coping motives in each RTC stage suggests that emphasising healthier alternatives for coping with negative moods decreases coping motive-influenced drinking motivation, improves sleep, and challenging thoughts may help reduce alcohol drinking days in alcoholic patients (Dolan et al., 2013).

As a prevention method, an increased focus on a personalized feedback intervention approach that includes an understanding of their maladaptive coping strategies, in addition to education about the associated health risks and self-help guidelines, can help reduce unsafe drinking levels at each RTC stage (Miller et al., 2013). Furthermore, a personalized feedback intervention without professional guidance may be possible as a far-reaching and inexpensive preventive measure (Riper et al., 2009). Using personalized feedback interventions to increase readiness to change is common in the health sector where the Transtheoretical Model is used.

Expanding these approaches to include factors that can circumvent drinking mis-adaptations can increase the effectiveness of interventions and reduce risky drinking. Most importantly, drinking motives can serve as a window to identify problem drinking behaviors in individuals who may be uncomfortable with being treated for their alcohol use, particularly due to social stigma (Capron et al., 2017).

Finding that social motives negatively predicted RTC in the earlier and later stages of change (pre-contemplation and action) may highlight that a decline in drinking for social rewards has broader social effects. Further exploration of this relationship would be necessary to better understand this finding. Furthermore, the finding that compliance motives were associated with higher RTC (levels of action) scores along with alcohol-related problems might suggest that the negative outcomes associated with alcohol use might influence drinking motives. Further research into how the other motives evolve into conformity motives may be needed to better understand the relationship between higher RTC stages and older age. Note that the age group of the current sample is predominantly university students who are young adults, and intrinsic motivations for alcohol consumption may change as a factor of age.

These unexpected results underscore that the current understanding of alcohol consumption in terms of drinking motives and RTC is not straightforward, mirroring the perspectives on the cyclical processes associated with the stages of change and tendency for individuals to not follow a linear process (DiClemente, 2015; Velasquez et al., 2015). Overall, the current study sheds light on how drinking motivation can influence change motivation. However, further research is needed to arrive at a generalisable result. Future studies and clinical research should aim at linking an individual's drinking motives to their motivation for change in order to provide an insightful component in the design of treatment, intervention, and prevention plans (Hammarberg et al., 2017). Developing this understanding can improve a person's progress during times of change and further reduce the likelihood of relapse, particularly in heavy drinking populations seeking treatment such as motivation enhancement therapy (Abo Hamza, 2011) or motivational interviewing as a means of impacting readiness to change (Abo Hamza, 2018).

Limitation

Due to the cross-sectional and correlational nature of the study, no causal conclusions can be drawn. Given that transitions within RTC stages are dynamic and can change due to various external and internal factors, and that drinking motives are known to change over time (Adams et al., 2012; Gaume et al., 2017; Merrill et al., 2015), a longitudinal study can provide more convincing evidence of the relationship between the variables.

In addition, the sample was limited to first-year undergraduate students due to time and resource constraints, which skewed the population distribution and limited generalizability. In particular, age was strongly skewed towards a younger age group (M = 22), with a large majority being female (77%). Social motives change among females may well impact drinking behavior and readiness to change as it did for other behaviors such as smoking. Therefore, recruiting different populations and testing within clinical samples would be required to test the generalizability of these results.

In addition, people who are not currently consuming alcohol could have been excluded to further improve the power of the study. Although the questionnaires included in the study, except the AUDIT, which asked about alcohol consumption in the past 12 months, were non-specific with regard to alcohol consumption in a period, abstinent would currently have to resort to a retrospective recall to answer the associated questions as well as their potential error-prone drinking behavior (Kuntsche & Labhart, 2012). Non-user participants should be excluded in future studies.

Future research should also examine other variables such as psychosocial stress, coping, impulsivity, and mindfulness that may affect RTC, alcohol misuse, and drinking motivation (Garami et al., 2017; Moustafa, 2020; Moustafa et al., 2021a, b). Importantly, future research should also investigate the relationship between RTC and readiness to seek help for alcohol addiction, in light of RTC (Freyer et al., 2004, 2005). Future research should also investigate how drinking motives impact readiness to seek help for recovery from alcohol addiction.

Conclusion

In summary, it is believed that long-term change outcomes are better achieved when they are intrinsic and intentional (DiClemente, 1999). To potentially improve the effectiveness of alcohol prevention and treatment plans, this study examined the relationship between drinking motives and RTC associated with alcohol use. Coping motives were found to be significant in predicting change in each of the three stages of change studied, underscoring the importance of this motive over other drinking motives. Additionally, the importance of coping motives suggests that motives may underlie hazardous drinking and alcohol-related problems and addressing personal drives and alternative coping strategies for drinking in treatment and prevention plans can help individuals make behavioral changes to motivate them.

Furthermore, the enhancement motives did not significantly predict the outcomes in any of the stages of change, and externally driven social motives were found to have an unexpectedly negative relationship with lower and higher RTC (preview and action) scores. This negative relationship is thought to be influenced by a recent change in social attitudes or retention of self-identity, leading to a weaker dependence on drinking for social rewards. More specifically, individuals are less likely to engage in drinking behaviors that sabotage their self-identity, or that social rewards can be achieved without engaging in social drinking. Finally, conformity motives were found that predict the action stage. Individuals at this stage would have recognised their negative drinking habits and taken steps to change them. Therefore, it is believed that individuals evolved to drink from inner and positive dimensions (coping, enhancement, social) in order to fit into social situations (conformity). This underscores that drinking motives are likely to be dynamic, and movement between motives may depend on the experience of alcohol episodes and periods of change. These findings suggest the possibility of incorporating drinking motives into clinical situations to motivate RTC.

Data availability All data are all available upon request from the first author of this article.

Declarations

Ethical statement Our study gained ethics approval from *Western Sydney Universities* Human Research Ethics Committee in 2021. We complied with the 1964 Declaration of Helsinki and its later addenda.

Informed consent All participants have provided consent before participation in the study.

Conflict of interest The authors declared not having any conflict of interest.

References

Abo Hamza, E. (2011). The impact of group motivational enhancement therapy on motivation to change among adolescent male substance abusing clients in a controlled environment (Doctoral dissertation, University of Arkansas, Fayetteville).

Abo Hamza, E. (2018). The impact of group motivational interview on motivation to change among adolescent drug abusers. *The International Journal of Humanities & Social Studies, 6*(3), 173–190.

Adams, Z. W., Kaiser, A. J., Lynam, D. R., Charnigo, R. J., & Milich, R. (2012). Drinking motives as mediators of the impulsivity-substance use relation: pathways for negative urgency, lack of premeditation, and sensation seeking. *Addictive Behaviors, 37*(7), 848–855. https://doi.org/10.1016/j.addbeh.2012.03.016

Alley, E. S., Velasquez, M. M., & von Sternberg, K. (2018). Associated factors of readiness to change in young adult risky drinkers. *The American Journal of Drug and Alcohol Abuse, 44*(3), 348–357. https://doi.org/10.1080/00952990.2017.1363768

Babor, T. F., & Higgins-Biddle, J. C. (2001). Brief intervention for hazardous and harmful drinking: a manual for use in primary care. In *Brief intervention for hazardous and harmful drinking: a manual for use in primary care* (52–52). World Health Organisation. https://apps.who.int/iris/bitstream/handle/10665/67210/WHO?sequence=1

Bergagna, E., & Tartaglia, S. (2019). Drinking motives, perceived norms, and adolescents' drinking. *Journal of Drug Issues, 49*(1), 3–14. https://doi.org/10.1177/0022042618795138

Borsari, B., Murphy, J. G., & Carey, K. B. (2009). Readiness to change in brief motivational interventions: a requisite condition for drinking reductions? *Addictive Behaviors, 34*(2), 232–235. https://doi.org/10.1016/j.addbeh.2008.10.010

Bresin, K., & Mekawi, Y. (2021). The "why" of drinking matters: a meta-analysis of the association between drinking motives and drinking outcomes. *Alcoholism Clinical and Experimental Research, 45*(1), 38–50. https://doi.org/10.1111/acer.14518

Capron, D. W., Bauer, B. W., Madson, M. B., & Schmidt, N. B. (2017). Treatment seeking among college students with comorbid hazardous drinking and elevated mood/anxiety symptoms. *Substance Use & Misuse, 53*(6), 1041–1050. https://doi.org/10.1080/10826084.2017.1392982

Carbonari, J. P., & DiClemente, C. C. (2000). Using transtheoretical model profiles to differentiate levels of alcohol abstinence success. *Journal of Consulting and Clinical Psychology, 68*(5), 810. https://doi.org/10.1037/0022-006X.68.5.810

Chang, C., Wang, T. J., Chen, M. J., Liang, S. Y., Wu, S. F., & Bai, M. J. (2021). Factors influencing readiness to change in patients with alcoholic liver disease: a cross-sectional study. *Journal of Psychiatric and Mental Health Nursing, 28*(3), 344–355. https://doi.org/10.1111/jpm.12677

Collins, S. E., Logan, D. E., & Neighbors, C. (2010). Which came first: the readiness or the change? Longitudinal relationships between readiness to change and drinking among college drinkers. *Addiction, 105*(11), 1899–1909. https://doi.org/10.1111/j.1360-0443.2010.03064.x

Conegundes, L. S. O., Valente, J. Y., Martins, C. B., Andreoni, S., & Sanchez, Z. M. (2020). Binge drinking and frequent or heavy drinking among adolescents: prevalence and associated factors. *Jornal de Pediatria, 96*, 193–201. https://doi.org/10.1016/j.jped.2018.08.005

Cooper, M. L. (1994). Motivations for alcohol use among adolescents: development and validation of a four-factor model. *Psychological Assessment, 6*(2), 117–128. https://doi.org/10.1037/1040-3590.6.2.117

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

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

Cox, W. M., & Klinger, E. (1988). A motivational model of alcohol use. *Journal of Abnormal Psychology (1965), 97*(2), 168–180. https://doi.org/10.1037/0021-843X.97.2.168

Cronce, J. M., Zimmerman, L., Rhew, I. C., Cadigan, J. M., Atkins, D. C., & Lee, C. M. (2020). Does it work and does it last? Effects of social and drinking behavior on same- and next-day mood. *Addictive Behaviors, 100*, 106111–106111. https://doi.org/10.1016/j.addbeh.2019.106111

DiClemente, C. C. (2015). Change is a process not a product: reflections on pieces to the puzzle. *Substance Use & Misuse, 50*(8–9), 1225–1228. https://doi.org/10.3109/10826084.2015.1042338

DiClemente, C. C. (1999). Motivation for change: implications for substance abuse treatment. *Psychological Science, 10*(3), 209–213. https://doi.org/10.1111/1467-9280.00137

DiClemente, C. C., Doyle, S. R., & Donovan, D. (2009). Predicting treatment seekers' readiness to change their drinking behavior in the COMBINE study. *Alcoholism Clinical and Experimental Research, 33*(5), 879–892. https://doi.org/10.1111/j.1530-0277.2009.00905.x

Dolan, S. L., Rohsenow, D. J., Martin, R. A., & Monti, P. M. (2013). Urge-specific and lifestyle coping strategies of alcoholics: Relationships of specific strategies to treatment outcome. *Drug and Alcohol Dependence, 128*(1), 8–14. https://doi.org/10.1016/j.drugalcdep.2012.07.010

Dozois, D. J., Westra, H. A., Collins, K. A., Fung, T. S., & Garry, J. K. (2004). Stages of change in anxiety: psychometric properties of the University of Rhode Island Change Assessment (URICA) scale. *Behaviour Research and Therapy, 42*(6), 711–729. https://doi.org/10.1016/S0005-7967(03)00193-1

Duckworth, J. C., Abdallah, D. A., Gilson, M. S., & Lee, C. M. (2022). Alcohol and marijuana use, consequences, and perceived descriptive norms: Differences between two-and four-year college students. *Journal of American College Health*, 1–8. https://doi.org/10.1080/07448481.2022.2060043

El Haj, M., Gandolphe, M. C., Moustafa, A. A., & Nandrino, J. L. (2018). Tell about yourself to improve your autobiographical memory: a study of Korsakoff's syndrome. *Psychiatry Research, 268*, 37–41. https://doi.org/10.1016/j.psychres.2018.06.064

El Haj, M., & Moustafa, A. A. (2020). Social cognition impairment in different types of drug addictions. In A. A. Moustafa (Ed.), *Cognitive, clinical, and neural aspects of drug addiction*. Elsevier.

El Haj, M., Moustafa, A. A., & Nandrino, J. L. (2019). Future thinking in Korsakoff Syndrome. *Alcohol and Alcoholism, 54*(4), 455–462. https://doi.org/10.1093/alcalc/agz037

Foster, D. W., & Neighbors, C. (2013). Self-consciousness as a moderator of the effect of social drinking motives on alcohol use. *Addictive Behaviors, 38*(4), 1996–2002. https://doi.org/10.1016/j.addbeh.2013.01.011

Freyer, J., Tonigan, J. S., Keller, S., John, U., Rumpf, H. J., & Hapke, U. (2004). Readiness to change versus readiness to seek help for alcohol problems: the development of the Treatment Readiness Tool (TReaT). *Journal of Studies on Alcohol, 65*(6), 801–809. https://doi.org/10.15288/jsa.2004.65.801

Freyer, J., Tonigan, J. S., Keller, S., Rumpf, H. J., John, U., & Hapke, U. (2005). Readiness for change and readiness for help-seeking: a composite assessment of client motivation. *Alcohol and Alcoholism, 40*(6), 540–544. https://doi.org/10.1093/alcalc/agh195

Friman, M., Huck, J., & Olsson, L. E. (2017). Transtheoretical model of change during travel behavior interventions: an integrative review. *International Journal of Environmental Research and Public Health, 14*(6), 581. https://doi.org/10.3390/ijerph14060581

Garami, J., Haber, P., Myers, C. E., Allen, M. T., Misiak, B., Frydecka, D., & Moustafa, A. A. (2017). Intolerance of uncertainty in opioid dependency – relationship with trait anxiety and impulsivity. *PLoS One, 12*(7), e0181955. https://doi.org/10.1371/journal.pone.0181955

Gaume, J., Bertholet, N., & Daeppen, J. B. (2017). Readiness to change predicts drinking: findings from 12-month follow-up of alcohol use

disorder outpatients. *Alcohol and Alcoholism, 52*(1), 65–71. https://doi.org/10.1093/alcalc/agw047

Gilson, K. M., Bryant, C., Bei, B., Komiti, A., Jackson, H., & Judd, F. (2013). Validation of the drinking motives questionnaire (DMQ) in older adults. *Addictive Behaviors, 38*(5), 2196–2202. https://doi.org/10.1016/j.addbeh.2013.01.021

Grant, V. V., Stewart, S. H., O'Connor, R. M., Blackwell, E., & Conrod, P. J. (2007). Psychometric evaluation of the five-factor modified drinking motives questionnaire — revised in undergraduates. *Addictive Behaviors, 32*(11), 2611–2632. https://doi.org/10.1016/j.addbeh.2007.07.004

Grossbard, J. R., Mastroleo, N. R., Geisner, I. M., Atkins, D., Ray, A. E., Kilmer, J. R., Mallett, K., Larimer, M. E., & Turrisi, R. (2016). Drinking norms, readiness to change, and gender as moderators of a combined alcohol intervention for first-year college students. *Addictive Behaviors, 52*, 75–82. https://doi.org/10.1016/j.addbeh.2015.07.028

Hallgren, K. A., & Moyers, T. B. (2011). Does readiness to change predict in-session motivational language? Correspondence between two conceptualizations of client motivation. *Addiction, 106*(7), 1261–1269. https://doi.org/10.1111/j.1360-0443.2011.03421.x

Halim, A., Hasking, P., & Allen, F. (2012). The role of social drinking motives in the relationship between social norms and alcohol consumption. *Addictive Behaviors, 37*(12), 1335–1341. https://doi.org/10.1016/j.addbeh.2012.07.004

Hammarberg, A., Öster, C., & Nehlin, C. (2017). Drinking motives of adult patients seeking treatment for problematic alcohol use. *Journal of Addictive Diseases, 36*(2), 127–135. https://doi.org/10.1080/10550887.2017.1291052

Hasking, P., Lyvers, M., & Carlopio, C. (2011). The relationship between coping strategies, alcohol expectancies, drinking motives and drinking behavior. *Addictive Behaviors, 36*(5), 479–487. https://doi.org/10.1016/j.addbeh.2011.01.014

Harris, T. R., Walters, S. T., & Leahy, M. M. (2008). Readiness to change among a group of heavy-drinking college students: correlates of readiness and a comparison of measures. *Journal of American College Health, 57*(3), 325–330. https://doi.org/10.3200/JACH.57.3.325-330

Heather, N., Rollnick, S., & Bell, A. (1993). Predictive validity of the readiness to change questionnaire. *Addiction, 88*(12), 1667–1677. https://doi.org/10.1111/j.1360-0443.1993.tb02042.x

Hernández-Vásquez, A., Chacón-Torrico, H., Vargas-Fernández, R., Grendas, L. N., & Bendezu-Quispe, G. (2022). Gender differences in the factors associated with alcohol binge drinking: a population-based analysis in a Latin American country. *International Journal of Environmental Research and Public Health, 19*(9), 4931. https://doi.org/10.3390/ijerph19094931

Herrero-Montes, M., Alonso-Blanco, C., Paz-Zulueta, M., Sarabia-Cobo, C., Ruiz-Azcona, L., & Parás-Bravo, P. (2019). Binge drinking in spanish university students: associated factors and repercussions: a preliminary study. *International Journal of Environmental Research and Public Health, 16*(23), 4822. https://doi.org/10.3390/ijerph16234822

Hile, M. G., & Adkins, R. E. (1998). The impact of substance abusers' readiness to change on psychological and behavioral functioning. *Addictive Behaviors, 23*(3), 365–370. https://doi.org/10.1016/S0306-4603(98)00016-1

Hills, A. M. (2011). *Foolproof guide to statistics using IBM SPSS* (2nd ed.). Pearson Australia.

Howard, A. R., Albery, I. P., Frings, D., Spada, M. M., & Moss, A. C. (2019). Pre-partying amongst students in the UK: measuring motivations and consumption levels across different educational contexts. *Substance Use & Misuse, 54*(9), 1519–1529. https://doi.org/10.1080/10826084.2019.1590414

Jiang, H., Livingston, M., Room, R., Callinan, S., Marzan, M., Brennan, A., & Doran, C. (2020). Modelling the effects of alcohol pricing policies on alcohol consumption in subpopulations in Australia. *Addiction, 115*(6), 1038–1049. https://doi.org/10.1111/add.14898

Kaysen, D. L., Lee, C. M., LaBrie, J. W., & Tollison, S. J. (2009). Readiness to change drinking behavior in female college students. *Journal of Studies on Alcohol and Drugs Supplement*, (16), 106–114. https://doi.org/10.15288/jsads.2009.s16.106

Keyes, K. M., Jager, J., Mal-Sarkar, T., Patrick, M. E., Rutherford, C., & Hasin, D. (2019). Is there a recent epidemic of women's drinking? A critical review of national studies. *Alcoholism: Clinical and Experimental Research, 43*, 1344–1359. https://doi.org/10.1111/acer.14082

Knuppenburg, R. M. (2021). The relationship between sense of coherence, readiness to change, and alcohol use in emerging adults (Doctoral dissertation, University of Nevada, Reno).

Kuntsche, E., & Labhart, F. (2012). Investigating the drinking patterns of young people over the course of the evening at weekends. *Drug and Alcohol Dependence, 124*(3), 319–324. https://doi.org/10.1016/j.drugalcdep.2012.02.001

Kuntsche, E., Knibbe, R., Gmel, G., & Engels, R. (2005). Why do young people drink? A review of drinking motives. *Clinical Psychology Review, 25*(7), 841–861. https://doi.org/10.1016/j.cpr.2005.06.002

Le Berre, A. P., Vabret, F., Cauvin, C., Pinon, K., Allain, P., Pitel, A. L., & Beaunieux, H. (2012). Cognitive barriers to readiness to change in alcohol-dependent patients. *Alcoholism: Clinical and Experimental Research, 36*(9), 1542–1549. https://doi.org/10.1111/j.1530-0277.2012.01760.x

Lines, S. R., Marroquin, A., Corbett, S., Sergeant, J., Choi, W., & Faseru, B. (2022). Factors associated with binge drinking—findings from 2019 Kansas behavioral risk factor surveillance system. *Substance Abuse, 43*(1), 949–955. https://doi.org/10.1080/08897077.2022.2060437

Littlefield, A. K., Sher, K. J., & Wood, P. K. (2010). Do changes in drinking motives mediate the relation between personality change and "maturing out" of problem drinking? *Journal of Abnormal Psychology (1965), 119*(1), 93–105. https://doi.org/10.1037/a0017512

Livingston, M. (2015). Understanding recent trends in Australian alcohol consumption. Foundation for Alcohol Research and Education. https://fare.org.au/wp-content/uploads/Understanding-recent-trends-in-Australian-alcohol-consumption.pdf

Lyvers, M., Coundouris, S., Edwards, M. S., & Thorberg, F. A. (2018). Alexithymia, reward sensitivity and risky drinking: the role of internal drinking motives. *Addiction Research & Theory, 26*(2), 114–122. https://doi.org/10.1080/16066359.2017.1333110

Lyvers, M., Hasking, P., Hani, R., Rhodes, M., & Trew, E. (2010). Drinking motives, drinking restraint and drinking behavior among young adults. *Addictive Behaviors, 35*(2), 116–122. https://doi.org/10.1016/j.addbeh.2009.09.011

Maisto, S. A., Carey, M. P., Carey, K. B., Gordon, C. M., & Gleason, J. R. (2000). Use of the AUDIT and the DAST-10 to identify alcohol and drug use disorders among adults with a severe and persistent mental illness. *Psychological Assessment, 12*(2), 186–192. https://doi.org/10.1037/1040-3590.12.2.186

Marcus, B. H., & Simkin, L. R. (1994). The transtheoretical model: applications to exercise behavior. *Medicine & Science in Sports & Exercise.* https://doi.org/10.1249/00005768-199411000-00016

Matwin, S. P. D., & Chang, G. M. D. M. P. H. (2011). Readiness to change and risk drinking women. *Journal of Substance Abuse Treatment, 40*(3), 230–240. https://doi.org/10.1016/j.jsat.2010.11.004

Merrill, J. E., Wardell, J. D., & Read, J. P. (2014). Drinking motives in the prospective prediction of unique alcohol-related consequences in college students. *Journal of Studies on Alcohol and Drugs, 75*(1), 93–102. https://doi.org/10.15288/jsad.2014.75.93

Merrill, J. E. P., Wardell, J. D. P., & Read, J. P. P. (2015). Is readiness to change drinking related to reductions in alcohol use and consequences? A week-to-week analysis. *Journal of Studies on*

Alcohol and Drugs, 76(5), 790. https://doi.org/10.15288/jsad.2015.76.790

Miller, W. R., Westerberg, V. S., Harris, R. J., & Tonigan, J. S. (1996). What predicts relapse? Prospective testing of antecedent models. *Addiction, 91*(12s1), 155–172.

Miller, M. B., Leffingwell, T., Claborn, K., Meier, E., Walters, S., & Neighbors, C. (2013). Personalized feedback interventions for college alcohol misuse: An update of Walters & Neighbors (2005). *Psychology of Addictive Behaviors, 27*(4), 909–920. https://doi.org/10.1037/a0031174

Moustafa, A. A. (2020). *Cognitive, clinical, and neural aspects of drug addiction*. Elsevier.

Moustafa, A. A., Parkes, D., Fitzgerald, L., Underhill, D., Garami, J., Levy-Gigi, E., & Misiak, B. (2021a). The relationship between childhood trauma, early-life stress, and alcohol and drug use, abuse, and addiction: an integrative review. *Current Psychology, 40*(2), 579–584. https://doi.org/10.1007/s12144-018-9973-9

Moustafa, A. A., Miezah, D., Dadabai, S., & Richard, Y. (2021b). Chapter 11 - impulsivity and its relationship with anxiety, stress, and depression. In A. A. Moustafa (Ed.), *The nature of depression* (pp. 183–194). Academic. https://doi.org/10.1016/B978-0-12-817676-4.00011-0

Opsal, A., Kristensen, Ø, & Clausen, T. (2019). Readiness to change among involuntarily and voluntarily admitted patients with substance use disorders. *Substance Abuse Treatment Prevention and Policy, 14*(1), 1–10. https://doi.org/10.1186/s13011-019-0237-y

Patrick, M. E., & Terry-McElrath, Y. M. (2021). Drinking motives and drinking consequences across days: differences and similarities between moderate, binge, and high-intensity drinking. alcoholism. *Clinical and Experimental Research, 45*(5), 1078–1090. https://doi.org/10.1111/acer.14591

Prochaska, J. O., & DiClemente, C. C. (1982). Transtheoretical therapy: Toward a more integrative model of change. *Psychotherapy: Theory, Research & Practice, 19*(3), 276.

Richards, D. K., Morera, O. F., Schwebel, F. J., Pearson, M. R., & Field, C. A. (2021). Measurement invariance of the readiness to change questionnaire among injured patients who received a brief intervention for alcohol use. *Assessment*. https://doi.org/10.1177/10731911211040106

Riper, H., van Straten, A., Keuken, M., Smit, F., Schippers, G., & Cuijpers, P. (2009). Curbing problem drinking with personalized-feedback interventions: a meta-analysis. *American Journal of Preventive Medicine, 36*(3), 247–255. https://doi.org/10.1016/j.amepre.2008.10.016

Rollnick, S., Heather, N., Gold, R., & Hall, W. (1992). Development of a short 'readiness to Change' questionnaire for use in brief, opportunistic interventions among excessive drinkers. *British Journal of Addiction, 87*(5), 743–754. https://doi.org/10.1111/j.1360-0443.1992.tb02720.x

Ryder, M. I., Couch, E. T., & Chaffee, B. W. (2018). Personalized periodontal treatment for the tobacco-and alcohol-using patient. *Periodontology 2000, 78*(1), 30–46. https://doi.org/10.1111/prd.12229

Scheer, J. R., Batchelder, A. W., Bochicchio, L. A., Kidd, J. D., & Hughes, T. L. (2022). Alcohol use, behavioral and mental health help-seeking, and treatment satisfaction among sexual minority women. *Alcoholism: Clinical and Experimental Research, 46*(4), 641–656. https://doi.org/10.1111/acer.14789

Schmidt, A. F., & Finan, C. (2018). Linear regression and the normality assumption. *Journal of Clinical Epidemiology, 98*, 146–151. https://doi.org/10.1016/j.jclinepi.2017.12.006

Schwebel, F. J., Chavez, J. G., & Pearson, M. R. (2021). Measuring readiness to change substance use. *Alcohol use, and cannabis use: an experimental manipulation of cognitive effort*. Psycharix.

Segrin, C., & Bowers, J. (2019). Reciprocal effects of transitional instability, problem drinking, and drinking motives in emerging adulthood. *Current Psychology, 38*(2), 376–386. https://doi.org/10.1007/s12144-017-9617-5

Shealy, A. E., Murphy, J. G., Borsari, B., & Correia, C. J. (2007). Predictors of motivation to change alcohol use among referred college students. *Addictive Behaviors, 32*(10), 2358–2364. https://doi.org/10.1016/j.addbeh.2007.02.003

Sjödin, L., Larm, P., Karlsson, P., Livingston, M., & Raninen, J. (2021). Drinking motives and their associations with alcohol use among adolescents in Sweden. *Nordic Studies on Alcohol and Drugs, 38*(3), 256–269. https://doi.org/10.1177/1455072520985974

Stevens, J. (2012). *Applied multivariate statistics for the social sciences* (5th ed.). Routledge.

Tabachnick, B. G., & Fidell, L. S. (2013). Using multivariate statistics (6th ed.). Pearson.

Törrönen, J., Roumeliotis, F., Samuelsson, E., Kraus, L., & Room, R. (2019). Why are young people drinking less than earlier? Identifying and specifying social mechanisms with a pragmatist approach. *The International Journal of Drug Policy, 64*, 13–20. https://doi.org/10.1016/j.drugpo.2018.12.001

Van Damme, J., Hublet, A., De Clercq, B., Kuntsche, E., Maes, L., & Clays, E. (2017). Who does not cut down? Comparing characteristics and drinking motives of drinkers and abstainers during the exam periods. *Journal of American College Health, 65*(8), 558–566. https://doi.org/10.1080/07448481.2017.1356311

Velasquez, M. M., Crouch, C., Stephens, N. S., & DiClemente, C. C. (2015). *Group treatment for substance abuse: a stages-of-change therapy manual*. Guilford Publications.

Vik, P. W., Culbertson, K. A., & Sellers, K. (2000). Readiness to change drinking among heavy-drinking college students. *Journal of Studies on Alcohol, 61*(5), 674–680. https://doi.org/10.15288/jsa.2000.61.674

Wahesh, E., Moreton, A., & McKechnie, M. (2020). The indirect effect of distress tolerance on young adult alcohol use behaviors via coping motives. *Journal of Addictions & Offender Counselling, 41*(2), 111–127. https://doi.org/10.1002/jaoc.12084

Watakakosol, R., Suttiwan, P., Ngamake, S. T., Raveepatarakul, J., Wiwattanapantuwong, J., Iamsupasit, S., & Tuicomepee, A. (2021). Integration of the theory of planned behavior and transtheoretical model of change for prediction of intentions to reduce or stop alcohol use among thai adolescents. *Substance Use & Misuse, 56*(1), 72–80. https://doi.org/10.1080/10826084.2020.1837168

Watt, A. M., & Roche, K. (1999). Drinking and university students: from celebration to inebriation. *Drug and Alcohol Review, 18*(4), 389–399. https://doi.org/10.1080/09595239996257

White, H. R., Anderson, K. G., Ray, A. E., & Mun, E. Y. (2016). Do drinking motives distinguish extreme drinking college students from their peers? *Addictive Behaviors, 60*, 213–218. https://doi.org/10.1016/j.addbeh.2016.04.011

Wicki, M., Kuntsche, E. N., Eichenberger, Y., Aasvee, K., Bendtsen, P., Dankulincová Veselká, Z., Demetrovics, Z., Dzielska, A., Farkas, J., de Gaspar, M., Roberts, C., Tynjälä, J., Välimaa, R., & Vieno, A. (2017). Different drinking motives, different adverse consequences? Evidence among adolescents from 10 european countries. *Drug and Alcohol Review, 36*(6), 731–741. https://doi.org/10.1111/dar.12572

Zamboanga, B. L., Merrill, J. E., Olthuis, J. V., Martin, J. L., Jarrell, J. T., Cannon, M., Meca, A., Milroy, J. J., & Wyrick, D. L. (2022). A national study on drinking game behaviors and related consequences among NCAA student-athletes: racial/ethnic and sex differences. *Journal of Studies On Alcohol and Drugs, 83*(1), 74–84. https://doi.org/10.15288/jsad.2022.83.74