Bilişsel Davranışçı Psikoterapi ve Araştırmalar Dergisi
Journal of Cognitive-Behavioral Psychotherapy and Research
DOI: 10.14744/JCBPR.2025.37622
J Cogn Behav Psychother Res 2025;14(2):99–107

The Mediating Role of Cognitive Flexibility and Worry in the Effect of Rumination on Stress: An Evaluation of Risky Alcohol Use

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ABSTRACT

This study examined the serial mediating roles of cognitive flexibility and worry in the relationship between rumination and stress. Additionally, this study examines the moderating effect of risky alcohol use levels on these mediating relationships. The study sample comprised 832 university students aged 18–25 years, of whom 79% were female. Data collection instruments included the Personal Information Form, Addiction Profile Index Risk Scanning Scale - Alcohol, Cognitive Flexibility Inventory, Penn State Worry Questionnaire, Depression Anxiety and Stress Scale (Short Form), and Ruminative Thought Style Questionnaire. Based on the cutoff scores from the Addiction Profile Index Risk Scanning Scale for Alcohol, the participants were categorized into two groups: low risk (n=650) and high risk (n=182). This grouping variable was used as the moderating variable in the analysis. The findings from the serial mediation analysis (Model 6) demonstrated that cognitive flexibility and worry both exhibited significant mediating effects in the relationship between rumination and stress. Furthermore, the moderated mediation analysis (Model 92) revealed that the moderating effect of risky alcohol use levels was significant only in the relationship between stress and cognitive flexibility. Specifically, the mediating role of cognitive flexibility was nonsignificant in the low-risk alcohol use group but reached significance within the high-risk group. The results underscore the importance of interventions targeting cognitive flexibility—such as mindfulness-based programs and cognitive-behavioral therapies—in mitigating the ruminative effect of stress. Such interventions may also exert an indirect influence on reducing risky alcohol use, particularly among individuals in high-risk groups.

Keywords: Alcohol, cognitive flexibility, risky alcohol use, rumination, stress, worry.

ÖZ

Ruminasyonun Stres Üzerindeki Etkisinde Bilişsel Esneklik ve Endişenin Aracı Rolü: Riskli Alkol Kullanımı Üzerinden Bir Değerlendirme

Bu çalışma, ruminasyon ile stres arasındaki ilişkide bilişsel esneklik ve endişenin seri aracı rollerini incelemeyi ve bu aracı ilişkiler üzerinde riskli alkol kullanım düzeylerinin düzenleyici etkisini araştırmayı amaçlamaktadır. Örneklemi, yaşları 18–25 arasında değişen, %79'u kadın 832 üniversite öğrencisi oluşturmaktadır. Veri toplama araçları olarak Kişisel Bilgi Formu, Bağımlılık Profil İndeksi Risk Tarama Formu-Alkol Ölçeği, Bilişsel Esneklik Ölçeği, Penn State Endişe Ölçeği, Depresyon Anksiyete Stres Ölçeği-Kısa Formu ve Ruminatif Düşünce Biçimi Ölçeği kullanıldı. Bağımlılık Profil İndeksi Risk Tarama Formu-Alkol Ölçeğinden elde edilen kesme puanlarına göre katılımcılar düşük riskli (n=650) ve yüksek riskli (n=182) olmak üzere iki gruba ayrıldı ve söz konusu değişken analizde düzenleyici değişken olarak kullanıldı. Seri aracılık

Cite this article as:
Erdoğan Yıldırım Z, Aktaş E, Tekinsav Sütcü S. The Mediating Role of Cognitive Flexibility and Worry in the Effect of Rumination on Stress: An Evaluation of Risky Alcohol Use. J Cogn Behav Psychother Res 2025; 14(2): 99–107.

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Submitted: 02.12.2024
Revised: 15.01.2025
Accepted: 24.01.2025
Available Online: 23.05.2025

JCBPR, Available online at
http://www.jcbpr.org/

analizinden (Model 6) elde edilen bulgular, ruminasyon ile stres arasındaki ilişkide bilişsel esneklik ve endişenin anlamlı aracı etkiler sergilediğini gösterdi. Ayrıca, koşullu dolaylı etki modeli (Model 92) bulguları, riskli alkol kullanım düzeylerinin düzenleyici etkisinin yalnızca bilişsel esneklik ve stres arasındaki ilişkide anlamlı olduğunu ortaya koydu. Bilişsel esnekliğin aracı rolü, düşük riskli alkol kullanımı grubunda anlamlı bulunmazken, yüksek risk grubunda anlamlı hale geldi. Bu sonuçlar, bilişsel esnekliği hedefleyen müdahalelerin -farkındalık temelli programlar ve bilişsel davranışçı terapiler- stresin ruminatif etkilerini azaltmada önemine dikkat çekmektedir. Bu tür müdahalelerin, özellikle yüksek riskli alkol kullanan bireylerde alkol kullanımını azaltmada dolaylı bir etki gösterebileceği de düşünülmektedir.

Anahtar Kelimeler: Alkol, bilişsel esneklik, riskli alkol kullanımı, ruminasyon, stres, endişe.

INTRODUCTION

Alcohol has been used since the early stages of human history and continues to be widely consumed today (WHO, 2024). Alcohol-related psychiatric disorders are classified in diagnostic manuals, each with distinct diagnostic criteria and terminology. These manuals evaluate psychiatric disorders according to the presence or absence of specific criteria, typically using a categorical approach (Regier et al, 2013). However, this approach presents challenges in identifying individuals who may not meet the criteria for alcohol use disorder but engage in risky drinking behaviors (Saunders & Lee, 2000). Several studies (Friesen et al, 2022; MacKillop et al, 2022; National Collaborating Centre for Mental Health, 2011) have identified individuals who exhibit risky alcohol use despite not fulfilling the diagnostic criteria for alcohol dependence or alcohol use disorder. Risky alcohol use is characterized by repetitive drinking patterns that lead to harmful consequences, particularly acute and chronic health issues (GBD 2016 Alcohol Collaborators, 2018; MacKillop et al, 2022). Identifying risky drinkers before their behaviors escalate into addiction is crucial.

Previous research has shown a relationship between alcohol use disorders and stress (Morgan, 2019), which is conceptualized as an experience that disrupts an individual's equilibrium under pressure (Wittgens et al, 2022). The connection between stress and alcohol use has been substantiated by studies demonstrating that individuals with alcohol use disorders exhibit impaired physiological stress responses (Anthenelli & Grandison, 2012). Despite the growing body of research on transdiagnostic factors in psychology, studies specifically addressing stress—one of the most frequently studied psychological constructs—remain limited (Eberle & Maercker, 2023). Research suggests that stress is positively correlated with rumination, a repetitive pattern of negative thinking that disrupts self-regulation (Nolen–Hoeksema, 1991; Michl et al, 2013). There are studies that show that rumination is a determinant of alcohol consumption levels (Caselli et al, 2010), as well as studies indicating a direct effect of alcohol consumption on rumination (Devynck et al, 2019). Conversely, cognitive flexibility, defined as the ability to adjust coping strategies based on contextual demands (Dennis & Vander Wal, 2010), is often impaired during stress (Gabrys et al, 2018). It has been shown that cognitive flexibility decreases over time in individuals with alcohol use disorder, and this decrease is related to the severity of alcohol consumption (Piccoli et al, 2024). Additionally, Roussis and Wells (2008) identified worry as a predictor of stress. There are studies that show that worry is a risk factor for alcohol consumption (Improvisato et al, 2024). Studies examining the relationships among cognitive flexibility, rumination, worry, and alcohol use have emerged in the literature (Ma et al, 2022; Wolitzky–Taylor et al, 2021). However, no research to date has demonstrated how these interrelated concepts, known to be linked to stress and alcohol use, affect one another in this context.

Considering the high prevalence of risky alcohol use among university students (Florimbio et al, 2023), the primary aim of this study was to investigate the relationships between worry, rumination, and cognitive flexibility within the context of a proposed model that incorporates risky alcohol use and stress. Specifically, cognitive flexibility and worry were examined as serial mediators of the relationship between rumination and stress. In addition, risky alcohol use was included in the model as a moderator.

METHODS

Participants

The sample of this study consists of 832 university students aged 18–25, with the majority enrolled in various departments at Ege University (79% female). The mean age of the participants, who were selected using a convenience sampling method based on the principle of accessibility, was 20.44 years (SD=1.85). A total of 65 participants (7.8%) reported having a family member diagnosed with an alcohol use disorder. Additionally, 126 individuals perceived themselves as having a

low income, 687 as having a middle income, and 19 as having a high income. The inclusion criteria for the study required participants to be over 18 years old and currently enrolled as university students. The exclusion criterion was a self-reported diagnosis of any psychotic disorder at any point in the participant's life.

Instruments

In this study, data were collected using a Personal Information Form, developed by the researchers to gather demographic and background information (e.g., gender, age, income level, psychiatric diagnosis), along with standardized scales: the Addiction Profile Index Risk Scanning Scale—Alcohol for assessing risky alcohol use, the Cognitive Flexibility Inventory for measuring cognitive flexibility, the Penn State Worry Questionnaire for evaluating worry, the Depression, Anxiety, and Stress Scale—Short Form for measuring stress, and the Ruminative Thought Style Questionnaire for measuring rumination.

Addiction Profile Index Risk Scanning Scale-Alcohol

The scale, developed by Ögel and colleagues (2017) to assess the risk levels of alcohol users, consists of six items. Participants with a total score of 3 or higher were classified into the "high risk" group. The Cronbach's alpha internal consistency coefficient of the scale was 0.70, and item-total score correlations ranged between 0.64 and 0.69 (Ögel et al, 2017). In the present study, the Cronbach's alpha reliability coefficient of the scale was found to be 0.80.

Cognitive Flexibility Inventory

The scale, developed by Dennis and Vander Wal (2010), with Turkish validity and reliability studies conducted by Gülüm and Dağ (2012), consists of two subscales (alternatives and control) and 20 items, rated on a 5-point Likert scale. The scale was designed to assess individuals' ability to generate alternative and adaptive thoughts in challenging situations. In the adaptation study, the Cronbach's alpha coefficients were found to be.90 for the entire scale, 0.89 for the alternatives subscale, and 0.85 for the control subscale (Gülüm & Dağ, 2012). In the present study, the Cronbach's alpha reliability coefficient of the scale was found to be 0.90.

Depression, Anxiety, and Stress Scale-Short Form

The short form of the scale, developed by Lovibond and Lovibond (1995), consists of 21 items and is evaluated on a 4-point Likert scale. Each of the depression, anxiety, and stress dimensions was measured by seven items. In the Turkish validity and reliability study conducted by Sarıçam (2018), the Cronbach's alpha internal consistency coefficients were found to be 0.87, 0.85, and 0.81 for depression, anxiety, and stress, respectively. In the present study, the Cronbach's alpha reliability coefficient for the stress subscale was found to be 0.82.

The Penn State Worry Questionnaire

The scale assesses excessive, persistent, and uncontrollable levels of worry and consists of 16 items rated on a 5-point Likert scale (Meyer et al, 1990). In the Turkish adaptation, validity, and reliability study conducted by Yilmaz et al. (2008), the Cronbach's alpha and split-half reliability coefficients were found to be 0.91, while the test-retest reliability coefficient was 0.88. In the present study, the Cronbach's alpha reliability coefficient of the scale was found to be 0.93.

The Ruminative Thought Style Questionnaire

The scale, developed to measure ruminative thoughts, consists of 20 items and uses a 7-point Likert-type measurement (Brinker & Dozois, 2009). In the Turkish validity and reliability study conducted by Karatepe et al. (2013), the scale demonstrated high internal consistency (α=0.91) and test-retest reliability (r=0.84). This scale distinguishes itself from other measurement tools by assessing an individual's general tendency toward ruminative thinking independent of their current emotional state. Scores on the scale range from 20 to 140, with higher scores indicating a greater tendency toward ruminative thinking (Karatepe et al, 2013). In the present study, the Cronbach's alpha reliability coefficient of the scale was found to be 0.93.

Procedure

Before initiating the research process, ethical approval was obtained from the Ege University Social and Human Sciences Ethics Committee (Approval number: 01/20-119; Date: January 31, 2019). Prior to the administration of the scales, participants were provided with general information about the study, and their written informed consent was obtained, ensuring that participation was voluntary. The study was conducted in accordance with the ethical standards of the Declaration of Helsinki. The data collection process, which took an average of 25 min, was conducted through an online survey platform.

Statistical Analysis

The data obtained from the measurement tools were analyzed using IBM SPSS Statistics 25.0. Before addressing the main research objective, descriptive characteristics were examined, and a two-level group variable was created based on the cutoff score (3 or above) of the Addiction Profile Index Risk Scanning Scale - Alcohol, categorizing participants into low-risk and high-risk groups. To examine the relationships among the

Table 1. Means and standard deviations with Pearson's correlation coefficients between variables

Variables	Mean	SD	Rumination	Cognitive flexibility	Worry	Stress
Total (n=832, F=655, M=177)						
Rumination	95.31	22.00	–	–	–	
Cognitive flexibility	76.27	10.94	-0.33*	–	–	
Worry	50.03	13.94	0.60*	-0.36*	–	
Stress	7.78	4.54	0.50*	-0.29*	0.52*	–
Low risky (n=650, F=550, M=100)						
Rumination	94.68	21.39	–	–	–	
Cognitive flexibility	76.49	10.63	-0.33*	–	–	
Worry	50.30	13.43	0.58*	-0.35*	–	
Stress	7.45	4.31	0.48*	-0.24*	0.51*	–
High risky (n=182, F=105, M=77)						
Rumination	97.56	23.99	–	–	–	
Cognitive flexibility	75.50	11.97	-0.35*	–	–	
Worry	49.03	15.61	0.68*	-0.41*	–	
Stress	8.98	5.12	0.56*	-0.42*	0.57*	–

*: P<0.001; F: Female; M: Male; n: Sample size; SD: Standard deviation.

variables, Pearson's correlation analysis was conducted, and to examine the differences between the groups, an independent samples t-test was performed. To test the hypotheses, a Serial Mediation Model (Model 6) was employed, and a Moderated Mediation Model (Model 92) was employed to examine group differences using the SPSS Process 4.2 macro package (Hayes, 2017). In this analysis, cognitive flexibility and worry were included as serial mediators in the relationship between rumination and stress, with risky alcohol use serving as a moderator. The gender variable was controlled for because of the imbalance in gender distribution.

RESULTS

The participants' scores on the scales were analyzed, and the mean and standard deviation values for groups categorized by risky alcohol use are presented in Table 1. Independent sample t-tests were conducted to examine group differences across all variables included in the study. The results indicated a significant difference between the groups only for the stress variable, t (257,060)=-3.684, p<0.001, d=-0.34. Specifically, the high-risk group (M=8.98 SD=5.12) demonstrated a higher mean stress level than the low-risk group (M=7.45, SD=4.31). Pearson correlation analyses were conducted to examine the relationships among the variables included in the serial mediation and moderated mediation models for both the overall sample and the subgroups based on risky alcohol use. As shown in Table 1, the relationships among all variables were statistically significant for each group (p<0.001). Notably, the correlation coefficients were higher in the high-risk alcohol use group than in the other groups, indicating stronger associations among the variables within this subgroup.

The findings of the Serial Mediation Analysis (Model 6) with stress as the dependent variable and gender control are presented in Table 2. The analysis results indicate that cognitive flexibility (B=0.01, SE=0.003, 95% BCa CI [0.00, 0.01]) and worry (B=0.04, SE=0.01, 95% BCa CI [0.03, 0.05]) both play a mediating role in the relationship between rumination and stress. The serial mediating effect of cognitive flexibility and worry in the same relationship was also found to be significant (B=0.00, SE=0.00, 95% BCa CI [0.00, 0.01]). The total effect of rumination on stress (B=0.10, SE=0.01, 95% BCa CI [0.09, 0.11]) and the direct effect (B=0.06, SE=0.01, 95% BCa CI [0.04, 0.07]) were significant (Fig. 1). This means that when cognitive flexibility and worry are included in the model, the significance of the relationship between rumination and stress is maintained, although the effect is reduced. Therefore, cognitive flexibility and worry play a partial mediating role in the relationship between rumination and stress.

The study also aimed to investigate, as illustrated in Figure 1, the moderating effect of risky alcohol use on the mediating roles of cognitive flexibility and worry in the relationship between rumination and stress using a moderated mediation analysis (Model 92), with the findings presented in Table 3. According to the analysis results, after controlling for gender,

Table 2. Regression coefficients of the serial mediation model

Predictor	Cognitive flexibility						Worry						Stress					
	β	SE	t	p	%95 BCa, CI		β	SE	t	p	%95 BCa, CI		Bul ll	SE	t	p	%95 BCa, CI	
					LL	UL					LL	UL					LL	UL
Constant	92.23	1.98	46.60	<0.001	88.35	96.12	42.14	3.90	10.82	<0.001	34.50	49.79	-1.21	1.45	-0.84	0.40	-4.06	1.63
Sex	-0.09	0.88	-0.10	0.92	-1.81	1.63	-5.35	0.91	-5.90	<0.001	-7.13	-3.57	0.52	0.32	1.61	0.11	-0.11	1.15
Rumination	-0.17	0.02	-10.19	<0.001	-0.20	-0.13	0.34	0.02	18.74	<0.001	0.30	0.37	0.06	0.01	7.77	<0.001	0.04	0.07
CF							-0.23	0.04	-6.42	<0.001	-0.30	-0.16	-0.03	0.01	-2.58	0.01	-0.06	-0.01
Worry													0.11	0.01	8.90	<0.001	0.08	0.13
R^2	0.11						0.42						0.33					
F	52.10 (p<0.001)						196.04 (p<0.001)						103.31 (p<0.001)					

Unstandardized beta coefficients are provided in the following. The effect of gender was controlled. CF: Cognitive flexibility; Bca CI: Bias-corrected and accelerated confidence interval; β: Unstandardized regression coefficient; SE: Standard error; LL: Lower limit; UL: Upper limit. Bootstrap sample size: 5000.

Table 3. Regression coefficients of the moderated mediation model

Predictor	Cognitive flexibility						Worry						Stress					
	β	SE	t	p	%95 BCa, CI		β	SE	t	p	%95 BCa, CI		β	SE	t	p	%95 BCa, CI	
					LL	UL					LL	UL					LL	UL
Constant	91.79	2.16	42.45	<0.001	87.54	96.03	42.62	4.42	9.64	<0.001	33.95	51.31	-2.38	1.61	-1.47	.14	-5.54	0.79
Sex	0.03	0.92	0.04	0.97	-1.76	1.83	-4.94	0.95	-5.22	<0.001	-6.79	-3.08	0.12	0.33	0.35	0.73	-0.54	0.77
Rumination	-0.16	0.02	-8.53	<0.001	-0.20	-0.13	0.32	0.02	15.54	<0.001	0.28	0.36	0.05	0.01	6.43	<0.001	0.04	0.07
RAU	0.82	3.74	0.22	0.83	-6.52	8.16	-4.66	8.53	-0.55	0.59	-21.4	12.07	6.75	3.06	2.21	0.03	0.75	12.75
Rumination×RAU	-0.01	0.04	-0.37	0.71	-0.09	0.06	0.06	0.04	1.41	0.16	-0.02	0.14	0.01	0.02	0.44	0.66	-0.03	0.04
CF							-0.22	0.04	-5.37	<0.001	-0.31	-0.14	-0.01	0.02	-0.92	0.36	-0.04	0.02
CF×RAU							-0.03	0.08	-0.33	0.74	-0.19	0.13	-0.07	0.03	-2.45	0.02	-0.13	-0.01
Worry													0.11	0.01	8.29	<0.001	0.09	0.14
Worry×RAU													-0.01	0.03	-0.49	0.63	-0.07	0.04
R^2	0.11						0.42						0.36					
F	26.12 (p<0.001)						98.86 (p<0.001)						56.56 (p<0.001)					

Unstandardized beta coefficients are provided in the following. The effect of gender was controlled. Cognitive ulexibility; RAU: Risky alcohol use; BCa CI: Bias-corrected and accelerated confidence interval; β: Unstandardized regression coefficient; SE: Standard error; LL: Lower limit; UL: Upper limit. Bootstrap sample size: 5000.

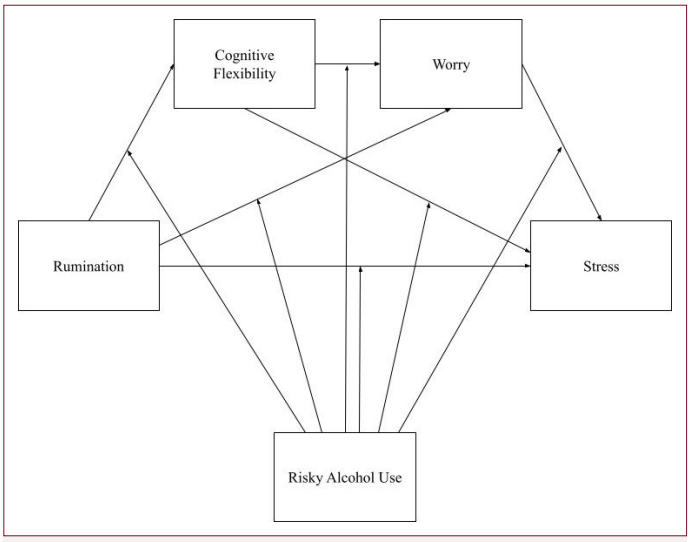

Figure 1. Proposed moderated mediation model (Model 92; see Hayes, 2022).

the interaction of risky alcohol use was found to be significant only with cognitive flexibility (B=-0.07, SE=0.03, 95% BCa CI [-0.13, -0.01]). In line with this finding, when the conditional indirect effects were examined, the effects were significant for both groups in all models except for the model in which cognitive flexibility acted as a mediator alone. In this model, the mediating effect of cognitive flexibility was not significant for the low-risk alcohol use group (B=0.002, SE=0.003, 95% BCa CI [-0.003, 0.01]), whereas this effect was significant for the high-risk group (B=0.02, SE=0.01, 95% BCa CI [0.004, 0.03]). When examining the conditional direct effect of rumination on stress, it was found to be significant for both the low-risk (B=0.05, SE=0.01, 95% BCa CI [0.04, 0.07]) and high-risk alcohol use groups (B=0.06, SE=0.02, 95% BCa CI [0.03, 0.09]). As a result, the risky alcohol use group variable moderated the indirect relationship between rumination and stress, which arises only through cognitive flexibility (Fig. 2).

DISCUSSION

The present study examined the serial mediating effects of cognitive flexibility and worry on the relationship between rumination and stress, along with the moderating role of risky alcohol use. The serial mediation analyses, controlling for gender, revealed that all mediating effects were significant. However, in the conditional indirect effect model, the moderating effect of risky alcohol use was significant only in the relationship between cognitive flexibility and stress. Specifically, when the risky alcohol use variable was included in the analysis, the mediating effect of cognitive flexibility remained significant in the high-risk alcohol use group but was diminished in the low-risk group.

A notable finding pertains to the gender distribution within high-risk alcohol use groups. Although women constituted the majority of the study sample (78.7%), 21.9% of the participants

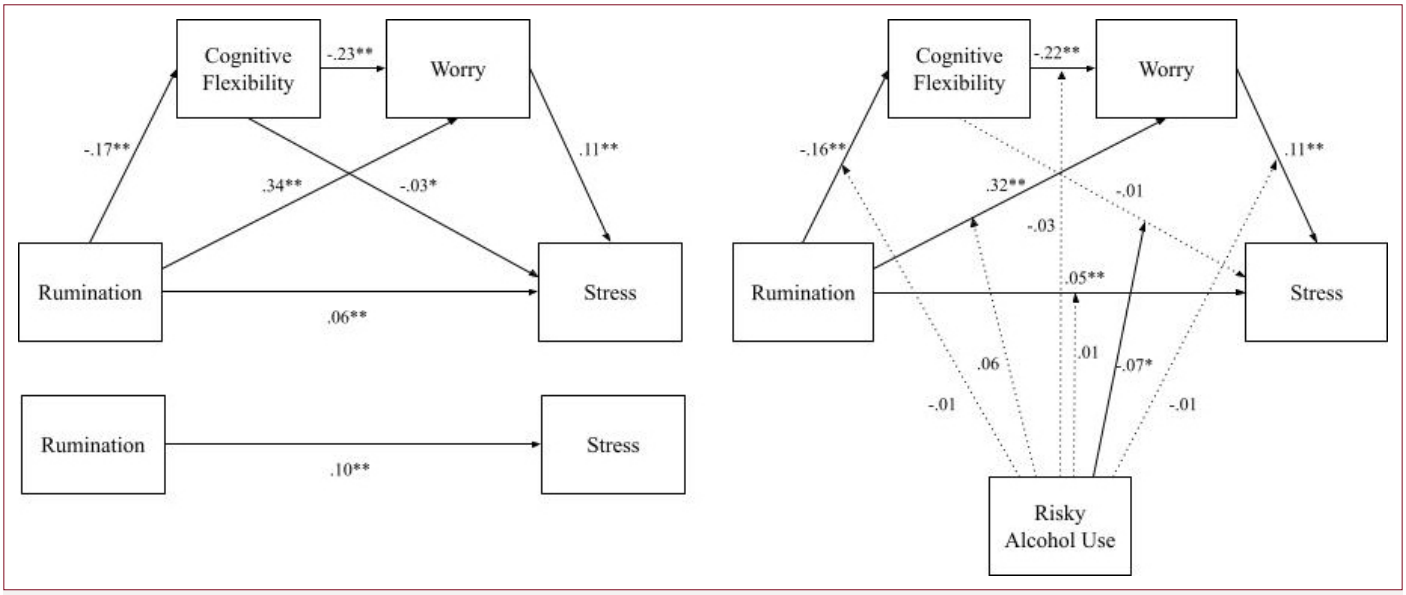

Figure 2. Results of the Serial Mediation and Moderated Mediation Models (Model 6&92; see Hayes 2022).
**: P<0.001; *: P<0.01. Unstandardized beta coefficients are provided. The effect of gender has been controlled. Dashed lines indicate non-significant pathways.

were classified as high-risk alcohol users. Interestingly, although most participants in this group were women, the percentage of women engaging in high-risk alcohol use (16%) was markedly lower than that of men (43.5%). Nearly half of the male university students in the sample fell into the high-risk alcohol use category. This aligns with the findings of the Global Alcohol and Health Report by the World Health Organization (2018), which noted that men generally consume more alcohol than women, exhibit higher rates of risky alcohol use, and that 18.4% of adults (aged 15 and older) globally have engaged in heavy episodic drinking at least once. Considering this disparity, gender was included as a control variable in all analyses.

Initial Pearson correlation analyses demonstrated stronger correlations among variables in the high-risk alcohol use group than in the low-risk alcohol use group. These significant associations align with previous findings linking risky alcohol use and negative psychological outcomes (GBD 2016 Alcohol Collaborators, 2018; MacKillop et al, 2022). Before including risky alcohol use as a moderator, serial mediation analyses revealed that cognitive flexibility and worry mediated the relationship between rumination and stress. These relationships are consistent with prior research highlighting the interconnected roles of these variables (Anthenelli & Grandison, 2012; Ma et al, 2022; Wolitzky–Taylor et al, 2021).

The moderation analysis demonstrated that the moderating effect of risky alcohol use was significant only in the pathway between cognitive flexibility and stress. Cognitive flexibility, which is widely regarded as a protective factor against the negative effects of stress (Harel et al, 2023), was not significantly associated with stress in the low-risk alcohol use group. The finding of no significant relationship in the low-risk group suggests that the protective role of cognitive flexibility may not be as effective when alcohol use is minimal. This can be interpreted as an indication that alcohol consumption levels should be considered a factor in understanding stress-coping abilities. Findings by Ma et al. (2022) indicate that chronic alcohol use impairs cognitive flexibility, further supporting the importance of this interaction. Conversely, the lack of a moderating effect on other pathways suggests that risky alcohol use does not substantially differentiate the groups in these relationships. This finding aligns with prior studies, such as Nolen–Hoeksema and Harrell (2002), who found that depressive rumination does not necessarily lead to alcohol use, and Mollaahmetoğlu et al. (2021), who noted that rumination alone is not predictive of alcohol-related problems. Similarly, Wolitzky–Taylor et al. (2021) reported an insignificant mediating role of worry in the relationship between alcohol use and psychological disorders. These studies emphasize the importance of other factors (such as personality traits, environmental stressors, and genetic factors) in the onset and development of alcohol use disorders.

This study differentiates itself from prior research by integrating risky alcohol use as a moderating variable, allowing for nuanced intergroup comparisons. The inclusion of these variables within a unified model provides a novel framework, especially in the context of a transdiagnostic approach. This perspective emphasizes the shared underlying factors of various psychopathologies. While many studies have examined these variables separately or in relation to specific disorders, the integration of cognitive flexibility, worry, and stress within the context of risky alcohol use underscores the significance of this study's findings. Notably, the results suggest that interventions aimed at enhancing cognitive flexibility, such as cognitive-behavioral therapy and mindfulness-based techniques, may mitigate the impact of rumination on stress and, indirectly, reduce risky alcohol use.

The early identification of risky alcohol use is critical for public mental health because of its potential progression to alcohol use disorder. Identifying the factors that contribute to risky alcohol consumption offers a valuable avenue for prevention strategies. However, because this study is cross-sectional and relies on self-reported data, its explanatory power is inherently limited. Future longitudinal research incorporating behavioral assessments is essential to elucidate the processes underlying risky alcohol use and inform interventions aimed at breaking the cycle of addiction. It is also important that future research on risky alcohol use or alcohol use disorders, designed with a longitudinal approach, incorporates other transdiagnostic variables. Moreover, since the study was conducted with a university student sample, its findings are limited to this demographic. Future research addressing lifelong developmental processes is expected to provide broader insights and make a significant contribution to the literature.

Acknowledgments: The authors would like to thank Psk. Ceylan Hasanoğlu for their support during the data collection process.

Ethics Committee Approval: The Ege University Social and Human Sciences Scientific Research and Publication Ethics Committee granted approval for this study (date: 31.01.2019, number: 01/20-119).

Author Contributions: Concept – ZEY, EA, STS; Design – ZEY, EA; Supervision – STS; Data Collection and/or Processing – EA; Analysis and/or Interpretation – ZEY; Literature Review – ZEY, EA; Writing – ZEY, EA; Critical Review – ZEY, EA, STS.

Conflict of Interest: The authors have no conflict of interest to declare.

Use of AI for Writing Assistance: Not declared.

Financial Disclosure: The authors declared that this study has received no financial support.

Peer-review: Externally peer-reviewed.

REFERENCES

Anthenelli, R., & Grandison, L. (2012). Effects of stress on alcohol consumption. *Alcohol Res, 34(4)*, 381–382.

Brinker, J. K., & Dozois, D. J. (2009). Ruminative thought style and depressed mood. *J Clin Psychol, 65*(1), 1–19.

Caselli, G., Ferretti, C., Leoni, M., Rebecchi, D., Rovetto, F., & Spada, M. M. (2010). Rumination as a predictor of drinking behaviour in alcohol abusers: A prospective study. *Addiction, 105*(6), 1041–1048.

Dennis, J. P., & Vander Wal, J. S. (2010). The Cognitive Flexibility Inventory: Instrument development and estimates of reliability and validity. *Cogn Ther Res, 34*(3), 241–253.

Devynck, F., Rousseau, A., & Romo, L. (2019). Does repetitive negative thinking influence alcohol use? A systematic review of the literature. *Front Psychol, 10*, 1482.

Eberle, D. J., & Maercker, A. (2023). Stress-associated symptoms and disorders: A transdiagnostic comparison. *Clin Psychol Psychother, 30*(5), 1047–1057.

Florimbio, A. R., Coughlin, L. N., Bauermeister, J. A., Young, S. D., Zimmerman, M. A., Walton, M. A., & Bonar, E. E. (2023). Risky drinking in adolescents and emerging adults: Differences between individuals using alcohol only versus polysubstances. *Subst Use Misuse, 58*(2), 211–220.

Friesen, E. L., Bailey, J., Hyett, S., Sedighi, S., de Snoo, M. L., Williams, K., Barry, R., Erickson, A., Foroutan, F., Selby, P., Rosella, L., & Kurdyak, P. (2022). Hazardous alcohol use and alcohol-related harm in rural and remote communities: A scoping review. *Lancet Public Health, 7*(2), e177–e187.

Gabrys, R. L., Tabri, N., Anisman, H., & Matheson, K. (2018). Cognitive control and flexibility in the context of stress and depressive symptoms: The cognitive control and flexibility questionnaire. *Front Psychol, 9*, 2219.

GBD 2016 Alcohol Collaborators. (2018). Alcohol use and burden for 195 countries and territories, 1990-2016: A systematic analysis for the Global Burden of Disease Study 2016. *Lancet, 392*(10152), 1015–1035.

Gülüm, I. V., & Dağ, İ. (2012). Tekrarlayıcı düşünme ölçeği ve bilişsel esneklik envanterinin Türkçeye uyarlanması, geçerliliği ve güvenilirliği. *Anadolu Psikiyatri Derg, 13*(3), 216–223.

Harel, O., Hemi, A., & Levy-Gigi, E. (2023). The role of cognitive flexibility in moderating the effect of school-related stress exposure. *Sci Rep, 13*(1), 5241.

Hayes, A. F. (2017). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. Guilford Press.

Improvisato, P., Trouillet, R., Schuldiner, S., Luquiens, A., Hamonnière, T., Donnadieu, H., & Perney, P. (2024). Role of worry in addiction: Implication of metacognitive beliefs and type 2 worry. *Clin Psychol Psychother, 31*(5), e3048.

Karatepe, H. T., Yavuz, F. K., & Turkcan, A. (2013). Validity and reliability of the Turkish version of the ruminative thought style questionnaire. *Bull Clin Psychopharmacol, 23*(3), 231–241.

Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behav Res Ther, 33*(3), 335–343.

Ma, T., Huang, Z., Xie, X., Cheng, Y., Zhuang, X., Childs, M. J., Gangal, H., Wang, X., Smith, L. N., Smith, R. J., Zhou, Y., & Wang, J. (2022). Chronic alcohol drinking persistently suppresses thalamostriatal excitation of cholinergic neurons to impair cognitive flexibility. *J Clin Invest, 132*(4), e154969.

MacKillop, J., Agabio, R., Feldstein Ewing, S. W., Heilig, M., Kelly, J. F., Leggio, L., Lingford-Hughes, A., Palmer, A. A., Parry, C. D., Ray, L., & Rehm, J. (2022). Hazardous drinking and alcohol use disorders. *Nat Rev Dis Primers, 8*(1), 80.

Meyer, T. J., Miller, M. L., Metzger, R. L., & Borkovec, T. D. (1990). Development and validation of the Penn State Worry Questionnaire. *Behav Res Ther, 28*(6), 487–495.

Michl, L. C., McLaughlin, K. A., Shepherd, K., & Nolen-Hoeksema, S. (2013). Rumination as a mechanism linking stressful life events to symptoms of depression and anxiety: Longitudinal evidence in early adolescents and adults. *J Abnorm Psychol, 122*(2), 339–352.

Mollaahmetoglu, O. M., Palmer, E., Maschauer, E., Nolan, M. C., Stevens, T., Carlyle, M., Hardy, L., Watkins, E. R., & Morgan, C. J. A. (2021). The acute effects of alcohol on state rumination in the laboratory. *Psychopharmacology, 238(*6), 1671–1686.

Morgan, O. J. (2019). *Addiction, attachment, trauma and recovery: The power of connection* (Norton Series on Interpersonal Neurobiology). WW Norton & Company.

National Collaborating Centre for Mental Health (UK). (2011). *Alcohol-use disorders: Diagnosis, assessment and management of harmful drinking and alcohol dependence.* British Psychological Society.

Nolen-Hoeksema, S. (1991). Responses to depression and their effects on the duration of depressive episodes. *J Abnorm Psychol, 100*(4), 569–582.

Nolen-Hoeksema, S., & Harrell, Z. A. (2002). Rumination, depression, and alcohol use: Tests of gender differences. *J Cogn Psychother, 16*(4), 391–403.

Ögel, K., Koç, C., & Görücü, S. (2017). Study on development, validity and reliability of a risk-screening questionnaire for alcohol and drug use. *Psychiatry Clin Psychopharmacol,*

27(2), 164–172.

Piccoli, L. R., Albertella, L., Christensen, E., Fontenelle, L. F., Suo, C., Richardson, K., Yücel, M., & Lee, R. S. C. (2024). Cognitive inflexibility moderates the relationship between relief-driven drinking motives and alcohol use. *Addict Behav Rep, 20*, 100559.

Regier, D. A., Kuhl, E. A., & Kupfer, D. J. (2013). The DSM-5: Classification and criteria changes. *World Psychiatry, 12*(2), 92–98.

Roussis, P., & Wells, A. (2008). Psychological factors predicting stress symptoms: Metacognition, thought control, and varieties of worry. *Anxiety, Stress & Coping: An International Journal, 21*(3), 213–225.

Sariçam, H. (2018). The psychometric properties of Turkish version of Depression Anxiety Stress Scale-21 (DASS-21) in health control and clinical samples. *J Cognit Behav Psychother Res, 7*(1), 19.

Saunders, J. B., & Lee, N. K. (2000). Hazardous alcohol use: Its delineation as a subthreshold disorder, and approaches to its diagnosis and management. *Compr Psychiatry, 41*(2 Suppl 1), 95–103.

Wittgens, C., Muehlhan, M., Kräplin, A., Wolff, M., & Trautmann, S. (2022). Underlying mechanisms in the relationship between stress and alcohol consumption in regular and risky drinkers (MESA): Methods and design of a randomized laboratory study. *BMC Psychol, 10*(1), 233.

Wolitzky-Taylor, K., Sewart, A., Zinbarg, R., Mineka, S., & Craske, M. G. (2021). Rumination and worry as putative mediators explaining the association between emotional disorders and alcohol use disorder in a longitudinal study. *Addict Behav, 119*, 106915.

World Health Organization. (2018). *Global status report on alcohol and health*. https://www.who.int/publications/i/item/9789241565639

World Health Organization. (2024). *Global status report on alcohol and health and treatment of substance use disorders*. https://www.who.int/publications/i/item/9789240096745

Yilmaz, A. E., Gençöz, T., & Wells, A. (2008). Psychometric characteristics of the Penn State Worry Questionnaire and Metacognitions Questionnaire-30 and metacognitive predictors of worry and obsessive-compulsive symptoms in a Turkish sample. *Clin Psychol Psychother, 15*(6), 424–439.