The Effect of Stress on Alcohol Consumption Mediated by Coping Among University Students who Study in the Netherlands and Germany After Lifted Covid-19 Regulations

Luca Marie Siera (s2359510)

Behavioural Management and Social Sciences, University of Twente

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1st Supervisor: Martha Kreuzberg

2nd Supervisor: Dr E. Marcel Pieterse

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Abstract

Objectives: Alcohol use has been associated with several severe mental and physical health consequences. Predictors of increased alcohol consumption have been investigated in multiple studies. This study sought to find whether stress positively predicts alcohol consumption among students after lifted Covid-19 regulations and if coping (maladaptive coping and adaptive coping) mediated this effect.

Methods/Design: Bachelor's and Master's students who studied in Germany and the Netherlands (N=97) completed a self-report online questionnaire measuring their perceived stress level, alcohol intake, and coping strategies. Data was collected through a convenience sampling method, distributed one month after Covid-19 regulations had been lifted in Germany and one and a half months in the Netherlands.

Results: Results revealed no correlation between stress and alcohol consumption. Surprisingly, both mediation analyses indicated no mediation effect of maladaptive and adaptive coping on the relationship between stress and alcohol consumption. Despite that, significant effects were found between stress and maladaptive coping. Further, maladaptive coping was found to correlate positively with alcohol consumption. Additionally, stress was found to correlate negatively with adaptive coping. Unexpectedly, gender was found as a covariate for alcohol consumption in both mediation models.

Conclusion: The present study provides important information regarding students' alcohol consumption related to stress and coping. Future research may replicate these findings through a longitudinal study design.

Keywords: students, alcohol consumption, maladaptive coping, adaptive coping, mediation, cross-sectional

The Effect of Stress on Alcohol Consumption Mediated by Coping Among University Students who Study in the Netherlands and Germany After Lifted Covid-19 Regulations

This paper aimed to identify if a positive relationship between stress and students' alcohol consumption after the pandemic could be found, and if coping mediated this relationship. This research investigated the relationship between stress and alcohol consumption among students studying in Germany and the Netherlands after Covid-19 regulations were lifted. Further, a cross-sectional research design investigated the effect of coping as a mediator on this relationship. Specifically, maladaptive coping was expected to have a mediating effect on the stress-alcohol relation among university students.

Alcohol Consumption

Alcohol Consumption is found to be one of the main risk factors for premature death. In 2019, a total of 557,171 people died from the risks related to alcohol consumption in Europe. Further, the consumption of alcohol was greater associated with younger white men than women (Beenstock et al., 2010). Although the rate of premature deaths due to alcohol has decreased from 43 deaths per 100,00 people from 1990 to 35 deaths in 2017, this number is still concerning (Ritchie & Roser, 2018). The global average consumption of alcohol per person, who is older than 15 years, was 6.18 litres per year in 2016. Western European countries such as Germany, Belgium, Denmark, and the Netherlands follow this high alcohol intake with around 10-13 litres per person per year (Ritchie & Roser, 2018).

Multiple health concerns are associated with alcohol consumption, consisting of increased mortality cases, brain damage, physical and mental damage, and an increased chance to engage in risk-taking behaviour (Barranger et al., 2020; Mekonen et al., 2017; Verma et al., 2021). A study in 2020 investigated the effect of alcohol consumption on the human brain in more detail. It revealed that alcohol consumption could be associated with changes in the brain’s gray matter volume (Barranger et al., 2020). Equally important is that alcohol is a toxin for the nervous system, which causes a depletion of brain cells and serious

neurological problems (Verma et al., 2021). Likewise, alcohol can have severe consequences for the liver (Barranger et al., 2020).

However, alcohol consumption is further associated with behaviour-related consequences. In this respect, alcohol consumption has an increased risk of engaging in sexual contact with the possibility of transferring illnesses such as AIDS or causing an unplanned pregnancy (Mekonen et al., 2017). Further, alcohol misuse was found to affect a person's executive functions, eliciting blackouts, low motivation levels, injuries, and even a reduction in academic performance (Mekonen et al., 2017). It is therefore important to evaluate the underlying concept of alcohol consumption. Clearly, heavy alcohol consumption does have detrimental effects on mental and physical health and is even considered a disorder in DSM-5.

Alcohol consumption was defined and classified in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5). DSM-5 incorporated alcohol abuse and alcohol dependence into a single disorder called alcohol use disorder (*Alcohol Use Disorder: A Comparison Between DSM–IV and DSM–5 | National Institute on Alcohol Abuse and Alcoholism (NIAAA)*, 2021). Alcohol use disorder (AUD) is a conditional disorder related to the harmful use of alcohol. To be diagnosed with this disorder, an individual must experience multiple conditions. One can further differentiate between mild, moderate, and severe AUD. All three differ in the number of symptoms a person experience (Cottler & Smith, 2018). Additionally, there is a term associated with drinking occasionally, or in short, binge drinking (BD), which was defined as *"the consumption of five or more alcoholic drinks on one or more occasions during the past one month"* (2004-2005 West Virginia Behavioral Risk Factor Survey Report, 2007). Increased rates of alcohol consumption display the need to evaluate possible determinants for alcohol consumption, as it will provide insights into psychological phenomena causing problematic alcohol use in high-risk groups.

Determinants of Student's Alcohol Consumption

Previous research investigating determinants for alcohol consumption in university students differs significantly in terms of study designs, hypothesis testing, and outcomes. Determinants investigated in this research include stress, coping, and the effects of Covid-19 on students' drinking behaviour.

Stress

One determinant associated with students' alcohol consumption is their perceived stress level. Stress was defined as "*the body's reaction to changes that requires physical, mental, or physiological adjustment*" (Melaku, Mossie, & Negash, 2015, p.2). Primarily, students must deal with various challenges at the start of and throughout their academic careers. If students perceive such challenges as unsolvable and unfavourable, their perception of stress increases (Prabu, 2015). Mainly, academic stress was found to be high in students. Multiple stressors were responsible for high-stress rates, including the number of assignments, competitions with other students, failures, and poor relationships with other students or professors (Fairbrother & Warn, 2003). Considering the high levels of stress students might experience in their academic careers, it is essential to consider these as potential factors for students 'alcohol consumption.

Multiple studies revealed a positive relationship between students' perceived stress level and their alcohol intake (Park, Armeli, & Tennen, 2004; Bodenlos et al., 2013). Park, Armeli, and Tennen (2004), measured students perceived stress levels related to alcohol consumption for around 28 days. Results indicated that students drank more alcohol on days they perceived as extra stressful. Despite that, various aspects of stressful days were either associated with less alcohol consumption due to problem-focused coping or more alcohol consumption when problem-focused coping was low (Park, Armeli, & Tennen, 2004). Academic stress was connected to higher alcohol use and heavy episodic drinking in students (Metzger et al., 2017). Supported by another study, higher stress levels were positively

associated with higher levels of consuming alcohol to cope with stress and anxiety (Corbin et al., 2013; Grant et al., 2007). Regarding coping, previous research investigated students' coping strategies as a mediator in the stress-alcohol relation.

Coping Strategies

Coping was defined as "*an attempt to master, tolerate, or reduce internal or external stressors that an individual perceives as exceeding existing resources*" (Lazarus & Folkman, 1984, as cited in Saxon et al., 2016, p.276). The aim of coping is to compensate for stressful situations by adjusting to a new situation or reformulating objectives to deal with a new situation (Galiana et al., 2020). Coping is categorized as either an emotion-focused, problem-focused, or avoidance strategy (Britton, 2004). One can further differentiate between maladaptive and adaptive coping strategies, whereas maladaptive coping strategies reduce symptoms while maintaining or even strengthening the stressor. Since it only serves as short-term alleviation and the stressor is not adequately dealt with, maladaptive coping is not seen as effective. Additionally, avoidance strategies belong to maladaptive coping, whereas emotion-focused and problem-focused coping are forms of adaptive coping. Adaptive coping aims to deal with the cause of the problem. This type of coping can even improve functioning and is seen as effective (Brown et., 2015).

Various research investigated coping as a mediator for the relationship between stress and students' alcohol consumption. A study by Metzger et al. (2017), investigated possible determinants for stress concerning alcohol use behaviours among college students. These alcohol use behaviours were also called alcohol outcomes, which were composed of either general alcohol consumption or heavy episodic drinking. A mediation effect of maladaptive coping for alcohol consumption and two out of three alcohol use outcomes was confirmed (Metzger et al., 2017). Another study associated drinking to cope with overcoming negative emotions which led to higher levels of weekly alcohol consumption, further it provided additional evidence for a mediation effect of coping on the stress-alcohol relation (Corbin et

al., 2013). Contrary to these findings, a study by Park, Armeli, and Tennen (2004), demonstrated that alcohol consumption could not be fully mediated by coping. Avoidance coping was not found to influence alcohol consumption. Despite these findings, investigating the effect of avoidance coping on alcohol consumption was suggested for future research. Given that maladaptive coping entails an increased risk of increasing negative mood and alcohol consumption.

Looking at the self-medication hypothesis, which might serve as an explanation for the mediating effect of coping on the stress-alcohol relation. This theory entails, that students who used maladaptive coping strategies were more likely to fail to effectively deal with stress since maladaptive coping strategies only serve as a short-term solution. As a result, the stress would maintain and may lead students to search for other solutions to decrease it. Since then, it was argued that students have a high risk to engage in alcohol consumption, with the aim of experiencing short-term relief of stress (Metzger et al., 2017). Metzger et al (2017), called this course of action a vicious cycle, in which maladaptive coping strategies and problematic alcohol consumption could cause even more stress.

Summarizing the previous findings, students' tendency to use substances to cope with stress, might be an essential determinant of students' alcohol consumption (Britton, 2004). The effect of the Covid-19 pandemic on increased alcohol intake among students might have a similar effect then stress, considering that the Covid-19 pandemic has affected the world globally in the past two years. Especially students experienced high levels of stress and fear as they had to adjust to online universities and other Covid-19 regulations (Quintiliani et al., 2021).

Covid-19

The effects of the Covid-19 pandemic on students´ drinking behaviour is possibly one of the most previously investigated determinants. Despite a wide range of research in this area, outcomes differ greatly and can be separated into two categories. The first category of

research provides evidence for an increase in alcohol consumption in students during the pandemic. Various research demonstrated an increase in students' alcohol consumption related to Covid-19 consequences (Charles et al., 2021; Lechner et al., 2020; Mohr et al., 2021). It was further proven that the consequences of Covid-19 affected students' well-being and drinking behaviour in such a way, that students used alcohol to cope with the situation (Charles et al., 2021). This effect might be explained by students´ fear of getting infected with the virus (Charles et al., 2021; Lechner et al., 2020). Despite that, some studies revealed contradictory results in which students' alcohol intake was not found to be increased during the pandemic (Bonar et al., 2021; Jackson et al., 2021; Jaffe et al., 2021).

Even though research differs greatly in this area, the spread of Covid-19 elicited fear and distress often associated with changes in students' alcohol consumption (Lechner et al., 2020). Likewise, this topic should be investigated further, considering that reopening universities and lifting Covid-19 regulations might influence students' stress levels related and alcohol consumption as well. To better understand students drinking behaviour, it was essential to investigate their alcohol consumption in relation to perceived stress levels and coping after lifted Covid-19 regulations. In addition, research assessing the effects of stress on students' alcohol use after lifted Covid-19 regulations is quite scarce.

Target Group

Students represent one of the groups, which have a high risk for engaging in BD or developing an AUD. A variety of studies have provided information about students drinking patterns. Martin, Benca-Bachmann, and Palmer (2021) examined the effects of stress and personality on alcohol misuse among first-year college students. This study underlined students’ risk of developing an AUD (Martin et al., 2021). Another study, conducted by Blanco et al. (2015), revealed that one in five students met the criteria for alcohol use disorder per DSM-5 criteria. Another 9-year follow-up study focused on identifying differences between the risky consumption (RC) of alcohol and binge drinking (BD) trends in students

who followed either one of these behaviours from starting university or did not follow these patterns. In support of the previous results, prevalence rates of RC or BD at age 27 were high for students who engaged in either of these drinking patterns at age 18. Students who did not engage in such patterns at age 18 reported lower prevalence rates (Moure-Rodriguez et al., 2018). These findings demonstrate that students engage in BD and RC, especially if they followed such drinking patterns in their past. Thus, students will be investigated as a target group for this study. As previously stated, multiple determinants, including stress and coping, influence students drinking behaviour, which will also be investigated in this study.

The Present Study

The purpose of this study was to examine the effect between students' perceived stress levels and students' alcohol consumption after lifted Covid-19 regulations, mediated by coping. The mentioned variables were investigated for exploratory purposes, specifically on the shift from students returning to their everyday life without being restricted by Covid-19 regulations. Students represent one of the most affected groups by problematic alcohol consumption, students studying in Germany and the Netherlands seemed convenient as Covid-19 restrictions were lifted at similar times (Prince et al., 2018; Verma et al., 2021). Lifted Covid-19 regulations will not be investigated as a variable for itself, but the other variables will represent it, as the data will be measured after Covid-19 regulations have been lifted. Students experienced lifted Covid-19 regulations multiple weeks prior to this research and may had the time to adjust back to a life without restrictions.

Research Questions

The first part of this study's research question was: "*Does stress contribute to greater alcohol consumption in university students in Germany and the Netherlands after lifted Covid-19 regulations?"*

The second part of this study's research question was*: "Does coping mediate the effect of stress on alcohol consumption?".*

Hypotheses

Several hypotheses were derived from this:

H1: Stress positively predicts alcohol consumption in university students from Germany and the Netherlands after lifted Covid-19 regulations.

H2: Maladaptive coping mediates the effect of stress on alcohol consumption in university students

H3: Adaptive coping does not mediate the effect of stress on alcohol consumption in university students

Methods

Participants

A sample of 97 students studying in Germany or the Netherlands, including 60.8% women, 38.1% men, and 1.0% who describe themselves as non-binary, were recruited through a convenience sampling method and investigated in a cross-sectional research design. Data was collected through social media. Students had to fill out an online self-report questionnaire, distributed approximately one month after Covid-19 regulations had been lifted, during the period from April 10th to May 30th 2022. Inclusion criteria for participation involved being a student at a German or Dutch university. Additionally, participants needed to be either Bachelor's or Master's students. Further, participants had to give their consent, finish the study, and answer the control questions satisfactory. Participants that did not fulfil those inclusion criteria were removed. In total, 110 responses were excluded based on those criteria. Participants were between 17 and 28 years old (M = 21.76, SD =2.11). 30.9% of them stated that they were studying in Germany, and 69.1% stated that they were studying in the Netherlands. 92.8% of them studied for their Bachelor's degree, and 7.2% stated they were Master’s students.

Procedure

Approval was obtained through the BMS Ethical Review/Domain Humanities and

Social Sciences, before starting to collect data. Participants were recruited using a convenience sampling method through social media platforms such as Instagram, Facebook, and WhatsApp. A link invited students to participate in a 15-minute-long questionnaire through a secure web server called Qualtrics/Sona. The questionnaire remained available for three weeks, with the final date being May 08th 2022. The online consent form outlined that information obtained through the questionnaire was anonymized and treated confidentially. Further, voluntary participation according to the BMS Committee guidelines was ensured. As this questionnaire deals with sensitive topics, the nature of the study was explained to the participants in the consent form. All questions in the survey were randomized to account for order effects. To ensure participants' attention, three control questions were included in the questionnaire (Item 29, e.g.:" If you are still reading this question, please tick *Strongly Agree*"). After giving their consent, participants completed multiple questions related to their alcohol consumption, stress level, and coping. After that, participants were dismissed. Participants who completed the questionnaire through Sona received 0.25 credits after completion.

Materials and Measures

Sociodemographic data

Participants' demographic information was collected through questions related to their age, sex, nationality, education, and whether they studied in Germany or the Netherlands (In total five questions).

Alcohol Use

To assess students' alcohol consumption, the Alcohol Use Disorder Identification Test (AUDIT) was used. The scale had two different versions. The 10-item self-report version was used for this study. 7 items were scored on a 5-point scale. (Item 1, e.g.: "How often do you have a drink containing alcohol?"). Answers ranged from "never" to "4 or more times a week". A score of 8 or higher was considered harmful alcohol use. Some Items, which

included phrases such as "during the last year", were changed to "during the last month" to ensure that students' alcohol consumption after lifted Covid-19 regulations were measured. 2 of the items were scored on a 5-point scale, ranging from "never" to "very often" to ensure that the answer categories matched the questions (Item 9, e.g., "Have you or someone else been injured because of your drinking?"). Item number 10 was scored with five different answer possibilities, including different ranges of numbers related to how many alcoholic drinks someone consumed on a typical day of drinking. Ranges included "1-2", "3-4", "5-6", "7-9", "10 or more" (Item 10, e.g.: "How many drinks containing alcohol do you have on a typical day when you are drinking?"). Within the sample, the scale's reliability was high (α =.79). Multiple studies revealed that the validity of this scale is high (Meneses-Gaya et al., 2009).

Stress

Stress was assessed using the Perceived Stress Scale by Cohen et al. (1988). This Scale included 10 items (Items, e.g.: "In the last month, how often have you felt nervous and stressed?"). Responses were rated on a 5-point Likert scale from "never" to "very often"**.** Higher scores indicated higher stress levels (Carnegie Mellon University, 2021). The reliability of the scale was satisfactory (α =.65). The Perceived Stress Scale was found to have a satisfactory validity (Andreou et al., 2011).

Coping

Coping strategies were measured using the BRIEF Cope, developed by Carver (1997). Further, participants were advised to think of a hardship in their life and how they dealt with it before answering the questionnaire. There are 14 two-item subscales in the BRIEF Cope (Two Item Subscales, e.g., "Self-Distraction", "Active Coping", "Denial", and "Substance Use"). Each subscale was made up of two items (Items, e.g., "I've been concentrating my efforts on doing something about the situation I'm in."). The original version of the Brief COPE contained a 4-point Likert scale. For this study, the scale was adjusted to a 5-point-

Likert scale. Responses rated from "strongly disagree" to "strongly agree". The 14 two-item subscales had low reliability within the sample (α =.13). Internal validity was found to be satisfactory since each dimension achieved the .40 standard for item-internal consistency (Baumstarck et al., 2017).

Data Analysis

IBM SPSS statistics 28 software was used to analyse the collected data. Analyses were performed to test for mediation (for coping) and the main effect of stress on students' alcohol consumption. One model was designed to evaluate each of the outcomes of interest.

First, data that did not fulfil the inclusion criteria were excluded. To answer the first part of the research question, "*Does stress contribute to greater alcohol consumption in university students in Germany and the Netherlands after lifted Covid-19 regulations?*" variables were computed for stress and alcohol consumption. For stress, items 4,5,7 and 8 From the AUDIT needed to be reverse coded (see Appendix). After recoding these variables, all 10 Items from the PSS-10 were computed into one variable. To construct a variable for alcohol consumption, all items from the AUDIT needed to be recoded for scoring purposes (from 1-5 to 0-4). After this step, all 10 items from the AUDIT were computed into the same variable. Next, the data was controlled for multiple assumptions, including the distribution of the sample, Homoscedasticity, Collinearity, and Linearity, which could be confirmed. Then, a one-way linear regression analysis was conducted. The linear model used stress as a numeric predictor variable and the participants' score on alcohol consumption as an outcome variable. It was investigated whether an increase in stress leads to an increase in alcohol consumption. The significance level for this assumption was set at an alpha of 0.05.

For the second part of the research question, "*Does coping mediate the effect of stress on alcohol consumption among students?*" two variables for coping needed to be computed first. Items from the Brief COPE were classified as maladaptive coping and adaptive coping. For maladaptive coping, six sub-scales were created, including self-distraction, denial,

substance use, venting, behavioural disengagement, and self-blame, each of these contained two items from the Brief COPE. After that, these sub-scales were computed into one variable labelled maladaptive coping. For adaptive coping, eight sub-scales needed to be created, including active coping, emotional support, instrumental support, positive reframing, planning, acceptance, humour, and religion. Each of these sub-scales contained two items from the Brief COPE. After this step, the sub-scales were computed into one variable. Again, numerous assumptions were controlled, including Normality, Homoscedasticity, Collinearity, and Linearity, which could be confirmed. Next, two mediation analyses were conducted in SPSS to test whether maladaptive coping and adaptive coping mediated the effect of stress on alcohol consumption. Then, version 4.0 of the PROCESS macro extension by Andrew Hayes was used to conduct the mediation analyses (Hayes, 2022). The necessary assumptions of significance were fulfilled when the *IV* predicted the *DP*, the *IV* predicted *M*, and the effect of the *IV* on the *DV* via the mediator was significant. Significance was fulfilled when $p<.05$.

Results

Descriptive Statistics

Descriptive statistics were calculated for the variables stress, alcohol consumption, adaptive coping and maladaptive coping. Results revealed that participants reported higher scores for adaptive coping ($M = 57.52$, $SD = 6.58$) than for maladaptive coping ($M = 33.61$, $SD = 7.15$), indicating that participants made more use of adaptive coping than maladaptive coping. Further, alcohol consumption had a mean score of 7.45, demonstrating low-risk consumption. Alcohol use is considered hazardous, from and above a score of 8 (Scoring the AUDIT, n.d.). The mean score of stress was 19.43, which illustrates a moderate stress level, as the highest score which can be achieved is 40.

Table 1

Descriptive Statistics Alcohol, Stress, Adaptive and Maladaptive Coping Strategies

	N	Minimum	Maximum	*Mean*	*SD*
1. Alcohol Consumption	97	1.00	21.00	7.45	4.10
2. Stress	97	1.00	39.00	19.25	6.54
3. Adaptive Coping	97	42.00	71.00	57.52	6.58
4. Maladaptive Coping	97	12.00	53.00	33.61	7.15

Correlations

Pearson's correlations were used to examine the relationship between stress, alcohol consumption, adaptive coping, and maladaptive coping. Further, it was assessed if the variables gender and age had a significant relationship with these variables. A positive correlation between stress and maladaptive coping was found. Indicating that an increase in stress leads to an increase in maladaptive coping. Additionally, adaptive coping was found to be correlated negatively with stress. An increase in stress would therefore lead to a decrease in adaptive coping. Surprisingly, stress was not found to be correlated with alcohol consumption. In comparison, maladaptive coping confirmed a positive correlation with alcohol consumption. Gender was significantly correlated with stress, alcohol consumption, and age (see Table 2).

Table 2

Means, standard deviations, and inter-correlations among variables

Variables	*Mean*	*SD*	1	2	3	4	5	6
1. Stress	19.39	6.41	1	-.32**	.56**	-.00	-.06	.25*

Variables	*Mean*	*SD*	1	2	3	4	5	6
2. Adaptive Coping	33.87	7.28	-	1	-.15	-.04	.15	.06
3. Maladaptive Coping	56.44	7.78	-	-	1	.21*	.04	.11
4. Alcohol Consumption	1.12	1.79	-	-	-	1	.08	.26**
5. Age	21.69	2.12	-	-	-	-	1	.37**
6. Gender	1.65	.51	-	-	-	-	-	1

*. Correlation is significant at the 0.05 level (2-tailed)

**. Correlation is significant at the 0.01 level (2-tailed)

Effect of Stress on Alcohol Consumption

The first hypothesis indicated that *IV* stress positively predicts *DV* alcohol consumption. This hypothesis was evaluated in the form of a simple linear regression analysis. Results demonstrated that no significant effect of stress on alcohol consumption could be confirmed, with the coefficient being, $b = -.00$, $t(95) = -.03$, $p = .98$. Since gender negatively correlated with alcohol consumption, it was included in the regression analysis as a covariate. Results demonstrated a significant negative effect of gender as a covariate, with the coefficient being, $b = -2.27$, $t(94) = -2.74$, $p = .01$.

Mediation Analyses for Coping

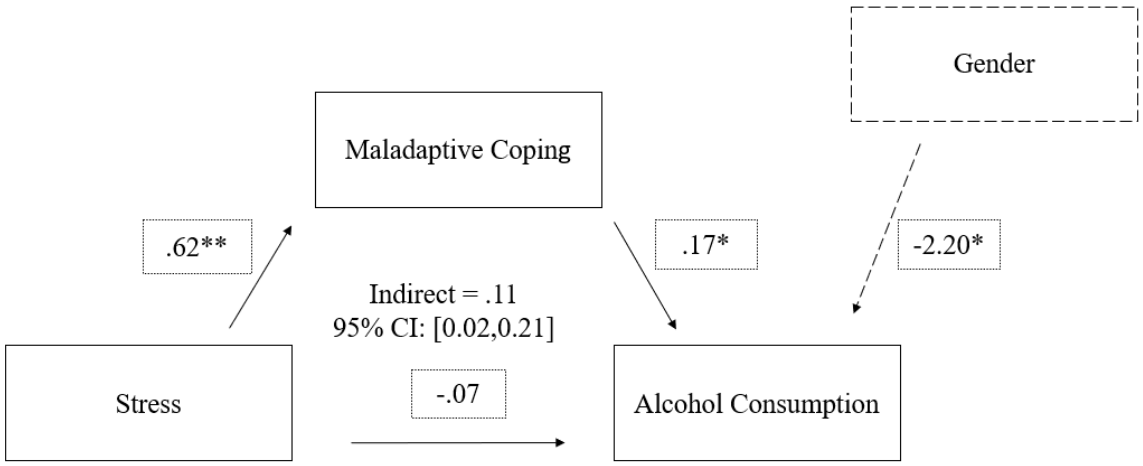
Hypothesis 2 predicted that students' coping has a mediator effect on the relationship between stress and alcohol consumption. Therefore, the PROCESS macro for SPSS was used to test for 2 different mediation effects. In total, 3 conditions had to be met for the mediations to be significant.

Mediation Analysis for Maladaptive Coping

First, the results of the regression analysis revealed that the effect of stress on alcohol consumption was found to be insignificant, with the coefficient of stress being, b = -.07, t(93) = -.90, p = .40. Further, while controlling for the mediator maladaptive coping, the results of the second regression analysis showed that the coefficient predicted a slightly positive effect of stress on maladaptive coping, b = .62, t(94) = 6.45, p = .00. The effect of maladaptive coping could be confirmed by the results, b = .17, t(93) = 2.62, p = .01. While controlling for the indirect effect of stress on alcohol consumption via the mediator maladaptive coping, results confirmed that this effect was significant, b = .11, SE = .05, 95% CI [0.02, 0.21]. Therefore, it was concluded that maladaptive coping did not mediate the relationship between stress and alcohol consumption. Since the first condition of the *IV* stress predicting the *DV* alcohol consumption was not met, it was further tested whether gender was a covariate to this effect. Results demonstrated a significant negative effect of gender on *DV* alcohol consumption with the coefficient being, b = -2.20, t(93) = -2.74, p =.01 (see Figure 1).

Figure 1

Mediation Model with Maladaptive Coping as Mediator



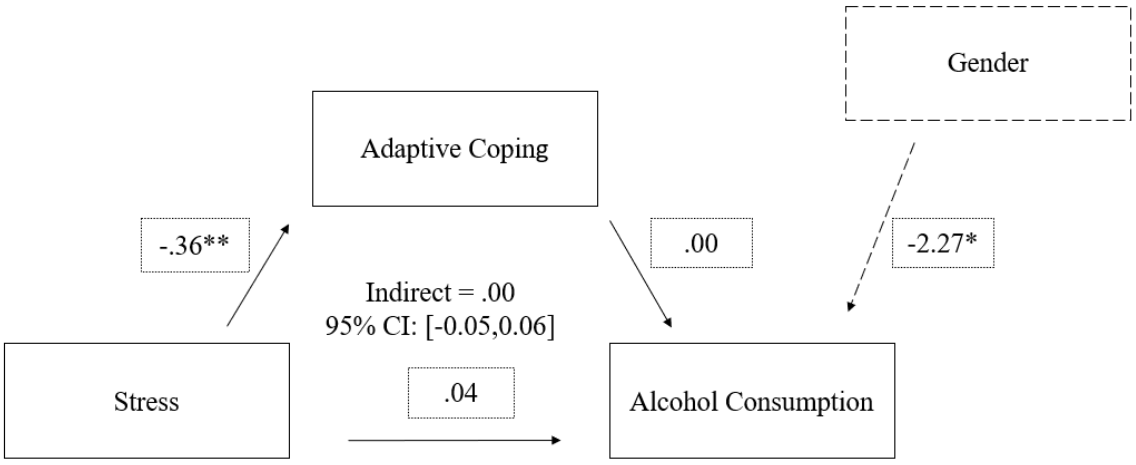
Note. * $p < 0.05$, ** $p < 0.01$

Mediation Analysis for Adaptive Coping

The first condition that the *IV* stress predicts *DP* alcohol consumption could not be confirmed by the results. This effect was found to be insignificant with the coefficient being, $b = .04$, $t(93) = .59$, $p = .56$. Unexpectedly, the second condition that *IV* stress predicts *M* adaptive coping was confirmed. Here, the effect was significant, $b = -.36$, $t(94) = -3.57$, $p = .00$. The results could not confirm the effect of *M* adaptive coping on *DP* alcohol consumption. Here, the effect was insignificant with the coefficient being, $b = .00$, $t(93) = -.03$, $p = .98$. Next, the indirect effect of *IV* stress on *DV* alcohol consumption via the mediator adaptive coping was tested. Results demonstrated that this effect was insignificant, $b = .00$, SE = .03, 95% CIs [-.05, .06]. Therefore, it was concluded that adaptive coping strategies did not mediate the relationship between stress and alcohol consumption. It was further tested whether gender displayed a covariate to this effect. Results demonstrated a significant negative effect from gender on alcohol consumption, with the coefficient being, $b = -2.27$, $t(93) = -2.69$, $p = .01$ (see Figure 2).

Figure 2

Mediation Model with Adaptive Coping as Mediator



Note. * $p < 0.05$, ** $p < 0.01$

Discussion

The present study investigated if alcohol consumption was positively predicted by stress and if this relation was mediated by coping. Overall, the results revealed that hypotheses 1 and 2 could not be confirmed. Surprisingly, stress was not found to positively correlate with alcohol consumption among students. Additionally, maladaptive coping was not found to mediate the relationship between stress and alcohol consumption. Hypothesis 3 could be confirmed by the results, which suggested that adaptive coping was not likely to mediate the relationship between stress and alcohol consumption in the present study.

Theoretical and Practical implications

The first hypothesis could not be confirmed, as no positive effect of stress on alcohol consumption was found. The present study even demonstrated a slightly negative effect of stress on alcohol consumption. Even though this effect was not significant, it is contradictory considering that other studies provided evidence of a positive effect between these variables (Corbin et al., 2013; Bodenlos et al., 2013; Park, Armeli, & Tennen, 2004). An explanation for this difference might be that past studies were conducted at different points in time, as these studies were conducted prior to the Covid-19 pandemic and, therefore, prior to Covid-19 regulations. Whereas the present study was conducted after regulations had been lifted, it might have influenced trends in stress perception related to maintaining a work-life balance after the pandemic.

According to Keyserlingk et al. (2021), a missing work-life balance could be related to high-stress levels during the lockdown. Considering that participants were restricted by multiple regulations, including campus closure, and limitations for social activities during the lockdown, it was only, to a certain extent, possible to achieve work-life balance (Keyserlingk et al., 2021). Mean scores of the PSS-10 revealed that students experienced moderate stress levels. Still, the sample displayed variance within the PSS-10 scores, which indicates that some participants experienced high levels of stress compared to other participants who

experienced low levels of stress. An explanation for the mean score could be that students who experienced moderate stress already had maintained a work-life balance after lifted Covid-19 regulations. Therefore, the mean score of the PSS-10 scale could result from increased social opportunities after lifted Covid-19 regulations, which enhanced the possibility of developing and maintaining a work-life balance. Regarding the variance on the PSS-10 scale, it is crucial to consider that Covid-19 regulations were lifted later in Germany than in the Netherlands (Al Jazeera, 2022; Marcus, 2022). Therefore, students who studied in the Netherlands might have had more time to adjust to a life without Covid-19 regulations and to establish a work-life balance compared to students studying in Germany.

Likewise, participants scored relatively high on adaptive coping compared to maladaptive coping. Regarding that, there might not be a positive correlation between stress and alcohol consumption because students used adaptive coping strategies and found effective ways to deal with stress, considering that adaptive coping is associated with high effectiveness in solving problems (Higuchi, 2020).

The second hypothesis could not be confirmed. There was no mediation effect of maladaptive coping on the relationship between stress and alcohol consumption within this sample due to a missing significant effect of stress on alcohol consumption. Still, significant effects between stress, maladaptive coping, and alcohol consumption were found but not in the way predicted. Regarding students coping strategies, it was found that maladaptive coping correlated positively with alcohol consumption. Additionally, stress correlated positively with maladaptive coping, supported by previous literature, which stated that increased stress levels lead to increased maladaptive coping strategies (Metzger et al., 2017). In comparison, the effect of maladaptive coping on alcohol consumption was relatively low. However, alcohol consumption can be seen as a form of maladaptive coping, which is associated with drinking to cope with negative emotions (Corbin et al., 2013). Therefore, a positive correlation between maladaptive coping and alcohol consumption would indicate that students

who make use of maladaptive coping have a higher chance to engage in alcohol consumption (Metzger et al., 2017).

Furthermore, gender was found as a covariate for alcohol consumption. Previous literature provided information on men's and women's alcohol coping behaviour. Men were found to rely more on alcohol to cope than women (Park & Levenson, 2002). Looking at men's tendency to rely more on alcohol to cope than women the effect of gender on alcohol consumption could be explained by that difference.

The third hypothesis predicted that adaptive coping had no mediation effect on the relationship between stress and alcohol consumption. Unexpectedly, the first condition of mediation was met, meaning that stress was found to correlate negatively with adaptive coping. This seems plausible, looking at the self-medication hypothesis. Since adaptive coping strategies aim to reduce stress effectively, no further precautions may be taken to experience short-term relief from stress, which would be the case for engaging in maladaptive coping (Metzger et al., 2017). Further, Higuchi (2020), associated adaptive coping with more healthy strategies to deal with stressful events. For the present findings, this could mean that students who made use of adaptive coping managed to effectively reduce stress and therefore were less likely to consider alcohol consumption as a short-term solution. However, the present findings can only be used as an indication. Still, the indirect effect in this model indicated a strong likelihood for the third hypothesis.

As research that investigates students drinking behaviour post-Covid-19 regulations has only recently come into view and is therefore quite scarce, the present study makes data on students' alcohol consumption related to stress and coping more available to other researchers. Further, alcohol and its severe consequences need to be taken seriously in light of the pandemic, as especially students were vulnerable to experiencing stress and using maladaptive coping (Lechner et al., 2020). Bodenlos et al. (2013) investigated stress as mediating the relationship between mindfulness and alcohol problems. Mindfulness is defined

as a form of positive reappraisal coping. Therefore, it can be seen as a form of adaptive coping, as its' goal is to increase awareness and use it as a relaxation tool (Garland et al., 2009). Considering that stress was found to negatively correlate with adaptive coping in the present study, findings might be used so that stress will be investigated as a mediator for the relationship between coping and alcohol consumption. It might also be essential to investigate stress as a mediator for maladaptive coping and alcohol consumption as results indicated significant effects between these variables.

Despite that, it is still important to remember that this study had several limitations that could have influenced the present outcome.

Strengths, Limitations, and Future Recommendations

Considering the limitations of this study, alcohol consumption, as well as stress, can be considered sensitive topics. Therefore, it was hard to assess alcohol consumption and stress through an online questionnaire and ensure that all participants answered the questions as honestly as possible. Following that, there are multiple limitations linked to self-reports. Limitations that are relevant for the present study include a lack of willingness of students to participate in research, respondents who might not answer truthfully, and possible technical issues which might occur when conducting an online study (Lefever et al., 2007). Despite that, other self-report studies suffer from the same limitations, and results can therefore still be compared. Furthermore, more than half of the participants had to be excluded due to missing data for two specific items from the AUDIT scale. Therefore, it was difficult to approach a sufficient sample from which to draw valid conclusions.

Additionally, it could have been more accurate to measure participants' stress levels concerning their alcohol consumption and coping over a certain period. A longitudinal design would have allowed comparing how these variables might have evolved, the longer covid-19 restrictions were lifted. Further, an additional statistical approach might have been appropriate for testing the third hypothesis. The Bayesian approach to inference would make it possible to

define lower and upper limits in which the coefficient stayed to make inferences about the point at which the underlying distribution changes, thus accepting no mediation occurred (Smith, 1976).

Despite these limitations, this study provided further insights into the stress coping-alcohol relationship, even if the present findings should be used and interpreted with caution. Future research could focus on stress as a mediator in the coping-alcohol relationship through a longitudinal research design. Additionally, investigating determinants for adaptive coping and maladaptive coping could help to get more insights into the psychological processes which lead students to use either form of coping. Such research may even be used to develop programs that aim at facilitating and increasing adaptive coping in students.

Conclusion

Overall, this study did not confirm a correlation between stress and alcohol. Further, a mediation effect of coping with stress and alcohol consumption was not supported by the above findings. However, the present study adds valuable information to existing data related to this domain and can be further used for future studies. Additionally, it provides a solid ground for future research related to students' alcohol consumption, perceived level of stress, and coping after lifted Covid-19 regulations. All in all, future studies should investigate stress as a mediator for coping and alcohol consumption in students through a longitudinal research design.

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Appendix

Alcohol Use Identification Test (AUDIT)

Instructions. Because alcohol use can affect your health and can interfere with certain medications and treatments, it is important that we ask some questions about your use of alcohol. Your answers will remain confidential so please be honest. Click on the box that best describes your answer to each question.

Items:

1. How often do you have a drink containing alcohol?

2. How many drinks containing alcohol do you have on a typical day when you are drinking?

3. How often do you have six or more drinks on one monthly almost occasion?

4. How often during the past month have you found that you are not able to stop drinking once you had started?

5. How often during the past year have you failed to do what was normally expected of you because of drinking?

6. How often during the past month have you needed a first drink almost in the morning to get yourself going after a heavy drinking session?

7. How often during the past month did you had a feeling of guilt monthly almost or remorse after drinking?

8. How often during the past month have you been unable to remember what happened the night before because of your drinking?

9. Have you or someone else been injured because of your drinking?

10. Has a relative, friend, doctor, or other health care worker been concerned about your drinking or suggested you cut down?

Perceived Stress Scale

Instructions. The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate by circling how often you felt or thought a certain way.

Items:

1. In the last month, how often have you been upset because of something that happened unexpectedly?

2. In the last month, how often have you felt that you were unable to control the important things in your life?

3. In the last month, how often have you felt nervous and “stressed”?

4. In the last month, how often have you felt confident about your ability to handle your personal problems?

5. In the last month, how often have you felt that things were going your way?

6. In the last month, how often have you found that you could not cope with all the things that you had to do?

7. In the last month, how often have you been able to control irritations in your life?

8. In the last month, how often have you felt that you were on top of things?

9. In the last month, how often have you been angered because of things that were outside of your control?

10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

Brief COPE

Instructions. The following questions ask how you have sought to cope with a hardship in your life. Read the statements carefully and indicate how much you have been using each coping style.

Items:

1. I've been turning to work or other activities to take my mind off things.

2. I've been concentrating my efforts on doing something about the situation I'm in.

3. I've been saying to myself "this isn't real."

4. I've been using alcohol or other drugs to make myself feel better.

5. I've been getting emotional support from others.

6. I've been giving up trying to deal with it.

7. I've been taking action to try to make the situation better.

8. I've been refusing to believe that it has happened.

9. I've been saying things to let my unpleasant feelings escape.

10. I've been getting help and advice from other people.

11. I've been using alcohol or other drugs to help me get through it.

12. I've been trying to see it in a different light, to make it seem more positive.

13. I've been criticizing myself.

14. I've been trying to come up with a strategy about what to do.

15. I've been getting comfort and understanding from someone.

16. I've been giving up the attempt to cope.

17. I've been looking for something good in what is happening.

18. I've been making jokes about it.

19. I've been doing something to think about it less, such as going to movies, watching TV, reading, daydreaming, sleeping, or shopping.

20. I've been accepting the reality of the fact that it has happened.

21. I've been expressing my negative feelings.

22. I've been trying to find comfort in my religion or spiritual beliefs.

23. I’ve been trying to get advice or help from other people about what to do.

24. I've been learning to live with it.

25. I've been thinking hard about what steps to take.

26. I’ve been blaming myself for things that happened.

27. I've been praying or meditating.

28. I've been making fun of the situation