Changes in the alcohol consumption among university students due to the Covid-19 pandemic

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Abstract

Introduction: Since the outbreak of the Covid-19 pandemic, governments worldwide have imposed curfews and other social distancing measures that have significant impacts on people's lives and mental health. As low mental health conditions are associated with increased alcohol consumption, this study aims at exploring changes in the alcohol consumption patterns of students before and during the Covid-19 pandemic, while considering the variables “perceived stress”, “gender”, “age” and “country of origin”.

Methods: Data was collected by conducting an online questionnaire and using convenience sampling (n=216). The survey consists of the Alcohol Use Disorder Identification Test (AUDIT), the Perceived Stress Scale-10 (PSS-10), and additional questions about demographics and alcohol consumption before the pandemic. The survey was created via Qualtrics, and the data was analysed using SPSS (version 27). Repeated measures ANOVA, T-tests, and a Pearson Correlation were conducted to explore changes in the consumption behaviour of students, individual differences in their demographics and the relationship between perceived stress and alcohol consumption.

Results: The findings of the study indicate that students reduced their alcohol consumption significantly during the Covid-19 pandemic. No significant differences were found in students individual characteristics (gender, age, country of origin), and no significant correlation was found between total scores of AUDIT and PSS-10.

Discussion: The study indicates a decrease in alcohol consumption due to a reduction in social interactions and highlights social drinking as a common consumption pattern of students, which should be further investigated by future research.

Keywords: Alcohol consumption, Mental health, Covid-19 Pandemic, Students, Social drinking

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1. Changes in the alcohol consumption of university students due to the Covid-19 pandemic

1.1. Covid-19 pandemic

Since the Severe Acute Respiratory Syndrome coronavirus 2 (SARS-CoV-2) outbreak, which is the virus that causes Covid-19 disease, people worldwide experience negative impacts on their mental and physical health (Cullen et al., 2020; Jakob et al., 2020). Coronavirus is a highly infectious disease caused by the pathogen SARS-CoV-2 (Hu et al., 2020). The first cases of infections were reported in December 2019 and can be linked to a seafood and wet animal wholesale market in the Chinese city Wuhan (Rothan & Byrareddy, 2020). Depending on the individual case, the disease can cause asymptomatic infections or infections with mild symptoms but can also lead to severe symptoms that even include death (Velvan & Meyer, 2020). Often the symptoms resemble those of pneumonia, as the disease targets the respiratory system (Ciotti et al., 2019). The symptoms occur after an incubation time of approximately five days (Rothan & Byrareddy, 2020), and the most common symptoms are fever, cough, and fatigue, as well as sputum production, headache, haemoptysis, diarrhoea, dysphonia, and lymphopenia (Rothan & Byrareddy, 2020). The disease can be transmitted across humans directly by airborne contagion through coughing, sneezing, or talking and indirectly by touching contaminated surfaces (Lotfi et al., 2020).

More than one year after the outbreak (29.04.2021), the statistics show about 150.5 million infections and about 3.1 million Covid-19 related deaths worldwide (Statista, 2021). These data indicate serious worldwide concerns why several governments across the world have imposed curfews and social distancing measures to prevent the spreading of the virus. Such restrictions seem to be helpful in avoiding the spread of the virus, but they also facilitate social isolation and feelings of fear and anger, which are associated with poor mental health conditions and psychological distress (Jaspal et al., 2020). Another factor contributing to psychological distress is how people perceive and evaluate the implementation of restrictions of the respective governments and their effectiveness (Mækelæ et al., 2020). Many people are restricted in their personal freedom as the governments of several countries imposed curfews, social distancing and the closing of non-essential businesses, schools, and universities (Bloem & Salemi, 2021). The restrictions have large impacts on citizens daily lives, who have to adapt to new challenges such as online education or home office. Facing such difficulties can result in negative consequences like experiencing psychological distress and worse mental health conditions (Cullen et al., 2020; Jakob et al., 2020).

1.2. Implications of Covid-19 pandemic on mental health

If people are dissatisfied with governmental restrictions, they tend to experience more worry and fear, which is again associated with increased psychological distress (Mækelæ et al., 2020). The WHO (World Health Organization) confirmed this by indicating that self-isolating and social distancing can result in people becoming more anxious, withdrawn, stressed, agitated and angry (Smith et al., 2020). Additionally, the experiencing of fear during the pandemic is also due to the spreading of questionable or false information about factors like virus transmission, numbers of incubated or mortality rates, which might again worsen mental health conditions (Ornell, 2020). A study that investigated a sample from the UK showed that 36,8% of the population reported poor mental health conditions, which might imply the breakout of a mental health pandemic after the Covid-19 pandemic (Ornell, 2020), as experiencing psychological distress or poor mental health conditions can cause problems like depressions or an increase in the alcohol consumption (Smith et al., 2021).

Especially students perceive high amounts of stress due to changes in their private life, a fear of failures, and the transitional nature of university life, like the environmental change from the parents' home to an own flat or a shared apartment (Ross et al., 1999). Another factor contributing to the perception of high amounts of stress is that they often face stressful life challenges like finding a partner or a part-time job (Ross et al., 1999). With the outbreak of the Covid-19 pandemic, those challenges might be even more stressful for students, as their possibilities to find a partner or a job are limited due to governmental restrictions like social distancing or the closing of shops (Gostin et al., 2020). Also, academic life might be more stressful for students, as online classes and learning from home require new responsibilities and challenges, which might lead to an increase in stress (AlAteeq et al., 2020). When looking at factors that impact the mental well-being of students, it shows that chronic stressors and stressful life events are correlated with depressions and an increase in alcohol consumption, which in turn can result in several other problems (Jose et al., 2000).

1.3. Alcohol use in the general population

Worldwide there are three million alcohol-related deaths annually (Clay & Parker, 2020), which make up 3,8% of all deaths (Pandey et al., 2017). Additionally, 4,6% of all disability-adjusted life-years are related to alcohol misuse (Pandey et al., 2017). These studies demonstrate that consistent and heavy alcohol consumption is a concerned with physical, psychological, social, and economic implications. Still, many people consume and abuse

alcohol as it is a socially accepted tool to reduce stress and has high availability (Jose et al., 2000).

Systematic alcohol misuse may facilitate the development of an Alcohol Use Disorder (AUD). According to the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; DSM-5; American Psychiatric Association, APA, 2013), an AUD can be classified into three different levels: mild, moderate, and severe, depending on how many criteria of an AUD are met. People who suffer from AUD may have difficulties controlling their drinking and might also display a tendency to prioritize drinking over their responsibilities (World Health Organization, 2007). In addition, some AUD individuals develop tolerance over time, which reflects drinking a higher amount of alcohol to experience initial effects, and conversely, a lower dose of alcohol intake may precipitate the initial effects of drinking, perceiving withdrawal symptoms, and even continue to drink alcohol despite the negative consequences according to the DSM-5 (APA, 2013). Typical withdrawal symptoms that individuals with AUD experience are tremulousness, nausea, insomnia, increased hand tremor, restlessness, sweating, sleeping problems, and an increased heart rate (Bayard et al., 2004; APA, 2013). The severity of the symptoms depends on the amount of alcohol intake, and the duration of the individual's drinking habit (Bayard et al., 2004). Still, many people drink alcohol despite the negative consequences, and during the Covid-19 pandemic, the amount might have even increased as people experience fear and isolation (Lock-down, social distancing), which can lead to worse mental health conditions (Jaspal et al., 2020). According to a study by Bell and Britton (2014), mental health is the leading indicator of people's alcohol consumption. The results of another study showed that students who reported consuming alcohol at hazardous levels were 1.2 times more likely to suffer from psychological distress than students who reported drinking much less (Tembo et al., 2017). Both studies show that a relationship between poor mental health conditions or psychological distress and changes in alcohol consumption during the pandemic exists.

1.4. Alcohol use in students

As students consume alcohol more excessively than many other groups, they are at higher risk of experiencing alcohol-related consequences (Varvil-Weld, 2013). Studies indicate different reasons why and how students consume alcohol. On the one hand, students use alcohol to feel more comfortable, relieve tension, relax, or forget their troubles (Sebena et al., 2012). Therefore, it plays a crucial role in how the students perceive stressful events and how they cope with them, as students who have other coping mechanisms might not use alcohol for coping with stress but other coping strategies (Struthers et al., 2000). On the other hand,

students consume alcohol to celebrate, feel more comfortable in contact with potential partners, or reward their hard work (Sebena et al., 2012). Most studies show that students have more alcohol-related problems and more often engage in problematic drinking, even if the frequency of drinking might be lower than in non-students (Sebena et al., 2012). Male students seem to have a higher alcohol consumption than female students, as they reported to have more units of alcohol per week, but no significant difference was found, as the alcohol limits for women are lower than for men (Bewick et al., 2008). The most frequently reported alcohol-related problems for both genders were hangovers, vomiting, and blackouts (McGee & Kypri, 2007). Other alcohol-related problems seem to be gender-specific, as women reported emotional outbursts more frequently, while men rather reported problems like physical aggression, stealing, and vandalism (McGee & Kypri, 2007). Furthermore, students who reported having a higher alcohol consumption, also reported that alcohol negatively affected their finances, academic performance, and physical health (Bewick et al., 2008; Tembo et al., 2017). Another common problem for people who abuse alcohol is poor mental health or depressions (PMHD) (Weitzman, 2004). People with PMHD more frequently reported drinking to get drunk, less likely reported not to drink at all, and generally reported more alcohol-related problems like unplanned and unsafe sex or alcohol overdosing (Weitzman, 2004).

1.5. Drinking patterns

Even though many people consume alcohol, people differ in their drinking patterns. Most drinking patterns can be categorized in one or more of three different concepts: *moderate to heavy drinking patterns*, *social drinking*, and *binge drinking* (Saha et al., 2007). Moderate drinking is defined as consuming a maximum of one drink per day for women and a maximum of two drinks per day for men, which is associated with low health and addiction risks (Ashley et al., 1997). Next, heavy alcohol consumption or heavy drinking distinguishes from moderate drinking by a concept that is called binge-drinking, which is defined as reaching a blood-alcohol concentration of 0.08 grams per decilitre or higher (about four drinks for women and five drinks for men within two hours) (Saha et al., 2007). Heavy drinking can be described as binge drinking on five or more days in the past 30 days (Shankar et al., 2006). Social drinking indicates alcohol consumption based on social motives and norms, while the alcohol consumption of social drinkers can vary between moderate and heavy (Halim et al., 2012). The previously described concepts can be measured by using standard drinks as a measurement to define cut-off scores for alcohol consumption and to distinguish between the different concepts (Kerr & Stockwell, 2012).

The amount of alcohol a standard drink contains is different for each country, but for most countries, one standard drink equals a 355ml bottle of beer with 5% of alcohol (Kerr & Stockwell, 2012). However, the literature indicates that drinking patterns and the amount of alcohol that is consumed can be influenced by cultural and social background (Sudhinaraset et al., 2016). A study about alcohol consumption in Europe showed that in 2016, Germany was one of the European countries with the highest alcohol consumption per person (Ritchie & Roser, 2018). Another study suggests that a preference for beer consumption, high in Germany, was associated with an increased risk for heavy drinking or binge drinking (Dey et al., 2013). In contrast, a preference for wine, which is preferred in other European countries such as France, was associated with lower risks of heavy alcohol consumption (Dey et al., 2013). Finally, existing literature indicates that also age and gender of participants seem to influence the alcohol consumption patterns of people, as men tend to prefer beer over other alcoholic beverages while woman prefer wine (Anderson et al., 2012). Furthermore, non-drinkers tended to be older, while heavy drinkers were found to be younger (Anderson et al., 2012). To sum up, the previously mentioned findings indicate that age, gender and nationality are variables that might play an important role in determining people's alcohol consumption.

1.6. Scope of the study

The primary objective of this study is to determine how the alcohol consumption patterns of university students have changed during the Covid-19 pandemic. As a secondary objective, this study investigates various individual differences (gender, age, nationality) regarding changes in the alcohol consumption of students due to the Covid-19 pandemic. As another secondary objective, the study aims to explore whether students who perceive high amounts of stress experienced different changes in their alcohol consumption than students who perceive low levels of stress.

1.7. Research questions & hypotheses

Based on the previously mentioned literature, several research questions and hypotheses can be formulated. To clarify the structure of this study, all hypotheses were visualized in a conceptual model below (see Figure 1). The model shows that the hypotheses can be distinguished into three different parts.

First, H_1 investigates the changes in students' alcohol consumption over time (before pandemic + during pandemic) and assumes an increase in student's alcohol consumption due to the Covid-19 pandemic.

Secondly, H_2, H_3, and H_4 assume being male, younger than 22, and German as at-risk factors to increase students' alcohol consumption.

Thirdly, H_5 investigates whether there is a positive relationship between students' perceived stress level and alcohol consumption.

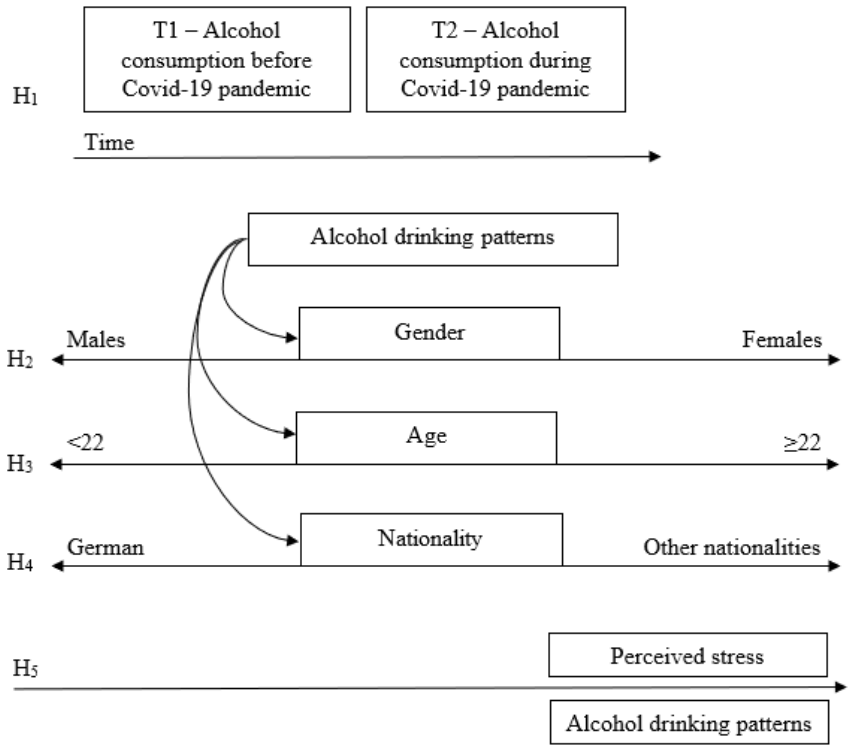
RQ_1: What is the impact of the Covid-19 pandemic on alcohol consumption in university students?
H_1: The alcohol consumption of students increased significantly due to the Covid-19 pandemic.

RQ_2: Are there individual differences in terms of alcohol consumption in university students?
H_2: Male students consume more alcohol than female students during the pandemic
H_3: Students younger than 22 consume more alcohol during the pandemic than students who are 22 or older.
H_4: Students from Germany consume more alcohol than students from other countries during the pandemic.

RQ_3: What is the relationship between stress and alcohol consumption in university students?
H_5: There is a positive relationship between perceived stress and alcohol consumption of students.

Figure 1

Conceptual model for the visualization of the research hypotheses



2. Methods

2.1. Design

A web-based cross-sectional survey was conducted, containing questionnaires about alcohol consumption and perceived stress. Data from participants were collected by using convenience sampling as a recruitment technique. For the first research question, *alcohol consumption* was the dependent variable, while *time* was the independent variable. Regarding the second research question, *alcohol consumption* was again the dependent variable, with *gender*, *age*, and *nationality* as independent variables. For the last research question, *alcohol consumption* and *perceived stress* were defined as variables to explore.

2.2. Participants

The online survey was conducted with a sample size of 362 participants. All participants had to meet specific inclusion criteria to participate in the study. As a first criterion, the participants had to agree to the informed consent (see Appendix F) previously to the study. Next, participants were chosen who are currently enrolled in a university or applied university, speak English at a sufficient level and are at least 18 years old. Data of participants who did not finish the survey were excluded as well. Responses of 146 (40.3%) participants who did not meet the inclusion criteria were excluded from the dataset; therefore, a prepared dataset with

data from 216 participants remained. Participants who chose the gender option ‘others’ (n = 216) were excluded from the analysis, as only two persons indicated to identify as others, so there was not sufficient data from other genders to explore gender differences.

To further describe the sample that was investigated in this study (see Table 1), most of the respondents were female (71.3%), from Germany (70.4%), and currently doing their bachelor’s degree (88.4%). The age of the respondents varied between 18 and 32 years, with a mean age of 21.73 (SD = 1.944). Only a minority of the respondents were infected with SARS-COV-2 (9.3%) before, previously searched for psychological or pharmacological treatment (18.5%) or were ever diagnosed with a particular mental health condition (13%).

Table 1

Participants’ sociodemographic characteristics

Characteristics	Full Sample			
	N (216)	M(SD)/ %	Minimum	Maximum
Gender				
Male	60	27.8%		
Female	154	71.3%		
Other	2	0.9%		
Age		21.73 (1,94)	18	32
Country of Origin				
Germany	152	70.4%		
Netherlands	29	13.4%		
Other	35	16.2%		
Current degree				
Bachelor	191	88.4%		
Master	23	10.6%		

PhD	2	0.9%
Ever infected with SARS-COV-2 [a]	20	9.3%
Ever searched psychological/pharmacological treatment [a]	40	18.5%
Previously diagnosed with mental health condition [a]	28	13%
Total score PSS-10		21.579 (7.065)
Total score PSS-10 in categories		
Low		14.4%
Moderate		64.8%
High		20.8%
Total score AUDIT		5.732 (4.820)
Total score Alcohol consumption before pandemic		3.009 (1.878)
Total score Alcohol consumption during pandemic		2.639 (1.698)

Note. SD = Standard deviation, AUDIT = Alcohol Use Disorder Identification Test, PSS-10 = Perceived Stress Scale-10.

2.3. Instruments

To gather all data that was necessary to answer the research question and reject or accept the hypotheses, the survey consisted of three different parts, which are namely: demographics, perceived stress, and alcohol consumption.

2.3.1 Demographics

Sociodemographic data consisted of four closed-ended questions that asked about the variables: age, gender, level of education, country of origin (see Appendix D). Further closed questions asked whether a participant ever searched for addiction treatment and if participants

ever got diagnosed with any mental disorder in the past. Examples for such questions are: “Have you ever sought psychological or pharmacological treatment for any mental health concerns (e.g., anxiety, depression, eating disorders)?” and “Have you ever been diagnosed with a mental health condition?”. The answer options were “Yes” or “No”, while participants who chose the first option were able to indicate the type of mental health concern or mental health condition in a blank text field themselves.

2.3.2. Alcohol consumption before and during the pandemic

Next, two closed questions about participant’s alcohol consumption before the Covid-19 pandemic were included to have comparative values for the Alcohol Use Disorder Identification Test (AUDIT) outcomes that measure the alcohol consumption during the pandemic (see Appendix E). The questions were modified versions of items 1 and 2 of the AUDIT and were therefore scored on the same answer scale and the same scoring protocol as AUDIT. An example of such a question would be: “Before the pandemic started, how often did you have a drink containing alcohol?”. The response to this question was scored on a 5-Point Likert scale with the response possibilities: Never, Monthly or less, 2-4 times a month, 2-3 times a week, four or more times a week.

2.3.3. Perceived Stress Scale (PSS-10)

The perceived stress of the participants was measured by using the Perceived Stress Scale (PSS-10) (see Appendix B). PSS-10 is the most widely used scale for measuring the perception of stress (Cohen et al., 1994) and consists of 10 items, which are scored on a 5-point Likert scale, ranging from 0 = never to 4 = very often. The individual PSS-10 score was estimated by reversing the responses to the four questions that are formulated negatively (question 4, 5, 7, 8) and summing up all responses to the scale items (Cohen et al., 1994). After scoring the PPS-10, the results were compared with the mean value from a norm table to evaluate whether a score is low or high compared to other individuals of the same gender/age/race (Cohen et al., 1994). The total scores vary between 0 and 40, while scores ranging from 0 to 13 indicate low perceived stress levels, scores from 14 to 26 indicate moderate perceived stress levels, and scores from 27 to 40 indicate high perceived stress (Swaminathan et al., 2016). Next, a Cronbach’s alpha reliability coefficient of 0,85 was found for the PSS-10, indicating a high internal consistency (Cohen et al., 1994; Roberti et al., 2006). Finally, some studies found evidence for validity, as high scores on the PSS-10 are associated with failure to quit smoking and greater vulnerability to experience depressive symptoms (Cohen et

al., 1994). Also, more recent literature evaluates the psychometric properties of the PSS-10 as good (Lee, 2012).

2.3.4. Alcohol Use Disorder Identification Test (AUDIT)

The Alcohol Use Disorder Identification Test (AUDIT) was used to estimate the consumption behaviour of the participants during the pandemic (see Appendix C). The questionnaire covers three different domains: alcohol consumption, drinking behaviour, and alcohol-related problems (Saunders et al., 1993). It consists of ten items, scored on a 5-Point Likert scale or a 3-Point Likert Scale, depending on the question (questions 1-8 on a 5-point Likert scale; question 9-10 on a 3-point Likert scale). The response scores vary between 0 and 4 (for the questions scored on a 3-point Likert scale, the response scores are: 0, 2, 4), indicating a maximum total score of 40, whereas a score of 8 or higher indicates tendencies towards harmful or hazardous drinking (Saunders et al., 1993). A Cronbach's alpha of 0,80 was reported for AUDIT, indicating a good internal consistency (La et al., 2019). Finally, a study investigated the scales' validity by conducting a factor analysis, which confirmed the validity of the three factors: risky use, dependence symptoms, and harmful alcohol use (La et al., 2019).

2.4. Procedure

First, the questionnaire was developed by using the online software Qualtrics. The Qualtrics link was spread via the SONA system of the University of Twente (UT), an online system for scientific research. The survey was further distributed by a Qualtrics link via social media and instant messaging channels (e.g., WhatsApp, Instagram, Facebook). Previously to the questionnaire, the participants were informed about the aim of the study, about the length of the questionnaire, that their data will be collected anonymously and that they can withdraw from the survey at any time. After that, they were asked to give their informed consent to start the questionnaire. When finishing the questionnaire, the participants were thanked for participating in the study. The data collection started on April 9th, 2021, and ended on Mai, 10th, 2021. The Ethics Committee of the UT approved the online survey (request number: 210233). Finally, the data was transferred into the Statistical Package for Social Science (SPSS, version 27) for further analysis.

2.5. Data analysis

As the planned analysis consists of parametric tests, it was investigated first whether the data is normally distributed by using Shapiro-Wilk tests. For the total scores of PSS-10, the test showed a value, which is statistically significant, W(216) = 0.992, p = 0,280. This indicates normally distributed data. Although Shapiro-Wilk tests for the total scores of AUDIT, W(216) = 0.900, p = 0,000, the total scores for the alcohol consumption during the pandemic, W(216) = 0.945, p = 0.000 and, before the pandemic, W(216) = 0.952, p = 0.000 did not indicate normally distributed data, a visual inspection of QQ-plots showed normally distributed data with no significant deviations (see Figure A1, A2 and A3).

The first step in SPSS was to analyse the participants' demographics (age, gender, level of education and country of origin), whether they ever had a diagnosed mental health condition and whether they ever sought pharmacological or psychological help by using descriptive statistics to calculate the mean, standard deviation, minimum and maximum values of the data.

Next, the scoring of the PSS-10 and the AUDIT was conducted, by creating two new variables for the total scores of each scale, according to their scoring protocols. Also, the two individual variables, "alcohol consumption before the pandemic" and "alcohol consumption during the pandemic" were scored by using the scoring protocol for specific items from AUDIT, which measure the amount of alcohol consumed.

To address H_1, repeated-measures ANOVA was conducted to explore the mean alcohol consumption before (T0) and during (T1) Covid-19 pandemic in university students. By doing so, it was investigated how the quantity of the students' alcohol consumption developed with the outbreak of the pandemic.

Regarding H_2, H_3, and H_4, T-tests for individual samples were used to explore the group differences of the variables 'gender', 'age' ($< 22 + \geq 22$), and 'country of origin' (Germany + Other). Alcohol consumption during the pandemic was used as a test variable.

To investigate H_5, a Pearson's correlation was conducted to explore the relationship between the total scores of AUDIT and the PSS-10.

3. Results

3.1. Descriptive data

In general, the sample reported a total mean score of 5.732 (SD = 4.820) for AUDIT and a total mean score of 21,579 (SD = 7.065) for the PSS-10 (see Table 1). The PSS-10 total scores were categorized in 14.4% of the participants reporting a low level of perceived stress,

64.8% reporting a moderate level of perceived stress and 20.8% reporting a high level of perceived stress. Next, the participants reported a mean score of 2.639 (SD = 1.698) for the alcohol consumption during the pandemic and a total mean score of 3.009 (SD = 1.878) for the alcohol consumption before the pandemic.

3.2. Hypotheses testing

To test H_1, a one-way repeated measures ANOVA with a Greenhouse-Geisser correction was carried out to investigate whether there is a statistically significant difference in students' alcohol consumption due to the Covid-19 pandemic (see Table 2). The test indicated a statistically significant difference in alcohol consumption between two points of time (T0 - before and T1 - during the Covid-19 pandemic), $F(1.215) = 18.827$, $p < .05$. Furthermore, the analysis showed a mean value of 3,01 (SD = 1.878) for alcohol consumption before the pandemic and a mean value of 2.64 (SD = 1.698) for alcohol consumption during the pandemic. Those results indicated a significant decrease in the alcohol consumption of students, so H_1 was rejected.

To investigate H_2, a t-test for independent samples indicated no statistically significant difference 95% CI [-0.378, 0.219], $t(212) = -.522$, $p = .602$, between male students ($M = 2.533$, $SD = 2.103$) and female students ($M = 2.669$, $SD = 1.526$) regarding alcohol consumption during the pandemic (see Table 2). The hypothesis was rejected.

To address H_3, a t-test for independent samples showed no statistically significant difference 95% CI [-0.277, -0.258], $t(214) = -.071$, $p = .943$, for the alcohol consumption of students younger than 22 ($M = 2.630$, $SD = 1.662$) and students who are 22 years old or older ($M = 2.647$, $SD = 1.739$) (see Table 2). Therefore, the hypothesis was rejected.

In contrast to H_4, there was no statistical significant difference found, $M = -0.214$, 95% CI [-0.505, 0.078], $t(214) = -1.443$, $p = .151$, between students from other countries ($M = 2.892$, $SD = 2.009$) in comparison to German students ($M = 2.530$, $SD = 1.540$) (see Table 2). Therefore, the hypothesis was rejected.

To test H_5, a Pearson's correlation was conducted to investigate the relationship between alcohol consumption and perceived stress (see Table 2). The test indicated no statistically significant relationship between the total scores of AUDIT and the total scores of PSS-10 in university students, $r(214) = -.075$, $p = .247$. Therefore, the hypothesis was rejected.

Table 2

The relationship between demographic data, AUDIT, PSS-10, and alcohol consumption before and during the Covid-19 pandemic

Characteristic	**Alcohol consumption during pandemic**		
	***M* (*SD*)**		***t* (*p*)**
Gender			-0.522 (0.602)
Female	2.669 (1,526)		
Male	2.533 (2,103)		
Age			-.071 (0.943)
Younger than 22	2.630 (1.662)		
22 or older	2,647 (1,739)		
Country of Origin			-1,443 (0,151)
German	2,530 (1,540)		
Other	2,892 (2,009)		
	***M* (*SD*)**		***F* (*p*)**
Difference in alcohol consumption			18,827 (0.00)
(T0)	3.01 (1,878)		
(T1)	2.64 (1,698)		
	M (SD)	***r* (*p*)**	***r* (*p*)**
Variable		**1.**	**2.**
1. PSS-10	5.732 (4.820)	1 (0.247)	-.075 (0.247)
2. AUDIT	21.579 (7.065)	-.075 (0.247)	1 (0.247)

M = mean; *SD* = Standard deviation; *t* = t-test for independent samples; F = repeated measures ANOVA; T0 = Alcohol consumption before pandemic; T1 = Alcohol consumption during pandemic; *r* = Pearson correlation

4. Discussion

4.1. Interpretation of results

As a primary objective, the present study aims to explore changes in students' alcohol consumption behaviour while also addressing students' individual differences and the relationship between perceived stress and alcohol consumption. In general, the results of this study can be described as rather unexpected as all of the hypotheses were rejected. Nevertheless, do the results provide insights into the alcohol consumption behaviour of students during the Covid-19 pandemic. First of all, the outcomes of the PSS-10 indicated that 85.6 % of the students reported moderate (64.8%) or high (20.8%) perceived stress levels (see Table 1). Based on these findings, one could assume that students might consume alcohol to cope with the high stress they perceive. However, the average alcohol consumption of the student sample during the Covid-19 pandemic did not show hazardous levels, which was indicated by the AUDIT total score (see Table 1). This might sound reassuring, but it must be mentioned that AUDIT is only measuring whether an individual has already reached hazardous levels of alcohol consumption and already developed alcohol related-problems (Bergman & Källmén, 2002), it does not work as a predictor for later life. Students who scored low on AUDIT are therefore not prevented from developing an alcohol use disorder in the long term. The test only indicates that they do not show hazardous drinking behaviour in the past 12 months before the test conduction.

Next, the results indicate a statistically significant difference between the alcohol consumption of students before and during the pandemic. Since H1 indicates an increase in alcohol consumption, the hypothesis was rejected as an opposite pattern was found because students significantly reduced their alcohol consumption during the pandemic (see table 2). Other recent studies agree that students reduced their alcohol consumption due to the Covid-19 pandemic, based on the social isolation imposed by authorities (Graupensperger et al., 2021; White et al., 2020). Students seem to consume more alcohol when they get together, which is in line with reasons for student's alcohol consumption that were mentioned previously in the present study, like celebrating and feeling more comfortable in contact with potential partners or peers (Sebena et al., 2012). As those contacts are strongly restricted during the Covid-19 pandemic, the consumption behaviour might have decreased as a consequence, which is in line with previous research. A study that investigated a sample of Belgian students showed that students reduced their alcohol consumption during the pandemic due to enhancement and social motives (Bollen et al., 2021). Another study confirmed that students drinking behaviour depends on their social context, as during the Covid-19 pandemic, students tended to shift from consuming large amounts of alcohol with their peers to drinking small amounts with their family members (Jackson et al., 2021). Those findings indicate that social drinking is indeed

one of the most common drinking patterns for students, as they seem to consume less alcohol when not socializing with peers.

Regarding students' individual differences, the results show that no statistically significant individual differences were found between males and females, the country of origin, or students younger or older than 22. Still, data from the present study indicate that female students consumed alcohol more frequently during the pandemic than their male colleagues. Comparing this to existing literature, recent studies indicate that traditionally males drink alcohol more frequently and heavily, but over the last decades, the alcohol consumption of women increased, especially in countries with greater gender equality (Bratberg et al., 2016). Another study indicated that female adolescents might consume alcohol more frequently due to coping mechanisms and males rather due to social and enhancement motives (Knutsche et al., 2015). When considering the current situation, it could be interpreted that the female students increased their alcohol consumption frequency to cope with the mental consequences of the Covid-19 pandemic, while male students reduced their alcohol consumption frequency due to social restrictions. The findings of a recent study confirm that female students experience more fear of Covid-19, which in turn was associated with keeping their alcohol consumption at an unchanged level or even increasing it during the Covid-19 pandemic (Nguyen et al., 2020). However, another study indicates that Covid-19 related distress was only linked to women's alcohol consumption quantity (drinks consumed on one occasion), but no gender differences were found for drinking frequencies (Rodriguez et al., 2020). Those findings demonstrate that women seem to be more affected by the Covid-19 pandemic in terms of alcohol consumption, but existing literature is not coherent about the specific changes.

Next, the results showed that students from Germany consumed slightly less alcohol than their colleagues from other countries. In general, cultural differences in alcohol consumption seem to be mediated by social motives, enhancement motives, and coping motives (Knutsche et al., 2015). As the research for the existing study was conducted with many students from the UT or acquaintances of the researchers from Germany, it can be assumed that the German students that were investigated in this sample might be close to their peers and relatives, while students from other countries might not be able to visit their families and friends as they study in Germany or the Netherlands but are not allowed to visit their families due to current travelling restrictions. Therefore, it can be interpreted that students from other countries might feel lonelier than their German colleagues, which is associated with higher alcohol consumption based on coping motives (McKay, 2017). However, this only explains differences in alcohol consumption for students from countries that are at risk areas for Covid-19 or not easy to reach

from the Netherlands or Germany. Other studies suggest that ethnic differences in alcohol consumption can be explained by the cultural history of countries, as they differ in their preferences for types of alcohol (distilled vs fermented) and their drinking patterns (Järwinen & Room, 2017).

When evaluating the age differences in students' alcohol consumption, it shows that students older than 21 seem to consume more alcohol than their younger colleagues. This is surprising as lower self-regulation is associated with more alcohol-related problems (Muraven et al., 2005) and self-regulation improves during the mid-twenties (Steinberg et al., 2018). Therefore, older students may have developed skills to facilitate inhibitory control regarding alcohol consumption. However, older students might be more affected by the Covid-19 pandemic than their younger colleagues, as they might have more responsibilities in terms of personal, economic, and societal responsibilities. Literature indicates that financial problems and new responsibilities are associated with using alcohol as a coping strategy (Metzger et al., 2017). As, due to the Covid-19 pandemic, several businesses were closed, older students might have lost their jobs and have to face new responsibilities in terms of finding a new job to finance their life, because they might be used to having a certain income and take this into account for their life planning.

For the relationship between perceived stress and alcohol consumption, the results do not account for a statistically significant relationship between both variables, indicating that stress might not be a significant variable in facilitating alcohol consumption in a sample of students or at least that other variables should be investigated as mediator variables like e.g., loneliness. Even if perceived stress had no direct impact on students' alcohol consumption in this sample, literature indicates that it might have an indirect one, as a lack of alternative coping strategies for stress might be a variable that influences alcohol consumption (Corbin et al., 2013). However, it must be evaluated that AUDIT total scores were used as a measure for students' alcohol consumption, as they do not solely measure the amount of alcohol but also how harmful or hazardous the persons' consumption is (La et al., 2019). As an example, two questions from AUDIT ask about feelings of guilt after heavy drinking sessions or whether someone hurt himself or others (see Appendix C). Answers to those questions also contributed to the AUDIT total score but are not directly linked to the amount of alcohol a student consumed. Therefore, an explanation for the non-significant result, which is not in line with previous research (Balogun et al., 2014), might be that students' AUDIT total scores were correlated with perceived stress, but not solely the actual amount of alcohol they consumed.

4.2. Limitations and strengths

When looking at the limitations and strength of this study, several aspects can be estimated that should be improved or kept in future research about the alcohol consumption patterns of students. A strength of the study is the large sample size, as it enhances the reliability of the study, which was already high as the instruments utilized in this study (PSS-10 and AUDIT) were widely used in previous research and evaluated as highly reliable and valid (Cohen et al., 1994; La et al., 2019). However, as a first limitation, the sociodemographic data of the participants demonstrate that the sample used in this study is only representative of the students' population to some extent due to imbalances in gender and country of origin. A broad majority of the participants were female and German, which might have impacted the results. Still, it is not unusual to have such imbalances in the data set, as convenience sampling was chosen as a recruitment method. Therefore, the survey was distributed in a WhatsApp group for the psychology bachelor track of the UT. Psychology is a bachelor track that is favourited by females, at least is this the case for received doctorates in psychology (American Psychology Association, 2015). As the survey was also spread via Sona Systems of the UT and many of the UT students are German, that probably explains the imbalance in the country of origin. Furthermore, four of the five researchers were Germans and shared the survey with their German friends who were enrolled at a University during the data collection. The last limitation of this study is that for the testing of H_5, AUDIT total scores were used instead of the actual alcohol consumption of students. Therefore, perceived stress was not solely correlated with students' alcohol consumption, but also with the harmfulness of students' alcohol consumption.

4.3. Future research implications

In general, this study contributed to the existing literature of students' alcohol consumption during the Covid-19 pandemic by exploring changes in students' alcohol consumption while considering certain individual differences of students and the relationship between alcohol consumption and perceived stress. However, based on the limitations of this study, several implications can be made for future research on similar topics. As mentioned earlier, other variables than perceived stress should be considered to influence student's alcohol consumption, as perceived stress was not correlated with changes in (harmful) alcohol consumption. On the one hand, mediator variables could be explored, which are influenced by perceived stress like experiencing loneliness (Stoliker & Lafreniere, 2015). On the other hand, also completely different variables might influence students' alcohol consumption. Therefore, variables like, e.g. level of social anxiety, sleep patterns, physical activity, or depression

probably also impact student's alcohol consumption and might be even better predictors.

Nevertheless, based on limitations of this study, future studies should explore the relationship between students' perceived stress and alcohol consumption in more detail, by putting focus on the actual amount of alcohol consumed. Next, as women reported to have a higher alcohol consumption during the pandemic than men, investigating the specific reasons for this can be advised because previous studies are not coherent about it. Also, even if the sample did not show hazardous levels of alcohol consumption and decreased their consumption behaviour during the pandemic, the results showed that students seem to drink more when socializing with peers, so it important to figure out how to prevent not only individuals but also whole groups from increasing their consumption again when the restrictions end, and social life continues. Further studies should also investigate whether student's alcohol consumption increases again after the Covid-19 induced restrictions end. As mentioned earlier, a lack of alternative coping strategies can be associated with increased alcohol consumption (Corbin et al., 2013) Therefore, future research should focus on identifying coping strategies that might support students to increase their alcohol consumption.

4.4. Conclusion

To conclude, it can be said that the findings of this study indicate a significant decrease in alcohol consumption of students during the Covid-19 pandemic. In this study, the reduction in alcohol consumption was associated with a lack of social interaction due to the Covid-19 pandemic. Next, the variable perceived psychological distress might play a role in facilitating alcohol consumption among students in general, but in this study, no evidence was found for a relationship between student's perceived psychological distress and alcohol consumption. Finally, the findings of this study indicate that individual differences in country of origin, gender, and age do not play a crucial role in determining the alcohol consumption of students.

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Appendices

Appendix A
Normal Q-Q Plots

Figure A1

Normal Q-Q Plot for AUDIT Total score

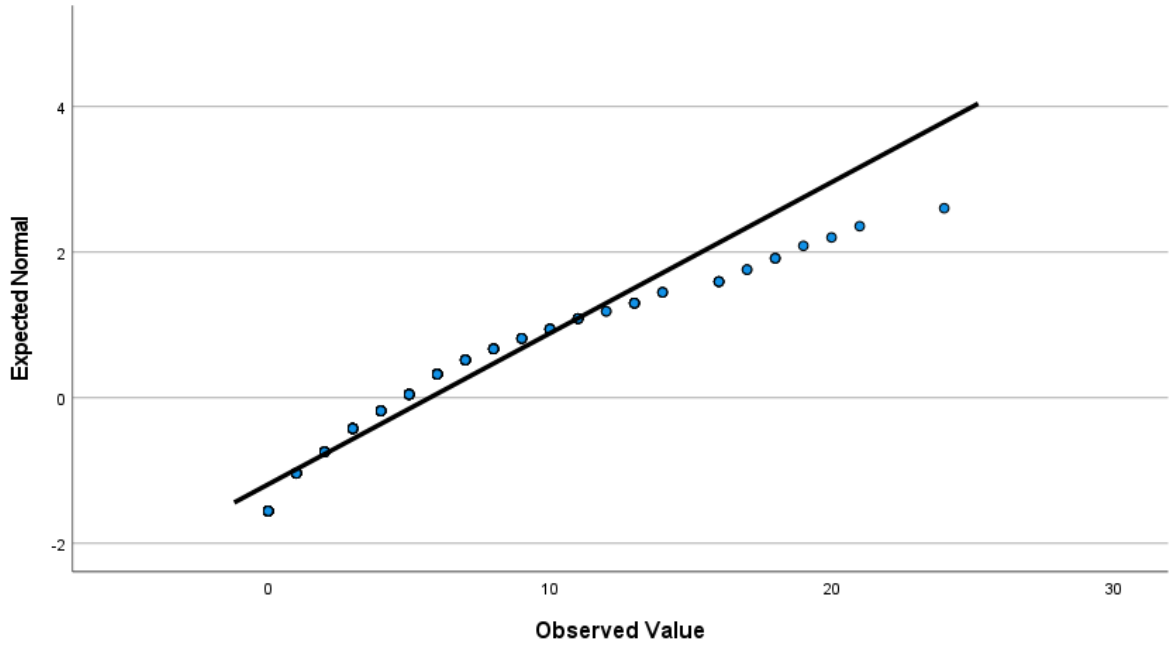


Figure A2

Normal Q-Q Plot for Alcohol consumption before the pandemic

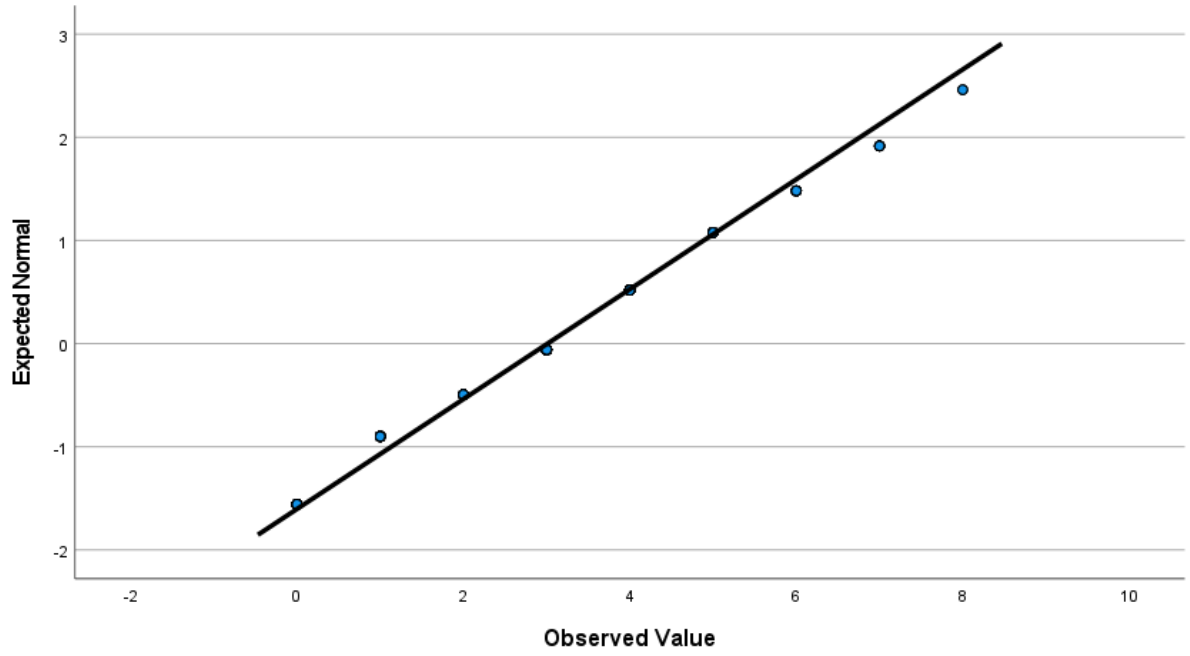
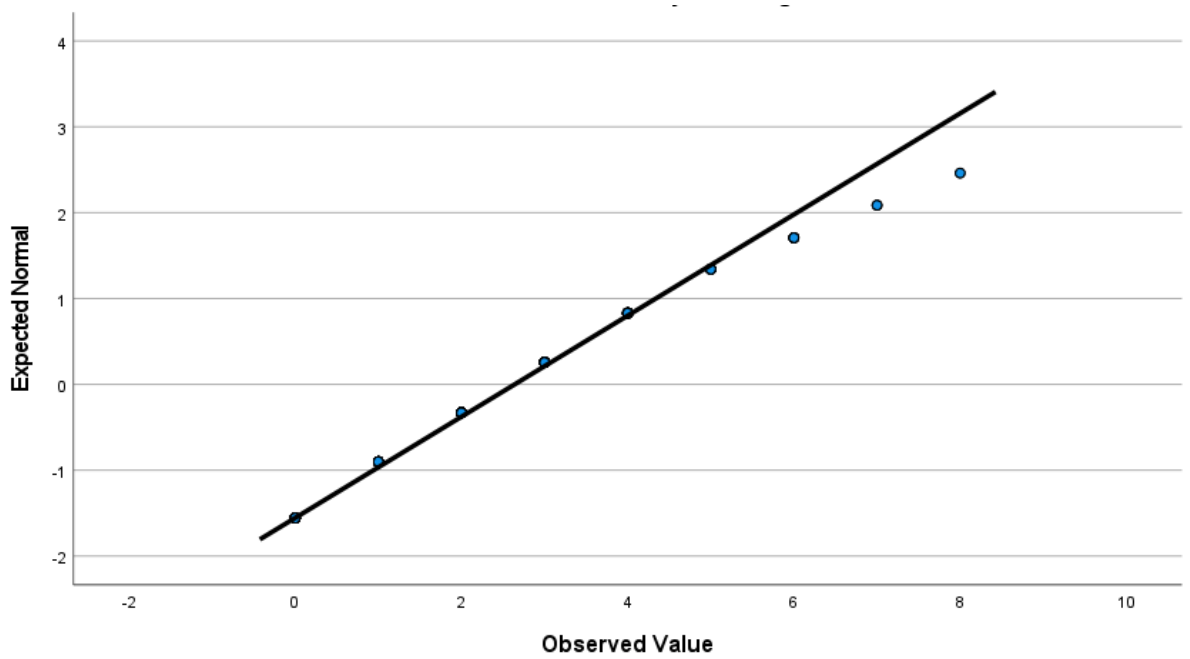


Figure A3

Normal Q-Q Plot for Alcohol consumption during the pandemic



Appendix B
Perceived Stress Scale (PSS-10)

Item	Never	Almost Never	Sometimes	Fairly Often	Very Often
1) In the last month, how often have you been upset because of something that happened unexpectedly?	0	1	2	3	4
2) In the last month, how often have you felt that you were unable to control the important things in your life?	0	1	2	3	4
3) In the last month, how often have you felt nervous and “stressed”?	0	1	2	3	4
4) In the last month, how often have you felt confident about your ability to handle your personal problems?	0	1	2	3	4
5) In the last month, how often have you felt that things were going your way?	0	1	2	3	4
6) In the last month, how often have you found that you could not cope with all the things that you had to do?	0	1	2	3	4
7) In the last month, how often have you been able to control irritations in your life?	0	1	2	3	4
8) In the last month, how often have you felt that you were on top of things?	0	1	2	3	4
9) In the last month, how often have you been angered because of things that were outside of your control?	0	1	2	3	4
10) In the last month, how often have you felt difficulties were piling up so	0	1	2	3	4

high that you could not overcome them?

Appendix C

Alcohol Use Disorder Identification Test (AUDIT)

Item	Never	Monthly or less	2-4 times a month	2-3 times a week	4 or more times a week
How often do you have a drink containing alcohol?	0	1	2	3	4
	1 or 2	**3 or 4**	**5 or 6**	**7, 8 or 9**	**10 or more**
How many standard drinks containing alcohol do you have on a typical day when you are drinking?	0	1	2	3	4
	Never	**Less than monthly**	**Monthly**	**Weekly**	**Daily or almost daily**
How often do you have more than 6 drinks on one occasion?	0	1	2	3	4
How often during the last year have you found that you were not able to stop drinking once you started?	0	1	2	3	4
How often during the last year have you failed to do what was normally expected from	0	1	2	3	4

you because of drinking?					
How often during the last year have you been unable to remember what happened the night before because you had been drinking?	0	1	2	3	4
How often during the last year have you needed an alcoholic drink first thing in the morning to get yourself going after a night of heavy drinking?	0	1	2	3	4
How often during the last year have you had a feeling of guilt or remorse after drinking?	0	1	2	3	4

	Never	**Yes, but not in the past year**	**Yes, during the past year**
Have you or someone else been injured as a result of your drinking?	0	2	4
Has a relative, friend, doctor, or another health professional expressed concern about your drinking or	0	2	4

suggested you
cut down?

Appendix D

Demographics

Item	Answer categories		
What is the degree you are currently working on?	Bachelor	Master	PHD
What is your age?		Open question	
What is your country of origin?		Open question	
What is your gender?	Male	Female	Other
Have you ever sought psychological or pharmacological treatment for any mental health concerns (e.g., anxiety, depression, eating disorders)?	Yes (please indicate)		No
Have you ever been diagnosed with a mental health condition?	Yes (please indicate)		No

Appendix E

Individual Variables

Item	Never	Monthly or less	2-4 times a month	2-3 times a week	4 or more times a week
Before the Covid-19 pandemic started, how often did you have a drink containing alcohol?	0	1	2	3	4
	1 or 2	**3 or 4**	**5 or 6**	**7, 8 or 9**	**10 or more**
Before the Covid-19 pandemic started, how many standard drinks containing alcohol did you have on a casual occasion?	0	1	2	3	4

Appendix F
Informed consent

Welcome!
You are invited to participate in a research study titled “Exploring the impact of COVID-19 on students’ mental wellbeing”. This study is conducted by Marius Schulte-Frankenfeld, Emma Simons, Lia Landwehr, Buket Korkut and Laura Holzwarth from the Faculty of Behavioural, Management and Social Sciences at the University of Twente.

The purpose of this research study is twofold. On the one hand, the study aims at exploring the impact of the COVID-19 pandemic on different aspects of mental well-being. On the other hand, the purpose is also to explore the influence of protective factors on well-being during the pandemic. Generally, the survey will take you approximately 20 minutes to complete. The data will be used for research purposes only.

Your participation in this study is entirely voluntary and you can withdraw at any time. **Please be aware that all of your data will be treated confidentially, and your responses are anonymous!**

We believe there are no known risks associated with this research study; however, as with any online related activity the risk of a breach is always possible. To minimize your risks, no identifying information about you will be collected and survey data will only be stored on a password-protected computer.

For further information, please contact: (…)

The supervisors of the study are Alexandra Ghita (…) and Sofia Bastoni (…).

By clicking "I agree" below you are indicating that you are at least 18 years old, have read and understood the consent form and agree to participate in this research study.

- I agree
- I don’t agree