Exploring Social Influences on Alcohol Consumption: An Analysis of Social Context and Perceived Social Norms among Students from the Netherlands

Lea S. Wohlfarth (s2529653)

Department of Psychology, University of Twente

Faculty of Behavioural, Management, and Social Sciences

202000381: Positive Clinical Psychology and Technology

M. Berkhoff, Dr. H. Kip

January 26th, 2024

APA 7th

Word count: 6011

Abstract

Background: Generally, alcohol consumption among students is a prevalent and current problem, especially in European countries. Hence, investigating reasons and triggers why drinking occurs at that stage of development is of high interest to further develop interventions. **Methods:** The present study examined the relationships between social context and perceived social norms on alcohol usage among students aged between 18 and 25 in the Netherlands. This research used the method of experience sampling, wherein each participant ($N = 68$) received two questionnaires daily over the period of one week about their alcohol consumption and reasons for it. **Results:** A qualitative analysis showed that the social drinking context was characterized by a high presence of social contacts. The own home was most frequently stated as a drinking environment. Bars and parties were highly prevalent as well, these are typical places with a high number of contacts. In addition, in about 50 % of the answers, using alcohol with friends was mentioned. Moreover, in this sample a significant relationship was found between participants' self-reported and perceived peer drinking behaviour, regarding the decision to drink as well as the number of drinks. Lastly, the perception of a high influence of peers significantly impacted participants decision to drink, the number of drinks were not impacted. **Discussion**: It can be concluded that the social context where drinking occurs includes pre-eminently social contacts. Peers had a high influence on participants drinking behaviour, therefore, perceived social norms play a crucial role in alcohol use among students.

Keywords: alcohol usage, students, perceived social norms, social context, experience sampling, peer influence, Netherlands

Contents

Introduction

The consumption of excessive amounts of alcohol is a perilous issue, especially among university students (Alcohol Rehab Guide, 2023). Generally, consuming high amounts of alcohol can manifest itself in problematic drinking behaviour that is accompanied by adverse consequences, such as health issues (Mekonen et al., 2017). Problematic alcohol use is defined as drinking that is accompanied by unpleasant consequences or heavy drinking, which is characterized by consuming high amounts of alcohol in a short time drinking that is accompanied by unpleasant consequences (O'Malley, 2004). It was observed the events associated with the transition into adult roles, particularly when leaving parental home or attending university, coincided with an upsurge in heavy alcohol use (O'Malley, 2004). Particularly university students between 18 and 25 years old showed patterns of frequent binge drinking (Tavolacci, 2019). Globally, 80 % of college students use alcohol to some degree while 50% of these students show patterns of binge drinking (Alcohol Rehab Guide, 2023). Mekonen et al. (2017) found that problematic alcohol use by students has been linked to several adverse consequences, such as increased symptoms of depression, attempted suicide, self-harm as well as aggressive behaviours. Furthermore, it was stated that students facing issues with alcohol tend to engage in risky sexual activity, exhibit impaired executive functions, and perform poorly academically (Mekonen et al.,2017). Given its detrimental and wideranging consequences for physical, behavioural, and mental health, the identification of possible predictors for problematic alcohol use becomes increasingly urgent. This underlines the importance of students aged between 18 and 25 as a target group for understanding and addressing drinking behaviour as well as interventions.

Social Context and Alcohol Usage

The social context is crucial to understand the inducement of using as well as craving alcohol. Social context is defined as the situational, temporal, and motivational factors that

influence drinking behaviour (Beck et al., 1995). The surroundings function therefore as a social framework that impacts behaviour, actions, and emotions (APA, 2024)

Its importance has been emphasized in previous research by Ham and Hope (2003), which showed that risk factors for alcohol use can be ascribed to the social environment. It was found that larger drinking groups are related to greater consumption of alcohol. Furthermore, they stated that the place where drinking takes place is crucial due to social interactions. Problematic alcohol use was associated with drinking in contexts of social facilitation, e.g., drinking in a bar, with peers, or at a party. This was explained by consequently higher peer pressure and effortless access to alcohol in those settings (Ham & Hope, 2003). Additionally, Pavis et al. (1997) reported on participants' main reasons for drinking and identified peer influence and pressure, social facilitation, mood alteration, coping with personal issues, and reducing stress. Previous research undermines the significance of the social context in understanding reasons for alcohol consumption, indicating that peers, social motives, and social settings impact alcohol usage.

Current research used relied on cross-sectional studies to investigate alcohol consumption and its motives with findings relying on the memory of participants. However, alcohol consumption can change over time and can be influenced by fluctuation factors, such as the social context (Ham & Hope, 2003). This emphasises the importance of applying methods that capture the dynamic nature of the relationship between social context and alcohol consumption. Therefore, this research will Experience Sampling Methodology (ESM) to assess the dynamic relationship between alcohol consumption and social context as a potential predictor in students over one week of students directly and over a timespan.

Perceived Social Norms, Influence of Peers, and Alcohol Usage

Perceived social norms have been found to be influential in alcohol consumption (Lo Monaco et al., 2020). For instance, perceived drinking levels in the social environment were

found to be strongly correlated with individual drinking levels, among students from New Zealand (Kypri & Langley, 2003). Individuals often adapt their behaviour to their peers (Sharma et al., 2013). Lapinski and Rimal (2005) examined that social norms can be expressed implicitly or explicitly. They stated that norms can be understood as prevailing codes of implementation to specify or exclude behaviours that group members may perform. Subjective norms describe the individual interpretation and understanding of collective norms. Individuals therefore hold different beliefs regarding the normative behaviours of the groups they are in (Lapinski & Rimal, 2005). Perceived social norms can be seen as a critical factor when understanding the dynamics of the social context and individuals' drinking behaviour (Lo Monaco et al., 2020). They were found to be predictors of alcohol usage in college students (Neighbors et al., 2010). Furthermore, particularly for students, who are in a critical phase of self-definition, a high influence of the social circle was found (Sharma et al., 2013). Furthermore, particularly for students, who are in a critical phase of self-definition, a high influence of the social circle was found (Sharma et al., 2013). Thus, perceived social norms have been found to be predictors of alcohol usage in college students, and therefore, investigating perceived social norms provides insight into the motivation for alcohol use of students. Previous literature utilised retrospective methods that negatively influenced the accuracy of self-reports on alcohol consumption, leading to a reduced validity of the results (Davis et al., 2010). Consequently, there is a need to momentarily assess perceived social norms of drinking when it occurs rather than retrospectively.

Current Study

Previous research has used retrospective methods that reduced the validity and reliability of the results due to retrospective bias or cognitive bias. The methodology could lead to issues of poor recall, high impact of the current mood, and social desirability (Larson & Csikszentmihalyi, 2014). This study employ ESM to examine the dynamic relationship

between social context and perceived social norms in the realm of drinking behaviour (Davis et al., 2010). Applying this research methodology to gather data about alcohol usage was rarely used in the past. It provides questions on multiple occasions over time through a mobile application (Larson & Csikszentmihalyi, 2014). Due to the frequent provision of questions, ES is a possibility to minimize biases that result from forgetting and social desirability (Thomas & Azmitia, 2015). Using this method, participants could report actual experiences with alcohol usage with little or no time delay (Thomas & Azmitia, 2015). Thus, the application of ES in the field of alcohol usage among students could provide insight into actual behaviour, motivation, and the influence of social context in almost real-time.

This research aims to explore the extent of the relationships between the social context and perceived social norms on alcohol use among students in the Netherlands, providing important insights for prevention and developing interventions. Therefore, the following research questions were formulated:

RQ_1 How does the self-reported social context, influence alcohol use among students aged between 18 and 25 in the Netherlands?

RQ_2 To what extent is there a relationship between perceived social norms and alcohol use among students aged between 18 and 25 in the Netherlands?

The present study is exploratory in nature. However, based on the literature, it can be hypothesized:

H_1 There is an indication of a higher occurrence of alcohol consumption in an environment where social contacts are present, compared to an environment where no social contacts are present.

H_2 There is a significant positive relationship between perceived levels of alcohol consumption within the immediate social circle and quantity and frequency of participants' alcohol use.

H_3 There is a significant positive relationship between perceived influence of the immediate social circle on quantity and frequency of participants' alcohol use.

Methods

Participants

The target group of the study consisted of students aged between 18 and 25 from the Netherlands. Besides the country of study program and age, it was required that participants were studying in the field of applied sciences or scientific education. Exclusion criteria included an ongoing mental health disorder or current treatment of substance abuse, and non-English speaking participants.

Recruitment was carried out through convenience and snowball sampling. Participants were invited via social media and asked to recruit more participants through group chats and word of mouth. Additional sampling was conducted through an upload of the study on SONA, a Psychology Test Subject Pool of the BMS faculty from the University of Twente. 23 Undergraduate students gained 1 SONA credit by completing the study via the SONA system.

Out of 134 participants who signed up for the pre-survey, 78 participants subscribed through the app, whereby 68 completed the daily surveys. 37 finished the pre-survey and informed consent, 66 the half-time survey, and 45 the post-survey. Due to technical circumstances, participants were led to the daily questionnaires, even if they skipped the informed consent. Participants that skipped it and did not confirm the informed consent officially, remained for further analysis since disagreeing with the consent was not chosen and skipping was handled as confirmation. The circumstances explain the discrepancy between the pre- and daily surveys of 31 participants. The sample of the pre-survey consisted of 30 participants identifying as female, and 7 as male. The age ranged from 18 to 25 years (M = 21.8, SD = 1.9). Furthermore, the most represented nationality was German (N = 21),

followed by Dutch ($N = 9$), and other nationalities ($N = 7$). The most common highest educational degree that was obtained was high school ($N = 25$), 12 participants had a bachelor's degree. 48.6% of the participants were conducting a bachelor's in academics and 24.3 % in applied sciences. In addition, 9 participants (24.3%) were doing their master's in academic sciences, and one (2.7%) was accomplishing a PhD in that field. Lastly, one was participating in the master's program of applied sciences during the time of the study (2.7%).

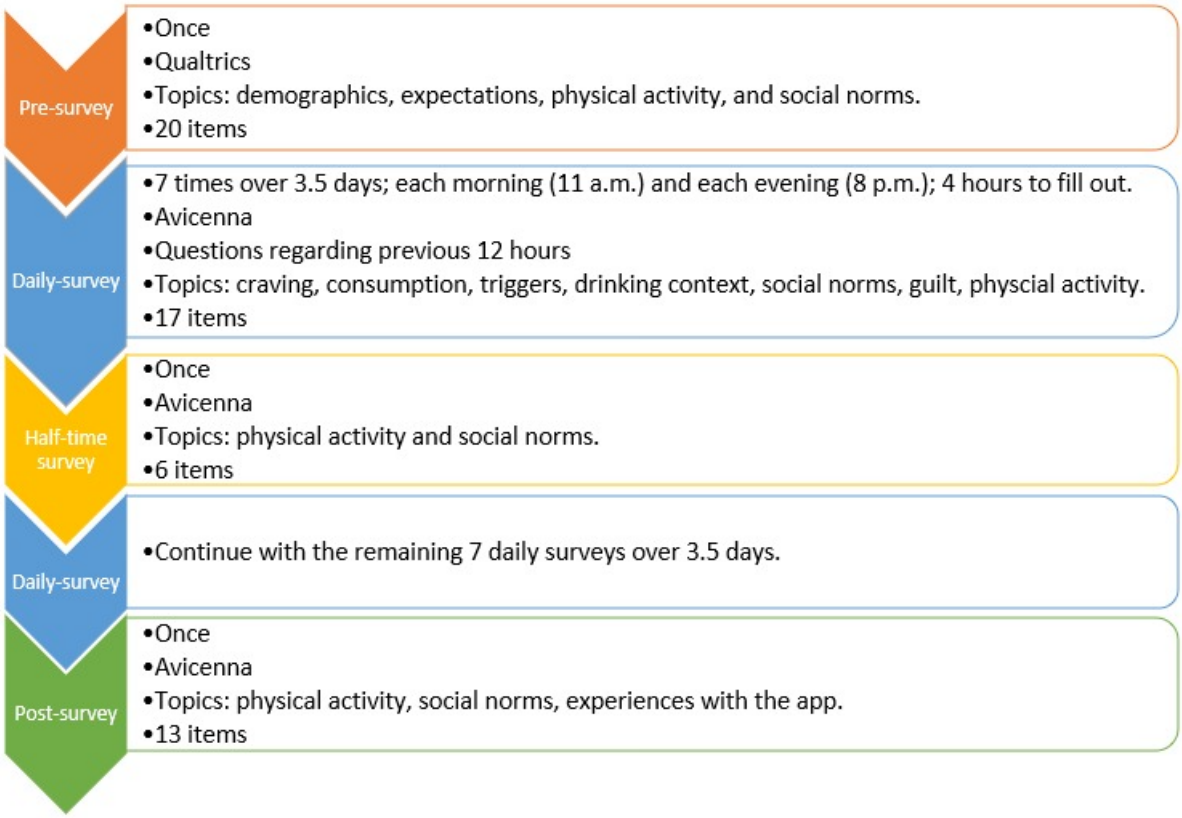
Materials & Procedure

Participants took part in this study between the 16th of November and the 4th of December, 2023. The study was approved by the Ethics Committee of the Faculty of Behavioural, Management, and Social Sciences at the University of Twente (approval number: 231331). It was implemented through online surveys. Therefore, Qualtrics was used, which is a web-based software to create and conduct surveys as well as Avicenna, a research app useful for collecting answers to multiple questionnaires over a specific timespan. Participants completed daily surveys on their mobile devices, the pre-questionnaire was filled in on either their mobile devices well as, a desktop, or laptop.

The study included different types of questionnaires: pre-survey, daily morning and evening surveys, half-time survey, and post- survey, whereby they provide questions about demographics, expectations, overall alcohol usage and craving, social context and norms, physical activity, and experiences with the app (see Figure 1). The variables physical activity and experiences with the app will not be presented in this paper because it is part of another study.

Figure 1

Overview of the Study Design



Informed Consent and Pre-Survey

The study began with an introduction and integrated informed consent where participants were welcomed. It was further elucidated that if alcohol cravings were perceived due to the surveys, the study should be stopped and contact information to talk about these cravings was provided. The following page consisted of a more detailed informed consent as well as requirements with statements that participants could either agree or disagree with (see Appendix A). Next, the pre-survey was provided via Qualtrics and consisted of demographics about gender, age, nationality, education level, academic program, and descriptive norms regarding peer drinking. Descriptive norms were examined through the Drinking Norms Rating Form (Cheng et al., 2022). The entire form was used and consisted of three questions, e.g., “How many of your close friends drink primarily to get drunk?” A 5-point Likert scale was given to answer these questions. When finishing the pre-survey, app instructions to get access to the study were explained, involving a link for Avicenna and a registration code.

Morning and Evening Surveys

Immediately the morning after registration on Avicenna, participants received their first morning survey. The notifications were sent out at 11 am and 8 pm. Due to low response rates in the first three days, the times to fill in the surveys were expanded from two to four hours for morning and evening questionnaires. Daily surveys involved 16 resembling questions. The items were merely changed and adapted to the point of time, for instance, morning questions dealt with the past evening and evening questions with the past day. The number of questions was dependent on the answers that were given by the participants. Open questions were therefore posed about the reasons for craving, drinking, and respectively not drinking depending on the previous answer (see Appendix A). As an example, craving alcohol was measured with the statement "I craved alcohol in the last 12 hours." and categories from "Strongly agree" to "Strongly disagree". If participants answered, "Strongly agree" or "Agree", the reasons for craving were openly questioned.

Social context involving perceived social drinking norms was further examined with multiple questions about the drinking environment, accompanies, peers' drinking behaviour, and perceived influence of peers (see Appendix A). The participants finished the period of daily questionnaires on day 8, afterwards, they received a message to fill out the post-questionnaire on day 9 (see Figure 1). The message provided contact details of one of the researchers and links if a participant was triggered during the study to protect the participants' mental health.

Half-Time Survey

A half-time survey was invented due to technical circumstances with the pre-survey. Data was missing since several participants filled in the pre-survey insufficiently. Moreover, the pre- and post-survey were created on different platforms, therefore, a comparison between participants was not possible. The Drinking Norms Rating Form was questioned a second

time in Avicenna (Cheng et al., 2022). A Cronbach's alpha of .75 was calculated, indicating moderate internal reliability.

Post-Survey

At the end of the study, the post-survey was provided with the Drinking Norms Rating Form (Cheng et al., 2022). Drinking norms were assessed similarly to the pre-and mid-survey to examine differences. Cronbach's alpha for the Drinking Norms Rating Form was .77, showing acceptable consistency between the responses.

Data Analysis

The software Excel was applied to investigate qualitative data and the statistical program RStudio was used to analyse collected quantitative data (version 2023.03.0-daily+82.pro2). For preparation, the data set was cleaned according to the inclusion criteria. In addition, participants who filled out three or fewer questionnaires were excluded. Furthermore, answers that were reported as raw scores were converted into numeric scores. After preparing the data set, descriptive statistics were computed for the demographic variables.

Before investigating the daily questionnaires, the mid-term and post-survey were compared to measure differences between the Drinking Norms Rating Form. Therefore, means were compared with a t-test to check if the difference was significant.

H1 was tested through a qualitative analysis of the answers to the item "Where and with whom did you drink in the last 12 hours?". The answers about the social context were inductively categorized regarding setting and social contacts to analyse the distribution in percentage and prevalence. Additionally, reasons for drinking were examined and coded in either intrinsic or extrinsic reasons and further sub-coded into categories for analysing if the social context was stated as an extrinsic reason for drinking. The three analyses were further visualised with a pie chart.

H2 and H3 were tested with a quantitative analysis. For H3, a comparison between the number of participants' drinks and perceived peer drinks was assessed. Therefore, the answers to the items about the drinking behaviour of the participant itself, namely "How many alcoholic drinks did you have?" and their perception of peers drinking behaviour were assessed with the item "How many alcoholic drinks did your fellow peers consume on average per person?" were used. A mixed linear regression was generalized with the perceived number of peers' drinks as independent, and the number of participants' drinks as dependent variable. In addition, means and standard deviations were computed and further analysed with a t-test to examine if the numbers significantly differentiated. A second linear mixed model was conducted to investigate if participants' decision to use alcohol or not is related to the perceived use of peers. Perceived use of peers was determined with an estimation of participants on peers that were drinking in the immediate environment. Perceived use of peers was included as the independent variable and the decision to use alcohol of participants as dependent variable. Therefore, the model aimed to show if the number of drinking peers in the environment is related to the decision to use alcohol of participants.

The last hypothesis (H3) about the relationship between perceived influence of peers and alcohol consumption of participants was examined through two linear mixed models. Perceived influence was assessed with a Likert scale, therefore, the higher the value, the higher the influence of peers was perceived by participants. Firstly, the answer distribution of the item about perceived influence was calculated to gain a general overview. Secondly, the relationship between perceived influence of peers as independent and the decision of participants to drink or not as dependent variable was analysed. Thirdly, a linear mixed model with the variables perceived influence of peers as independent and number of drinks of participants as a dependent variable was conducted. Lastly, both models were visualised in a

plot. For the four linear mixed models the assumptions of linearity, homoscedasticity, and normality were checked.

Results

This section aims to examine the relationship between perceived social norms, social context, and alcohol consumption. Therefore, qualitative as well as quantitative data were combined to understand the reason for drinking among students.

Descriptive Statistics

In total, 78 participants subscribed to the study in Avicenna with 68 finishing it, the half-time survey was completed by 66 participants and 45 individuals filled in the post-survey. During the study, participants reported 512 times that they did not drink alcohol and 129 times that they did. Additionally, 10 participants were removed because they did not drink alcohol during the entire study. On average 9.42 daily surveys out of 14 were filled in by participants.

Furthermore, possible changes in descriptive norms regarding peer drinking during the study and immediately after the study were examined. Therefore, the same questions about participants' close friends drinking behaviour regarding frequency, regularity, and reason for drinking were posed. On average, scores of norms were higher in the mid-term questionnaire ($N = 66$) with a $M = 3.78$ and $SD = 0.82$, than in the post-questionnaire ($N = 45$) with a $M = 3.63$ and $SD = 0.86$. Thus, indicating that participants perceived greater alcohol consumption of peers during the study than afterward. However, there was no significant difference between scores of the norms on measuring points, $t(91.43) = 0.86$, $p = 0.39$.

Social Context and Alcohol Use

The relationship between social context and alcohol consumption was examined using qualitative data. The first hypothesis predicted a higher occurrence of alcohol consumption in an environment where social contacts are present. Therefore, answers to the question "Where

and with whom did you drink in the last 12 hours?" were first coded into settings (Figure 2) and social contacts (Figure 3).

Figure 2

Distribution of Settings where Drinking Occurred

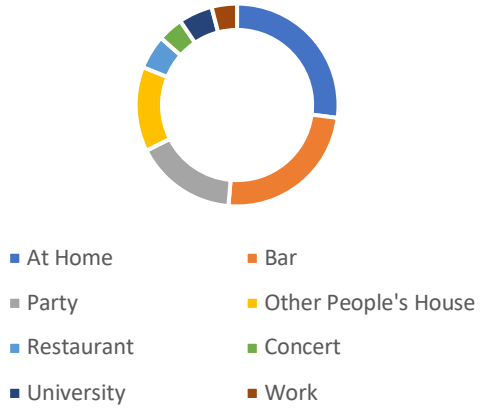


Figure 3

Distribution of the Social Contacts when Drinking Occurred

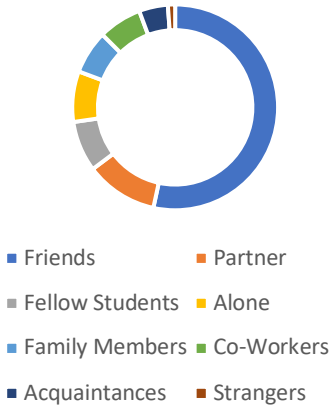


Figure 2 shows the setting distribution: drinking at home (22.22%), in bars (20%), at parties (13.33%), in other people's houses (11.11%), in restaurants (4.44%,), at the university (4.44%), at concerts (3.33%), and at work (3.33%) were reported. Figure 3 demonstrates that it was most prevalent to drink with friends (52.22%). It was further reported to drink with the partner (11.11%), fellow students (7.78%), alone (7.78%), family members (6.67%), co-workers (6.67%), acquaintances (4.44%), and strangers (1.11%).

The qualitative analysis revealed that drinking occurred mainly with social contacts since half of the participants stated that they were using alcohol when friends were in the environment. However, in 7.78% of the answers, it was reported that the participant drank alone, without accompanies. Thus, indicating that social contacts, particularly friends play a crucial role in drinking among students. Examining the drinking setting, it was shown that typical places with a high number of social contacts were prevalent (e.g. bars, parties), although, drinking at home was stated as the most common setting. Regarding hypothesis 1, it can be concluded that there is an indication of a higher occurrence of alcohol consumption in

a context where social contacts are present, compared to a context where no social contacts are present.

Moreover, the reasons of participants that were stated when drinking occurred were coded, to examine the factors of the social context that were mentioned. In total, 128 reasons were given among 24 different participants. The reasons were first coded as either intrinsic or extrinsic. Due to the focus of the hypothesis, extrinsic reasons regarding the social context were further investigated.

Figure 4

Extrinsic Reasons for Drinking

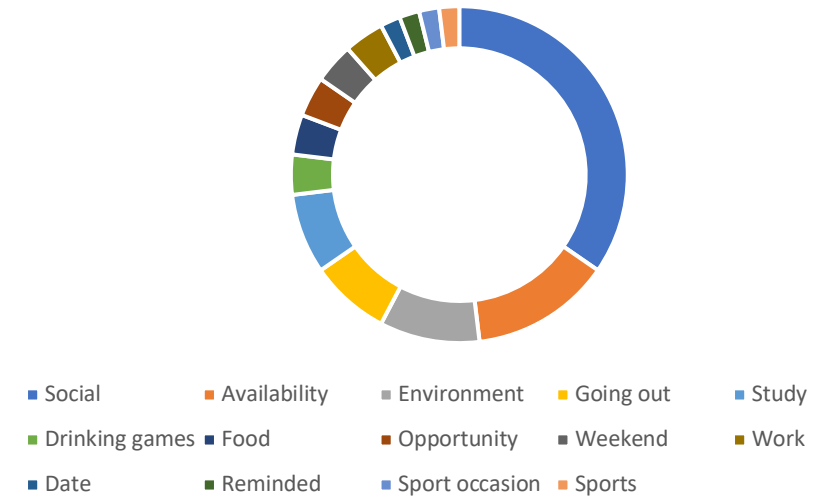


Figure 4 demonstrates the answers that were categorized in subcodes. The pie chart shows that social aspects were most frequently stated as extrinsic reasons. Furthermore, the availability of alcohol as well as the environment were reported to be reasons for drinking. Therefore, it can be assumed that the social context had an influence on participants' decision to drink.

Peers' Perceived and Participants' Alcohol Use

Two linear mixed models were performed to check if there is a positive relationship between perceived levels of alcohol consumption within the immediate social circle and

participants' quantity and frequency of alcohol usage based on the daily questionnaires of the ES-items. In addition, a t-test was conducted to examine if the means of participants' and perceived peers' number of drinks differentiate. The following ES-items were analysed: "How many drinks did you consume in the last 12 hours?" and "How many drinks did your peers consume in the last 12 hours?" Again, the amount was assessed with the answers that were reported by the participants for themselves and their peers. They were further categorized, for instance, 1 represented the category "1 or 2 drinks". Frequency refers to how often the participants and peers decided to drink alcohol during the study. The ES-items "Did you decide to drink in the last 12 hours?" and "How many of your fellow peers drank alcoholic beverages in your immediate environment in the last 12 hours?" were used for further analysis of the frequency of drinking.

Assumptions of linearity, normality, independence, and homoscedasticity were checked for both linear mixed models. The assumptions for linearity, independence, and homoscedasticity were met (see Appendix F). However, a Shapiro-Wilk test revealed that normality was violated for the model assessing the relationship between the frequency of alcohol usage of participants and peers, $W(296) = 0.97$, $p = .58$. Subsequently, a histogram was plotted and showed that residuals were almost normally distributed. Therefore, the assumption of normality was met as well.

A significant positive relationship was found between the participants' reported alcoholic drinks and perceived peers' alcohol drinks, $b = .85$, $t(76) = 13.3$, $p < .001$, meaning that the number of participants drinks was higher when peers were perceived to be drinking a higher number as well. Additionally, a t-test was performed to check for group mean differences. Participants reported a slightly higher numbers of drinks ($M = 2.29$, $SD = 1.52$), compared to perceived peer number of drinks ($M = 2.14$, $SD = 1.53$). There was however no significant difference between both means, $t(150) = 0.58$, $p = .56$. Due to the fact that the

means of 2.29 and 2.14 both represent the answer category of "3 or 4 drinks", it is in line with the findings of the t-test. According to the LMM, it can be assumed that the reported number of participants' drinks and the perceived number of peers were similar.

A second model was performed with two items of the daily questionnaires about the decision to drink or not of participants and the perceived quantity of peers that drank alcohol in the last 12 hours. The model was statistically significant and positive, $b = 1.56$, $t(296) = 13.14$, $p < .001$. This indicates that the more drinking peers were perceived, the higher the likelihood that participants consume alcohol. In this sample, a perceived higher number of alcoholic drinks and a greater quantity of drinking peers in the social circle, positively influence individuals' decision to consume and the number of drinks. Therefore, H2 can be accepted.

Perceived Influence of Peers and Alcohol Use

For the analysis of the third hypothesis, two linear mixed models were performed to examine if a there is a positive relationship between perceived influence of the immediate social circle and alcohol use particularly is related to a higher number of alcoholic drinks and leads more often to the decision to drink in general.

Assumptions of linearity, normality, and homoscedasticity were assessed for the linear mixed models. Linearity and homoscedasticity were met (see Appendix 6). A Shapiro-Wilk test showed that normality was violated for the linear model testing if perceived influence of peers is related to the number of drinks, $W(73) = 0.98$, $p = .5$. A histogram was created and revealed that residuals were almost normally distributed. It was concluded that the assumption of normality was met as well.

Figure 5

Relationship between the Perceived Influence of Peers and Participant's Alcohol Use

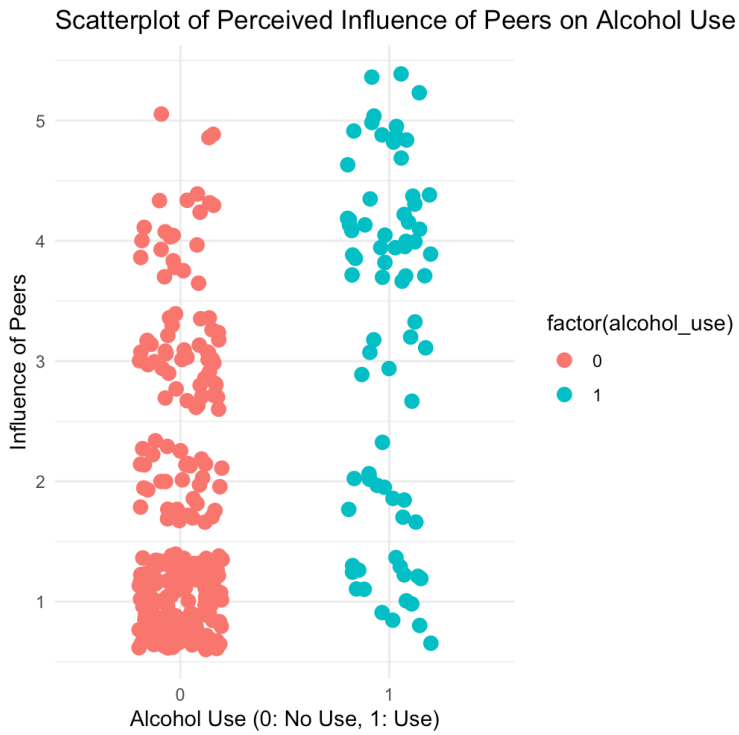
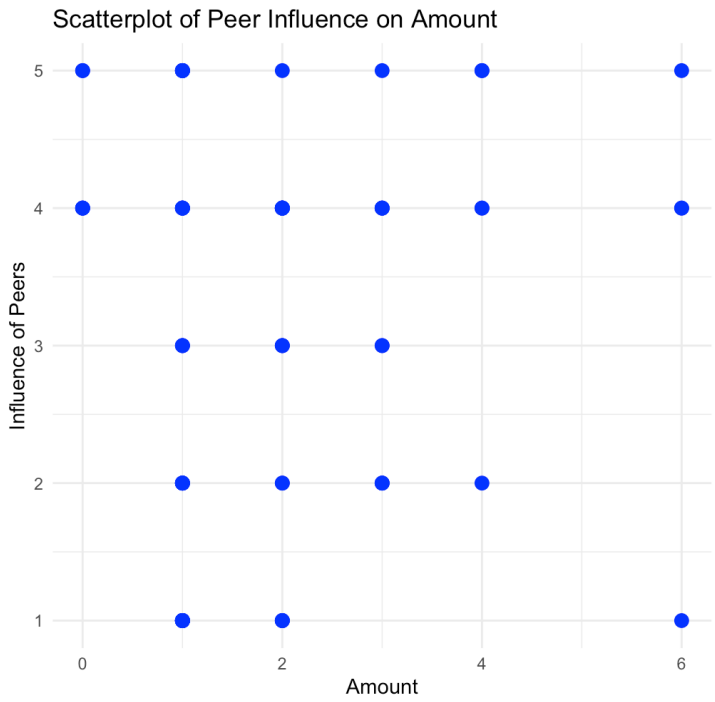


Figure 5 visualizes the distribution of drinking and not drinking in relation to perceived influence of peers. The perceived peer influence was measured with a Likert scale, therefore 1 indicates the answer category “Strongly disagree” to the item “In the last 12 hours, I think my drinking behaviour was influenced by my peers”, subsequently 5 represents the answer category “Strongly agree”. The graph shows that not using alcohol was the decision of mainly participants, without perceiving the influence of peers. Peer influence was more present when using alcohol. A linear mixed model proves that there was a statistically significant positive relationship between the perceived influence of peers and whether the participant decided to drink or not, $b = 1.33$, $t(325) = 10.1$, $p < .001$. This indicates that if participants perceived their drinking behaviour to be influenced by peers, they were more likely to drink alcohol.

Figure 6

Relationship between the Perceived Influence of Peers and the Number of Drinks



Note. Amount represents categories: 0 as "0 drinks", 1 as "1 or 2 drinks", 2 as "3 or 4 drinks", 3 as "5 or 6 drinks", 4 as "7 or 8 drinks", 5 as "9 or 10 drinks", 6 as "11 or more". The dots represent all data points of the analysis.

Figure 6 demonstrates the relationship between the number of drinks of participants and the perceived influence of peers. The scatterplot shows that a higher perceived influence is related to all categories of drinks. A second linear mixed model confirmed that, there was no significant effect of the influence of peers on the number of drinks, $b = .09$, $t(73) = 1.06$, $p = 0.3$. This means that a perceived influence of peers is related to the decision of drinking, but not to the amount of alcohol that was consumed. According to the linear mixed models that were conducted, H3 can be partly accepted, as perceived influence of peers had an impact on the decision to use alcohol. However, the perception of influence of the immediate social circle did not affect the number of drinks that were consumed.

Discussion

This research examined how the self-reported social context influenced alcohol use and if there was a relationship between perceived social norms and alcohol use among

students aged between 18 and 25 in the Netherlands. It aimed to understand the reasons for drinking regarding environment, peers, and their influence on alcohol consumption. It was found that drinking in a social context with a higher number of contacts was prevalent, for instance, in bars or at parties. Nevertheless, the most common drinking environment was the home of participants. Furthermore, in half of the answers, it was stated that peers were prominent when drinking occurred, therefore, they were drinking mainly with friends. A positive relationship was found between perceived peer alcohol usage and the self-reported usage of participants. Subsequently, participants were more likely to decide to drink when a higher perceived frequency of peers consumed in the immediate social circle. Therefore, the decision to drink and the number of drinks consumed were similar to peers perceived behaviour. Lastly, the perception of being influenced by peers was positively associated with the decision to drink, however, the number of drinks was not significantly influenced.

Social Context and Alcohol Use

A qualitative analysis showed that drinking occurred in contexts that are characterized by social contacts. The presence seems to be a crucial factor for students to drink since drinking alone was rarely reported, compared to drinking with friends or other social contacts. Notably, drinking at home was the most prevalent drinking setting. In addition, participants stated that most reasons for drinking were due to social aspects, and the availability of alcohol which are both part of the social context. The findings of drinking in environments with a high number of social contacts (e.g., bars, parties) are in line with Ham and Hope (2003) who stated that problem drinking of students can be ascribed to consumption in larger groups and the presence of alcohol. Bars and parties are both contexts in which interactions with others and alcohol availability are prominent. However, it was found that alcohol use takes place mostly at home. The home of a participant might vary regarding its social contacts, drinking alone or in a large group are both possible. Due to the fact that an analysis of social drinking

contacts revealed that participants were mainly drinking with friends, it can be assumed that the home was characterized by groups or at least a social contact as well. Past research assumed that drinking in social contexts with a high number of contacts might be due to peer pressure and social facilitation (Ham & Hope, 2003). Peer pressure occurs when other group members are drinking and a fear of being excluded from this group arises (Overbeek et al., 2019). Furthermore, Ham and Hope (2003) stated that alcohol leads to social facilitation in a social context with a high number of individuals. Therefore, alcohol functions as a facilitator in interactions.

Social contacts seem to be an important aspect when looking at students' drinking behaviour. Contacts are mostly present when alcohol is consumed, therefore, interventions aiming to prevent problematic alcohol use among students could focus on groups and the surroundings instead of merely the individual (McNally & Palfai, 2003). Additionally, the interplay of the social context and perceived social norms could be elucidated in more detail to reveal crucial factors.

Peers' Perceived and Participants' Self-Reported Alcohol Use

A relationship between the number of participants' drinks and their perception of peers' number was found in this sample. Additionally, a LMM revealed that participants who perceived a higher number of drinking peers in their immediate environment were more likely to decide to drink. This indicates that perceived social drinking norms were prevalent and might influence participants behaviour in terms of frequency and quantity. Past findings are in line with this research, it was found that perceived drinking levels in the social environment were correlated to the individual drinking levels (Kypri & Langley, 2003). Through conformity, participants might adapt their drinking behaviour to the group members who consumed alcohol to increase their sense of belonging to the group. Particularly during

students' critical stage of developing the self, avoidance of negative evaluation is common (Borsari & Carey, 2001).

Generally, future research could delve more into the understanding of social norms and their components. The influence of group size could be explored investigating whether varying numbers of peers impact the decision to drink. Previous research showed that there is a relationship between the larger groups and norms (Cullum et al., 2012). Peers seem to play a crucial role in drinking, it is, however, unclear in what aspect: merely through their presence, quality of peer relationships, or group size.

Perceived Influence of Peers and Alcohol Use

A significant relationship was found between perceived influence of peers and the decision to drink of participants. Therefore, they felt more influenced by their peers when participants decided to drink than when they were not drinking. This supports the assumption that the social circle an individual is situated during drinking can act as a predictor for consumption. This relationship between perceived influence of peers and the decision to drink was proven in other studies as well. Past findings showed that alcohol use among peer groups significantly predicts the decision to drink, binge drinking, and drunkenness (Grevenstein et al., 2020). The reason for perceived influence impacting only the decision to drink and not the number of drinks could be due to their effectiveness in reaching the goal of group acceptance (Overbeek et al, 2019). Group acceptance might be already achieved through consumption regardless of the amount. Interestingly, it contradicts with the previous results of this study due to the relationship between perceived drinks of peers and participants. This indicates that participants were not aware of the influence that peers had. According to Kwon and Lease (2014) children perceived peer influence often on a subconscious level well.

Future research could focus on understanding whether a stronger relationship impacts the individual's need for conformity and acceptance within the group, and subsequently

drinking behaviour. Conformity plays a crucial role in groups of friends, hence, a stronger relationship could increase alcohol usage (Overbeek et al., 2019).

Strengths and Limitations

ESM might increase validity of the results due to accompanying participants over the span of nine days, instead of posing questions in a single survey. Furthermore, the timespan between consumption and report was short (around 12 hours), and the problem of forgetting and therefore memory biases that occur in conventional questionnaires, was minimized. During the study, different technical circumstances occurred that are mainly responsible for the limitations. An aim of the pre-questionnaire was the comparison of specific items with the similar ones in the post-questionnaire. This was not possible since both surveys were created through different platforms and participants' responses were anonymous. A mid-questionnaire on day 3 was established as an alternative, however answers might vary from the pre-questionnaire. The pre-questionnaire revealed a higher number of females with 30 women and 7 men. As a consequence, the representativeness of the sample declines. Due to the lack of a pilot test beforehand, notifications were missing at the beginning of the app period. By accident, multiple notifications were displayed at day 2, leading to confusion, and annoyance among the participants, as stated in the post-questionnaire, and indicated by around 12 subsequent dropouts. A smaller sample size leads to a decline in reliability.

Conclusion

This study underlined the relationships between social context and perceived social norms on alcohol consumption. Participants mostly stated that they were drinking together with friends or a partner, at home, at a bar, or party. Furthermore, relationships between participants’ and perceived peer behaviour were found regarding their amount and frequency of drinking. In addition, an association between the perceived influence of peers on participants and their decision to drink was discovered. These findings imply that the social

context was determined by social contacts when drinking occurred. Moreover, perceived social drinking norms seem to influence students in terms of their number of drinks and the decision to use alcohol. Lastly, students were more likely to decide to consume when they perceived a higher influence of peers. In general, more attention can be paid to the interplay between social context, perceived norms, and alcohol usage. Aspects that are crucial in fully understanding the social context can be studied in more detail to further develop interventions that reach the target group of students.

References

Alcohol Rehab Guide (2023). *College Alcoholism and Binge Drinking- Alcohol Rehab guide*. https://www.alcoholrehabguide.org/resources/college-alcohol-abuse/#:~:text=Roughly%2080%25%20of%20college%20students,even%20before%20they%20enter%20college

APA (2024). *APA Dictionary of Psychology*. https://dictionary.apa.org/social-context

Borsari, B., & Carey, K. B. (2001). Peer influences on college drinking: A review of the research. *Journal of Substance Abuse*, *13*(4), 391–424. https://doi.org/10.1016/s0899-3289(01)00098-0

Chen, J., Li, Y., Zhang, Y., Feng, J., & Jia, L. (2022). Descriptive peer drinking norms and binge drinking: Enhancement motives as a mediator and alcohol resistance self-efficacy as a moderator. *Frontiers in Psychology*, *13*. https://doi.org/10.3389/fpsyg.2022.876274

Cullum, J., O'Grady, M. A., Armeli, S., & Tennen, H. (2012). The role of Context-Specific Norms and Group Size in Alcohol Consumption and Compliance Drinking during natural drinking events. *Basic and Applied Social Psychology*, *34*(4), 304–312. https://doi.org/10.1080/01973533.2012.693341

Davis, C. G., Thake, J., & Vilhena, N. (2010). Social desirability biases in self-reported alcohol consumption and harms. *Addictive Behaviors*, *35*(4), 302–311. https://doi.org/10.1016/j.addbeh.2009.11.001

Grevenstein, D., Nikendei, C., & Nagy, E. (2020). Alcohol Use, Binge Drinking, and Drunkenness Experience in Adolescence: Complex Associations with Family, Peers, Social Context, and Risk Perceptions. *Substance Use & Misuse*, *55*(11), 1834–1845. https://doi.org/10.1080/10826084.2020.1766504

Ham, L. S., & Hope, D. A. (2003). College students and problematic drinking: A review of the literature. *Clinical Psychology Review*, *23*(5), 719–759. https://doi.org/10.1016/s0272-7358(03)00071-0

Jamison, J., & Myers, L. B. (2008). Peer-Group and Price Influence Students Drinking along with Planned Behaviour. *Alcohol and Alcoholism*, *43*(4), 492–497. https://doi.org/10.1093/alcalc/agn033

Kwon, K., & Lease, A. M. (2014). Perceived influence of close friends, well-liked peers, and popular peers. *Journal of Social and Personal Relationships*, *31*(8), 1116–1133. https://doi.org/10.1177/0265407514522887

Kypri, K., & Langley, J. D. (2003). Perceived social norms and their relation to university student drinking. *Journal of Studies on Alcohol*, *64*(6), 829–834. https://doi.org/10.15288/jsa.2003.64.829

Larson, R., & Csíkszentmihályi, M. (2014). The experience sampling method. In *Springer eBooks* (pp. 21–34). https://doi.org/10.1007/978-94-017-9088-8_2

Lapinski, M. K., & Rimal, R. N. (2005). An explication of social norms. *Communication Theory*, *15*(2), 127–147. https://doi.org/10.1111/j.1468-2885.2005.tb00329.x

Lo Monaco, G., Bonetto, É., Codaccioni, C., Araújo, M. V., & Piermattéo, A. (2020). Alcohol 'use' and 'abuse': when culture, social context and identity matter. *Current Opinion in Food Science*, *33*, 9–13. https://doi.org/10.1016/j.cofs.2019.09.005

McNally, A. M., & Palfai, T. P. (2003). Brief Group Alcohol Interventions with College Students: Examining Motivational Components. *Journal of Drug Education*, *33*(2), 159–176. https://doi.org/10.2190/82ct-lrc5-amtw-c090

Mekonen, T., Fekadu, W., Chane, T., & Workie, S. B. (2017). Problematic Alcohol Use among University Students. *Frontiers in Psychiatry*, *8*. https://doi.org/10.3389/fpsyt.2017.00086

National Institute on Alcohol Abuse and Alcoholism (NIAAA). (2023). Drinking levels defined. https://www.niaaa.nih.gov/alcohol-health/overview-alcohol-consumption/moderate-binge-drinking

Neighbors, C., LaBrie, J. W., Hummer, J. F., Lewis, M. A., Lee, C. M., Desai, S., Kilmer, J. R., & Larimer, M. E. (2010). Group identification as a moderator of the relationship between perceived social norms and alcohol consumption. *Psychology of Addictive Behaviors*, *24*(3), 522–528. https://doi.org/10.1037/a0019944

O'Malley, P. M. (2004). *Maturing out of problematic alcohol use*. PubMed Central (PMC). https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6601682/

Overbeek, G., Bot, S. M., Meeus, W., Sentse, M., Knibbe, R. A., & Engels, R. C. M. E. (2010). Where it's at! The role of best friends and peer group members in young adults' alcohol use. *Journal of Research on Adolescence*, *21*(3), 631–638. https://doi.org/10.1111/j.1532-7795.2010.00696.x

Pavis, S., Cunningham-Burley, S., & Amos, A. (1997). Alcohol consumption and young people: exploring meaning and social context. *Health Education Research*, *12*(3), 311–322. https://doi.org/10.1093/her/12.3.311

Senchak, M., Leonard, K. E., & Greene, B. (1998). Alcohol use among college students as a function of their typical social drinking context. *Psychology of Addictive Behaviors*, *12*(1), 62–70. https://doi.org/10.1037/0893-164x.12.1.62

Sharma, B., Raciti, M., O'Hara, R., Reinhard, K., & Davies, F. M. (2013). A tri-country social marketing study of young university women's alcohol consumption and the perceived influence of their peers' attitudes. *e-Journal of Social and Behavioural Research in Business*, *4*(1), 1–11. https://www.ejsbrb.org/upload/e-JSBRB_Sharma,_Raciti,_OHara,_Reinhard_Davies.pdf

Tavolacci, M., Berthon, Q., Cerasuolo, D., Déchelotte, P., Ladner, J., & Baguet, A. (2019). Does binge drinking between the age of 18 and 25 years predict alcohol dependence in adulthood? A retrospective case–control study in France. *BMJ Open*, *9*(5), e026375. https://doi.org/10.1136/bmjopen-2018-026375

Thomas, V., & Azmitia, M. (2015). Tapping into the app. *Emerging Adulthood*, *4*(1), 60–67. https://doi.org/10.1177/2167696815618489

Appendix A - Pre-Questionnaire

Dear participant,

Welcome to our study "Cheers! Tracking the alcohol usage and its triggers amongst students with an ES App", thank you for participating. In this study, you will fill out questionnaires to help us gain more insight into students' drinking behaviour, to study triggers and reasons for alcohol use, and experiences with tracking alcohol consumption.

These questionnaires will be sent twice a day for a period of one week and contain 5 to 16 questions each regarding your drinking behaviour. Moreover, after signing for informed consent at the bottom of this page, you will be redirected to the pre-questionnaire, which consists of 14 questions. Another one-time post-questionnaire will have to be filled out at the end of the one-week period, consisting of 13 questions. Both questionnaires will contain more general questions about, e.g., demographics, expectations, app use, physical activity and social norms. Each questionnaire will take approximately 5 minutes to answer.

You will be provided with short questionnaires via the app Ethica (Avicenna), once in the morning and once in the evening. The pre-questionnaire will be received directly after signing up, only after filling out this survey you can continue with the daily questionnaire. This daily questionnaire will then be the following morning.
One questionnaire can be filled out for one hour after receiving its notification. It can happen that you do not respond to the notification in time and thus miss a questionnaire. However, please try to fill out the questionnaires as often and as honestly as you can, since it is important for us to gain a sufficient overview.

If you find yourself getting increased cravings for alcohol as a result of these questionnaires, please stop this study at any minute. In case you want to talk to someone about your alcohol use, please contact your GP, SACC (University of Twente: https://www.utwente.nl/en/ces/sacc/) or check out the following links:

- Dutch: https://mindverslaving.nl/
- English: https://www.drinkaware.co.uk/ (remember the hour time difference for opening hours online chat)

Your answers in this study will remain confidential. We will minimise any risks by anonymizing all names and personal information and secure the collected data according to the ethical standards of the American Psychological Association (APA). Your participation in this study is entirely voluntary, and you can withdraw at any time. You are free to omit any question.

Before we can start this study, we need to ensure that you understand and agree with the nature of this research. Please read the conditions on the following page carefully and confirm that you understand and agree with them at the end of this page.

- Alright, next page.
- Rather not, leave the questionnaire.

Consent form

	Please answer "yes" or "no"	
	Yes	No
I confirm that I have read the participant information sheet for this study. I have had the opportunity to consider the information, ask questions, and have had these answered satisfactorily	○	○
I understand that to take part in this study, I should be at least 18 years old	○	○
I possess a basic level of English	○	○
I am a student in the Netherlands in applied sciences or scientific education	○	○
I am not ongoing a mental health disorder	○	○
I am not getting a current treatment of substance abuse	○	○
I understand that personal data about me will be collected for the purposes of the research study including age, gender, nationality, level of education, current studies, and primary occupation, and this data will be processed completely anonymous and in accordance with data protection regulations	○	○
I understand that taking part in this study involves filling out two questionnaires every day for one week	○	○
I am voluntarily taking part in this research, and I know that I can stop the research at any time without giving any reason, without my rights being affected	○	○
I don't expect to receive any benefit or payment for my participation.	○	○
I understand that the data collected in this study will be anonymized, and only be used for academic purposes i.e., writing a thesis for the bachelor and/or master.	○	○
I understand that personal data that will be collected within this study will not be shared with anyone other than the study team.	○	○
I agree to take part in this study.	○	○

If you have questions about your rights as a research participant or wish to obtain information, ask questions, or discuss any concerns about this study with someone other than the researcher(s), please contact the Secretary of the Ethics Committee/domain Humanities & Social Sciences of the Faculty of Behavioural, Management and Social Sciences at the University of Twente by ethicscommittee-hss@utwente.nl

Finally, for filling out the daily questionnaires you need to install the Ethica app and sign up for this study. Please follow the steps below:

- Download the app for

- Android: https://play.google.com/store/apps/details?id=com.ethica.logger
- iOs: https://apps.apple.com/us/app/ethica/id1137173052

- Log in or create an account and log in
- Click 'Join another study'
- Fill in this registration code: 3592

- Make sure the settings on your phone and in the app allow notifications
- Wait until you can start your first questionnaire!

We would like to thank you again for your participation.
If you have any questions left, feel free to contact the research-team
via m.bezuijen@student.utwente.nl .

Now, you will be redirected to the pre-questionnaire.

Welcome to the first survey before starting the daily questionnaires. Once again, thank you for participating! We'll start with five demographic questions followed by different questions regarding your expectations, physical activity and social norms.

What is your age? (open)
What is your sex? (male, female, non-binary, prefer not to say)
What is your nationality? (German, Dutch)
What is your highest degree obtained? (Middle school, High school, Bachelor, Master, PhD, Other)
What is the level of the academic program you are currently in? (applied sciences bachelor (hbo), applied sciences master (hbo), academic sciences bachelor (wo), academic sciences master (wo), academic sciences PhD (wo)).

Those were the demographic questions, could you now tell us what your expectations are of using this app for the upcoming period? (open)
Do you hope to gain something from the app/study? If so, please elaborate. (yes .., no)

Please answer the following statement on 5-point Likert scale from 1 (none) to 5 (nearly all).

- How many of your close friends' drink alcohol?
- How many of your friends get drunk on a regular basis (at least once a month)?
- How many of your close friends drink primarily to get drink?

Appendix B - Daily Questionnaire

Indicate how much you would agree/disagree:

- I craved alcohol in the last 12 hours. (strongly agree, somewhat agree, neither disagree nor
- Why did you experience craving? Please describe the reasons and circumstances for craving.
- Did you drink alcohol in the last 12 hours? (yes/no)
    - How many alcoholic drinks did you have? (1 or 2, 3 or 4, 5 or 6, 7 to 9, 10 or more)
    - Please describe where you were during the day when you were drinking and with whom.
    - Why did you decide to drink? /
    - Why did you decide not to drink?

The second questionnaire will contain questions about the context you were in today.

- How many of your fellow peers/people drank alcoholic beverages in your immediate environment during the day (last 12 hours)? (None, less than one third, about half, more than two third, all)

    - How much alcoholic drinks did your fellow peers consume on average per person? (1 or 2, 3 or 4, 5 or 6, 7 to 9, 10 or more)
- Indicate how much you would agree:
    - In the last 12 hours, I think my drinking behaviour was influenced by my peers (strongly disagree, somewhat disagree, neither disagree nor agree, somewhat agree, strongly agree)

Appendix C - Post-Questionnaire

You're almost done with this study! Just like at the start of this period, we have one extra survey with more general questions. We are aiming to compare your answers before and after the study, therefore, you may recognise questions from the pre-questionnaire. Please answer the following questions as honest as possible.

Please answer the following statement on 5-point Likert scale from 1 (none) to 5 (nearly all).

- How many of your close friends' drink alcohol?
- How many of your friends get drunk on a regular basis (at least once a month)?
- How many of your close friends drink primarily to get drink?

What are your experiences with using this app? (open)
Did this app provide any insight into your triggers for drinking alcohol? If so, how? (open)
What do you think of the use of this app over the last week? (open)
What could improve your experience with such an app? (open)
Would you consider taking part in a similar study based on your experience with this research? (open)
Did you feel any influence on your own craving or the actual alcohol usage due to daily questions about your consumption?

- Yes, I felt an increase in my craving.
- Yes, I consumed more alcohol than usual.
- Yes, I felt a decrease in my craving.
- Yes, I consumed less alcohol than usual.
- No.

If you would like to share additional experiences about this research, please state them here.

Appendix D - R-Script

```
#import data
getwd()
setwd("C:/Users/leawo/Downloads")
dataPre <- read.xlsx("PreSurvey_RawData_5Dec23.xlsx")
dataPost <- read.xlsx ("PostSurvey_RawData_5Dec23.xlsx")
dataMor <- read.xlsx("MorningSurvey_RawData_5Dec23.xlsx")
dataMid <- read.xlsx("HalfTime_RawData_5Dec23.xlsx")
dataEv <- read.xlsx("EveningSurvey_RawData_5Dec23.xlsx")
filtered_Mor.Ev <- read.xlsx("filtered_Mor.Ev.xlsx")
all_data <- read.xlsx("all_data.xlsx")
##prepare data
num_columns_to_check <- 13
unique_col_names <- make.unique(names(dataPreFi1))
```

```
names(dataPreFi1) <- unique_col_names
all_data <- dataPreFi1[, 18:96]
dataPreFi1 <- dataPreFi1 %>%
   select(18:96)
#second preparation -> #134 > #108 > #44
dataPreFi1 <- dataPreFi1 %>%
  filter(across(starts_with("Informed.Consent"), ~. %in% c("Yes", NA))) %>%
  rename(age = Q3, gender = Q4, nationality = Q5, degree = Q7, academic_programme =
Q16) %>%
  filter(!is.na(age) & !is.na(gender) & !is.na(nationality) & !is.na(degree) &
!is.na(academic_programme)) #44
#filter dataset with all variables
all_data <- all_data %>%
  filter(across(starts_with("Informed.Consent"), ~. %in% c("Yes", NA))) %>%
  rename(age = Q3, gender = Q4, nationality = Q5, degree = Q7, academic_programme =
Q16) %>%
  filter(!is.na(age) & !is.na(gender) & !is.na(nationality) & !is.na(degree) &
!is.na(academic_programme))
all_data <- all_data %>%
  mutate(age = as.numeric(age))
#newdataset
file_path <- file.path("/Users/leawo/Downloads", "all_data.csv")
write.csv(all_data, file = file_path, row.names = FALSE)
cat("DataFrame exported to:", file_path, "\n")
##demographics Marleen
M_age <- mean(all_data$age)
SD_age <- sd(all_data$age)
frequency_table_gender <- table(all_data$gender)
frequency_table_nationality <- table(all_data$nationality)
frequency_table_academic_programme <- table(all_data$academic_programme)
frequency_table_degree <- table(all_data$degree)
print(frequency_table_gender)
print(frequency_table_nationality)
print(frequency_table_academic_programme)
print(frequency_table_degree)
total_obs <- nrow(all_data)
frequency_table_gender <- prop.table(table(all_data$gender)) * 100
frequency_table_nationality <- prop.table(table(all_data$nationality)) * 100
frequency_table_academic_programme <- prop.table(table(all_data$academic_programme))
* 100
frequency_table_degree <- prop.table(table(all_data$degree)) * 100
print(frequency_table_gender)
print(frequency_table_nationality)
print(frequency_table_academic_programme)
print(frequency_table_degree)
##Check morning_questionnaire
#merge Mor and Ev together
merged_MorEv <- merge(dataMor, dataEv, all = TRUE, suffixes = c("dataMor", "dataEv"))
#overview participants
data_points_per_person <- table(filtered_MorEv$Participant.ID)
```

```
print(data_points_per_person)
average_data_points_per_person <- filtered_MorEv %>%
  group_by(Participant.ID) %>%
  summarise(data_points = n()) %>%
  summarise(average_data_points = mean(data_points))
print(average_data_points_per_person$average_data_points)
num_participants <- filtered_MorEv %>%
  summarise(num_participants = n_distinct(Participant.ID))
print(num_participants$num_participants)
#check number of datapoints
summary_table <- data.frame(
  ParticipantID = unique(merged_MorEv$Participant.ID),
  Total_Data_Points = table(merged_MorEv$Participant.ID)
)
#exclude NA 1035 > 649 > 641 (cut-off 3)
filtered_MorEv <- merged_MorEv[complete.cases(merged_MorEv[, 6]), ]
frequency_able_datapoints <- table(summary_table$Total_Data_Points.Freq)
print(frequency_table_datapoints)
participant_counts <- table(filtered_MorEv$Participant.ID)
print(participant_counts)
selected_participants <- names(participant_counts[participant_counts >= 3])
filtered_MorEv <- filtered_MorEv[filtered_MorEv$Participant.ID %in%
selected_participants, ]
#send data
file_path <- file.path("/Users/leawo/Downloads", "filtered_Mor.Ev.csv")
write.csv(filtered_Mor.Ev, file = file_path, row.names = FALSE)
cat("DataFrame exported to:", file_path, "\n")
##prepare dataMid 71 > 66
filtered_dataMid <- dataMid[complete.cases(dataMid[, 4]), ]
#send data
file_path <- file.path("/Users/leawo/Downloads", "filtered_dataMid.csv")
write.csv(filtered_dataMid, file = file_path, row.names = FALSE)
cat("DataFrame exported to:", file_path, "\n")
##prepare dataPost 66 > 45
filtered_dataPost <- dataPost[complete.cases(dataPost[, 4]), ]
#send data
file_path <- file.path("/Users/leawo/Downloads", "filtered_dataPost.csv")
write.csv(filtered_dataPost, file = file_path, row.names = FALSE)
cat("DataFrame exported to:", file_path, "\n")
#filter based on age 44 > 37
Pre <- all_data %>%
 mutate(age = as.numeric(age)) %>%
  filter(age > 18 & age < 25)
file_path <- file.path("/Users/leawo/Downloads", "Pre.csv")
write.csv(Pre, file = file_path, row.names = FALSE)
cat("DataFrame exported to:", file_path, "\n")
# Check frequency of responses
filtered_MorEv$`[3_SAQ.].Drank.alcohol.yes/no` <-
tolower(filtered_MorEv$`[3_SAQ].Drank.alcohol.yes/no`)
```

```
yes_count_per_participant <- tapply(filtered_MorEv$`[3_SAQ].Drank.alcohol.yes/no`,
filtered_MorEv$Participant.ID, function(x) sum(x == "yes"))
print(yes_count_per_participant)
filtered_MorEv$`[3_SAQ.].Drank.alcohol.yes/no` <-
tolower(filtered_MorEv$`[3_SAQ].Drank.alcohol.yes/no`)
yes_count_per_participant <- tapply(filtered_MorEv$`[3_SAQ].Drank.alcohol.yes/no`,
filtered_MorEv$Participant.ID, function(x) sum(x == "Yes"))
print(yes_count_per_participant)
##added packages
install.packages("psych")
library(psych)
install.packages("Hmisc")
library(Hmisc)
##check mid-&post-questionnaire
#Mid
selected_columns <- c(1, 10, 12, 14)
Mid <- dataMid[, selected_columns]
colnames(Mid)[2] <- "drink"
colnames(Mid)[3] <- "regularity"
colnames(Mid)[4] <- "primarily"
#recode
Mid <- Mid[-c(2, 6, 10, 18, 51), ]
columns_to_recode <- c("drink", "regularity", "primarily")
Mid <- Mid %>%
  mutate_at(vars(all_of(columns_to_recode)),
            ~case_when(
              . == "None" ~ 1,
              . == "A few" ~ 2,
              . == "Some" ~ 3,
              . == "Most" ~ 4,
              . == "Nearly all" ~ 5,
              TRUE ~ as.numeric(.)
            ))
Mid <- Mid %>%
  mutate(drink = ifelse(is.na(drink), 3, drink))
#average
Mid <- Mid %>%
  mutate(norm_score = rowMeans(select(., c("drink", "regularity", "primarily")), na.rm =
TRUE))
M_norm <- mean(Mid$norm_score) #3.78
SD_norm <- sd(Mid$norm_score) #0.82
M_drink <- mean(Mid$drink)
SD_drink <- sd(Mid$drink)
M_regularity <- mean(Mid$regularity)
SD_regularity <- sd(Mid$regularity)
M_primarily <- mean(Mid$primarily)
SD_primarily <- sd(Mid$primarily)
#cronbach's alpha
scale_items <- c("drink", "regularity", "primarily")
alpha_result <- alpha(Mid[, scale_items])
```

```
print(alpha_result)
#validity
correlation_variables <- c("drink", "regularity", "primarily")
correlation_result <- cor(Mid[, c(scale_items, correlation_variables)], use = "complete.obs")
print(correlation_result)
#Pearson + p-values <.001
cor_matrix <- cor(Mid, use = "complete.obs")
print(cor_matrix)
get_p_values <- function(mat) {
  p_values <- matrix(NA, ncol = ncol(mat), nrow = ncol(mat))
  for (i in 1:(ncol(mat)-1)) {
    for (j in (i+1):ncol(mat)) {
      test_result <- cor.test(mat[, i], mat[, j], method = "pearson")
      p_values[i, j] <- test_result$p.value
      p_values[j, i] <- test_result$p.value
    }
  }
  rownames(p_values) <- colnames(p_values) <- colnames(mat)
  return(p_values)
}
p_values_matrix <- get_p_values(Mid)
print(p_values_matrix)
#Post
selected_columns <- c(1, 10, 12, 14)
Post <- Post[, selected_columns]
colnames(Post)[2] <- "drink."
colnames(Post)[3] <- "regularity."
colnames(Post)[4] <- "primarily."
Post <- dataPost[complete.cases(dataPost$`[3_FFT].PA`), ]
#mean and sd
M_drink <- mean(Post$drink)
SD_drink <- sd(Post$drink)
M_regularity <- mean(Post$regularity)
SD_regularity <- sd(Post$regularity)
M_primarily <- mean(Post$primarily)
SD_primarily <- sd(Post$primarily)
#recode
columns_to_recode <- c("drink.", "regularity.", "primarily.")
Post <- Post %>%
  mutate_at(vars(all_of(columns_to_recode)),
            ~case_when(
              . == "None" ~ 1,
              . == "A few" ~ 2,
              . == "Some" ~ 3,
              . == "Most" ~ 4,
              . == "Nearly all" ~ 5,
              TRUE ~ as.numeric(.)
            ))
Post <- Post %>%
  mutate(drink = ifelse(is.na(drink), 3, drink))
```

```
#average
Post <- Post %>%
  mutate(norm_score = rowMeans(select(., c("drink", "regularity", "primarily")), na.rm =
TRUE))
M_norm <- mean(Post$norm_score) #3.63
SD_norm <- sd(Post$norm_score) #0.86
#cronbach's alpha
scale_items <- c("drink.", "regularity.", "primarily.")
alpha_result <- alpha(Post[, scale_items])
print(alpha_result)
#validity
correlation_variables <- c("drink", "regularity", "primarily")
correlation_result <- cor(Post[, c(scale_items, correlation_variables)], use = "complete.obs")
print(correlation_result)
#Pearson
cor_matrix <- cor(Post, use = "complete.obs")
print(cor_matrix)
cor_matrix <- cor(cbind(Mid$drink, Mid$regularity, Mid$primarily, Post$drink,
Post$regularity,
                        +                         Post$primarily), method = "pearson")
get_p_values <- function(cor_matrix, n) {
  p_values_matrix <- matrix(NA, ncol = n, nrow = n)
  for (i in 1:(n - 1)) {
    for (j in (i + 1):n) {
      r <- cor_matrix[i, j]
      df <- n - 2  # Degrees of freedom
      p_values_matrix[i, j] <- 2 * (1 - pt(abs(r * sqrt(df) / sqrt(1 - r^2)), df))
      p_values_matrix[j, i] <- p_values_matrix[i, j]
    }
  }
  rownames(p_values_matrix) <- colnames(p_values_matrix) <- colnames(cor_matrix)
  return(p_values_matrix)
}
p_values_matrix <- get_p_values(cor_matrix, ncol(cor_matrix))
print(p_values_matrix)
#merge Mid and Post
merged_MidPost <- merge(Mid, Post, by = "Participant.ID", suffixes = c("Mid", "Post"))
summary_table <- data.frame(
  ParticipantID = unique(merged_MidPost$Participant.ID),
  Total_Data_Points = table(merged_MidPost$Participant.ID)
)
frequency_table_datapoints <- table(summary_table$Total_Data_Points.Freq)
print(frequency_table_datapoints)
participant_counts <- table(merged_MidPost$Participant.ID)
#pearson check
# Select corresponding variables from the merged dataset
variables_Mid <- merged_MidPost[, c("drink", "regularity", "primarily")]
variables_Post <- merged_MidPost[, c("drink.", "regularity.", "primarily.")]
# Initialize matrices to store correlation coefficients and p-values
cor_matrix <- matrix(NA, nrow = ncol(variables_Mid), ncol = ncol(variables_Post))
```

```
p_values_matrix <- matrix(NA, nrow = ncol(variables_Mid), ncol = ncol(variables_Post))
# Loop through each pair of variables and calculate correlation along with p-value
for (i in seq_along(variables_Mid)) {
  for (j in seq_along(variables_Post)) {
    cor_test_result <- cor.test(variables_Mid[, i], variables_Post[, j], method = "pearson")
    # Store correlation coefficient in the matrix
    cor_matrix[i, j] <- cor_test_result$estimate
    # Store p-value in the matrix
    p_values_matrix[i, j] <- cor_test_result$p.value
  }
}
# Display the correlation matrix
print("Correlation Matrix between Mid and Post Variables:")
print(cor_matrix)
# Display the p-values matrix
print("P-values Matrix:")
print(p_values_matrix)
# mean variable for Mid and Post dataset
Mid$mean_variable <- rowMeans(Mid[, c("drink", "regularity", "primarily")], na.rm =
TRUE)
Post$mean_variable <- rowMeans(Post[, c("drink.", "regularity.", "primarily.")], na.rm =
TRUE)
merged_MidPost <- merge(Mid, Post, by = "Participant.ID",
                        all = TRUE, suffixes = c("_Mid", "_Post"))
t_test_result <- t.test(merged_MidPost$mean_variable_Mid,
merged_MidPost$mean_variable_Post, paired = FALSE)
print(t_test_result)
M_peer_drinks <- mean(selected_columns_H2$drinks_peers_category)
SD_peer_drinks <- sd(selected_columns_H2$drinks_peers_category)
M_participant_drinks <- mean(selected_columns_H2$drinks_participant_category)
SD_participant_drinks <- sd(selected_columns_H2$drinks_participant_category)

##assumptions
install.packages("lme4")
library(lme4)
library(tidyverse)
install.packages("ggpubr")
library(ggpubr)
install.packages("rstatix")
library(rstatix)
#outliers
standard_residuals_H1.1 <- resid(mixed_model_H1.1, type = "pearson")
z_threshold <- 3.29
outliers_H1.1 <- abs(standard_residuals_H1.1) > z_threshold
outlier_indices_H1.1 <- which(outliers_H1.1)
print(outlier_indices_H1.1)
standard_residuals_H2.1 <- resid(mixed_model_H2.1, type = "pearson")
z_threshold <- 3.29
outliers_H2.1 <- abs(standard_residuals_H2.1) > z_threshold
outlier_indices_H2.1 <- which(outliers_H2.1)
```

```
print(outlier_indices_H2.1)

standard_residuals_H2.2 <- resid(mixed_model_H1.1, type = "pearson")
z_threshold <- 3.29
outliers_H2.2 <- abs(standard_residuals_H2.2) > z_threshold
outlier_indices_H2.2 <- which(outliers_H2.2)
print(outlier_indices_H2.2)
standard_residuals_H3 <- resid(mixed_model_H3, type = "pearson")
z_threshold <- 3.29
outliers_H3 <- abs(standard_residuals_H3) > z_threshold
outlier_indices_H3 <- which(outliers_H3)
print(outlier_indices_H3)
standard_residuals_H3.1 <- resid(mixed_model_H3.1, type = "pearson")
z_threshold <- 3.29
outliers_H3.1 <- abs(standard_residuals_H3.1) > z_threshold
outlier_indices_H3.1 <- which(outliers_H3.1)
print(outlier_indices_H3.1)
standard_residuals_H3.3 <- resid(mixed_model_H3.3, type = "pearson")
z_threshold <- 3.29
outliers_H3.3 <- abs(standard_residuals_H3.3) > z_threshold
outlier_indices_H3.3 <- which(outliers_H3.3)
print(outlier_indices_H3.3)
#normality
residuals.H1.1 <- residuals(mixed_model_H1.1)
hist(residuals.H1.1, main = "Histogram of Residuals", xlab = "Residuals")
residuals.H2.1 <- residuals(mixed_model_H2.1)
hist(residuals.H2.1, main = "Histogram of Residuals", xlab = "Residuals")
residuals.H2.2 <- residuals(mixed_model_H2)
hist(residuals.H2.2, main = "Histogram of Residuals", xlab = "Residuals")
residuals.H3 <- residuals(mixed_model_H3)
hist(residuals.H3, main = "Histogram of Residuals", xlab = "Residuals")
residuals.H3.1 <- residuals(mixed_model_H3.1)
hist(residuals.H3.1, main = "Histogram of Residuals", xlab = "Residuals")

residuals.H3.3 <- residuals(mixed_model_H3.3)
hist(residuals.H3.3, main = "Histogram of Residuals", xlab = "Residuals")
shapiro.test(residuals(mixed_model_H1.1))
shapiro.test(residuals(mixed_model_H2.1))
shapiro.test(residuals(mixed_model_H2.2))
shapiro.test(residuals(mixed_model_H3))
shapiro.test(residuals(mixed_model_H3.1))
shapiro.test(residuals(mixed_model_H3.3))
#ANOVA
H1 %>%
  group_by(Category) %>%
  get_summary_stats(amount_category, type = "mean_sd")
#independence
plot(mixed_model_H2.1, which = c(1, 2))
plot(mixed_model_H2, which = c(1, 2))
plot(mixed_model_H3, which = c(1, 2))
```

```
plot(mixed_model_H3.1, which = c(1, 2))
#linearity
plot(model_H1, 1)
H1 %>% levene_test(amount_category ~ Category)
fitted_values <- predict(mixed_model_H2.1, type = "response")
residuals <- resid(mixed_model_H2.1)
plot(fitted_values, residuals, xlab = "Fitted Values", ylab = "Residuals", main = "Linearity
and Homoscedasticity Check")
abline(h = 0, col = "red", lty = 2)
smooth_line <- loess(residuals ~ fitted_values)
lines(fitted_values, predict(smooth_line), col = "blue", lty = 2)
fitted_values <- predict(mixed_model_H2, type = "response")
residuals <- resid(mixed_model_H2)
plot(fitted_values, residuals, xlab = "Fitted Values", ylab = "Residuals", main = "Linearity
and Homoscedasticity Check")
abline(h = 0, col = "red", lty = 2)
smooth_line <- loess(residuals ~ fitted_values)
lines(fitted_values, predict(smooth_line), col = "blue", lty = 2)
fitted_values <- predict(mixed_model_H3, type = "response")
residuals <- resid(mixed_model_H3)
plot(fitted_values, residuals, xlab = "Fitted Values", ylab = "Residuals", main = "Linearity
and Homoscedasticity Check")
abline(h = 0, col = "red", lty = 2)
smooth_line <- loess(residuals ~ fitted_values)
lines(fitted_values, predict(smooth_line), col = "blue", lty = 2)
fitted_values <- predict(mixed_model_H3.1, type = "response")
residuals <- resid(mixed_model_H3.1)
plot(fitted_values, residuals, xlab = "Fitted Values", ylab = "Residuals", main = "Linearity
and Homoscedasticity Check")
abline(h = 0, col = "red", lty = 2)
smooth_line <- loess(residuals ~ fitted_values)
lines(fitted_values, predict(smooth_line), col = "blue", lty = 2)
plot(model_H3, 1)
#homoscedasticity
install.packages("lmtest")
library(lmtest)
plot(mixed_model_H2.1, which = 1)
fitted_values <- predict(mixed_model_H2.1, type = "response")
residuals <- resid(mixed_model_H2.1)
plot(fitted_values, residuals, xlab = "Fitted Values", ylab = "Residuals",
    main = "Homoscedasticity Check", pch = 16, col = "blue")
abline(h = 0, col = "red", lty = 2)
smooth_line <- loess(residuals ~ fitted_values)
lines(fitted_values, predict(smooth_line), col = "green", lty = 2)
fitted_values <- predict(mixed_model_H2, type = "response")
residuals <- resid(mixed_model_H2)
plot(fitted_values, residuals, xlab = "Fitted Values", ylab = "Residuals",
    main = "Homoscedasticity Check", pch = 16, col = "blue")
abline(h = 0, col = "red", lty = 2)
smooth_line <- loess(residuals ~ fitted_values)
```

```
lines(fitted_values, predict(smooth_line), col = "green", lty = 2
fitted_values <- predict(mixed_model_H3, type = "response")
residuals <- resid(mixed_model_H3)
plot(fitted_values, residuals, xlab = "Fitted Values", ylab = "Residuals",
    main = "Homoscedasticity Check", pch = 16, col = "blue")
abline(h = 0, col = "red", lty = 2)
smooth_line <- loess(residuals ~ fitted_values)
lines(fitted_values, predict(smooth_line), col = "green", lty = 2)
fitted_values <- predict(mixed_model_H3.1, type = "response")
residuals <- resid(mixed_model_H3.1)
plot(fitted_values, residuals, xlab = "Fitted Values", ylab = "Residuals",
    main = "Homoscedasticity Check", pch = 16, col = "blue")
abline(h = 0, col = "red", lty = 2)
smooth_line <- loess(residuals ~ fitted_values)
lines(fitted_values, predict(smooth_line), col = "green", lty = 2)
#plot differences within individuals
# Extract Random Effects
random_effects <- ranef(mixed_model_H2.1)
# Plot Random Effects
# Extract Random Effects
random_effects <- ranef(mixed_model_H2.1)$Participant.ID
# Plot Random Effects for Each Participant
boxplot(random_effects,
        main = "Random Effects Plot for Each Participant",
        ylab = "Random Effects",
        col = "lightblue")
abline(h = 0, col = "red", lty = 2)


##hypotheses testing
#H1
install.packages("Matrix")
library(Matrix)
library(lme4)
library(lmerTest)
Qua <- filtered_MorEv[, c(1, 20)]
write.xlsx(Qua, "Qua.xlsx", rowNames = FALSE)
Qua <- read.xlsx("Qua.xlsx")
selected_columns_H1_MorEv <- filtered_MorEv[, c(1, 6, 18, 20)]
selected_columns_H1 <- merge(selected_columns_H1_MorEv, Qua, by = c("Participant.ID",
"[7_FFT].drinking.context.description"), all.x = TRUE)
selected_columns_H1 <- na.omit(selected_columns_H1)
selected_columns_H1 <- selected_columns_H1 %>%
  rename(alcohol_use = colnames(.)[3], drinks_participant = colnames(.)[4])
#ANOVA
model_H1 <- lm(amount_category ~ as.factor(Category), data = H1)
anova_result <- anova(model_H1)
print(anova_result)
H1$Context <- as.factor(H1$Context)
```

```
group_stats <- aggregate(amount_category ~ Category, data = H1, FUN = function(x) c(mean
= mean(x), sd = sd(x)))
print(group_stats)
H3$Category <- as.factor(H3$Category)
group_stats <- aggregate(influence ~ Category, data = H3, FUN = function(x) c(mean =
mean(x), sd = sd(x)))
print(group_stats)
library(tidyr)
selected_columns_H1 <- selected_columns_H1 %>%
  mutate(
    Where_values = strsplit(as.character(Where), ","),
    With_Whom_values = strsplit(as.character(With.whom), ",")
  )
selected_columns_H1 <- selected_columns_H1 %>%
  unnest(Where_values, With_Whom_values)
selected_columns_H1$Where_values <- ifelse(selected_columns_H1$Where_values != "",
as.numeric(selected_columns_H1$Where_values), NA)
selected_columns_H1$With_Whom_values <-
ifelse(selected_columns_H1$With_Whom_values != "",
as.numeric(selected_columns_H1$With_Whom_values), NA)
where_counts <- table(exploded_data$Where_values, useNA = "ifany")
where_percentages <- prop.table(where_counts) * 100
where_summary <- data.frame(Value = as.numeric(names(where_counts)),
                            Count = as.numeric(where_counts),
                            Percentage = as.numeric(where_percentages))
with_whom_counts <- table(exploded_data$With_Whom_values, useNA = "ifany")
with_whom_percentages <- prop.table(with_whom_counts) * 100

with_whom_summary <- data.frame(Value = as.numeric(names(with_whom_counts)),
                                Count = as.numeric(with_whom_counts),
                                Percentage = as.numeric(with_whom_percentages))
print("Overview of 'Where':")
print(where_summary)
print("\nOverview of 'With.Whom':")
print(with_whom_summary)
#dataset
H1 <- cbind(Qua, selected_columns_H1_MorEv)
H1 <- na.omit(H1)
H1 <- H1[, c(1, 5, 7, 8)]
H1 <- H1 %>%
  rename(alcohol_use = colnames(.)[3], amount = colnames(.)[4])
#recode
H1 <- H1 %>%
  mutate(amount_category = ifelse(amount == "0", 0,
        ifelse(amount %in% c("1", "2", "1 or 2"), 1,
        ifelse(amount %in% c("3", "4", "3 or 4"), 2,
        ifelse(amount %in% c("5", "6", "5 or 6"), 3,
     ifelse(amount %in% c("7", "8", "7 or 8"), 4,
        ifelse(amount %in% c("9", "10", "9 or 10"), 5,
         ifelse(tolower(amount) %in% c("11 or more", "more than 10"), 6,
```

```
            NA))))))))
# Categorize 'alcohol_use' variable
H1 <- H1 %>%
  mutate(alcohol_use_category = case_when(
    tolower(alcohol_use) %in% c("no") ~ 0,
    tolower(alcohol_use) %in% c("yes") ~ 1,
    TRUE ~ NA_integer_
  ))
#percentages
where_counts <- table(selected_columns_H1$Where, useNA = "ifany")
where_percentages <- prop.table(where_counts) * 100
where_summary <- data.frame(Value = as.numeric(names(where_counts)),
                            Count = as.numeric(where_counts),
                            Percentage = as.numeric(where_percentages))
# Overview of 'With.Whom'
with_whom_counts <- table(selected_columns_H1$With.Whom)
with_whom_percentages <- prop.table(with_whom_counts) * 100
with_whom_summary <- data.frame(Value = as.numeric(names(with_whom_counts)),
                                Count = as.numeric(with_whom_counts),
                                Percentage = as.numeric(with_whom_percentages))
# Print summaries
print("Overview of 'Where':")
print(where_summary)
print("\nOverview of 'With.Whom':")
print(with_whom_summary)
category_counts <- table(exploded_data$category, useNA = "ifany")
category_percentages <- prop.table(category_counts) * 100
category_summary <- data.frame(Value = as.numeric(names(category_counts)),
                               Count = as.numeric(category_counts),
                               Percentage = as.numeric(category_percentages))
# Print summary
print("Overview of 'category':")
print(category_summary)
filtered_H1 <- exploded_data[exploded_data$category != 2, ]
##relationship alcohol amount and social context
mixed_model_H1.1 <- lmer(Category ~ amount_category + (1 | Participant.ID), data = H1)
summary(mixed_model_H1.1)
#H2.1
selected_columns_H2 <- filtered_MorEv[, c(1, 18, 28)]
selected_columns_H2 <- na.omit(selected_columns_H2)
selected_columns_H2 <- selected_columns_H2 %>%
  rename(drinks_participant = colnames(.)[2], drinks_peers = colnames(.)[3])
#recode
selected_columns_H2 <- selected_columns_H2 %>%
  mutate(drinks_participant_category = case_when(
    grepl("0", drinks_participant) ~ 0,
    grepl("1 or 2", drinks_participant) ~ 1,
    grepl("3 or 4", drinks_participant) ~ 2,
    grepl("5 or 6", drinks_participant) ~ 3,
    grepl("7 or 8", drinks_participant) ~ 4,
```

```
    grepl("9 or 10", drinks_participant) ~ 5,
    grepl("11 or more|more than 10", drinks_participant, ignore.case = TRUE) ~ 6,
    TRUE ~ NA_integer_
  ))
# Replace "9 or 10" with "9"
selected_columns_H2$drinks_participant <-
str_replace(selected_columns_H2$drinks_participant, "9 or 10", "9")
# Now categorize the data
selected_columns_H2 <- selected_columns_H2 %>%
  mutate(drinks_participant_category = case_when(
    grepl("0", drinks_participant) ~ 0,
    grepl("1|2", drinks_participant) ~ 1,
    grepl("3|4", drinks_participant) ~ 2,
    grepl("5|6", drinks_participant) ~ 3,
    grepl("7|8", drinks_participant) ~ 4,
    grepl("\\b9\\b", drinks_participant) ~ 5,
    grepl("11|more than 10", tolower(drinks_participant)) ~ 6,
    TRUE ~ NA_integer_
  ))
#recode
selected_columns_H2$drinks_participant <-
str_replace(selected_columns_H2$drinks_participant, "9 or 10", "9")
selected_columns_H2$drinks_peers <- str_replace(selected_columns_H2$drinks_peers, "9 or
10", "9")
selected_columns_H2 <- selected_columns_H2 %>%
  mutate(drinks_participant_category = case_when(
    grepl("0", drinks_participant) ~ 0,
    grepl("\\b1\\b|\\b2\\b", drinks_participant) ~ 1,
    grepl("\\b3\\b|\\b4\\b", drinks_participant) ~ 2,
    grepl("\\b5\\b|\\b6\\b", drinks_participant) ~ 3,
    grepl("\\b7\\b|\\b8\\b", drinks_participant) ~ 4,
    grepl("\\b9\\b", drinks_participant) ~ 5,
    str_detect(tolower(drinks_participant), "\\b10\\b|\\b11\\b") ~ 6,
    TRUE ~ NA_integer_
  ))
selected_columns_H2 <- selected_columns_H2 %>%
  mutate(drinks_peers_category = case_when(
    drinks_peers == "0" ~ 0,
    drinks_peers == "12" ~ 1,
    drinks_peers == "34" ~ 2,
    drinks_peers == "56" ~ 3,
    drinks_peers == "78" ~ 4,
    drinks_peers == "9" ~ 5,
    drinks_peers == "10" ~ 6,
    TRUE ~ NA_integer_
  ))
#relationship between drinks > positive
mixed_model_H2 <- lmer(drinks_peers_category ~ drinks_participant_category + (1 |
Participant.ID), data = selected_columns_H2)
summary(mixed_model_H2)
```

```
#H2.1
selected_columns_H2.1 <- filtered_MorEv[, c(1, 6, 26)]
selected_columns_H2.1 <- na.omit(selected_columns_H2.1)
selected_columns_H2.1 <- selected_columns_H2.1 %>%
  rename(alcohol_use = colnames(.)[2], peers_use = colnames(.)[3])
selected_columns_H2.1 <- selected_columns_H2.1 %>%
  mutate(alcohol_use = case_when(
    tolower(alcohol_use) %in% c("no", "No") ~ 0,
    tolower(alcohol_use) %in% c("yes", "Yes") ~ 1,
    TRUE ~ NA_integer_
  ))
selected_columns_H2.1 <- selected_columns_H2.1 %>%
  mutate(peers_use = case_when(
    peers_use == "None" ~ 0,
    peers_use == "Less than 1/3" ~ 1,
    peers_use == "About half" ~ 2,
    peers_use == "All of them" ~ 3,
    TRUE ~ NA_integer_
  ))
#relationship between alcohol use + peers use
mixed_model_H2.1 <- lmer(peers_use ~ alcohol_use + (1 | Participant.ID), data =
selected_columns_H2.1)
summary(mixed_model_H2.1)
#H3
selected_columns_H3 <- filtered_MorEv[, c(1, 6, 30)]
selected_columns_H3 <- na.omit(selected_columns_H3)
selected_columns_H3 <- selected_columns_H3 %>%
  rename(alcohol_use = colnames(.)[2], influence_peers = colnames(.)[3])
selected_columns_H3 <- selected_columns_H3 %>%
  mutate(alcohol_use = case_when(
    tolower(alcohol_use) %in% c("no", "No") ~ 0,
    tolower(alcohol_use) %in% c("yes", "Yes") ~ 1,
    TRUE ~ NA_integer_
  ))
selected_columns_H3 <- selected_columns_H3 %>%
  mutate(influence_peers = case_when(
    influence_peers == "Strongly disagree" ~ 1,
    influence_peers == "Somewhat disagree" ~ 2,
    influence_peers == "Neither agree nor disagree" ~ 3,
    influence_peers == "Somewhat agree" ~ 4,
    influence_peers == "Strongly agree" ~ 5,
    TRUE ~ NA_integer_
  ))
#relationship between alcohol use + peers influence
mixed_model_H3 <- lmer(influence_peers ~ alcohol_use + (1 | Participant.ID), data =
selected_columns_H3)
summary(mixed_model_H3)
#coding preparation
write.xlsx("/Users/leawo/Downloads", "filtered_Mor.Ev.xlsx")
write.xlsx(filtered_Mor.Ev, file = "/Users/leawo/Downloads.xls")
```

```
install.packages("writexl")
library(writexl)
write_xlsx(filtered_Mor.Ev, path = "/Users/leawo/Downloads.xls")
#H3.1
selected_columns_H3.1 <- filtered_MorEv[, c(1, 18, 30)]
selected_columns_H3.1 <- na.omit(selected_columns_H3.1)
selected_columns_H3.1 <- selected_columns_H3.1 %>%
  rename(drinks_peers = colnames(.)[2], influence_peers = colnames(.)[3])
  selected_columns_H3.1 <- selected_columns_H3.1 %>%
  mutate(drinks_peers = case_when(
    grepl("0", drinks_peers) ~ 0,
    grepl("1 or 2", drinks_peers) ~ 1,
    grepl("3 or 4", drinks_peers) ~ 2,
    grepl("5 or 6", drinks_peers) ~ 3,
    grepl("7 or 8", drinks_peers) ~ 4,
    grepl("9 or 10", drinks_peers) ~ 5,
    grepl("11 or more|more than 10", drinks_peers, ignore.case = TRUE) ~ 6,
    TRUE ~ NA_integer_
  ))
selected_columns_H3.1 <- selected_columns_H3.1 %>%
  mutate(influence_peers = case_when(
    influence_peers == "Strongly disagree" ~ 1,
    influence_peers == "Somewhat disagree" ~ 2,
    influence_peers == "Neither agree nor disagree" ~ 3,
    influence_peers == "Somewhat agree" ~ 4,
    influence_peers == "Strongly agree" ~ 5,
    TRUE ~ NA_integer_
  ))
#relationship between alcohol quantity + peers influence
mixed_model_H3.1 <- lmer(influence_peers ~ drinks_peers + (1 | Participant.ID), data =
selected_columns_H3.1)
summary(mixed_model_H3.1)
# Load the writexl package
library(writexl)
# Select the columns of interest
selected_excel <- filtered_Mor.Ev[, c(1, 20)]
# Assuming you want to save it to Downloads
write_xlsx(selected_excel, path = "/Users/leawo/Downloads/filtered_Mor.Ev.xlsx")
setwd("C:/Users/leawo/Downloads")
MorEv_Qua <- read.xlsx("MorEv_Qua.xlsx")
#relationship between context and influence
#preparation
H3 <- cbind(Qua, selected_columns_MorEv)
H3 <- na.omit(H3)
H3 <- H3[, c(1, 5, 8)]
H3 <- H3 %>%
  rename(influence = `[12_SAQ].influence.of.peers`)
#recode
H3 <- H3 %>%
```

```
  mutate(influence = case_when(
    influence == "Strongly disagree" ~ 1,
    influence == "Somewhat disagree" ~ 2,
    influence == "Neither agree nor disagree" ~ 3,
    influence == "Somewhat agree" ~ 4,
    influence == "Strongly agree" ~ 5,
    TRUE ~ NA_integer_
  ))
mixed_model_H3.3 <- lmer(Category ~ influence + (1 | Participant.ID), data = H3)
summary(mixed_model_H3.3)

model_H3 <- lm(influence ~ as.factor(Category), data = H3)
anova_result.3 <- anova(model_H3)
print(anova_result.3)
#visualization
ggplot(selected_columns_H2, aes(x = drinks_participant_category, y =
drinks_peers_category, color = as.factor(Participant.ID))) +
  geom_point() +
  labs(x = "Participant's Drink Category", y = "Peers' Drink Category") +
  theme_minimal()
selected_participants <- c(33578, 34817)
subset_data <- selected_columns_H2[selected_columns_H2$Participant.ID %in%
selected_participants, ]
ggplot(subset_data, aes(x = drinks_participant_category, y = drinks_peers_category, color =
as.factor(Participant.ID))) +
  geom_point() +
  labs(x = "Participant's Drink Category", y = "Peers' Drink Category") +
  theme_minimal()
selected_participants <- c(33578, 83922)
subset_data <- selected_columns_H2.1[selected_columns_H2.1$Participant.ID %in%
selected_participants, ]
ggplot(subset_data, aes(x = alcohol_use, y = peers_use, color = as.factor(Participant.ID))) +
  geom_point() +
  labs(x = "Participant's Alcohol Use", y = "Peers' Alcohol Use") +
  theme_minimal()
participants_to_plot <- c(68884, 34817)
selected_columns_H3_subset <- selected_columns_H3[selected_columns_H3$Participant.ID
%in% participants_to_plot, ]
ggplot(selected_columns_H3_subset, aes(x = alcohol_use, y = influence_peers, color =
as.factor(Participant.ID))) +
  geom_point() +
  geom_smooth(method = "lm", se = FALSE, linetype = "dashed", color = "black") +
  labs(x = "Alcohol Use", y = "Influence of Peers") +
  theme_minimal()
participants_to_plot <- c(83916, 34817)
selected_columns_H3.1_subset <-
selected_columns_H3.1[selected_columns_H3.1$Participant.ID %in% participants_to_plot, ]
ggplot(selected_columns_H3.1_subset, aes(x = drinks_peers, y = influence_peers, color =
as.factor(Participant.ID))) +
  geom_point() +
```

```
  geom_smooth(method = "lm", se = FALSE, linetype = "dashed", color = "black") +
  labs(x = "Drinks", y = "Influence of Peers") +
  theme_minimal()
#ratio
table(tolower(filtered_MorEv$`[3_SAQ].Drank.alcohol.yes/no`))
table(selected_columns_H3$influence_peers)
prop.table(table(selected_columns_H3$influence_peers)) * 100
#differences within individuals
library(lme4)
random_effects_var <- VarCorr(mixed_model_H3)
print(random_effects_var)
#Vizualisation
settings_labels <- c("At Home", "Bars", "Parties", "Other People's Houses", "Restaurants",
"Concerts", "University", "Work")
settings_percentages <- c(22.22, 20, 13.33, 11.11, 4.44, 3.33, 4.44, 3.33)
pie(settings_percentages, labels = settings_labels, main = "Reported Settings")
legend("topright", legend = settings_labels, title = "Settings", cex = 0.8, fill =
rainbow(length(settings_labels))
dev.off()
# Data
people_labels <- c("Friends", "Partner", "Fellow Students", "Alone", "Family Members",
"Co-workers", "Acquaintances", "Strangers", "Unclear Answers")
people_percentages <- c(52.22, 11.11, 7.78, 7.78, 6.67, 6.67, 4.44, 1.11, 6.67)

# Create a pie chart
pie(people_percentages, labels = people_labels, main = "Reported Social Environment")
```

Appendix E – Coding Scheme

[7_FFT].drinking.context.description	Where	With whom
At a concert with a friend and other people who had a drink.	4	1, 4
i had a wine tasting from my wine marketing class	0	5
Bachlorette party with friends At a varitÃ© abd at a friends place	1, 5	1
It was in my risotto so I am not sure if that even counts	0	0
I was at a birthday party of a friend of mine that i have not seen for a while.	1	1
I was at home, in the living room, with my parents	3	3
It was a social gathering	0	1
At home alone, but online with 4 friends	3	1, 6
i was drinking with some friends at a bar	2	1
I was drinking with friends at our place	3	1
I was with my friends out in the city	2	1
I was at home and had two beers while watching tv	3	6
At a club with friends	7	1
I visited driebds and we went to a eestaurabt where we got 2 beer each	8	1
I was at a house party with 20 people from my study program and we drank mainly beer. Later, we went to a bar (around mi	1, 2, 5	1
I went to a houseparty from 9pm - 1 am, with my girlfriend and friends from university	1, 5	1, 2
At a friends place wirh a group of friends from Uni	5	1
Locker room after sports		
we were in the sauna with some friends and i felt like drinking a glass.	0	1
I was in a Bar with friends and I had one glass of wine and one glass of an alcohol free drink.	2	1
Family on my grandmothers birthday	0	3
At a friends party	1	1
I was at a chilled party, we did beer pong with some friends and my boyfriend	1	2, 1
With friends in a bar	2	1
With my boyfriend for date night	0	2
In a bar with friends	2	1
With friends at home	3	1
i was in the city at a bar	2	0
i was having a sit in with my friends	0	1
at home with my friends	3	1
home alone	3	6
With my family at a restaurant and afterwards at my sisters home.	8, 3	3
We played beer pong and often drank shots. Afterwards we played bus drivers. We had already drunk a lot by the time we drc	7	0
in the cub and outside of the convenience store (in seoul south-korea) with 2 friends	7	1
in a bar with my friends	2	1
I was hanging out with friends in a dorm club room yesterday evening around 8 pm. We played olympics surrounding games	7	1
At a bar, with a friend	2	1
At home, watching tv with a friend	3	1
At a friendâ€™s place, cooking	5	1
I was with friends yesterday to celebrate a new move into a flat	0	1
At a party	1	0
i was drinking from 7 pm to 1 am with friends during and after the concert in a var	4, 2	1
I was with my boyfriend and friends of him at a bar.	2	1, 5
My boyfriend in our apartment while playing a card game and eating dinner.	3	2
My boyfriend in our apartment.	3	2
Party location with friends	1	1
Party with a good friend	1	1
i was at an alumni event	0	7
at home with housemates	3	1
Birthday party at a friends house with people from university	5, 1	7
In a rooftop bar, alone, at 22:30.	2	6
I drank a bit of wine at work and a beer at home. At work i was with two colleagues and at home alone	6, 3	6, 8
Christmas market, work (restaurant). Colleagues.	0, 8	8
At work, after work in a bar. With my colleague	6, 2	8
Home alone evening	3	6
Was out with friends at a Christmas market in the afternoon	0	1
I was doing bar hopping with my bf and we decided to drink together.	2	2
At home with the fam	3	3
In the city center at multiple bars (San Remo, Wigwam, Update) with my dispuut	2	0
Datediner	8	2
Still on teamweekend	0	5
Party with friends	1	1
In the city center the christmas lights were turned on and it was a big event. Afterwards we went to a bar. I was with my frier	2	1
i wss st homr tsking s bresk from studyimt	3	6
We were in a bar, had few beers. I was with my friend.	2	1
I was at my house with my best friend, we had a free evening without studying, so were watching a movie to relax	3	1
Predrinking with 4 friends and later at a club	7	1
At a bar with some erasmus friends	2	1
With my Girlfriend at home	3	2
I was at home with my girlfriend	3	2
At my cousins appartment with my cousins, friends and my girlfriend	5	1, 2, 3
with my close friends, to celebrate the weekend and that a hard exam was done	0	1
with my family, during a nice movie	0	1

Appendix F – Assumptions

Figure 7

Plot of Residuals for the Linear Mixed Model Assessing the Relationship between Alcoholic Drinks of Participants and Peers

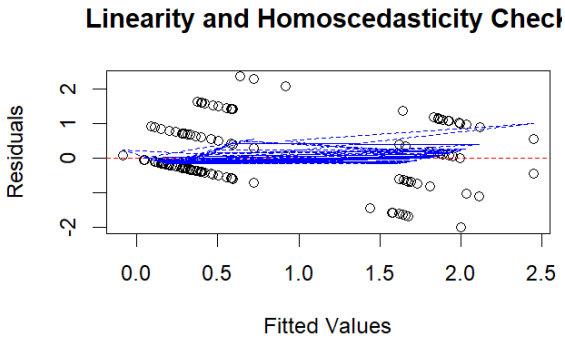


Figure 8

Plot of Residuals for the Linear Mixed Model Assessing the Relationship between the Alcohol Use of Participants and Peers

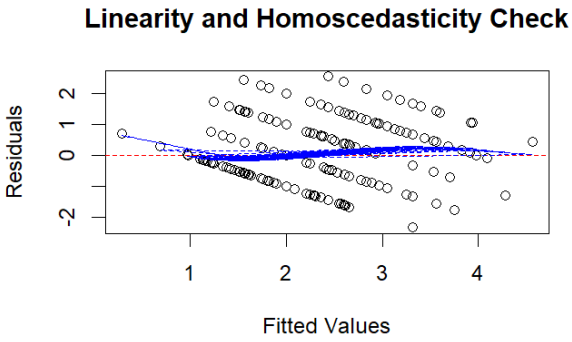


Figure 9

Plot of Residuals for the Linear Mixed Model Assessing the Relationship between the Perceived Influence of Peers and Alcohol Use of Participants

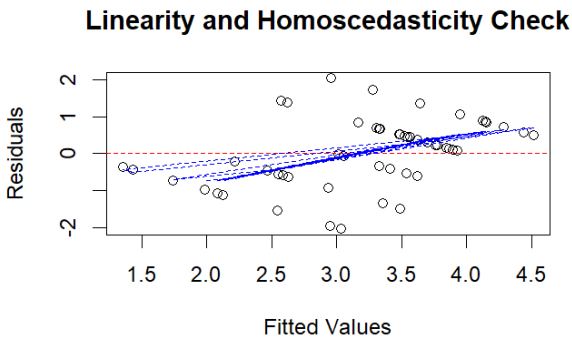


Figure 10

Plot of Residuals for the Linear Mixed Model Assessing the Relationship between the Perceived Influence of Peers and Alcoholic Drinks of Participants

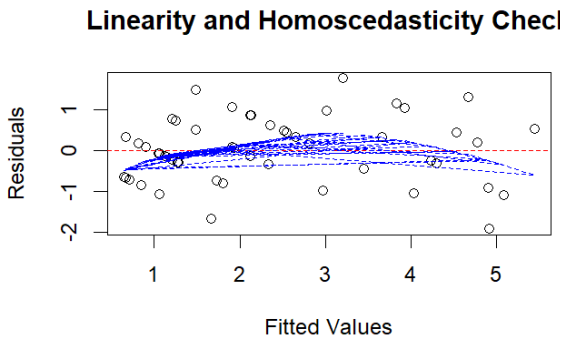


Figure 10

Figure 11

Plot of Residuals for the ANOVA Model assessing the Relationship between the Context and Alcoholic Drinks of Participants

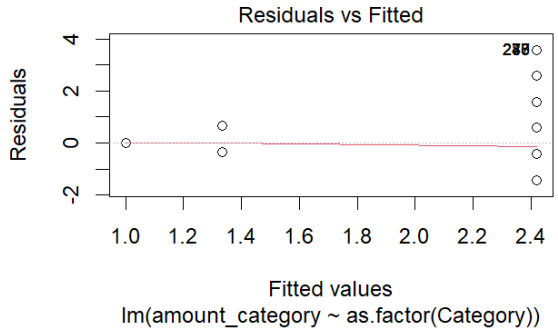


Figure 12

Histogram of Residuals for the Linear Mixed Model assessing the Relationship between Alcohol Use of Participants and Peers

Plot of Residuals for the ANOVA Model assessing the Relationship between the Context and Perceived Influence of Peers

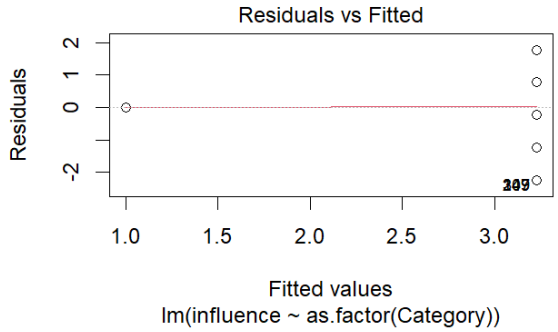


Figure 13

Histogram of Residuals for the Linear Mixed Model assessing the Relationship between Perceived Influence of Peers and Alcoholic Drinks

Table 1

Test of Normality for the Six Models

Model	Statistic	df	Sig.
Context and alcohol use of participants	0.4	66	.000*

Alcoholic drinks of participants and peers	0.87	76	.000*
Alcohol use of participants and peers	0.97	296	.58
Influence of peers and alcohol use of participants	0.97	325	.000*
Influence of peers and alcoholic drinks of participants	0.98	73	.5
Context and perceived influence of peers	0.58	65	.000*

Note. df = degrees of freedom

Through a Shapiro-Wilk test, it was found that the assumption of normality was met for four of the six models. Additionally, histograms were plotted for these two linear mixed models that assess the relationship between alcohol use of participants and peers as well as the perceived influence of peers and alcoholic drinks.

Figure 14

Histogram of Residuals for the Linear Mixed Model assessing the Relationship between Alcohol Use of Participants and Peers

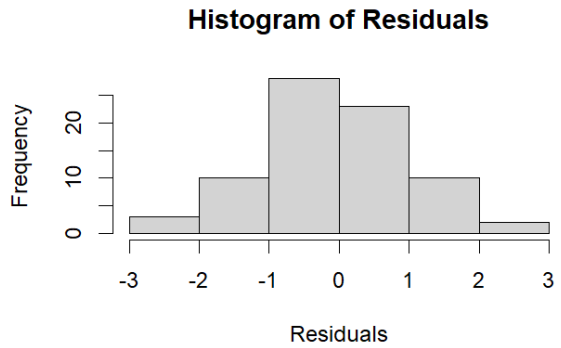


Figure 15

Histogram of Residuals for the Linear Mixed Model assessing the Relationship between Perceived Influence of Peers and Alcoholic Drinks