

The Relationship Between Physical Activity and Alcohol Consumption
An Experience Sampling Study among Dutch Students

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The Mechanisms Between Physical Activity and Alcohol Consumption

Abstract

Background

Current research on the relationship between physical activity (PA) and alcohol consumption (AC) holds inconsistent results. This could be because most studies have been conducted using retrospective techniques, which can heavily skew results due to memory bias. To produce accurate results, the current research applies Experience Sampling (ES) to answer the research question “*What is the relationship between AC and PA among students in the Netherlands?*”. An additional focus is set on the relevance of ‘treat’ and ‘guilt’ for this association.

Methods

Multi-method research was performed as Dutch students ($N = 68$), aged between 18 and 25, answered ES questionnaires related to AC and PA twice a day for seven days.

Results

No significant relationship between PA and AC has been found, and neither when comparing average AC levels of three PA intensity groups. A significant positive relationship between AC and experience of guilt was only found with the ‘number of alcoholic drinks’, but not for ‘average AC’. The findings suggest that the sub-code ‘treat’ might explain the relationship between AC and PA to some degree. No responses indicated that students engage in PA because they experience guilt after AC.

Conclusion

The findings must be treated cautiously as the overall availability of data was limited. As a result of the potential role of ‘treat’ for the relationship between PA and AC, quantitative tests could attempt to statistically verify the qualitative responses.

Keywords: physical activity, alcohol consumption, mechanism, differences in PA levels, experience sampling

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Introduction

Alcohol consumption (AC) is known to have severe health implications. According to the World Health Organization (2022), three million deaths per year are alcohol-related worldwide. Young adults are especially vulnerable to long-term consequences caused by excessive AC as the early onset may interrupt the development of the body. Lees et al. (2020) demonstrated that heavy alcohol intake is linked to neurological dysfunctions such as impaired learning and memory abilities for adolescents. This could especially be a risk for younger individuals, as the brains of humans are not completely developed until the age of 25 (Arain et al., 2013) and student's AC is particularly high. Compared to the population average, students are twice as likely to consume risky quantities of alcohol (Karschnick, 2012) which are defined as drinking more than ten alcoholic quantities per week (Brussen, 2010). Particularly within the Dutch population, the prevalence of heavy drinking among individuals aged 12 to 25 is considerably higher than in the broader Dutch population (Statistic Netherlands cited in Dutch Institute for Alcohol Policy, 2021). The severe consequences of excessive consumption on physical- and mental health highlight the importance of understanding its relationships and causes as these insights can be used to identify proper incentives for safe AC.

Literature Review

In an attempt to find the most effective intervention methods, the relationship between several risk factors and AC has been researched, one of the most heavily discussed ones being physical activity (PA). PA can be defined "as body movement that results in energy expenditure that surpasses baseline, and "exercise" as a subtype of physical activity that is intentionally performed in order to maintain or enhance fitness" (Leasure et al., 2015, p. 2). Despite the expected relevance of this factor, the research did not come to a consensus, neither regarding the direction-, nor the significance of the relationship (Dodge et al., 2016).

Dodge et al. (2016) conducted the first systematic review in that field in which seven out of the eight reviewed studies found that higher amounts of AC were related to those students who engaged in higher levels of PA, thereby indicating a positive relationship. The predictor of this relationship is not clear as the reviewed studies are split in half when it comes to the choice between AC and PA. The findings of Dodge et al. (2016) corresponded with a different study which showed “a positive relationship between meeting physical-activity guidelines and binge drinking” (Walker et al., 2015, p. 1). Both studies do not discuss the reasons for the positive relationship. The research by Musselman and Rutledge (2010) also confirmed the positive relationship as their results showed an increased drinking behaviour for higher levels of PA based on responses of fourth-year college students who attended three sessions of retrospective surveys. Werneck et al. (2018) used retrospective self-observations daily and found that AC was associated with lower levels of PA. However, they also found that weekly AC was associated with higher levels of PA among the participants. Moreover, Liangpunsakul et al. (2010) found that hazardous AC was related to lower PA among adults in Indianapolis. Lastly, the studies of Long et al. (2017) and Dodge & Clarke (2018) found no significant association between AC and PA among American adolescents at all. The inconsistency of results calls for further research on the relationship between PA and AC.

Adding to the inconsistency of results in prior literature, it was found that different types of PA in terms of intensity lead to different relationships to AC (Leasure & Neighbors, 2014; Werneck et al., 2018). Leasure and Neighbors (2014) found inconsistent results when studying undergraduate psychology students in the US as their study revealed that solely moderate exercise was positively related to AC while they found no significant relationship for other intensity levels of PA. Most of the research has found higher drinking levels to be associated with exercising at a high intensity level while this relationship is not significant for less intensive PA (French et al., 2009; VanKim et al., 2010; Park et al., 2011, Kopp et al., 2014). Conducting cross-sectional studies might have therefore contributed to the inconsistent

findings. To account for this issue, the current research will not only investigate the relationship between PA and AC, but also assess differences in AC between different levels of PA intensity.

One explanation for a positive relationship is that AC is perceived as a kind of reward or treat after engaging in strenuous activities such as PA. Spear (2018) found that adolescents are more likely to consume low doses of alcohol due to its rewarding effects. Boecker et al. (2008) explain that such rewards release endorphins and are therefore likely to be repeated. Pitts et al. (2018) studied athletes within teams and found that AC was used to celebrate successes, victories or hard work related to their sport by consuming alcohol.

Another explanation is that students that engage in AC might experience guilt and then try to 'control for the damages' by engaging in PA (Dodge et al, 2016; French et al., 2009, Werneck et al., 2018). While feelings of guilt after AC can have different reasons, one type of guilt is related to weight gain as AC goes along with relatively high amounts of calories (Musselman & Rutledge, 2010). Dodge & Clarke (2018) found that guilt in the form of body weight concerns mediate the relationship between heavy PA and intensive AC. Vickers et al. (2004) found that this type of guilt after AC is especially represented among female college students who were found by Davis et al. (2016) to prevent weight gain by engaging in PA. Further studying the role of 'treat' and 'guilt' can help to better understand the relationship which simplifies the adoption of adequate measures and limits the risks of excessive AC.

The fact that the majority of the aforementioned studies used retrospective techniques to study the relationship between PA and AC could have severely limited the accuracy of the findings. Recalling past events can result in incomplete or incorrect information and biased responses, usually referred to as memory bias (Belli et al., 2001). Thus, there is a need for more accuracy and precision, as the currently available conflicting results might be skewed. More reliable results can be achieved by using the experience sampling (ES) method that provides real-time feedback of data. This rather novel approach will be used in the current

study. Through ES, participants entered their activities and attitudes shortly after their occurrence in an app during the study. The daily diary method was in this context suggested by Musselman and Rutledge (2010) to find precise outcomes by using consecutive and comparable observations for each participant.

The relationship between PA and AC will be first analysed quantitatively. Second, using qualitative data, an additional focus will be set on ‘treat’ and ‘guilt’ that have been assumed to explain this relationship to some degree. Overall, this leads to the research question ‘*What is the relationship between AC and PA among students in the Netherlands?*’. Based on the findings of previous literature it is hypothesized that:

H₁: There is a positive significant relationship between AC and PA.

H₂: There are significant differences in the average AC between the three PA intensity levels: active, moderately active, and insufficiently active.

H₃: There is a positive significant relationship between AC and experience of guilt.

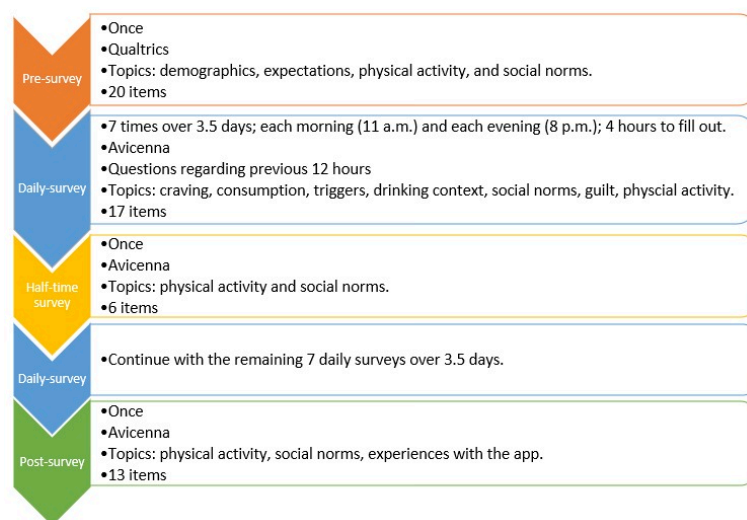
To get a better understanding of the relationship, two open questions will be assessed using qualitative data:

Q₁: What type of treat-related reasons for AC do students report after engaging in PA?

Q₂: What type of guilt-related reasons for PA do students report after engaging in AC?

Methods

This study used the ES approach by collecting data for a total of nine days with the Ethica Avicenna App. A multi-methodology was utilised, meaning data has been collected quantitative and qualitative. A visualization of the data collection process can be seen in Figure 1.

Figure 1*Visualization of Data Collection Process***Participants and Recruitment**

The inclusion criteria required participants to (1) generally consume alcohol, (2) be aged between 18-25 years old, (3) have proficiency in the English language, and (4) to be a student in the Netherlands. Participants were selected using the convenience sampling and snowball sampling approaches. Advertising the study on social media (Facebook and Instagram), publishing it on the SONA system website of the University of Twente (UT), as well as directly recruiting the researchers' friends and families attracted 134 participants to join the pre-questionnaire out of which 68 participants joined the ES study and 66 the half-time questionnaire.

45 completed the study until the last day. Based on the participation in the ES questionnaire, participants answered on average 9.5 out of 14 times. Of the participants who shared information about their gender, 30 (81.1%) were female and seven (18.9%) were male. The ages of participants ranged from 18 to 25 ($M = 21.8$, $SD = 1.9$) with the most represented nationalities being German (56.7%) and Dutch (24.3%). 48.6% of participants were at the time enrolled in an academic sciences bachelor, 24.3% in an academic sciences master, 18.9% in an applied sciences bachelor and 2.7% each in an academic sciences PhD and an applied

sciences master. 37 participants gave consent to the study in Qualtrics, but it is not possible to identify these participants in Ethica due to the lack of traceability. However, the researcher did not consider that the data collected are independent of each other in Qualtrics and the Ethica Avicenna App. The data will still be used for those who did not give consent as filling in the ES questionnaires implied their consent to participate which was explained in the study. Eight participants who had less than four responses in the 14 ES questionnaire (asked twice a day for seven consecutive days) were excluded from the study.

Materials and Procedure

The study was conducted from the 16th of November until the 4th of December 2023. Prior to data collection, ethical approval was obtained from the Ethics Committee of the Faculty of Behavioural, Management and Social Sciences at the University of Twente.

Pre-Questionnaire

A preliminary online questionnaire was generated in Qualtrics XM (Appendix A) to gather more detailed information about the sample consisting of seven items related to participants' demographics, current education level, social norms and expectations towards the study. The questions about social norms and expectations towards the study were part of different studies and not of relevance to this paper. Due to trackability issues and missing data of the participants, the pre-questionnaire had to be sent out again on day four of the ES questionnaires (called half-time questionnaire).

The Godin Leisure Time Exercise Questionnaire (GLTEQ) was used to measure the general PA level of the participants and was invented by Godin and Shephard in 1985 (Sari & Erdoğan, 2016). This single-item questionnaire consisted of the item "During a typical 7-Day period (a week), how many units on average do you do the following exercise for more than 15 minutes during your free time." (see Appendix A). This question referred to these three categories of exercising: strenuous, moderate, and light exercise. Based on the activity score,

participants were categorized into three PA levels: active, moderately active, and insufficiently active. Asiri et al. (2022) found an excellent internal consistency ($\alpha = .99$) and a high concurrent validity ($r = .86$) by using 150 participants. The internal consistency of the GLTEQ for this study has been measured by using Cronbach's Alpha. The raw alpha was .57 and the standardized alpha was .63, which suggests a moderate to questionable internal consistency.

ES Questionnaires

The main material used in this research was the Ethica Avicenna App which allows researchers to add triggering logics that are necessary for ES. This app could be downloaded by participants for Android and iOS smartphones. After downloading the app, participants had to register using their email address. The participant's data was collected twice a day in the form of a morning- and evening questionnaire for a total of seven days (see Appendix B). To ensure high participation, participants received push notifications at 11.00 am and 8.00 pm, reminding them to fill out the ES questionnaires. The questionnaires took approximately five minutes per session and remained available for responses for four hours until expiry. While the two types of questionnaires were mostly identical in structure and content, they only differed in their time references (e.g., 'during the day' or 'in the evening'). Each ES questionnaire contained questions related to the current, as well as two other studies, which were presented in the following order: 1) general questions about AC, 2) social context, and 3) PA. Out of the 17 items in the entire questionnaire, six questions that related to AC and PA were of interest for the hypotheses and the open research questions of this paper. Questions about AC were e.g., "How many alcoholic drinks did you consume?" or "Please describe your reasons for exercising." Similarly, for PA "Did you exercise in the last 12 hours?" or "Please describe your reasons for exercising." was asked. The ES questionnaires contained both open-ended and closed-ended questions to allow for a quantitative- and qualitative analysis. The closed-ended questions had solely dichotomous and ordinal responses, e.g.,

‘yes’ and ‘no’ for “Did you consume alcohol in the last 12 hours?” and ‘1 or 2’, ‘3 or 4’, ‘5 or 6’, ‘7 to 9’ and ‘10 or more’ for “How many alcoholic drinks did you consume?”. The latter question serves as an example of a conditional question which would only appear if a participant provided a certain response since participants could only give information about the number of drinks consumed if they indicated that they drank alcohol.

Post-Questionnaire

A post-questionnaire was created to ask participants about social norms, PA and their experiences during the study, for instance, “What do you think of the usage of this app over the last week?”. Both open-ended and closed-ended questions were asked in the post-questionnaire (see Appendix C). However, this post-questionnaire was not of relevance to answering the hypotheses and open questions of this paper.

Data Analysis

The quantitative and qualitative analyses were evaluated separately in the results section with the former relating to the hypotheses and the latter to the open questions.

Quantitative Analysis

For the quantitative analysis, the statistical software program RStudio (version 4.3.0) was used. The cut-off level for missing data was three, which means that participants who filled out less than four of the 14 ES questionnaires were excluded. To perform additional statistical tests, it was necessary to delete the values that were not available (NA) for the chosen variable. The ‘yes/no’ values of the daily AC of each participant had been summarised into an additional variable ‘average AC’, ranging from zero to one, that minimises biases due to missing data points. Furthermore, the reliability of the GLTEQ was assessed by reporting Cronbach’s alpha for internal consistency. The responses of the GLTEQ had to be evaluated by categorising each participant into the respective levels: active, moderately active, and insufficiently active. Two Linear Mixed Models (LMM) were done each to assess the

relationship between (1) AC and PA, related to H₁, and (2) AC and experience of guilt, related to H₃. For both hypotheses, one of the LMM's measured AC as the number of alcoholic drinks while the other one was defined as the average of 'yes' or 'no' responses to the question "Did you consume alcohol within the last 12 hours?". Within these LMMs, the participant ID served to measure random effects and a measure of AC to find fixed effects. Moreover, a one-way ANOVA analysis was performed to see whether there are significant differences in the average AC between the three PA intensity levels, related to H₂. Thereby, the data of the GLTEQ was used from the half-time questionnaire since the post-questionnaire had insufficient data points due to the dropout rate.

Qualitative Analysis

For the qualitative analysis, the method of thematic analysis and the software Atlas.ti (version 23) were utilized. At first, the contents of the three open research questions of the 14 ES questionnaires about reasons for drinking, feelings of guilt/regret and reasons for exercising were organized and summarized into sub-codes and group codes. After this was done, the codes were reviewed a second time to ensure consistency and if needed, some general codes were split up while some similar ones were merged. In the next step, the coding scheme (see Appendix D) was utilized to identify those answers that were related to the open research question of the current study. The codes were then analysed to gain insights into the potential role of treat and guilt in the relationship between PA and AC.

Results

Quantitative Results

All four LMMs demonstrate linearity and a distribution of residuals close to a normal distribution. Further details of the results related to the linear assumptions can be found in Appendix E.

H₁: There is a positive significant relationship between AC and PA.

First LMM for Average AC ‘yes/no’ and PA ‘yes/no’. The results of the first LMM used 619 observations and showed a statistically non-significant relationship between ‘average AC (yes/no)’ and ‘PA (yes/no)’ which was indicated by the fixed effect of the LMM ($b = -.08, SE = .18, t(58.76) = -.44, p = .663$). The variable ‘average AC (yes/no)’ displayed the average responses of all ES questionnaires, ranging from zero to one for each participant, while ‘PA (yes/no)’ displayed whether a participant did engage in PA or not for each ES questionnaire. Thus, H₁ can be rejected. This indicates that there is no clear link between whether a person consumes alcohol on average and their PA.

Second LMM for Number of Alcoholic Drinks and PA ‘yes/no’. The results of the second used also 619 observations and indicated a statistically non-significant relationship between ‘number of alcoholic drinks’ and ‘PA (yes/no)’ which was shown by the fixed effect of the LMM ($b = -.02, SE = .03, t(110) = -.72, p = .472$). The variable ‘number of alcoholic drinks’ displayed how many drinks the participant consumed for each ES questionnaire, while ‘PA (yes/no)’ displayed whether a participant did PA or not for each ES questionnaire. Thus, H₁ can be rejected. This indicates that there is no clear link between the number of alcoholic drinks that a person consumed and their PA.

H₂: There are significant differences in the average AC between the three PA intensity levels: active, moderately active, and insufficiently active.

To test whether there are significant differences in AC between the three PA intensity levels, data of 66 participants who participated was analysed using the one-way ANOVA test (see Table 3). The variable ‘average AC’ demonstrated the average value of the number of alcoholic drinks that have been consumed for each ES questionnaire. AC was measured as the average drinks consumed by participants and the different ‘PA intensity levels’ groups were ‘active’, ‘moderately’ and ‘insufficiently active’. The ANOVA results indicated that there are

no statistically significant differences among the three 'PA intensity levels' with respect to 'AC', $F(1, 67) = .06, p = .802$. Thus, H_2 can be rejected.

H₃: There is a positive significant relationship between AC and experience of guilt.

Third LMM for Average AC 'yes/no' and Guilt 'yes/no'. The results of the LMM used 619 observations and found no statistically significant relationship between 'average AC (yes/no)' and 'guilt (yes/no)', which was indicated by the fixed effect ($b = .1, SE = .24, t(19.73) = .66, p = .518$). The variable the 'average AC (yes/no)' displayed the average responses of all ES questionnaire, ranging from zero to one for each participant, while 'guilt (yes/no)' demonstrated whether a participant experienced guilt or not for each ES questionnaire. Thus, the findings do not support H_3 . This suggests that there is no clear link between whether a person consumes alcohol on average and their experience of feelings of guilt.

Fourth LMM for Number of Alcoholic Drinks and Guilt 'yes/no'. The results of the LMM used 619 observations and found a positive relationship between 'number of alcoholic drinks' and 'guilt (yes/no)' that is statistically significant at the 10% level, which was indicated by the fixed effect ($b = .04, SE = .03, t(104.36) = 1.74, p = .084$). The variable 'number of alcoholic drinks' displayed how many drinks the participant consumed for each ES questionnaire and 'guilt (yes/no)' demonstrated whether a participant experienced guilt or not for each ES questionnaire. Thus, the findings support H_3 . This suggests that there is a clear link between the number of alcoholic drinks that a person consumed and their experience of feelings of guilt.

Qualitative Results

The qualitative analysis combines the responses from the morning- and evening ES questionnaires and will focus on the treat- and guilt-related reasons. Further responses for the reasons for experiencing craving for AC or not engaging in AC can be found in Appendix D.

Q1: What type of treat-related reasons for AC do students report after engaging in PA?

To find out whether students engaged in AC to treat themselves (not only after engaging in PA), participants were asked “Why did you decide to drink?”. Out of the 223 responses, eight mentioned ‘treat’ as a reason to drink (see Figure 2 and 3). Two exemplary answers include “Because it was cold outside and we wanted to treat ourselves with a warm mullet wine, as we were studying the whole day” or “We could relax, we had no other chores or responsibilities, and we were in a safe environment that allowed us to have a drink” (see Appendix D).

To see whether ‘treat’ could partially explain the relationship between PA and AC, only the answers of those participants who engaged in PA first and then consumed alcohol are considered. Most of the reasons stated for AC entailed ‘social’ reasons such as ‘going out’, ‘environment’ or ‘fun’ while the sub-code of interest ‘treat’ was mentioned two times. Specifically, the responses „tough practice, good mood” and “I had quite a busy day with working, studying, gym sessions, I wanted to spend some time doing what I enjoy “, capture this effect. Overall, the qualitative findings indicate that ‘treat’ might be able to explain the relationship between PA and AC to some degree.

Figure 2

Intrinsic Reasons to Consume Alcohol

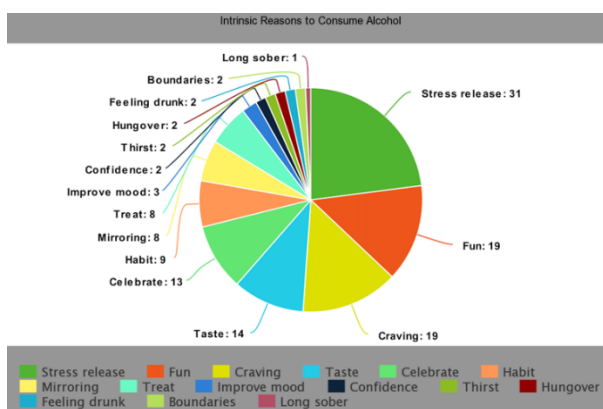
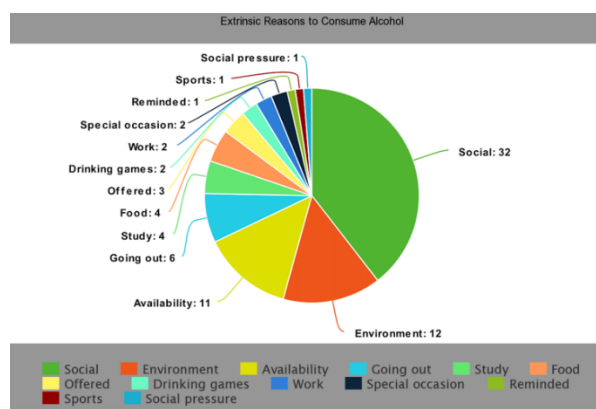


Figure 3

Extrinsic Reasons to Consume Alcohol



Q2: What type of guilt-related reasons for PA do students report after engaging in AC?

The first question that captures feelings of guilt after consuming alcohol was: “Why did you experience these feelings of guilt or regret?”. A total of 27 responses were identified, which were categorised as ‘physical’ (14 responses, see Figure 4), ‘mental’ (9 responses, see Figure 5) and ‘prestation’ (4 responses, see Figure 6). Guilt related to ‘being hungover’ or ‘lacking energy’ were the most frequently stated reasons as they were each mentioned five times. While physical implications were the most frequently mentioned reason to experience guilt, none of the reasons are clearly related to calorie intake or weight gain.

Whether the experience of guilt translated into engaging in PA was captured by the question “Please describe your reasons for exercising” (see Figure 7 and 8). Out of the 78 responses related to intrinsic reasons and 166 related to extrinsic reasons, none suggested that participants engaged in PA due to feelings of guilt after AC. Therefore, the qualitative analysis does not indicate that guilt can explain the relationship between AC and PA.

Figure 4

Physical Reasons for Feelings of Guilt

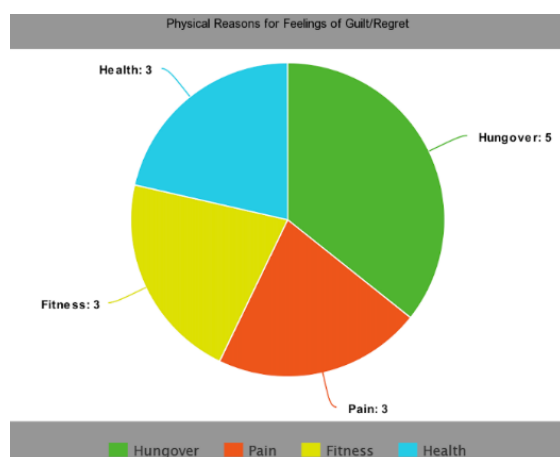


Figure 5

Mental Reasons for Feelings of Guilt

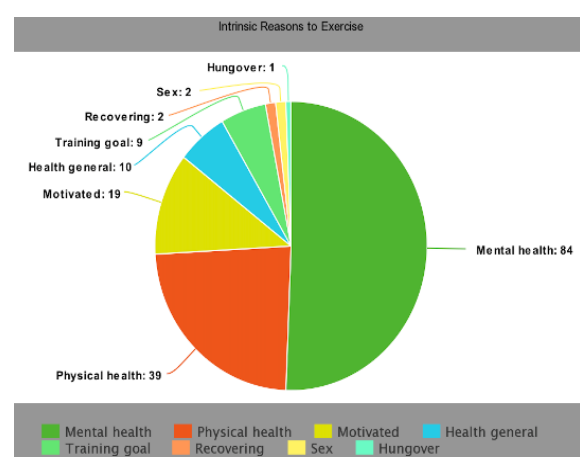


Figure 6

Prestation Reasons for Feelings of Guilt

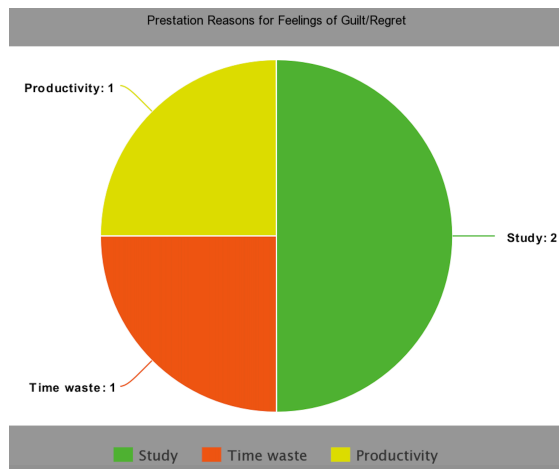


Figure 7

Intrinsic Reasons to Exercise

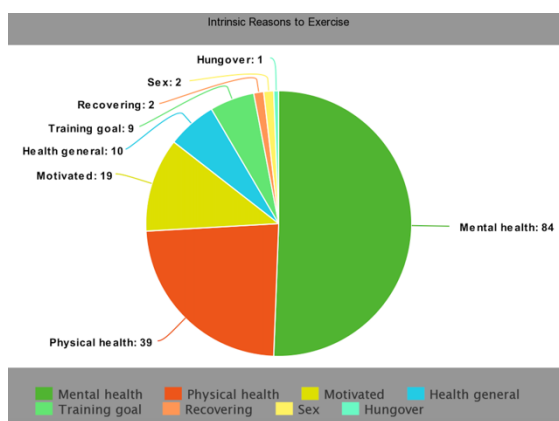
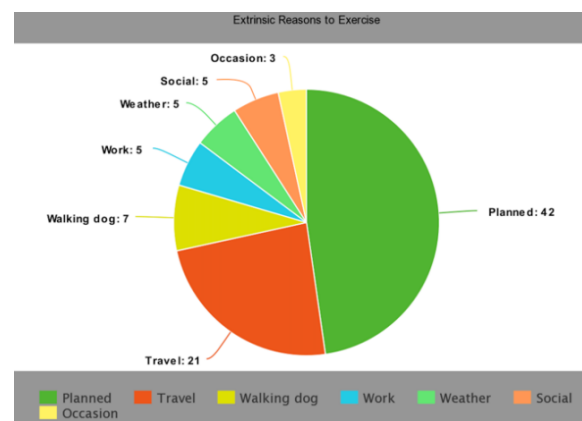


Figure 8

Extrinsic Reasons to Exercise



Discussion

This research aimed to gain further insights into the relationship between AC and PA among students. Specific attention was paid to the extent to which students engaged in AC as a treat after PA and to what degree they experienced guilt after AC.

Main Findings

The results indicate that H_1 and H_2 can be rejected as there was no significant relationship between AC and PA and no significant differences in the average AC between the three PA intensity levels. When investigating the relationship between AC and feelings of guilt, the two LMMs yielded different results. Therefore, H_3 cannot clearly be accepted or

rejected. While the LMM which measured AC as the 'number of alcoholic drinks' to the question of how many alcoholic drinks they consumed indicated a significant positive relationship, the LMM which measured AC as the average 'yes/no' response rate reported in each questionnaire did not show significant results. The qualitative analysis indicates that 'treat' explains the relationship between AC and PA to some degree while no responses were related to 'guilt'.

Relationship between AC and PA / AC and Guilt

Rejecting H_1 and H_2 contradicts the findings of most previous literature that found a significant relationship between AC and PA (French et al., 2009; Musselman & Rutledge, 2010; Walker et al., 2015, Dodge et al., 2016; Werneck et al., 2018) and those that identified significant differences in AC between PA intensity groups (Leasure & Neighbors, 2014; Werneck et al., 2018). One explanation for not finding a significant positive relationship when focusing on students is given by French et al. (2009) who found that, specifically heavy drinkers, engage in high levels of PA, which might not reflect the current sample of students. Considering that four units of alcohol per drinking session define heavy drinkers (National Institute on Alcohol Abuse and Alcoholism, 2023), only 17 out of 66 students can be defined as heavy drinkers. Likewise, Kopp et al. (2014) referred to men who had higher levels of PA and alcohol consumption, but more women participated in this research than men, which could have influenced the results.

The different findings between the two LLMs related to H_3 indicate that participants are more likely to feel guilty when consuming higher numbers of alcoholic drinks while the same cannot be said about AC in general. This seems plausible, considering that AC in the form of one or a few drinks barely results in unforeseen consequences such as intoxicated behaviour and excessive calorie intake. It could be that feelings of guilt are mainly due to physical distress in the form of feeling intoxicated or hungover.

Mechanisms Treat and Guilt

The qualitative results indicate that the sub-code ‘treat’ could partially explain the relationship between AC and PA in the sense of a reward effect as describes by Musselman & Rutledge (2010) and Boecker et al. (2008). It appears that the ‘treat effect’ is not the primary explanation for this relationship, as students mainly mentioned social aspects as well as stress release as reasons for drinking. However, because two responses provided the ‘treat effect’ as a reason to drink after PA, this factor seems to have some relevance. This seems plausible for several reasons. First, as explained by Boecker et al. (2008), a feeling of deserving a treat after engaging in a behaviour perceived as challenging is deeply integrated into human psychology and incentivised by the release of endorphins. Moreover, sociocultural factors can explain this as AC is a typical way of celebrating achievements, which can also be applied to successfully completing PA. Lastly, it could be due to the tendency of humans to justify less healthy behaviour because of proceeded healthy activities such as PA.

However, the study did not find any indicators that students engage in PA after AC because of feelings of guilt, for example, due to weight gain, as assumed by Musselman and Rutledge (2010) and Dodge et al. (2016). Possible reasons could be that students mostly engage in AC in the evening, which leaves little time to engage in PA before answering the next questionnaire. As it takes several hours until the influence of alcohol on the human body is not noticeable anymore, participants might not link their choice of engaging in PA to previous AC. These findings about the role of ‘treat’ and ‘guilt’ can help identify the right prevention methods to limit the risks of excessive AC. Finding that ‘treat’ could explain the relationship to some degree can be relevant to create interventions that protect students from the health implications of AC. Specifically, sports teams, associations, and also individuals could look into other ways of celebrating successes that do not include alcohol intake.

Strengths and Limitations

The key strength of this research is the high quality of available data due to the ES approach which reduced memory bias and the usage of quantitative- as well as qualitative data. Since participants were able to take part in the study using their own devices, the ecological validity was correspondingly higher because the participants participated in their natural environment and the findings were, therefore, more representative of real-world experiences. By using multi-method research, the study could not only gain accurate information about the relationship between AC and PA, but also find indications about the roles of 'treat' and 'guilt'.

First, one of the main limitations of the study is the set-up of the study in the Ethica Avicenna App. The need to send out the pre-questionnaire a second time, a relatively high dropout rate and a high number of NAs which could be due to missing app notifications might have limited the accuracy of the data and decreased the statistical power of the applied tests.

Second, during the statistical analysis, it became apparent that the normality assumption of the models was not entirely met, which is why the results of the LMMs should be handled with caution. Measuring AC and PA as dichotomous variables has also weakened the informative value of the dataset and therefore, the statistical tests. Moreover, the reliability of the GLTEQ was re-measured and, unexpectedly, Cronbach's alpha was no longer $\alpha = .99$ (Asiri et al., 2022) and instead was $\alpha = .63$ when measured on its own. Thus, the internal consistency changed from excellent to questionable, which diminishes the reliability of the results on PA intensity levels.

Third, the study's sampling method in the form of convenience and snowball methods, likely introduced biases as this approach skewed the sample towards self-selected students which were mainly Dutch and female, thereby limiting the generalizability of the findings.

Implications for Future Directions

Since the usage of the ES approach is a rather novel method, further research in this field should be conducted using the same approach to receive greater valuable insights into the nature of the relationship between PA and AC, instead of applying retrospective methodologies. Even though the current study did not find a significant relationship between PA and AC, LMMs should be applied to more complete datasets by requiring participants to fill out all questionnaires as this would increase the statistical power of the tests. Following the indicated relevance of ‘treat’ for the relationship between PA and AC, further research which also includes quantitative tests is necessary to test for example whether ‘treat’ has a mediating role for the relationship. The same should be done for the other most prominent reasons for AC after PA or the other way around, to further understand the relationship.

Conclusion

To conclude, the data that was gathered with the ES approach revealed no significant relationship between AC and PA. Moreover, no significant differences in AC between different levels of PA intensity were found. A significant positive relationship between average AC and experience of guilt was only found with the ‘number of alcoholic drinks’, but not for ‘average AC’. While the quantitative analysis did not find a significant relationship between AC and PA, the qualitative results suggest ‘treat’ to explain the relationship to some degree as two respondents consumed alcohol to reward themselves after engaging in PA. Meanwhile, no responses pointed towards an explanatory role of ‘guilt’ for PA after AC. Future research can build upon the findings of this study by using the ES approach with more complete datasets and further analysing potential explanations for the relationship between PA and AC.

References

- Arain, M., Haque, M., Johal, L., Mathur, P., Nel, W., Rais, A., Sandhu, R. S., & Sharma, S. (2013). Maturation of the adolescent brain. *Neuropsychiatric Disease and Treatment*, 449. <https://doi.org/10.2147/ndt.s39776>
- Asiri, F., Tedla, J. S., Reddy, R. S., Alshahrani, M. S., Alshahrani, A., Sangadala, D. R., Gular, K., Kakaraparthi, V. N., & Dixit, S. (2022). Cross-Cultural Adaptation of the Godin-Shephard Leisure-Time Physical Activity Questionnaire for Arabic Population and Testing its Psychometric Properties. *Medical Science Monitor*, 28. <https://doi.org/10.12659/msm.937245>
- Belli, R. F., Shay, W. L., & Stafford, F. P. (2001). Event history calendars and question list surveys. *Public Opinion Quarterly*, 65(1), 45–74. <https://doi.org/10.1086/320037>
- Boecker, H., Sprenger, T., Spilker, M. E., Henriksen, G., Koppenhoefer, M., Wagner, K. J., Valet, M., Berthele, A., & Tolle, T. R. (2008). The runner's high: opioidergic mechanisms in the human brain. *Cerebral Cortex*, 18(11), 2523–2531. <https://doi.org/10.1093/cercor/bhn013>
- Brussen, K. A. (2010). The Australian Guidelines to Reduce Health Risks from Drinking Alcohol. *Chisholm Health Ethics Bulletin*, 15(3), 9. <https://search.informit.com.au/documentSummary;dn=996963794508484;res=IELAPA;type=pdf>
- Davis, H. A., Riley, E. N., Smith, G. T., Milich, R., & Burris, J. L. (2016). Alcohol use and strenuous physical activity in college students: A longitudinal test of 2 explanatory models of health behavior. *Journal of American College Health*, 65(2), 112–121. <https://doi.org/10.1080/07448481.2016.1260571>
- Dodge, T., & Clarke, P. (2018). Testing weight motives and guilt/shame as mediators of the relationship between alcohol use and physical activity. *Addictive Behaviors*, 77, 131–136. <https://doi.org/10.1016/j.addbeh.2017.09.018>
- Dodge, T., Clarke, P., & Dwan, R. (2016). The relationship between physical activity and alcohol use among adults in the United States. *American Journal of Health Promotion*, 31(2), 97–108. <https://doi.org/10.1177/0890117116664710>

- Dutch Institute for Alcohol Policy. (2021). *Prevalence of heavy episodic drinking*. STAP. <https://www.stap.nl/en/home/facts-and-figures.html>
- French, M. T., Popovici, I., & Maclean, J. C. (2009). Do Alcohol Consumers Exercise More? Findings from a National Survey. *American Journal of Health Promotion*, 24(1), 2–10. <https://doi.org/10.4278/ajhp.0801104>
- Karschnick, R. (2012, July 26). *Alkohol-Studie: Jeder fünfte Student trinkt riskante Mengen Alkohol*. Zeit Online. https://www.zeit.de/studium/uni-leben/2012-07/studie-alkohol-studenten?utm_referrer=https%3A%2F%2Fwww.google.com%2F
- Kopp, M., Burtscher, M., Kopp-Wilfling, P., Ruedl, G., Kumnig, M., Ledochowski, L., & Rumpold, G. (2014). Is There a Link Between Physical Activity and Alcohol use? *Substance Use & Misuse*, 50(5), 546–551. <https://doi.org/10.3109/10826084.2014.980957>
- Leasure, J. L., & Neighbors, C. (2014). Impulsivity moderates the association between physical activity and alcohol consumption. *Alcohol*, 48(4), 361–366. <https://doi.org/10.1016/j.alcohol.2013.12.003>
- Leasure, J. L., Neighbors, C., Henderson, C. E., & Young, C. M. (2015). Exercise and Alcohol Consumption: What We Know, What We Need to Know, and Why it is Important. *Frontiers in Psychiatry*, 6. <https://doi.org/10.3389/fpsy.2015.00156>
- Lees, B., Meredith, L. R., Kirkland, A. E., Bryant, B. E., & Squeglia, L. M. (2020). Effect of alcohol use on the adolescent brain and behavior. *Pharmacology, Biochemistry and Behavior*, 192, 172906. <https://doi.org/10.1016/j.pbb.2020.172906>
- Liangpunsakul, S., Crabb, D. W., & Qi, R. (2010). Relationship among alcohol intake, body fat, and physical activity: A Population-Based Study. *Annals of Epidemiology*, 20(9), 670–675. <https://doi.org/10.1016/j.annepidem.2010.05.014>
- Long, E., Barrett, T. S., & Lockhart, G. (2017). Network-behavior dynamics of adolescent friendships, alcohol use, and physical activity. *Health Psychology*, 36(6), 577–586. <https://doi.org/10.1037/hea0000483>

- Musselman, J. R., & Rutledge, P. C. (2010). The incongruous alcohol-activity association: Physical activity and alcohol consumption in college students. *Psychology of Sport and Exercise, 11*(6), 609–618. <https://doi.org/10.1016/j.psychsport.2010.07.005>
- National Institute on Alcohol Abuse and Alcoholism. (2023). *Alcohol's Effects on Health*. <https://www.niaaa.nih.gov/alcohol-health/overview-alcohol-consumption/moderate-binge-drinking#:~:text=Heavy%20Alcohol%20Use%3A&text=For%20men%2C%20consuming%20five%20or,or%20more%20drinks%20per%20week>
- Nidirect. (2022). Young people and risks of alcohol. *Nidirect*. <https://www.nidirect.gov.uk/articles/young-people-and-risks-alcohol#toc-0>
- Park, S., Cho, M. J., Cho, S. J., Bae, J. N., Lee, J., Park, J., Kim, J. Y., Lee, D. W., & Hong, J. P. (2011). Relationship between physical activity and mental health in a nationwide sample of Korean adults. *Psychosomatics, 52*(1), 65–73. <https://doi.org/10.1016/j.psych.2010.11.017>
- Piazza-Gardner, A. K., & Barry, A. E. (2012). Examining physical activity levels and alcohol consumption: Are people who drink more active? *American Journal of Health Promotion, 26*(3), e95–e104. <https://doi.org/10.4278/ajhp.100929-lit-328>
- Pitts, M., Chow, G. M., & Donohue, B. (2018). Relationship between General and Sport-Related Drinking Motives and Athlete Alcohol Use and Problems. *Substance Use & Misuse, 54*(1), 146–155. <https://doi.org/10.1080/10826084.2018.1512624>
- Sari, E. E., & Erdoğan, S. (2016). Adaptation of the Godin Leisure-Time Exercise Questionnaire into Turkish: The Validity and Reliability Study. *Advances in Public Health, 2016*, 1–7. <https://doi.org/10.1155/2016/3756028>
- Spear, L. P. (2018). Effects of adolescent alcohol consumption on the brain and behaviour. *Nature Reviews Neuroscience, 19*(4), 197–214. <https://doi.org/10.1038/nrn.2018.10>
- Traversy, G., & Chaput, J. (2015). Alcohol Consumption and Obesity: An update. *Current Obesity Reports, 4*(1), 122–130. <https://doi.org/10.1007/s13679-014-0129-4>

- VanKim, N. A., Laska, M. N., Ehlinger, E., Lust, K., & Story, M. (2010). Understanding young adult physical activity, alcohol and tobacco use in community colleges and 4-year post-secondary institutions: A cross-sectional analysis of epidemiological surveillance data. *BMC Public Health, 10*(1). <https://doi.org/10.1186/1471-2458-10-208>
- Vickers, K. S., Patten, C. A., Bronars, C. A., Lane, K., Stevens, S. R., Croghan, I. T., Schroeder, D. R., & Clark, M. M. (2004). Binge drinking in female college students: The association of physical activity, weight concern, and depressive symptoms. *Journal of American College Health, 53*(3), 133–140. <https://doi.org/10.3200/jach.53.3.133-140>
- Walker, A. D., Langdon, J. L., & Johnson, K. A. (2015). Relationships among meeting Physical-Activity guidelines and health risk behaviors. *Journal of Physical Activity and Health, 12*(6), 776–781. <https://doi.org/10.1123/jpah.2014-0079>
- Werneck, A. O., Oyeyemi, A. L., Szwarcwald, C. L., & Silva, D. (2018). Association between physical activity and alcohol consumption: sociodemographic and behavioral patterns in Brazilian adults. *Journal of Public Health, 41*(4), 781–787. <https://doi.org/10.1093/pubmed/fdy202>
- World Health Organization. (2022). Alcohol. *www.who.int*. <https://www.who.int/news-room/fact-sheets/detail/alcohol>

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 AC.

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, PA 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	<input type="radio"/>	<input type="radio"/>
I understand that to take part in this study, I should be at least 18 years old	<input type="radio"/>	<input type="radio"/>
I possess a basic level of English	<input type="radio"/>	<input type="radio"/>
I am a student in the Netherlands in applied sciences or scientific education	<input type="radio"/>	<input type="radio"/>
I am not ongoing a mental health disorder	<input type="radio"/>	<input type="radio"/>
I am not getting a current treatment of substance abuse	<input type="radio"/>	<input type="radio"/>
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	<input type="radio"/>	<input type="radio"/>
I understand that taking part in this study involves filling out two questionnaires every day for one week	<input type="radio"/>	<input type="radio"/>
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	<input type="radio"/>	<input type="radio"/>
I don't expect to receive any benefit or payment for my participation.	<input type="radio"/>	<input type="radio"/>
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.	<input type="radio"/>	<input type="radio"/>
I understand that personal data that will be collected within this study will not be shared with anyone other than the study team.	<input type="radio"/>	<input type="radio"/>
I agree to take part in this study.	<input type="radio"/>	<input type="radio"/>

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, PA and social norms.

What is your age?

- Please fill in your age.

What is your sex?

- Female
- Non-binary / third gender
- Prefer not to say

What is your nationality?

- German
- Dutch
- Other: Please fill in you nationality.

What is the highest degree that you obtained?

- Bachelor's Degree
- Master's Degree
- PhD

- Other: Please fill in your highest degree.

What is the level of the academic programme you are currently in?

- Applied sciences (hbo)
- Academic sciences bachelor (wo)
- Academic sciences master (wo)
- Academic sciences PhD (wo)
- Other: Please fill in the level of the academic programme.

What are your expectations of using this app for the upcoming period?

- Please fill in your expectations.

Do you hope to gain something from the app/study? If so, please elaborate.

- Yes: Please elaborate.
- No

Now, we would like to get more information about your physical activity, in other terms, getting insight about your leisure time activity. During a typical **7-Day period** (a week), how many units on average do you do the following exercise for **more than 15 minutes** during your free time (write on each line the appropriate number)?

- Strenuous exercise, where your heart beats rapidly (e.g., running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling). Units per week: Please fill in.
- Moderate exercise, which is not exhausting for you (e.g., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing). Units per week: Please fill in.
- Mild/ light exercise, which is minimal effort for you (e.g., yoga, archery, fishing from river bank, bowling, horseshoes, golf, snow-mobiling, easy walking). Units per week: Please fill in.

Appendix B

ES Questionnaire

- Indicate how much you would agree: “I craved alcohol in the last 12 hours.” (strongly agree, somewhat agree, neither disagree nor agree, somewhat disagree, strongly disagree)
 - If strongly agree, agree:
 - Why did you experience craving? Please describe the reasons and circumstances for craving.
- Did you drink alcohol in the last 12 hours? (yes/no)
 - If yes:
 - 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 yesterday when you were drinking and with whom. (open)
 - Why did you decide to drink? (open)
 - If no:
 - Why did you decide not to drink? (open)
- How many of your fellow peers/people drank alcoholic beverages in your immediate environment yesterday? (None, less than one-third, about half, more than two-thirds, all)
- How many alcoholic drinks did your fellow peers consume yesterday on average per person? (1 or 2, 3 or 4, 5 or 6, 7 to 9, 10 or more)
- Indicate how much you 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)
- Did you experience feelings of guilt or regret after consuming alcohol in the last 12 hours? (yes/no)
 - If yes:
 - Why did you experience these feelings of guilt or regret?
- Did you exercise in the last 12 hours? (yes/no)
 - If yes:
 - Please rate the intensity level of the activity. (1: Very low intensity; 2: Low intensity; 3: Moderate intensity; 4: High intensity; 5: Very high intensity)

- Please describe your reasons for exercising. (open)
- Please indicate the order in which you drank and exercised.
 - I drank first, exercised afterwards.
 - I exercised first, drank afterwards.

Question asked in the morning questionnaire:

- Are you planning on exercising during the day? (yes/ no)

Question asked in the evening questionnaire:

- Are you planning on exercising in the evening? (yes/ no)

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.

Now, we would like to get more information about your physical activity, in other terms, getting insight about your leisure time activity. During a typical **7-Day period** (a week), how many units on average do you do the following exercise for **more than 15 minutes** during your free time (write on each line the appropriate number)?

- Strenuous exercise, where your heart beats rapidly (e.g., running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling). Units per week: Please fill in.
- Moderate exercise, which is not exhausting for you (e.g., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing). Units per week: Please fill in.
- Mild/ light exercise, which is minimal effort for you (e.g., yoga, archery, fishing from river bank, bowling, horseshoes, golf, snow-mobiling, easy walking). Units per week: Please fill in.

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.

(open)

Appendix D

Coding Scheme

Morning questionnaire

Q ID 5: Why did you experience craving? Please describe the reasons and circumstances for craving				Legend
P. ID	[5_FFT].reason.cravings	Sub-codes	Group codes	
84054	normally I have a party night at Thursday	Habit	Intrinsic	Intrinsic [83]: <ul style="list-style-type: none"> - Stress release [43] - Fun [6] - Celebrate [4] - Mirroring [4] - Taste [4] 1 - Time sober [3] - Christmas mood [2] - Feeling drunk [2] - Sleep [2] - Bored [1] - Confidence [1] - Habit [1] - Treat [1] - Marihuana [1] - Thirst [1] - Drank recently [3] - No drinking option [1]
84054	exam stress and relieve that it was done	Stress release Study Celebrate	Intrinsic Extrinsic	
83992	It was cold outside so me and my girlfriend wanted to drink some mulled wine to get into a christmas mood. We also wanted to treat ourselves because we were studying the whole day.	Relationship Treat Christmas mood	Intrinsic Extrinsic	
83992	because I was working over 8 hours this day till 2 am and had no time to enjoy my weekend.	Stress release Work	Intrinsic Extrinsic	
83932	Because I went out to a club, i wanted to get drunk	Going out	Extrinsic	
83932	We went to a bar and I wanted to drink abeer	Going out Social	Extrinsic	
83916	Because it is friday and I want to go out, socialize, not think about any work or problems and just have a good time	Weekend Going out Stress release Work Social	Intrinsic Extrinsic	
83916	Because I want to go out and have some fun, relax a bit	Going out Fun Stress release	Intrinsic Extrinsic	
83916	I was meeting my friend and we wanted to go to a bar	Going out Social	Extrinsic	
83915	cause i was working	Work	Extrinsic	

Extrinsic [84]:

- Going out [38]
- Social [17]
- Environment [8]

83889	I was kind of bored and also smoking a joint, which I also usually do in combination with a beer. Also I havent drank in a few days now (last time on Sunday) so I guess that plays into it as well	Bored Marihuana Time sober	Intrinsic	<ul style="list-style-type: none"> - Weekend [7] - Work [7] 1 - Availability [5] - Study [3] - Relationship [2] - Drinking plans [3] - Drinking games [2] - Family [2] - Reminded [1]
83889	I havent drank since Sunday, so I feel like my system is telling me it is time again haha.	Time sober	Intrinsic	
83889	I think it's because I hadnt drank for a few days. Also it was Friday and I went out.	Time sober Weekend Going out	Intrinsic Extrinsic	
83886	Weekend	Weekend	Extrinsic	
83865	I was out in the city center with many bars and because everyone was drunk there, i craved a drink as well.	Going out Mirroring	Intrinsic Extrinsic	
83845	After work, wanting to cool down. Get out of the day into bed smoothly.	Stress release Work Sleep	Intrinsic Extrinsic	
83845	I felt the urge to relax while and after working in the cafe. After the gym at home I craved the taste of a single cold beer. I ruminate a lot and with a beer by my side it's less frustrating.	Stress release Work	Intrinsic Extrinsic	
83845	Stress relieve from work, social enjoyment.	Stress release Work Fun Social	Intrinsic Extrinsic	
83845	My boss was slightly annoying at some points. Stress in the restaurant, craved alcohol to get in the flow.	Stress release Work	Intrinsic Extrinsic	
83820	post-exam relief	Stress release Study	Intrinsic Extrinsic	
83816	Done with exam	Study	Extrinsic	
83746	Party	Going out	Extrinsic	
83746	Go to a party	Going out	Extrinsic	
83739	We had planned going to a bar.	Going out	Extrinsic	
83739	I had to have a difficult talk with my partner and I thought it might be easier over a glass of wine.	Stress release Relationship	Intrinsic Extrinsic	

83739	I was told about something similar to Sangria and I really wanted to try it. Then we bought it at the store and I wanted to try it immediately.	Taste	Intrinsic
83739	It was a Friday night	Weekend	Extrinsic
83736	because i was at a concert and it was the vibe	Going out	Extrinsic
83733	Party	Going out	Extrinsic
83726	Because I love Glühwein and since it's almost Christmas I really want to drink some	Taste	Intrinsic
83705	Party with other people	Going out Social	Extrinsic
83690	I met with friends and alcohol was a part of the games we played, it is fun for me in general to drink in the company with others and also helps to feel less awkward and self-conscious. Instead it allows me to let loose a bit and feel more confident and I wanted to have this effect and the "feeling of togetherness" with the others yesterday.	Stress release Confidence Social Drinking games	Intrinsic Extrinsic
83688	I was going clubbing and I wanted to get drunk	Going out Feeling drunk	Intrinsic Extrinsic
83688	because it tastes so good	Taste	Intrinsic
83685	It was a friend's birthday and we celebrated there	Celebrate	Intrinsic
83684	I was around my family and feeling well and anxious at the same time. We went to a restaurant and afterwards spent some time home together watching tv.	Stress release Family	Intrinsic Extrinsic
83673	because a good friend was visiting me	Social	Extrinsic
83673	because my friends also drank alcohol	Social Mirroring	Intrinsic Extrinsic
83673	i was very thirsty and had a beer	Availability	Extrinsic
83671	Because I knew I'll have fun (when i'm drunk) after craving	Fun Feeling drunk	Intrinsic
83664	Birthday party	Celebrate	Intrinsic
83664	Played Beerpong	Drinking games	Extrinsic

83643	we were with some friends yesterday and i wanted to drink a glass because i like the taste and it was really relaxing	Social Taste Stress release	Intrinsic Extrinsic
83642	Was invited to an event, where i know alcohol would be served and i was exited about it.	Going out Availability	Extrinsic
83642	After a win in a Sports competition	Celebrate	Intrinsic
83642	stress	Stress release	Intrinsic
83631	I was invited to a house party which brought me in the mood to drink. Also, I had a good day and was in the mood to enjoy an evening with friends which is usually more fun when drinking a bit	Going out Social Fun	Intrinsic Extrinsic
83631	We went to a party and i was looking forward to drink some and enjoy the evening	Going out Fun	Intrinsic Extrinsic
70817	I was out with friends	Going out Social	Extrinsic
67143	its almost weekend	Weekend	Extrinsic
67143	always crave it on the weekend	Weekend	Extrinsic
67062	I saw I had one beer left in the fridge	Availability	Extrinsic
67062	My friend was talking about drinking alcohol	Reminded	Extrinsic
67062	I was having fun with friends and I bought soju earlier that day	Fun Social Availability	Intrinsic Extrinsic
53013	I have wanted to to drink a little bit before going to bed just to take the edge of a little bit.	Stress release Sleep	Intrinsic
53013	My parents were drinking next to me and were having a good time. So i have thought that one drink could bring me to the same state	Social Family Mirroring	Intrinsic Extrinsic
53013	I was around other people drinking and wanted to feel more social and approachable. Sadly people like me better when i drink lol	Social Mirroring Stress release	Intrinsic Extrinsic
53013	My father brought some beer to the living room. And i did not want to leave him hanging.	Social Availability	Extrinsic

33578	I was talking to a friend about christmas dinner and we both had the urge to drink some wine/gluehwein because we were in the mood	Social Christmas mood	Intrinsic Extrinsic	
33578	I went to a concert and aimed to have a good time by having a beer.	Going out	Extrinsic	
33578	Habging out with friends on a friday night	Social Weekend	Extrinsic	

Q ID 8: Why did you decide to drink?				Legend
P. ID	[8_FFT].reason.to.drink	Sub-codes	Group codes	
84054	I just felt like it, and some friends brought special beers	Craving Availability	Intrinsic Extrinsic	Intrinsic [96]: <ul style="list-style-type: none"> - Stress release [26] - Fun [16] - Craving [14] - Celebrate [7] - Taste [9] - Habit [5] - Mirroring [7] - Treat [6] - Improve mood [2] - Confidence [2] - Thirst [2] - Boundaries [1] - Hungover [1] - Feeling drunk [2] - Long sober [1]
84054	just felt like it	Craving	Intrinsic	
84046	Because i felt like it	Craving	Intrinsic	
83992	Because it was cold outside and we wanted to treat ourselves with a warm mullet wine, as we were studying the whole day.	Treat Study	Intrinsic Extrinsic	
83992	Because I wanted to celebrate how Conscientious i was working	Treat	Intrinsic	
83932	It was my friends birthday and we wanted to party	Celebrate	Intrinsic	
83932	Becos we went out	Going out	Extrinsic	
83922	We could relax, we had no other chores or responsibilities, and we were in a safe environment that allowed us to have a drink	Treat Stress release	Intrinsic Extrinsic	
83916	Because we wanted to try out different beer flavours and get drunk	Feeling drunk Taste	Intrinsic	
83915	as a reward	Treat	Intrinsic	
83889	I was craving it and it tastes good.	Craving Taste	Intrinsic	
83886	Weekend, party of a friebd to have fun	Social Going out	Extrinsic	
83880	I usually drink at the biweekly drinks of my dispuut, I like it and it is gezellig	Habit Social	Intrinsic Extrinsic	
83880	To relax and have a fun date	Stress release Social	Intrinsic Extrinsic	

83880	To get over my hangover and for fun	Hungover Fun	Intrinsic	<ul style="list-style-type: none"> - Study [4] - Food [2] - Offered (3) - Drinking games [2] - Work [2] - Special occasion [1] 1 - Reminded [1] - Sports [1] - social pressure [1]
83867	Felt like it	Craving	Intrinsic	
83865	Because we collectively decided we wanted some GlÃfÃ¼hwein.	Social Craving	Intrinsic Extrinsic	
83865	Recreational drug use - I wanted to have a good time.	Fun	Intrinsic	
83845	I like aesthetic cocktails, rooftop bars and being tipsy.	Fun Environment	Intrinsic Extrinsic	
83845	Because I like it, know i wouldnÃ¢âct go to far and its a personal little traditionÃ¢â habit.	Craving Boundaries Habit	Intrinsic	
83845	Because I can and wanted to. First glÃfÃ¼hwein of the year lets go.	Availability Craving	Intrinsic Extrinsic	
83845	Because I craved it, because i like to calm down after work.	Craving Stress release Work	Intrinsic Extrinsic	
83845	Left over	Availability	Extrinsic	
83844	I wanted to be more active and involved in the party	Social Going out	Extrinsic	
83820	had it easily accessible and wanted to celebrate	Availability Celebrate	Intrinsic Extrinsic	
83808	Another girl ordered a Glass of wine and I followed her example	Mirroring	Intrinsic	
83746	Have fun	Fun	Intrinsic	
83746	to have fun	Fun	Intrinsic	
83739	Because I like the beer/wine, and to socialize.	Taste Social	Intrinsic Extrinsic	
83739	I wanted to try a new drink.	Taste	Intrinsic	
83739	We decided to not go to a bar but we still wanted to drink	Social	Extrinsic	
83736	because i wanted to be a little drunk at the concert since its a special occasion and after that i was looking forward to drink mulled wine since its almost christmas and i love the taste	Environment Special occasion Craving	Intrinsic Extrinsic	
83733	Because of more fun	Fun	Intrinsic	

83705	I was enjoying the company	Social Fun	Intrinsic Extrinsic
83699	Good looking drinks on the menu	Reminded	Extrinsic
83699	Because i wanted to and the bottle of wine was already open	Craving Availability	Intrinsic Extrinsic
83699	It fitted the food	Food	Extrinsic
83690	It was included in the games and I knew that it would help me to feel less self-conscious and more comfortable and confident. I also just like to drink with friends from time to time, it has a social aspect.	Drinking games Stress release Confidence Social	Intrinsic Extrinsic
83688	because I didn't party in gangnam yet so I wanted to see how that was, and because my friends wanted to go clubbing	Environment Going out	Extrinsic
83688	because of tigos birthday	Celebrate	Intrinsic
83685	Because it was his Birthday and we wanna had fin together	Celebrate	Intrinsic
83684	Because its "normal" for me to drink a beer when having dinner at a restaurant, because i knew i would feel better after drinking it and because we were served free shots and i did not/ could not say "no"	Habit Environment Availability Social Improve mood	Intrinsic Extrinsic
83673	because it is fun	Fun	Intrinsic
83673	because the vibe was really nice	Environment	Extrinsic
83673	because a friend had bday	Celebrate	Intrinsic
83673	i just wanted to have a beer	Craving	Intrinsic
83671	Everyone was deunk, i wanted to relax and have a good time	Mirroring Stress release Fun	Intrinsic
83671	I wanted to get a good feeling	Improve mood	Intrinsic
83671	I enjoy it! i think it is healthy to have a good balance between free time, drinking in this case, and studying. I studied the whole day	Stress release Study Fun Treat	Intrinsic Extrinsic

83671	I was in the mood for it! :) I did so much for exams the last days, sometimes you have to enjoy your nights with friends and get some drinks	Craving Stress release Treat Study	Intrinsic Extrinsic	
83671	I had quite a busy day with working, studying, gym sessions I wanted to spend some time doing what I enjoy	Work Study Sports Stress release Fun	Intrinsic Extrinsic	
83664	Aunt offered	Availability Social	Extrinsic	
83664	Its actually no decision. It just kind of belongs to this kind of events.	Habit	Intrinsic	
83647	Because I was with my friends who drank alcohol and I like rose wine.	Social Mirroring Taste	Intrinsic Extrinsic	
83643	because i like the taste of champaign and it was relaxibg. i didnt really think much about ist	Taste Stress release	Intrinsic	
83642	Because its fun	Fun	Intrinsic	
83642	Won a game	Celebrate	Intrinsic	
83631	Just because i liked the taste abd everyone got a beer	Taste Mirroring Social	Intrinsic Extrinsic	
83631	Because everybody was drinking and usually these events are more fun if people drink	Social Mirroring Fun	Intrinsic Extrinsic	
83631	We played beerpong and basicslly meet to drink	Drinking games Social	Extrinsic	
70817	Everyone else was drinking and it was fun	Social Mirroring Fun	Intrinsic Extrinsic	
70475	I just felt like it no specific reason	Craving	Intrinsic	

68884	It was Friday-Saturday night its time to relax	Social Stress release	Intrinsic Extrinsic	
68884	It was a lovely evening, just to relax	Stress release	Intrinsic	
67143	cause we always do that on Thursday nights	Habit Social	Intrinsic Extrinsic	
67062	I wanted to try the soju	Taste	Intrinsic	
53156	Because everyone drank	Social Mirroring	Intrinsic Extrinsic	
53013	To feel less anxious and more social. It makes me a bit funnier and more chatty, which is needed in these situations	Stress release Confidence Social	Intrinsic Extrinsic	
53013	Because i wanted to have a good time and bond with my parents.	Fun Social	Intrinsic Extrinsic	
38959	Because I wanted to habe risotto	Food	Extrinsic	
37535	Because we were celebrating together abd a friends of mine who diesnt drink was the driver	Celebrate	Intrinsic Extrinsic	
34817	because i tasted the wine	Taste	Intrinsic	
33578	To relax, to enjoy the music more by getting a little tipsy	Stress release Fun	Intrinsic	

Q ID 9: Why did you decide not to drink?				Legend
P. ID	[9_FFT].reason.not.drinking	Sub-codes	Group codes	
84174	I was at work, doing my chores at home and had to sleep before I could even think about drinking. I also do not have alcohol in the house currently.	Responsibilities Sleep Availability	Obligations Environment Physical state	Personal [135]: <ul style="list-style-type: none"> - No craving [128] - Drank previously [5] - Anxiety [1] - Feeling drunk [1] - Other cravings [1] - Rational [1] -
84174	I was using other substances	Other drugs	Other activities	
84174	I did not feel a need to drink alcohol	No craving	Personal	
84174	It was Sunday night and I have school today. I also don't have alcohol in the house	Sunday Fit next day Study Availability	Obligations Environment Timing	

84054	because I would rather not drink on Mondays, Tuesdays and Wednesdays	Timing	Timing	Obligations [89]: <ul style="list-style-type: none"> - Study [32] - Wake up early [21] - Work [16] - Fit next day [9] - Alcohol break [6] - Responsibilities [6] Environment [69]: <ul style="list-style-type: none"> - No occasion [48] - Alone [11] - Availability [7] - Mirroring [2] - With parents [1] - Weather [1] Physical state [64]: <ul style="list-style-type: none"> - Sleep [32] - Sick [12] - Tired [13] - Hungover [2] - Pain prevention [3] - Health [2] - Recovering [1] Timing [17]: <ul style="list-style-type: none"> - Weekday [7] - Daytime (1) - Timing [6] - Sunday [3] - Drinking later [1]
84054	not feeling like it	No craving	Personal	
84054	did not feel like it	No craving	Personal	
84054	I have an exam today	Study	Obligations	
84046	Decided to sleep or work instead	Sleep Work	Obligations Physical state	
84046	Sleep/work	Sleep Work	Obligations Physical state	
84046	Work	Work	Obligations	
84046	Didnt think about it	No craving	Personal	
84046	Had other thinfs to do	Responsibilities	Obligations	
84046	Didkt think about it	No craving	Personal	
83992	Because I had to work on my Bachelor Theses	Study	Obligations	
83984	I was asleep/ a bit sick	Sleep Sick	Obligations Physical state	
83984	No Occasion	No occasion	Environment	
83984	Have to work today	Work	Obligations	
83984	Was alone at home/ no Occasion	Alone No occasion	Environment	
83962	No craving	No craving	Personal	
83962	Health	Health	Physical state	
83932	I wanted to spent the evening by myself and had no urge to drink	Alone No craving	Personal Environment	
83932	I had no urge to drink. None of my friends were deinking	No craving Mirroring	Personal Environment	
83932	I didnt want to	No craving	Personal	
83932	I had to study	Study	Obligations	
83922	I'm not much of a drinker, I only consume alcohol on special occasions when I'm hanging out with friends	No occasion	Environment	
83922	I didn't feel like it	No craving	Personal	

83922	I didn't feel like it	No craving	Personal	Other activities [15]: - Busy [7] - Sport [5] - Other drugs [3] - Traveling [1]
83922	I didn't want to	No craving	Personal	
83922	I didn't want to	No craving	Personal	
83922	I didn't want to	No craving	Personal	
83920	I don't really like alcohol	No craving	Personal	
83920	I don't really like alcohol	No craving	Personal	
83920	I have an alcohol break	Alcohol break	Obligations	
83920	I don't like alcohol	No craving	Personal	
83920	I didn't want alcohol	No craving	Personal	
83920	I had some alcohol before, but I already felt it so I didn't want alcohol anymore	Alcohol break	Personal	
83920	Alcoholbreak	Alcohol break	Obligations	
83916	Because I did not have any cravings to drink, also it is the middle of the week and I had classes the other day.	No craving Weekday Study	Personal Obligations Timing	
83916	Because i did not want to	No craving	Personal	
83916	Because I do not want to drink alone	Alone	Environment	
83916	Because I had enough last time	No craving Drank previously	Personal	
83916	Because I do not want it and do not have time for that	No craving Busy	Personal Other activities	
83915	cause i have to go to uni the next day	Study Fit next day	Obligations	
83915	i was sleeping	Sleep	Physical state	
83915	i was sleeping and studying	Sleep study	Obligations Physical state	
83915	i had nothing at home	Availability	Environment	
83915	sleep	Sleep	Physical state	
83915	sleep	Sleep	Physical state	
83912	no interest	No craving	Personal	
83912	no interest	No craving	Personal	

83912	no interest	No craving	Personal
83912	no interest	No craving	Personal
83912	no interest	No craving	Personal
83912	no interest	No craving	Personal
83889	I am on my period and was really tired. I was drinking a lot in the weekend and just need a break.	No craving Tired Alcohol break	Personal Obligations Physical state
83889	I wasn't in a social setting because I feel a little low energy right now (lots of travels in the past weeks, also I'm on my period). So I wasn't inclined to drink.	No craving Alone Tired	Personal Physical state
83889	I went to the gym and smoked a joint afterwards. I had cravings but I didn't feel like drinking, it also has given me heartburn a lot lately.	Sport Other drugs No craving Pain prevention	Personal Physical state Other activities
83889	I was out in a bar and had very low energy and felt like alcohol would just make me less energetic. Also I just wasn't feeling like it. I kind of had heart burn as well and alcohol makes it worse.	Tired No craving Pain prevention	Personal Physical state
83889	I wasn't in the mood. Also it's healthier.	No craving Health	Personal Physical state
83886	It was tuesday	Weekday	Timing
83886	Sock, wednesday	Weekday	Timing
83886	I was studying and it was a sunday. No special event	Study Sunday No occasion	Obligations Environment Timing
83880	I had to study and I don't want to drink every day	Study Alcohol break	Obligations
83880	Stayed home and didn't feel like it	No occasion No craving	Personal
83880	Not the occasion	No occasion	Environment
83880	Sports, tired, not the occasion, and had to be sharp/fit today	Sports Tired	Obligations Environment

		No occasion Fit next day	Physical state Other activities
83867	Busy with internship and tired	Busy Tired	Physical state Other activities
83867	I was sleeping	Sleep	Physical state
83866	because I was tired from drinking the day before	Drank previously Tired	Personal Physical state
83866	there was no need	No occasion	Environment
83866	no reason to	No occasion	Environment
83866	because i was tired of daydrinking	Tired Drank previously	Personal Physical state
83866	because i have to study today	Study	Obligations
83866	no reason to drink	No occasion	Environment
83865	I studied late and was alone at home so I had no reason/occasion to drink.	Alone No occasion	Environment
83865	There was no occassion for drinking and I was alone in the evening. I usually do not drink alone.	No occasion Alone	Environment
83865	I was hungover yesterday and today is monday so I have to gonto uni. I didnt want to be hungover again.	Drank previously Sunday Study Fit next day	Personal Obligations Timing
83865	I was sick and I am still sick today	Sick	Physical state
83845	Didnt feel like it. Had to wake up early today.	No craving Wake up early	Personal Obligations
83844	I didnt have the opprtunity and I dont need it	No occasion No craving	Personal Environment
83844	No need	No craving	Personal
83841	Because of work and studying.	Work Study	Obligations
83841	Didn't want to have a drink.	No craving	Personal
83841	No need to have a drink.	No craving	Personal
83841	No need to drink.	No craving	Personal

83841	Didn't want to.	No craving	Personal
83841	No need to	No craving	Personal
83836	Had to work	Work	Obligations
83836	Why should have I?	No craving	Personal
83825	Food poisoning	Sick	Physical state
83825	Food poisoning	Sick	Physical state
83825	Food poisoning	Sick	Physical state
83825	Food poisoning	Sick	Physical state
83825	Food poisoning	Sick	Physical state
83820	didn't consider	No craving	Personal
83816	I am studying and I do not want to drink alone	Study Alone	Obligations Environment
83816	Midterms	Study	Obligations
83816	Studying and had no interest in drinking	Study No craving	Personal Obligations
83816	No alcohol in my vicinity	Availability	Environment
83808	because I don't need it and I was doing stuff for university with a friend	No craving Study	Personal Obligations
83808	there was no reason to drink	No craving No occasion	Personal Environment
83808	i'm sick	Sick	Physical state
83808	I didn't think about it, was sick and didn't want to	No craving Sick	Personal Physical state
83746	Study, tired	Study Tired	Obligations Physical state
83746	Study, wake up early, sport	Study Wake up early Sport	Obligations Other activities
83746	Chill, sleep	No craving Sleep	Personal Physical state

83746	Study, need sleep	Study Sleep	Obligations Physical state
83742	I get migraines from drinking	Pain prevention	Physical state
83742	I was asleep	Sleep	Physical state
83742	I didnt want to	No craving	Personal
83742	I didnt want to	No craving	Personal
83742	I didnt want to	No craving	Personal
83740	I did not have a reason	No craving No occasion	Personal Environment
83740	I slept	Sleep	Physical state
83740	I slept	Sleep	Physical state
83740	I slept	Sleep	Physical state
83740	I slept	Sleep	Physical state
83739	I wasn't feeling like it.	No craving	Personal
83739	Had to get up early, didnt feel like it	Wake up early No craving	Personal Obligations
83739	Not feeling like it	No craving	Personal
83739	I don't want to drink to make things easier" (aka for the wrong reasons).	No craving	Personal
83736	i didnt think about drinking	No craving	Personal
83736	because i didnt want to	No craving	Personal
83736	i didnt want to, i am at uni, i have stuff to do, its morning	No craving Study Responsibilities Timing	Personal Obligations Timing
83736	i was sleeping	Sleep	Physical state
83736	no desore, i was sleeping and working	No craving Sleep Work	Personal Obligations Physical state
83736	i was sleeping	Sleep	Physical state

83733	Within the week, not in tye mood	Weekday No craving	Personal Timing	
83726	I was alone with my boyfriend and therefore didn't even have the idea to drink alcohol.	No craving	Personal	
83726	I had to go to uni next morning and just wanted to sleep.	Fit next day Study Sleep Wake up early	Obligations Physical state	
83726	I had school next day and needed to make a presentation for which I needed to be concentrated	Fit next day Study	Obligations	
83726	Because I needed to sleep and i had work from 6am on.	Sleep Tired Work	Obligations Physical state	
83726	I had to sleep and had to work	Sleep Work	Obligations Physical state	
83726	Because the only thing I did was sleeping	Sleep	Physical state	
83699	Didn't want to drink	No craving	Personal	
83699	Didnt have an occasion	No occasion	Environment	
83690	There was no resson or occasion and I do not drink alone	No craving No occasion Alone	Personal	
83688	still hangover and tired	Hungover Tired	Physical state	
83688	I was tired	Tired	Physical state	
83688	I was busy with other stuff, didn't think of it	Busy No craving	Personal Other activities	
83685	I had to lern a lot	Study	Obligations	
83685	I only drink alcohol when I go out to party	No occasion	Environment	

83684	Same reasons as the previous days Same reasons as the previous days <i>I wasn't in a (social) situation where it would be appropriate or where other people drank alcohol. Furthermore, im normally not drinking alcohol when im alone</i>	No occasion Alone No craving	Personal Environment	
83673	i had to work late	Work	Obligations	
83673	i was very hung over from the day before	Hungover	Physical state	
83673	because I wanted to stay sober	Alcohol break	Obligations	
83673	because it was not the vibe	No occasion No craving	Personal Environment	
83671	Because i was tired :(i was supposed to go to a party but i cancelled it	Tired No occasion	Environment Physical state	
83671	I was not in the mood and had to drive	No craving Responsibility	Personal Obligations	
83671	I was at home and didnt feel the incentive to drink, also i worked out in the evening	No occasion No craving Sport	Personal Environment	
83664	No creavings	No craving	Personal	
83664	Its a monday	Weekday	Timing	
83664	No opportunity	No occasion	Environment	
83662	There was not an occasion to drink (i usually only drink at parties/ late night hangouts with friends)	No occasion	Environment	
83662	No reason	No occasion No craving	Personal Environment	
83662	No reason to drink	No occasion No craving	Personal Environment	
83662	No reason	No occasion No craving	Personal Environment	
83662	No reason	No occasion No craving	Personal Environment	

83662	No reason	No occasion No craving	Personal Environment
83647	there was no occasion to drink	No occasion	Environment
83643	Because it didnt even came to my mind and there was no occassion to drink.	No occasion No craving	Personal Environment
83643	Because I went to the gym yesterday (from 8-10 pm) and therefore didn't drink, because it would affect my performance. i am also invited to my aunts birthay party today, so i dont want to be hungover.	Sports Fit next day	Obligations Other activities
83643	It didnt came to my mind to drink alcohol because i was really tired in the evening. i also wanted to do some study work this morning so i went to bed early	No craving Tired Study Wake up early	Personal Obligations Physical state
83643	Because i am working at a school on mondays. therefore i do not drink and especially not in the morning	Work	Obligations
83643	Because i am a little bit sick and dont feel very well right now. drinking alcohol would not make me feel better in my body	Sick	Physical state
83643	because i have uni today and i am still not feeling very well. i didnt even think about drinking alkohol	Study Sick No craving	Personal Obligations Physical state
83643	because i am at work right now and i am working in a school	Work	Obligations
83642	no active decision, i just didnt	No craving	Personal
83642	no reason or desire	No craving No occasion	Personal
83642	had nothing to mix, didnt want to drink pure vodka	Availability	Environment
83637	I mostly drink at parties/gatherings or when i go out and i did not participate in any of those activities in the last 12 hours because of school.	No occasion Study	Obligations
83637	I mostly drink in company and at parties/gatherings. There was no such event in the last 12 hours.	No occasion	Environment
83637	There was no event	No occasion	Environment
83632	because I'm throwing a party today	Fit next day	Obligations
83632	because nobody else did	Mirroring	Environment

83632	because I had to work today	Work	Obligations
83632	because I have to work today	Work	Obligations
83631	I had uni the next day early in the morning and wanted to stay fit	Study Wake up early Fit next day	Obligations
83631	I spent the evening at home and worked for uni, no need to drink alcohol	No occasion Study No craving	Obligations Environment
83631	I went to the gym and drinking before / after didnt make sense to me as ig would counterbalance my efforts	Sports	Other activities
83631	I studied last night	Study	Obligations
83628	I was asleep	Sleep	Physical state
70817	I had uni in the morning and was working until late. There was no reason to drink. I thought briefly that a drink would help me sleep but didnt crave it	Study Wake up early Work No occasion No craving	Personal Obligations Environment
70817	no craving and busy witj uni	No craving Study	Personal Obligations
70817	I was at my parents house	With parents	Environment
70475	I dont drink during the day	Daytime	Timing
70475	Wasnt in the mood, did some fun activities outside	No craving Busy	Personal Other activities
70475	Didnt want to	No craving	Personal
70475	Didnt feel like it	No craving	Personal
70475	Didnt feel like it	No craving	Personal
70296	was working	Work	Obligations
70296	were spliffin	Other drugs	Other activities
70151	I didn't decide i just didn't even think about it	No craving	Personal
70151	I didnt want to lol also i was literally sleeping	No craving Sleep	Personal Physical state

70151	I was sleeping/ i dont drink in the morning	Sleep Timing	Physical state Timing
70151	I didnt even consider it	No craving	Personal
68884	I was alone tonight, I normally dont drink alone	Alone	Environment
68884	I did not want	No craving	Personal
67143	I didnt feel like drinking yesterday	No craving	Personal
67143	had to drive	responsibility	Obligations
67143	already had a lot of alcohol during the day yesterday	Drank previously	Personal
67143	dont drink on a monday	Weekday	Timing
67143	had other things to do	Busy	Physical state
67062	It would be too much of a hassle to get the alcohol	Availability	Environment
67062	I wasn't really craving alcohol	No craving	Personal
67062	I wasn't craving alcohol at all	No craving	Personal
65213	I had to go to the dentinst and didn't feel like getting there drunk.	Responsibilities	Obligations
65213	I was either busy or sleeping	Busy Sleep	Physical state Other activities
65064	I had no cause to drink alcohol.	No craving No occasion	Personal Environment
65064	There was no reason to drink alcohol.	No craving No occasion	Personal Environment
65064	I didnt want to drink	No craving	Personal
65064	There was no reason to drink	No craving No occasion	Personal Environment
65064	There was no reason to drink	No craving No occasion	Personal Environment
65064	There was no reasonf for drinking	No craving No occasion	Personal Environment
65064	There was bo reason	No craving No occasion	Personal Environment

53156	It was a week day and no special occasion. Also i did not crave alcohol	Weekday No occasion No craving	Personal Environment Timing
53156	I did not feel like drinking	No craving	Personal
53156	I did not feel like drinking	No craving	Personal
53156	There was no urge to drink	No craving	Personal
53156	I did not thibk about drinking	No craving	Personal
53156	It never crossed my mind to drink	No craving	Personal
53013	I thought it was unnecessary since i am going to bed soon anyways and might have worse sleep due to being a bit intoxicated	Sleep	Physical state
53013	I felt like there was no reason for me to drink or go out of my way to find one	No craving No occasion Availability	Personal Environment
53013	It was already late, and i could still handle being sober as i was habing fun anyways	Timing No craving	Personal Timing
38959	Because I don't drink on my own and I had other stuff to do	Alone Busy	Environment Other activities
38959	I did not feel like it	No craving	Personal
38959	I did not want to	No craving	Personal
38959	I am sick	Sick	Physical state
38112	did not crave it	No craving	Personal
38112	didnt want to	No craving	Personal
38112	didnt want to	No craving	Personal
38112	didnt feel the need to	No craving No occasion	Personal Environment
38112	didnt want to	No craving	Personal
38112	didnt want ro	No craving	Personal
37535	I didn't want to drink any alcohol so there was also no need for it.	No craving	Personal
37535	There was no reason to drink and no craving	No craving No occasion	Personal Environment

37535	There was no reason for drinking	No craving No occasion	Personal Environment	
37535	I was sleeping most of the time and i dont drink in the morning	Sleep Timing	Physical state Timing	
34817	I was not thinking about drinking alcohol, so I did not conciously decided to not drink.	No craving	Personal	
34817	didn't think about it	No craving	Personal	
34817	did not think about it	No craving	Personal	
34817	i did not think about it	No craving	Personal	
34817	I did not want to drink.	No craving	Personal	
34817	I did not want to.	No craving	Personal	
33578	I was sleeping and went to uni this morning.	Sleep Study	Obligations Physical state	
33578	I was sleeping	Sleep	Physical state	
33578	Its too early for a drink	Timing	Timing	
33578	Not in the mood	No craving	Personal	
33578	I slept!! Who drinks alcohol before 11am	Sleep	Physical state	

Q ID 14: Why did you experience these feelings of guilt/regret?				Legend
P. ID	[14_FFT].reason.guilt	Sub-codes	Group codes	
83880	I drank too much and am hungover	Hungover	Physical	Physical [14]: - Hungover [5] - Pain [3] - Fitness [3] - Health [2]
83867	Cause it has bad effect on my sport goals	Fitness	Physical	
83865	Because now I am hungover and have a headache.	Hungover Pain	Physical	
83845	Felt a little slow this morning, not hungry until 12:00	Energy	Mental	Mental [9]: - Energy [5] - Black-out [1] - Habit [1]
83844	Quality of sleep not good and less concentration in studying	Energy Study	Mental Prestation	
83820	hangover	Hungover	Physical	

83808	it's actually yes and no because usually I don't regret it as I didn't drink much but I started to feel a bit like getting a cold yesterday and now the cold is getting stronger so maybe I should have taken a tea instead	Health	Physical	<ul style="list-style-type: none"> - Frequency [1] - Lost control [1] Prestation [4]: <ul style="list-style-type: none"> - Study [2] - Time waste [1] - Productivity [1]
83739	I had less sleep than I would have had without going out, and I had a slight headache.	Energy Pain	Physical Mental	
83699	I have a slight hangover	Hungover	Physical	
83688	because I'm feeling super hangover right know	Hungover	Physical	
83688	cuz I skipped my classes now	Study	Prestation	
83673	because I was too drunk yesterday and I can not remember most of the day	Black-out	Mental	
83671	Because of the sweet calories	Fitness	Physical	
83671	I know alcohol is very unhealthy for your body. Also I try to keep a more or less strict diet, and alcohol has lots of calories	Fitness Health	Physical	
83664	Habit	Habit	Mental	
67062	I felt like I drink alcohol too often	Frequency	Mental	
53013	I could have also not drank anything and felt a bit exhausted waking up this morning. Even though i only had 2 drinks	Energy	Mental	
53013	Because even low amounts of alcohol causes issues to my sleep quality and the next day	Energy	Mental	
33578	I had a bit of stomach aches afterwards and right now I'm in my way to uni with a small headache too. I dont know, j think i would have had a good time without the two beers too and experiencing complaints later	Pain	Physical	

Q ID 17: Please describe your reasons for exercising				Legend
P. ID	[17_FFT].reasons.exercising	Sub-codes	Group codes	
84054	to prepare for a marathon	Training goal	Intrinsic	Extrinsic [42]: <ul style="list-style-type: none"> - Occasion [2] - Social [2] - Walking dog [3] - Weather [2]
84054	staying fit	Physical health	Intrinsic	
84054	staying fit	Physical health	Intrinsic	
84054	staying fit	Physical health	Intrinsic	
84046	Routine	Planned	Extrinsic	

84046	Planned to work up early so I would have time to work out and couldnt back out	Planned	Extrinsic	<ul style="list-style-type: none"> - Work [1] - Travel [11] - Planned [20] Intrinsic [82]: <ul style="list-style-type: none"> - Motivated [5] - Sex [2] - Health general [5] - Mental health [43] - Physical health [21] - Hungover [1] - Training goal [5] - Recovering alcohol [2]
84046	Good weather	Weather	Extrinsic	
84046	Felt like it	Mental health	Intrinsic	
83962	Fun	Mental health	Intrinsic	
83962	Health	Health general	Intrinsic	
83932	I went running and did excersises afterwards	Motivated	Intrinsic	
83932	Went for a run and did pull- and push ups after that	Motivated	Intrinsic	
83922	Health reasons	Health general	Intrinsic	
83922	to be healthy	Health general	Intrinsic	
83922	health reasons	Health general	Intrinsic	
83920	I had hockey practice	Planned	Extrinsic	
83920	I had horse riding	Planned	Extrinsic	
83916	I live far away from the university, therefore, I need to walk home quite a lot (even from the bus stop).	Travel	Extrinsic	
83916	I went to the gym	Planned	Extrinsic	
83915	To feel more comfortable	Mental health	Intrinsic	
83889	I'm employed at a remote job right now and sit 8 hours a day. To balance my energy levels I need exercise in the afternoon, otherwise my back hurts and I feel like I have too much energy.	Physical health Mental health	Intrinsic	
83889	I had a lot of excess energy from sitting at my desk all day. It helps my back and my mental health.	Physical health Mental health	Intrinsic	
83889	Physical Health (e.g., for my back) because I sit all day. Also mental health	Physical health Mental health	Intrinsic	
83867	Felt motivated	Motivated	Intrinsic	
83867	Fun	Mental health	Intrinsic	
83866	it keeps me fit and i enjoy it	Physical health Mental health	Intrinsic	
83866	i was dancing on a festival	Occasion	Extrinsic	
83865	Trying to keep a healthy lifestyle as well ad possible	Health general	Intrinsic	
83865	I went for a walk because moving and fresh air helped my hungover	Hungover	Intrinsic	

83845	I want to look healthy and get some muscle.	Physical health Training goal	Intrinsic
83845	Keeping on track with training schedule	Planned Training goal	Extrinsic
83844	Mental and physical health. It helps for studying	Physical health Mental health	Intrinsic
83816	Um sports evening xcore xourse and biking through Maastricht	Planned Travel	Extrinsic
83816	Biking	Travel	Intrinsic
83816	Went bouldering and bike through Maastricht	Planned Travel	Extrinsic
83746	Uni, study	Travel	Intrinsic
83740	I had to work	Travel	Intrinsic
83740	I had to go to work	Travel	Intrinsic
83740	Sex	Sex	Intrinsic
83740	Yoga in the morgen verteibt kummer und sorgen	Mental health	Intrinsic
83739	I was feeling like it.	Motivated	Intrinsic
83739	It was a sunny day so I went hiking with my boyfriend.	Weather	Extrinsic
83733	Wanted to moove my body!!	Motivated	Intrinsic
83726	We had a match which I had to take part in. It's fun. I like my teammates. It's keeping me fit. I'm a huge teamplayer and therefore want to support them.	Planned Physical health Social	Extrinsic Intrinsic
83685	I want to reach my goals	Training goal	Intrinsic
83671	I like exercising! :)	Mental health	Intrinsic
83671	Yes, I like working out in the mornings :)	Mental health	Intrinsic
83671	Exercising is part of almost my daily routine	Planned	Extrinsic
83664	Football	Planned	Extrinsic
83664	Weekly gym routine	Planned	Extrinsic
83662	Get in shape	Training goal	Intrinsic

83643	Because going to the gym is my hobby and i feel better in my body when i did some sport	Mental health	Intrinsic
83643	my boyfriends friend visited us yesterday. they share the same hobby (gym, meal prep etc). and i decided to go to the gym with them. i was not able to go to the gym very often in the last weeks because of study work i had to do first. so i am really happy that i have more opportunities to go now. it helps me to balance my uni life and my free time	Social Mental health	Intrinsic Extrinsic
83642	Competition match	Planned	Extrinsic
83642	scheduled practice for team sports	Planned	Extrinsic
83632	because football is fun for me	Planned Mental health	Extrinsic Intrinsic
83631	No soecific reason, I wanted to do some excercising before drinking cause i know that i would not be able to do it the next day	Planned	Extrinsic
83631	I wanted to free my head from studying	Mental health	Intrinsic
83628	party	Occasion	Extrinsic
70817	Work activities	Work	Extrinsic
70475	I didn't have a reason i had to bike to get to my destination	Travel	Extrinsic
70475	Part of my routine	Planned	Extrinsic
70151	We walked a lot while exploring a City on a mountain	Travel	Extrinsic
67143	gym	Planned	Extrinsic
67143	going to the gym	Planned	Extrinsic
67143	Daily gym	Planned	Extrinsic
67062	I had to go somewhere, so I chose to bike there through the wind and snow	Travel	Extrinsic
65213	I was having sex	Sex	Intrinsic
53156	To stay fit and a nice distraction after uni	Physical health Mental health	Intrinsic
53156	It makes me feel good	Mental health	Intrinsic
38959	I biked yesterday and I also went to a work out class with my friend	Travel Planned	Extrinsic

37535	Walking with my dog	Walking dog	Extrinsic	
37535	Walking with my dog	Walking dog	Extrinsic	
37535	Walking with my dog	Walking dog	Extrinsic	
34817	I wanted to feel good.	Mental health	Intrinsic	
34817	to feel good	Mental health	Intrinsic	
34817	To feel good.	Mental health	Intrinsic	
34817	To reduce stress.	Mental health	Intrinsic	

Evening questionnaire

Q ID 2: Why did you experience craving? Please describe the reasons and circumstances for craving.				Legend
P. ID	[2_FFT].reason.cravings	Sub-codes	Group codes	
84174	I had a night planned with some wine with girls and I was looking forward to it :)	Social	Extrinsic	Intrinsic [27]: - Stress release [11] - Celebrate [1] - Mirroring [4] - Taste [1] - Bored [1] - Habit [4] - General [2] - Drank recently [2] - No drinking option [1] Extrinsic [21]: - Social [2] - Weekend [1] - Work [1] - Availability [3] - Study [1] - Relationship [1] - Reminded [1] - Environment [8] - Drinking plans [3]
84174	I had alcohol yesterday	Drank recently	Intrinsic	
84054	it's my party day	Habit	Intrinsic	
84054	because my friends were also enjoying beer	Mirroring	Intrinsic	
83916	Because i have made plans to go to a bar tomorrow, to meet with my friend	Drinking plans	Extrinsic	
83915	i am not sure maybe stress	Stress release	Intrinsic	
83915	stress	Stress release	Intrinsic	
83889	I just feel like having a beer. Craving is less because I drank yesterday but its still there.	General	Intrinsic	
83866	because im on a festival	Environment	Extrinsic	
83865	I was at a christmas market with friends and there were alcohol/GlÃfÃ¼hwein shops so we drank some.	Availability Environment	Extrinsic	
83865	I was sad and wanted to numb the feeling a bit but decided that this is not healthy behaviour and didnt drink.	Stress release	Intrinsic	
83845	During work, when I felt annoyed/stressed wanted to get in my flow	Stress release	Intrinsic	
83841	Had a good party with friends	Environment Social	Extrinsic	
83820	post-exam feeling, stress	Stress release	Intrinsic	
83820	stress	Stress release	Intrinsic	
83820	stress	Stress release	Intrinsic	
83816	Done with exam and its the weekend	Study Weekend	Extrinsic	
83739	I drank yesterday	Drank recently	Intrinsic	
83739	I was leaving my LDR boyfriend and could not drink tonight.	No drinking option Relationship	Intrinsic Extrinsic	

83736	i was at the christmas market	Environment	Extrinsic
83726	There was GlÃfÃ¼hwein at the christmasmarket and it was very cold and since I had no GlÃfÃ¼hwein yet I really wanted some.	Environment Availability	Extrinsic
83726	We were at a handball match as fans and we always drink beer at these games so it's like a tradition or more like a habit	Environment Habit	Intrinsic Extrinsic
83673	we went to a music festival in the city	Environment	Extrinsic
83673	because a friend had a beer	Mirroring	Intrinsic
83673	yes because I just wanted to have a drink	General	Intrinsic
83673	i had a hard day of work and wanted to relax with a beer	Stress release Work	Intrinsic Extrinsic
83664	Party is planned for the evening	Drinking plans	Extrinsic
83643	We went to a birthday party and my family had a drink so i wanted to have one too. i also like the taste of it	Celebrate Mirroring Taste	Intrinsic Extrinsic
83632	because I'm throwing a party today	Drinking plans	Extrinsic
67143	because its Thursday	Habit	Intrinsic
67143	other people where drinking alcohol	Mirroring	Intrinsic
67143	on sunday i always want to drink	Habit	Intrinsic
67062	I did groceries and as I put them away I realised I hadn't bought something alcoholic to drink, which made me crave a beer	Reminded	Extrinsic
67062	I had a hard day and wanted to unwind with a beer	Stress release	Intrinsic
67062	I had a hard day and wanted to unwind and feel tipsy	Stress release	Intrinsic
53013	I have got this craving because i want to numb some negative feelings and i also experience boredom. Its also available at home which makes it easy	Stress release Bored	Intrinsic
38112	not really cravings but i planned to drink some glÃfÃ¼hwein with a friend in the evening today so i was looking forward to that! its cozy during wintertime	Availability	Extrinsic
38112	i am at the christmas market	Environment	Extrinsic

Q ID 6: Why did you decide to drink?

P. ID	[6_FFT].reasons.for.drinking	Sub-codes	Group codes	Legend
84174	It was planned and we were celebrating me becoming official with my new partner	Celebrate	Intrinsic	Intrinsic [38]: <ul style="list-style-type: none"> - Stress release [5] - Fun [3] - Craving [5] - Taste [5] - Mirroring [1] - Celebrate [6] - Treat [2] - Habit [4] - Improve mood [1] - Hungover [1] - Feeling drunk [2] - Long sober [1] - Thirst [2] Extrinsic [37]: <ul style="list-style-type: none"> - Social [14] - Environment [8] - Availability [4] - Offered [3] - Food [2] - Weekend [1] - Party [2] - social pressure [1] - Occasion [1]
84054	I think it is habitual	Habit	Intrinsic	
83920	Because I felt pressure	Stress release	Intrinsic	
83916	Because we are watching a movie	Social Social	Extrinsic	
83880	Trying to get over my hangover	Hungover	Intrinsic	
83880	My teammanager made me	Social pressure	Extrinsic	
83867	To celebrate the end of internship and start of weekend	Celebrate Weekend	Intrinsic Extrinsic	
83866	to party	Party	Extrinsic	
83865	Because I havent has alcohol for 2 weeks and decided it was a good occassion	Long sober Occasion	Intrinsic Extrinsic	
83845	To celebrate	Celebrate	Intrinsic	
83845	I had some red wine left. Wouldn't hurt to empty it.	Availability	Extrinsic	
83845	Because I have plenty of drinks around and felt the need to drink	Availability Craving	Intrinsic Extrinsic	
83844	Because they ordered a bear for me and i didnt want to refuse it	Offered	Extrinsic	
83841	To get a bit comfy	Stress release	Intrinsic	
83820	unwind while we were watching a movie	Social Stress release	Intrinsic Extrinsic	
83816	Fitted with the meal and someone brought wine	Food	Extrinsic	
83808	the vibe	Environment	Extrinsic	
83742	I wanted a fruity drink and the waiter offered an Aperol	Craving Availability	Intrinsic Extrinsic	
83739	I like beer and to socialize.	Taste Social	Intrinsic Extrinsic	
83739	I felt like it	Craving	Intrinsic	
83739	I craved sangria	Craving	Intrinsic	

83736	because i love mulled wine and it belongs to the christmas vibe for me	Craving	Intrinsic	
83726	Because we always do it when we support our friends at their match	Habit Environment Social	Intrinsic Extrinsic	
83688	when I got to the restaurant	Environment	Extrinsic	
83688	because it is just one glass, it fit the vibe and I like wine	Environment Taste	Intrinsic Extrinsic	
83673	because I was seeing my friend	Social	Extrinsic	
83673	because i was thirsty	Thirst	Intrinsic	
83673	because a friend has his bday today	Social Celebrate	Intrinsic Extrinsic	
83673	because i was thirsty	Thirst	Intrinsic	
83664	It is an drinking party	Party	Extrinsic	
83643	i did not think about the reasons or why i decided to. it is somewhat normal to me to drink a little bit at such events	Habit Environment	Intrinsic Extrinsic	
83643	i was taking a bath and wanted to drink a beer. i just like the taste of it and it makes me a little bit more relaxed	Taste Stress release	Intrinsic Extrinsic	
83642	Tough practice, good mood	Treat Feeling drunk	Intrinsic	
83631	Because of the taste, it was a good drink for my dinner	Taste Food	Intrinsic Extrinsic	
83631	They ordered one round for all of us	Offered	Extrinsic	
70817	everyone else was drinking and i want to feel tipsy	Mirroring Feeling	Intrinsic	
70151	They had local beer that i wanted to try	Taste	Intrinsic	
68884	Because its Friday, its time to relax and have some fun	Weekend Stress release Fun	Intrinsic Extrinsic	
67143	we always do it after practise	Habit Environment Social	Intrinsic Extrinsic	

67143	makes hanging out with friends more fun	Fun Social	Intrinsic Extrinsic	
67143	to have fun	Fun	Intrinsic	
67062	I wanted to feel good	Improve mood	Intrinsic	
53156	Because it was social	Social	Extrinsic	
38112	social	Social	Extrinsic	
37535	Because we want to celebrate that my friend is getting married and we were at a nice location	Celebrate Environment Social	Intrinsic Extrinsic	
37535	Because it was part of the vidit in the synagogue although i could have taken grape juice but i did not want to drink it	Environment Availability Social	Extrinsic	
37535	To celebrate with my family	Celebrate Social	Intrinsic Extrinsic	
34817	Because I just finished my exam and 8l wanted to reward myself	Treat	Intrinsic	
34817	Because they were offering Hot Wine and I like to drink it during christmas time.	Offered	Extrinsic	

Q ID 7: Why did you not decide to drink?				Legend
P. ID	[7_FFT].reasons.for.not.drinking	Sub-codes	Group codes	
84174	I drank yesterday and was a little bit hungover today	Hungover	Physical state	Personal [138]: - No craving [129] - Drank recently [5] - Anxiety [1] - Feeling drunk [1] - Other cravings [1] - Rational [1]
84174	I used other substances yesterday so I am still recovering. I don't think it's healthy to drink alcohol after, and I don't want to either	Recovering No craving	Physical state Personal	
84174	I have school tomorrow	Study	Obligations	
84174	I was at school so I did not find the reasons the drink	Study	Obligations	
84054	not on monday	Monday	Timing	
84054	because I do not wanna drink on Tuesday	Tuesday	Timing	
84054	I have an exam tommorow	Study	Obligations	
84054	because it is monday	Monday	Timing	

84046	Busy doing other things	Busy	Other activities	<ul style="list-style-type: none"> - Fit next day [1] - Alcohol break [3] - Appointment [1] <p>Environment [72]:</p> <ul style="list-style-type: none"> - No occasion [60] - Alone [6] - Availability [3] - Home [2] - Weather [1] <p>Physical state [23]:</p> <ul style="list-style-type: none"> - Tired [4] - Sick [8] - Pain prevention [1] - Hungover [9] - Recovering [1] <p>Timing [19]:</p> <ul style="list-style-type: none"> - Weekday [3] - Sunday [2] - Daytime [7] - Monday [5] - Tuesday [1] - drinking later [1] <p>Other activities [28]:</p> <ul style="list-style-type: none"> - Busy [19] - Sport [8] - Traveling [1]
84046	I was working	Work	Obligations	
84046	I was working	Work	Obligations	
84046	Didnt thibk about it	No craving	Personal	
84046	Didnt think about it	No craving	Personal	
84046	Didnt have time to think about it	No craving	Personal	
83992	I was Busy working so I had not Intention to do it.	Work	Obligations	
83992	Because I had no interest and or use in it. I wanted to have a clear mind	No craving	Personal	
83984	Not the right Occasion/ was at work	No occasion Work	Obligations Environment	
83984	No Occasion	No occasion	Environment	
83984	Didnt want	No craving	Personal	
83984	At work	Work	Obligations	
83984	No Occasion	No occasion	Environment	
83962	No ocasion	No occasion	Environment	
83962	No occasion	No occasion	Environment	
83962	No occasion	No occasion	Environment	
83932	I am still hangover from yesterday	Hungover	Physical state	
83932	I had to study and no urge to drink	Study No craving	Personal	
83932	No urge to	No craving	Personal	
83932	No urge to	No craving	Personal	
83932	No reason to	No craving No occasion	Personal Environment	
83922	I didn't want to drink alcohol	No craving	Personal	
83922	I didn't feel like it	No craving	Personal	
83922	there was no occasion to drink	No occasion	Environment	
83922	I didn't want to	No craving	Personal	
83922	I didn't want to	No craving	Personal	
83922	I didn't want to	No craving	Personal	

83920	I don't like alcohol	No craving	Personal
83920	I don't like alcohol	No craving	Personal
83920	Alcohol break	Alcohol break	Obligations
83920	Now I really want an alcoholbreak	Alcohol break	Obligations
83920	don't like alcohol	No craving	Personal
83916	Because I am not craving it	No craving	Personal
83916	Because I do not want to drink today by myself and for no reason	No craving Alone No occasion	Personal Environment
83916	Because I did not want to	No craving	Personal
83916	I did not want to	No craving	Personal
83915	because of studying	Study	Obligations
83915	had none and its a sunday	Availability Sunday	Environment Timing
83915	i was at work	Work	Obligations
83915	rational thought that i shouldnt	Rational	Personal
83915	same reason as always. studying	Study	Obligations
83912	no interest	No craving	Personal
83912	no interest	No craving	Personal
83912	no interest	No craving	Personal
83889	It was daytime and I want to be clear during the day. I dont enjoy drinks during the day.	Daytime	Timing
83889	I wasnt in the mood also I need a break.	No craving Alcohol break	Personal Obligations
83886	Sick	Sick	Physical state
83880	Work	Work	Obligations
83880	I drank a lot yesterday	Drank recently	Personal
83880	Not really the occasio, and have had enough the last days	No occasion Drank recently	Personal Environment
83880	Working and not the occasion	Work No occasion	Obligations Environment

83867	No time, busy with internship and really tired	Busy Tired	Physical state Other activities	
83867	Tired and internship	Busy Tired	Physical state Other activities	
83866	because i did not have the urge and social activity according to	No craving No occasion	Personal Environment	
83866	because I had stuff to do during the day and wanted to exercise afterwards	Busy Sport	Other activities	
83866	because it is sunday	Sunday	Timing	
83866	no reason	No craving No occasion	Personal Environment	
83866	stuff to do	Busy	Other activities	
83865	I was very busy today and just wanted to watch a movie in the evening - alcohol is not needed for that	Busy No occasion	Environment Other activities	
83865	I was busy	Busy	Other activities	
83865	I was badly hungover from last night	Hungover	Physical state	
83865	See before. [referring to:] <i>"I was badly hungover from last night"</i>	Hungover	Physical state	
83865	I was sick and in bed.	Sick	Physical state	
83844	I have not thought about and i had the chance but i chose water	No craving	Personal	
83844	Not needed it	No craving No occasion	Personal Environment	
83844	No need	No craving No occasion	Personal Environment	
83844	I was studying	Study	Obligations	
83841	Focus on work. No need.	Work No craving	Personal Obligations	
83841	Work and studies.	Work Study	Obligations	

83841	No need to drink.	No craving No occasion	Personal Environment	
83841	Work and studies.	Work Study	Obligations	
83841	Work and studies	Work Study	Obligations	
83836	I had to work, if i drink alcohol, it goes along with social events. On a normal day, i dont even thing of alcoholic beverages.	No craving No occasion Work	Personal Obligations Environment	
83836	Because there wasnt a single reason to do it	No craving No occasion	Personal Environment	
83825	I have school and i dont care for alcohol at all	Study No craving	Personal Obligations	
83825	Food poisoning	Sick	Physical state	
83825	Food posooning	Sick	Physical state	
83825	Its monday	Monday	Timing	
83820	didn't consider it	No craving	Personal	
83820	busy	Busy	Other activities	
83820	busy	Busy	Other activities	
83816	Studying	Study	Obligations	
83808	i'm sick	Sick	Physical state	
83808	i'm sick	Sick	Physical state	
83808	i didn't want to	No craving	Personal	
83759	There was no opportunity. Plus i try not to drink during the week.	No occasion weekday	Environment Timing	
83759	There was no desire	No craving	Personal	
83746	Study	Study	Obligations	
83746	Study, sport	Study Sport	Obligations Other activities	
83746	Study, sport	Study Sport	Obligations Other activities	

83746	Shopping, exercising	Busy Sport	Other activities	
83742	I still get migraines from drinking	Pain prevention	Physical state	
83742	I didn't want to drink	No craving	Personal	
83742	I didn't want to.	No craving	Personal	
83742	I didn't want to. There was no reason to drink, I was at uni.	No craving No occasion Study	Personal Obligations	
83742	I was at uni. I didn't want to drink.	Study No craving	Personal Obligations	
83740	I did not have a reason to do so	No craving No occasion	Personal Environment	
83740	I had no reason to do so	No craving No occasion	Personal Environment	
83736	because i was alone and it was daytime, i had stuff to do and i dont like drinking alcohol that much	Alone Daytime Busy No craving	Personal Environment Timing Other activities	
83736	because i dont drink alone, i dont drink at daytime and i just didnt want to	Alone Daytime No craving	Personal Environment Timing	
83736	i didnt think about it	No craving	Personal	
83736	i didnt want to, i didnt think about it, i was studying	No craving Study	Personal	
83736	because i dont like the feeling of being tipsy/drun	Feeling drunk	Personal	
83736	because i didnt want to and didnt think of it	No craving	Personal	
83733	Wasnt in tte mood	No craving	Personal	
83733	Not in tge mood	No craving	Personal	
83733	Not in tge mood	No craving	Personal	
83726	There was no occasion for which it was necessary to drink.	No craving No occasion	Personal Environment	

83726	I was at my university and had to prepare a presentation, for which I had to concentrated for. Alcohol therefore would have been counterproductive.	Study	Obligations
83726	I was at university and had to go to the dentist, therefore alcohol would've been bad	Study Appointment	Obligations
83726	I had to work and then just took a nap and was very tired still so I didn't want to be any more tired, which mostmy happens when I drink alcohol	Work Tired	Obligations Physical state
83726	I had to work and then just wanted take a nap	Work Tired	Obligations Physical state
83726	It started to rain and I didn't want to drink in the rain	Weather	Environment
83705	I drank the day before	Drank recently	Personal
83705	Work	Work	Obligations
83705	Because i drank yesterday	Drank recently	Personal
83699	I didn't want to drink	No craving	Personal
83699	I didn't see a reason to drink and didn't want to	No craving No occasion	Personal Environment
83699	Bc I didnt want to	No craving	Personal
83690	I was in university the whole day and there was no urge, need or occasion to drink, especially during the day.	Study No craving No occasion Daytime	Personal Environment Timing
83690	There was no reason or occasion.	No craving No occasion	Personal Environment
83690	There was no occasion and I did different activities with a friend that did not have to include alcohol.	No occasion Busy	Environment Other activities
83688	because I was super hangover	Hungover	Physical state
83688	I was studying and just didn't feel like it	Study No craving	Personal Obligations

83684	I wasn't in a (social) situation where it would be appropriate or where other people drank alcohol. Furthermore, im normally not drinking alcohol when im alone	No occasion Alone	Environment
83673	i was busy working so i had no time to do something else	Work	Obligations
83673	because i had no time	Busy	Other activities
83673	I have no money for Alcohol	Availability	Environment
83673	because I was busy	Busy	Other activities
83671	Didnt feel like drinking and there was no occasion	No craving No occasion	Personal Environment
83671	I dont like to drink during the day	No craving Daytime	Personal Timing
83671	If there is no occassion i dont like to drink during the day, i rarely do that Mostly when i'm with other people	No craving No occasion Alone	Environment
83671	I worked and studied	Work Study	Obligations
83671	I worked and did uni stuff, were really busy today. No time to enjoy and had no incentive	Work Study Busy No craving	Personal Obligations Other activities
83671	I was busy the whole day, felt no incentive to drink today. Also there was no occasion to do it	Busy No craving	Personal Other activities
83671	I worked the whole day, felt no incentive	Work No craving	Personal Obligations
83671	Felt no incentive	No craving	Personal
83664	Only on the weekend	Weekday	Timing
83664	Hangover	Hungover	Physical state
83664	Don't drink on mondays	Monday	Timing

83662	No occasion (I dont drink alone)	No occasion Alone	Environment	
83662	No reason	No craving No occasion	Personal Environment	
83662	No reason	No craving No occasion	Personal Environment	
83647	there was no reason to drink. I spent a relaxed day at home and didn't go out.	No craving No occasion Home	Personal Environment	
83643	Because i am currently working on my essay and i wouldnt be able to focus if i drank alcohol. i also want to go to the gym this evening	Study Sports	Obligations Other activities	
83643	Because i had to do a lot of study work and therefore wanted to be concentrated	Study	Obligations	
83643	i am still relatively sick so i did not want to drink alcohol	Sick	Physical state	
83643	because i work at a school on fridays and i dont consume alcohol during my shift	Work	Obligations	
83642	I had no reason to drink	No craving No occasion	Personal Environment	
83642	no reason or desire	No craving No occasion	Personal Environment	
83642	no reason or desire	No craving No occasion	Personal Environment	
83637	I mostly drink in company at parties/gatherings or when i go out and i did not participate in any of that in the last 12 hours.	No occasion	Environment	
83632	because I have to work tomorrow	Work Fit next day	Obligations	
83632	because I'm throwing a party today	Drinking later	Timing	
83632	because I'm hungover	Hungover	Physical state	
83632	because I was working	Work	Obligations	

83632	because I was working	Work	Obligations
83632	because I was working	Work	Obligations
83631	There was no occasion, i was dtudying the whole day and went to the gym	No occasion Study Sport	Obligations Environment Other activities
83631	I spent the day at uni and had no incentive	Study No craving	Personal Obligations
83631	I usually only drink on weekends or special occasions to maintain a balance between uni, sport and drinking.	Weekday No occasion Sport Study	Obligations Environment Timing Other activities
83628	I wanted to be sober	No craving	Personal
83628	I did not think about it	No craving	Personal
83628	Hangover	Hungover	Physical state
70817	No cravings or opportunity	No craving No occasion	Personal Environment
70817	Work	Work	Obligations
70817	uni	Study	Obligations
70817	no reason	No craving No occasion	Personal Environment
70817	Hungover	Hungover	Physical state
70817	no reason to drink, work and school	No craving No occasion Work Study	Personal Obligations Environment
70475	I dont know	No craving No occasion	Personal Environment
70475	Did not feel like it	No craving	Personal
70475	Didnt feel like it	No craving	Personal
70475	Didnt feel like it	No craving	Personal
70296	didnt want	No craving	Personal

70296	didnt want to	No craving	Personal
70296	didnt want	No craving	Personal
70296	didnt want to	No craving	Personal
70151	I was traveling but also i didnt even consider it	Traveling No craving	Personal Other activities
70151	I didnt even consider it	No craving	Personal
70151	I didn't see why i should drink	No craving No occasion	Personal Environment
68884	I did not have any occasion, I was not in the mood as well	No craving No occasion	Personal Environment
68884	I was very busy, i did not have time to relax, i also did not want it	Busy No craving	Personal Other activities
68884	I was busy	Busy	Other activities
67143	i was just at home	Home	Environment
67143	i dont do that on a monday	Monday	Timing
67143	was busy	Busy	Other activities
67143	had uni the whole day	Study	Obligations
67062	I felt it was too early in the day for me to drink. So I did not.	Daytime	Timing
67062	It was too much of a hassle to go to the store for alcohol	Availability	Environment
67062	I wasn't craving alcohol at all	No craving	Personal
67062	I didn't crave alcohol at all today	No craving	Personal
65213	I've had enough to drink for one weekend I think.	Drank recently	Personal
65213	Training and drinking is not a good combination. And yes, I speak from experience.	Sport	Other activities
65064	No reason for it	No craving No occasion	Personal Environment
65064	There was no reason for deinking	No craving No occasion	Personal Environment
65064	There was no reason	No craving No occasion	Personal Environment

65064	There was no reason	No craving No occasion	Personal Environment
65064	There was no reason	No craving No occasion	Personal Environment
65064	There was no drinking reason	No craving No occasion	Personal Environment
53156	I didnt feel like drinking	No craving	Personal
53156	It did not cross my mind	No craving	Personal
53156	It did not cross my mind	No craving	Personal
53156	I did not feel like drinking	No craving	Personal
53156	I was not in the mood	No craving	Personal
53156	It was not on my mind	No craving	Personal
53013	It takes a lot of mental effort to actually pour myself a drink. Its not something that i am used to	No craving	Personal
53013	I felt very physically sick today, howver i craved oder things to reduce some heavy anxiety that i am having	Sick Other cravings Anxiety	Personal Physical state
53013	There was no reason, urge nor opportunity to drink.	No craving No occasion	Personal Environment
53013	No reason too, as well as being very early in the day	No craving No occasion Daytime	Personal Environment Timing
38959	I did not feel like it	No craving No occasion	Personal Environment
38959	I didn't want to	No craving	Personal
38959	I didn't want to	No craving	Personal
38959	Because I didn't want to	No craving	Personal
38112	why should i? i dont drink alcohol on a daily basis	No craving	Personal
38112	i did not crave it	No craving	Personal
38112	didnt want to	No craving	Personal
38112	had no reason to	No craving No occasion	Personal Environment

38112	didnt want to	No craving	Personal	
38112	didnt want to	No craving	Personal	
37535	There was no reason to drink	No craving No occasion	Personal Environment	
37535	There was no readon to drink	No craving No occasion	Personal Environment	
37535	There was no reason to drink	No craving No occasion	Personal Environment	
34817	did not think about it	No craving	Personal	
34817	I did not want to drink something	No craving	Personal	
34817	I did not want to drink.	No craving	Personal	
34817	I did not want to.	No craving	Personal	
34817	I did not want to.	No craving	Personal	
33578	I had uni, not in the mood to drink	Study No craving	Personal Obligations	
33578	Not in the mood	No craving	Personal	
33578	Studying	Study	Obligations	

Q ID 12: Why did you experience these feelings of guilt/regret?				Legend
P. ID	[12_FFT].reasons.for.guilt	Sub-codes	Group codes	
83844	I dont feel healthy	Health	Physical	Physical [2]: - Health [1] Mental [1]: - Lost control [1] Prestation [2]: - Time waste [1] - Productivity [1]
83688	because I waisted my sunday	Time waste	Prestation	
83673	because I was feeling out of control	Lost control	Mental	
83631	I did not really need it and still wanted to be productive today	Productivity	Prestation	

Q ID 21: Please describe your reasons for exercising.

P. ID	[21_FFT] Reasons.exercising	Sub-codes	Group codes	Legend
84174	I haven't exercised in a while and I like running	Mental health	Intrinsic	Extrinsic [47]: - Occasion [1] - Social [3] - Walking dog [4] - Weather [3] - Work [4] - Travel [10] - Planned [21] - Time [1] Intrinsic [86]: - Motivated [14] - Health general [5] - Mental health [41] - Physical health [18] - Recovering alcohol [2] - Training goal [4] - Compromising diet [2]
84054	staying fit	Physical health	Intrinsic	
84054	staying fir	Physical health	Intrinsic	
84054	voluntary work	Work	Extrinsic	
84054	soccer practice	Planned	Extrinsic	
84046	Felt like it	Motivated	Intrinsic	
84046	Routine	Planned	Extrinsic	
83984	Staying fit	Physical health	Intrinsic	
83984	To look and feel good	Physical health Mental health	Intrinsic	
83962	Being healthy.	Health general	Intrinsic	
83962	Well being	Mental health	Intrinsic	
83962	Fun	Mental health	Intrinsic	
83932	Workout in the gym	Planned	Extrinsic	
83932	Bcos i like to excercise and I had time to do so	Mental health Time	Extrinsic Intrinsic	
83920	I had horseriding	Planned	Extrinsic	
83920	hockey match	Planned	Extrinsic	
83920	Biking for 30 minutes	Travel	Extrinsic	
83916	I was walking from and to university for about 20 minutes two times today	Travel	Extrinsic	
83916	I decided to take a walk since the weather was good today	Weather	Extrinsic	
83912	had the feeling to move myself	Motivated	Intrinsic	
83912	friend asked me to join her	Social	Extrinsic	
83889	I sit all day because of my job. I do it for my back/body and it helps me deal with stress.	Physical health Mental health	Intrinsic	
83880	Went swimming	Motivated	Intrinsic	
83880	Weekly volleybal training	Planned	Extrinsic	
83880	Cycle to the amazing place	Travel	Extrinsic	

83866	i wanted to, feels good	Motivated Mental health	Intrinsic
83866	its nice	Mental health	Intrinsic
83865	Ive ate too much today (more than my calorie limit)	Compromising diet	Intrinsic
83865	I drank on the weekend and had a lot of unhealthy/ fatty food. I wanted to make up for the unhealthy stuff I did over the weekend.	Compromising diet	Intrinsic
83845	Building muscle	Training goal	Intrinsic
83844	Mental health, better studying, improve quality of sleeping	Mental health	Intrinsic
83844	Mental clearness, physical shape, socialising	Mental health Physical health Social	Extrinsic Intrinsic
83836	It was fun and is beneficial for health	Mental health Health general	Intrinsic
83825	I usually exercise once every day but couldn't because of illness	Physical health	Intrinsic
83820	good weather for running	Weather	Extrinsic
83820	commuting	Travel	Extrinsic
83820	commuting	Travel	Extrinsic
83816	Bycicling and walking through Maastricht	Travel	Extrinsic
83816	Outdoor cold water swimming and running	Motivated	Intrinsic
83759	Lacrosse practice	Planned	Extrinsic
83759	Gym	Planned	Extrinsic
83746	Motivated	Motivated	Intrinsic
83746	Uni, study, prepare for a test	Mental health	Intrinsic
83746	Study for tests, train for sport-tests	Mental health Training goal	Intrinsic
83746	Study	Mental health	Intrinsic
83742	I like dodgeball.	Mental health	Intrinsic
83740	I had to work	Work	Extrinsic
83740	I had to get to uni	Travel	Extrinsic

83739	I like it.	Mental health	Intrinsic
83736	i love doing sports, it clears my head and makes me feel good	Mental health Physical health	Intrinsic
83736	because i had my weekly hockey training and i enjoy moving my body to clear my head	Planned Mental health	Extrinsic Intrinsic
83736	i love swimming and feeling stronger everyday	Mental health Physical health	Intrinsic
83736	i went iceskating for fun	Mental health	Intrinsic
83733	Feel more energized then	Mental health	Intrinsic
83733	In tge mood	Motivated	Intrinsic
83733	More strength	Physical health Training goal	Intrinsic
83699	I like climbing	Mental health	Intrinsic
83688	I want to get fit	Physical health	Intrinsic
83688	I want to get fit	Physical health	Intrinsic
83671	I like doing sports!! :) Working out is good for your health and its been a while	Mental health Health general	Intrinsic
83671	I like working out, especially after an weekend of partying	Health general Recovering alcohol	Intrinsic
83671	I like exercising	Mental health	Intrinsic
83671	Work outs are part of my routine:) Even exercising more when i did smth unhealthy like drnking or fast food	Planned Recovering alcohol	Extrinsic
83664	Bachelorthesis due in december	Mental health	Intrinsic
83662	Getting in better shape	Physical health	Intrinsic
83662	Getting in shape	Physical health	Intrinsic
83643	because i feel better when i do some type of sport during the day. it is also helpful when i have lots of uni work to do something different that makes me fun	Mental health	Intrinsic
83642	scheduled practice	Planned	Extrinsic
83637	For fun.	Mental health	Intrinsic
83632	because i feel nice afterwards	Mental health	Intrinsic

83631	I go to the gym twice a week and didnt go for some time. Also it helos me to free my mind in the evening	Planned Mental health	Extrinsic Intrinsic
83631	I went to the gym cause i cannot do other sports at the monent	Planned	Extrinsic
83631	Riding the bile to uni and back (20 min)	Travel	Extrinsic
83631	Rode the bike fir half an hour to go to uni and back and get groceries on the way	Travel	Extrinsic
83628	party	Occasion	Extrinsic
70817	Walking and working	Travel Work	Extrinsic
70817	mental and physical health	Metal health Physical health	Intrinsic
70817	Needed some air	Mental health	Intrinsic
70817	work	Work	Extrinsic
70475	I felt the need ti	Motivated	Intrinsic
70475	It feels good	Mental health	Intrinsic
70296	wanted to feel exhausted	Motivated	Intrinsic
70296	wish for activation	Motivated	Intrinsic
70296	want to be active	Physical health	Intrinsic
70151	I wanted to improve my strength and practice some skills like handstand	Training goal	Intrinsic
68884	I was playing golf	Planned	Extrinsic
67143	football practise	Planned	Extrinsic
67143	Daily gym	Planned	Extrinsic
67143	just going to the gym	Planned	Extrinsic
67143	i had a football game	Planned	Extrinsic
67143	football practice	Planned	Extrinsic
67143	Daily gym	Planned	Extrinsic
65213	I have standard training days on Monday and Wednesday (I do gymnastics).	Planned	Extrinsic

65064	I exercised because its good for my body.	Physical health	Intrinsic	
65064	I had the desire for it	Motivated	Intrinsic	
65064	I just did it vecause its good for me	Health general	Intrinsic	
53156	It makes me feel good	Mental health	Intrinsic	
53156	To do something good to my body	Physical health	Intrinsic	
53156	I like exercising	Mental health	Intrinsic	
53156	I enjoy moving my body	Mental health	Intrinsic	
38959	I wanted to	Motivated	Intrinsic	
38959	I wanted to	Motivated	Intrinsic	
38112	to get my energy out	Mental health	Intrinsic	
38112	get energy out	Mental health	Intrinsic	
37535	Walking with my dog Want to move my body	Walking dog Motivated	Extrinsic Intrinsic	
37535	Walking with my dog Sports woth friends	Walking dog Social	Extrinsic	
37535	Walking the dog	Walking dog	Extrinsic	
37535	Walking with my dog	Walking dog	Extrinsic	
34817	after university I felt stressed and exercising helps me to relieve some stress and feel good about myself	Mental health	Intrinsic	
34817	To feel good and move my body after a long day of studying.	Mental health	Intrinsic	
34817	To reduce my stress level.	Mental health	Intrinsic	
34817	To feel good	Mental health	Intrinsic	

Appendix E

LMMs: Additional Information about Linear Assumptions

Model A accounts for the relationship between ‘PA (yes/no)’ and ‘average AC (yes/no)’, Model B accounts for the relationship between ‘PA (yes/no)’ and ‘number of alcoholic drinks’, Model C for the relationship between ‘guilt (yes/no)’ and ‘average AC (yes/no)’ and lastly, Model D for the relationship between ‘guilt (yes/no)’ and ‘number of alcoholic drinks’.

Linearity

Residuals of both Model A (see Figure 1), Model B (see Figure 2), Model C (see Figure 3) and Model D (see Figure 4) show random scatter patterns around the x-axis, indicating the linearity of all models. While some outliers from the main cloud can be observed, no clear discernible pattern can be observed. This means that the LMMs accurately represent the data points.

Figure 1

Linearity for Model A

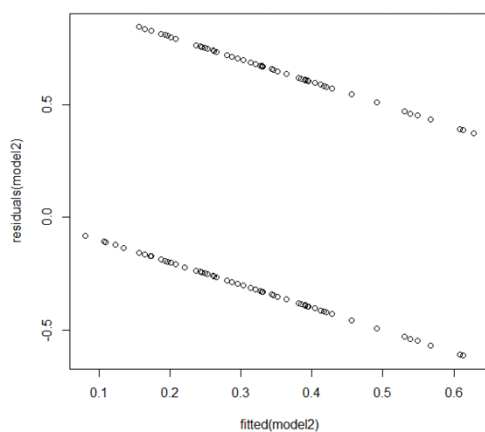


Figure 2

Linearity for Model B

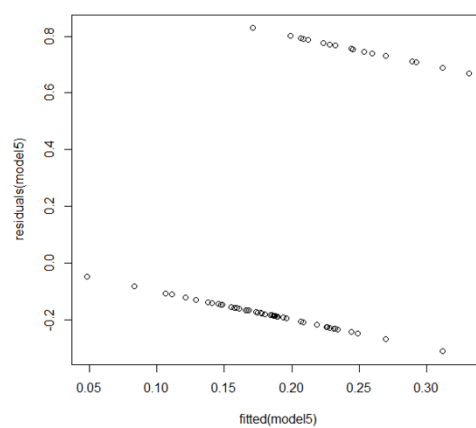
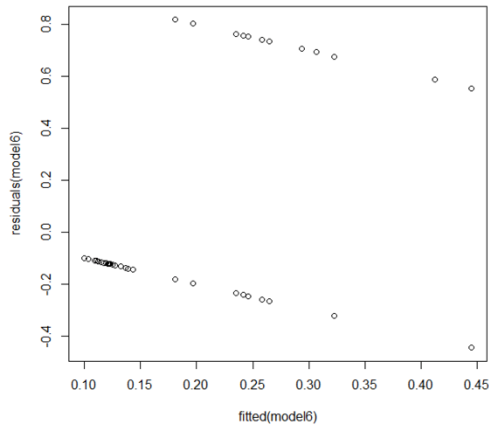
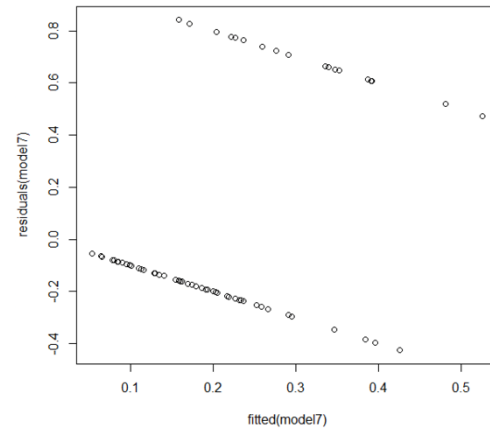


Figure 3*Linearity for Model C***Figure 4***Linearity for Model D***Normality of Residuals**

All models (see Figures 5, 6, 7 and 8) show a bulk of observation points in the middle of the distribution plot. However, the tails of the distribution deviate slightly from the line, indicating a higher frequency of outliers / extreme values. Despite these fat tails, the observations are close to a normally distributed data set.

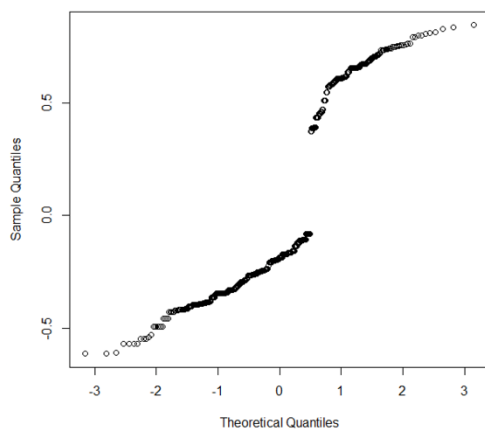
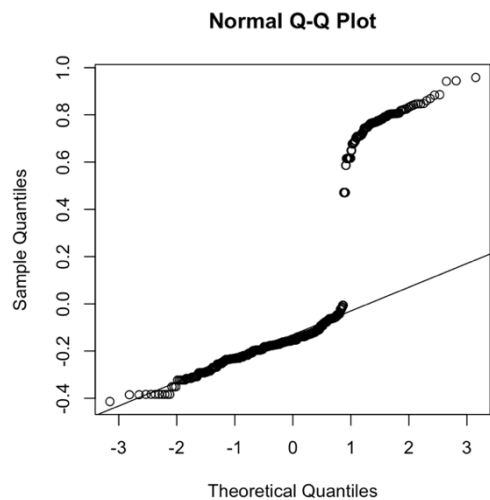
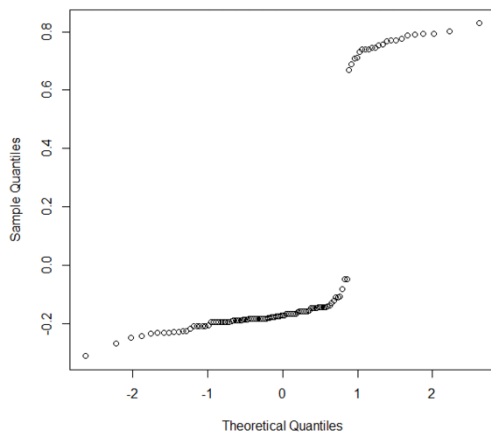
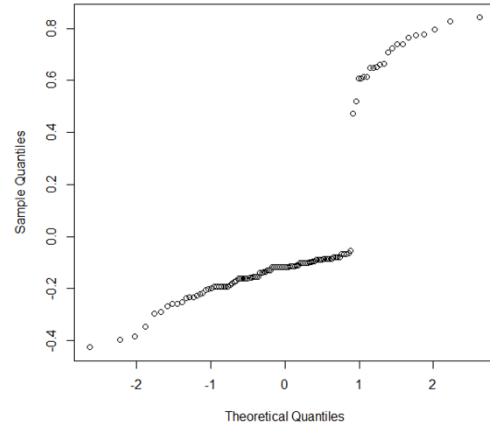
Figure 5*Normality of Residuals for Model A***Figure 6***Normality of Residuals for Model B*

Figure 7*Normality of Residuals for Model C***Figure 8***Normality of Residuals for Model D*

Homoscedasticity

Moreover, all models appear to be homoscedastic as the spread of residuals is relatively constant across all levels of fitted values.

Independence of Residuals

The independence of residuals is accounted for by all LMMs (Model A, B, C and D).