

**Tracking and Drinking: the Meaning of Self-Monitoring Drinking Behaviour for
Students Using a Mobile Application**

Marleen Bezuijen (s2560461)

Department of Psychology, University of Twente

202000381: Positive Clinical Psychology and Technology (PCPT)

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Supervisor: Meike Berkhoff, MSc

Second Supervisor: Dr. Hanneke Kip

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Abstract

Background: Consuming alcohol frequently and/or in high amounts as a student in the Netherlands is considered common behaviour for this group, despite its (in)direct negative consequences on both individual and societal level. Many self-monitoring based interventions have been developed for changing drinking behaviour. However, mixed results do arise questions regarding their effectiveness, especially when monitoring drinking behaviour.

Methods: This research aims to answer the question: what does it mean for students to self-monitor their drinking behaviour and underlying motivators using a mobile application? In order to do so, this study aims to answer the sub-questions: (1) how suitable is an ES app for finding drinking motives? and; (2) how do students experience the use of an ES app for self-monitoring? A sample ($n = 58$, age 19-27 [$M = 20.2$, $SD = 3.4$]) was recruited to fill out a one-time pre-survey in Qualtrics, two daily surveys for seven consecutive days, and a one-time post-survey both in the ES app Avicenna. **Results:** Regarding the sub-questions, it was found that an ES app seems to be suitable for finding drinking motives amongst students. Moreover, students expected to gain awareness into their drinking behaviour, which they partially got. However, adjustments to the app's content and logistics could still improve their experiences with such an app. **Discussion:** The ES app was able to identify a broad range of drinking motives, including those of the DMQR. Moreover, students experience the need of adjusting an ES app to their personal preferences. Tailoring an ES app-based intervention to the individual could therefore positively influence the effect of the intervention on this target group. However, further research is necessary to study if and how tailoring such interventions affects the results of said intervention.

Introduction

Consuming alcohol frequently and/or in high amounts as a student in the Netherlands is common behaviour for this group, despite its negative consequences (Samenwerkingsverband Vroegsignalering Alcoholproblematiek [SVA], 2022). In a Dutch study on substance use among 28,000 students in higher professional and academic education, it was found that a total of 27% of this group drinks either heavily (at least once a week ≥ 6 [male] or 4 [female] drinks) or excessively (> 21 [male] or 14 [female] drinks per week) while only 6% reported not to consume alcohol at all (Dopmeijer et al., 2021). Compared to the Dutch population, that is nearly twice the percentage for heavy/excessive drinkers (14.9%) and less than half for non-drinkers (12.6%) (Centraal Bureau voor de Statistiek, 2023). Such extreme drinking behaviour can lead to numerous problems on both individual as societal levels. For instance, alcohol (mis)use can lead to aggression and violence, unprotected sex and unwanted sexual experiences, traffic accidents and injuries (SVA, 2022). Moreover, SVA (2022) also mentions that this manner of consuming alcohol can lead students to experience problems with concentration, suffer a study delay or even drop out of their study programme, resulting in a cost of about 46 million euro for the Dutch government. Even when students do not drink themselves, they can experience stress as a result of others' drinking behaviour (e.g. being offended/ashamed or kept awake during nights by someone under influence), leading to negatively affected mental and behavioural health (Boyle et al., 2022).

Many studies have been conducted to search for what motivates students to drink extremely despite the negative consequences. According to the previously mentioned study by Dopmeijer et al. (2021), students tend to drink alcohol for mostly enhancement and social reasons. That is, they drink to gain more positive feelings through alcohol consumption and to enjoy time with peers. In said study, Dopmeijer et al. measured these motives along with the less popular reasons 'social pressure and conformity', and 'coping'. Although these

motives were generally less prominent, along enhancement they were more important for heavy/excessive drinkers compared to students who do not drink heavily/excessively. Social and enhancement motives were also frequently found in other studies regarding college students (Choi et al., 2017) and in adolescents aged 12-15 (Lannoy et al., 2019). However, these studies were based on the closed-ended Drinking Motives Questionnaire Revised (DMQR) (Cooper, 1994) and were conducted in retrospect. Despite the fact that the DMQR was carefully constructed, it still provides limited answers from the participants, leaving the question of how students would describe the motivations behind their drinking behaviour themselves. Moreover, the retrospective nature of these studies is less reliable than the also frequently used method experience sampling (ES) (Ellison et al., 2020). Especially in reporting alcohol consumption, ES is preferred since retrospective questionnaires often result in underestimations of the actual consumption (Monk et al., 2015; Patrick & Lee, 2010). Moreover, today's technology allows ES to sufficiently collect data digitally via mobile phones or other mobile devices (Berkel et al., 2017). Finally, the samples of said studies are large, providing good generalisability, yet lacking insight into individual motives. Thus, an ES study using open-ended questions and a relatively small sample would provide a more truthful picture of the students' drinking behaviour and individual motivations behind this behaviour (Berkel et al., 2017; Braun et al., 2021).

ES is also used in many interventions aiming to decrease alcohol consumption amongst students but various other groups too, such as veterans with HIV, adults struggling with problematic substance use, and homeless young adults (Binkowska et al., 2023; Patrick et al., 2023; Taylor et al., 2023; Thompson et al., 2020). Such interventions are often based on ES because ES is a sufficient method for gathering insights into human behaviour and it is of low burden to the participants since they often own a mobile device on which an ES app can be installed, keeping them from taking physical questionnaires everywhere with them (Berkel et

al., 2017). Moreover, according to Carpenter et al. (2023), (ES) self-monitoring can be helpful in combination with a reward system and the use of prompts. However, the act of self-monitoring can become tedious and boring, and could even provoke health disorder rather than preventing or decreasing it (Orji et al., 2018). Furthermore, Maas et al. (2013) compared the effect of self-monitoring on drinking alcohol with that on eating snacks and found that, especially compared to the latter, self-monitoring did not reduce alcohol intake. Even though this was in line with the findings of their literature search, no reason was found for this lack of effect. These differing results over various target groups raises the question of how the specific target group of students would experience self-monitoring their drinking behaviour and what is required from an ES app so that students can properly track said behaviour.

The questions mentioned above can be merged into one research question for this study: how do students experience self-monitoring their drinking behaviour and underlying motivators using a mobile application? In an attempt to answer this research question, the following sub-questions will be researched first: (1) how suitable is an ES app for finding drinking motives? and; (2) how do students experience the use of an app for self-monitoring? The aim of this research is to attain a deeper understanding of the individual experiences in self-monitoring alcohol consumption and drinking motives in order to investigate if and how ES can influence students' drinking behaviour.

Methodology

In order to answer the sub-questions and, in turn, the research question, a qualitative design was applied in which a questionnaire with open-ended questions was used for collecting data for an ESM-study on drinking behaviour amongst students. By means of self-reported answers, individual experiences in self-monitoring alcohol consumption and personal triggers and motivators for (not) drinking alcohol were collected. This design allows

for attaining a deeper exploration of how students perceive self-monitoring their drinking behaviour.

Participants

This study targeted students at Dutch universities (of applied sciences) that occasionally consumed alcohol. They were not allowed to have ongoing mental health problems nor receive treatment for alcohol abuse at the moment of participation. The sample was recruited via convenience sampling, and consisted of 58 people ranging from 19 to 27 years old, with an average age of 22.47 (SD = 3.32). Their demographics are given in Table 1.

Table 1

Demographical Characteristics of the Sample

Demographics	Absolute (n = 58)	Relative
Sex		
Female	35	60.3
Male	10	17.2
Unknown	13	22.5
Nationality		
Dutch	10	17.2
German	26	44.8
Other	9 ^a	15.5
Unknown	13	22.5
Highest degree obtained		
High school	27	46.5
Bachelor's	16	27.6
Master's	1	1.7
Other	1 ^b	1.7
Unknown	13	22.5
Current level education		

Applied sciences bachelor	8	13.8
Applied sciences master	3	5.2
Academic sciences bachelor	18	31
Academic sciences master	13	22.4
Doctorate	1	1.7
Other	2 ^c	3.4
Unknown	13	22.5

^a Once Brazilian, Finnish, French, Polish, and Ukrainian; Twice Lithuanian.

^b Post graduate course.

^c One master's degree starting the upcoming semester; one answer left blank.

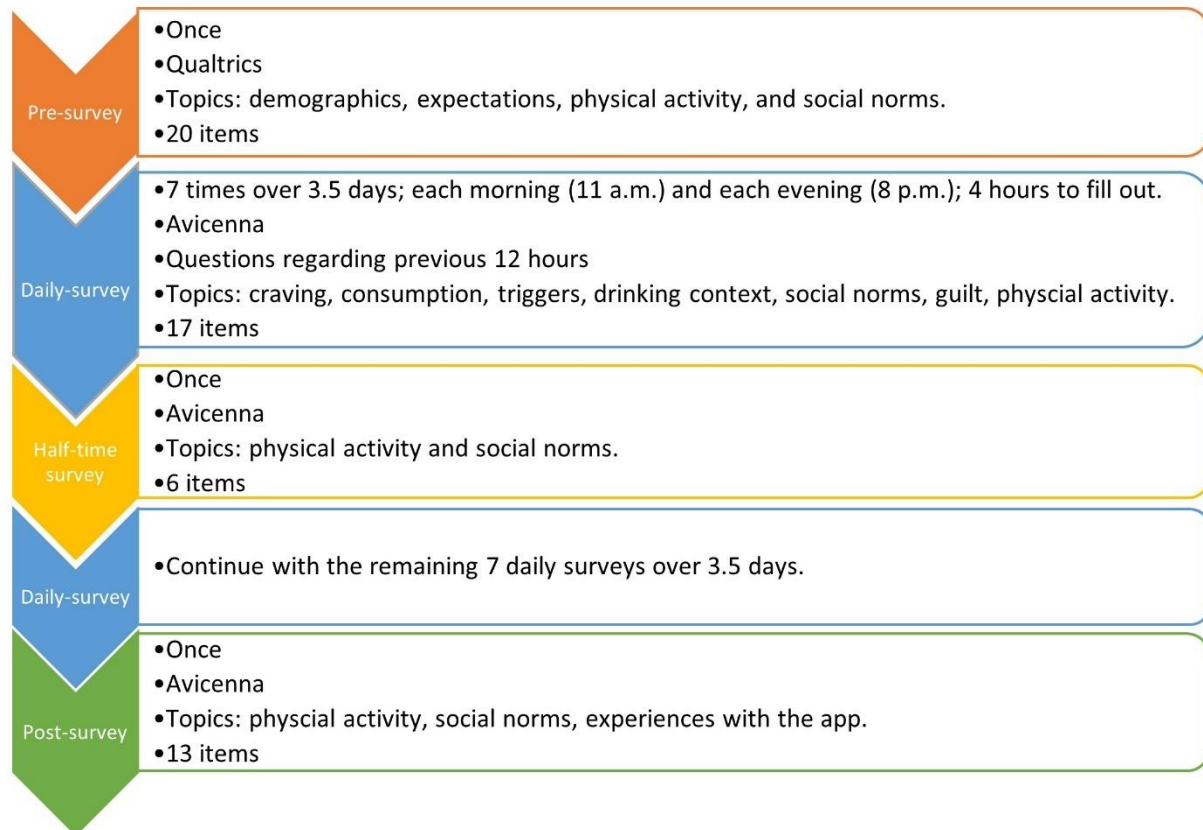
The sample was based on those participants who filled out both the pre-survey and the daily-survey. The pre-survey was started by 108 participants, of which 34 dropped out before finishing the pre-survey. Thus, 74 participants started the daily survey, yet another 16 proceeded to leave these surveys unanswered. The post-survey was started by 66 participants, however, 21 stopped the study at this point. The number of participants who completed the entire study was 45, making the completion rate 41.7%.

Materials

Four different surveys were used to gather data from the participants: one pre-survey, a daily survey collected twice a day, one half-time survey, and one post-survey. An overview of these surveys and their order is given in Figure 1. Of these questionnaires, not all questions were of interest since data collection was in collaboration with two other studies in alcohol use amongst students. The questions this study focused on are specified in the corresponding sections below. The complete questionnaires can be found in the appendices (appendices A-D).

Figure 1

Visualization of the Research Design: Surveys



Pre-Survey

The pre-survey (appendix A) was filled out directly after signing informed consent. In this survey, the focus was on demographic information of the participants and on the second sub-question ‘how do students experience the use of an app for self-monitoring?’. The participants were asked to describe their expectations of self-monitoring their alcohol consumption via an app by means of an open-ended question. This question was asked to

compare the questions with their reported experience later in this study. The data of this survey was collected via the online survey platform Qualtrics.

Daily Survey

The daily survey (appendix B) was filled out once every morning and evening for a period of seven days. The questions had the same content, however, the phrasing of the questions depended on the corresponding time period. In total, 17 questions regarding drinking behaviour, physical activity and social norms were asked. Of these, five were of interest of this study, including: (1) indicate how much you agree with the following statement: “I craved alcohol in the last 12 hours” [5-point Likert-scale: strongly disagree-strongly agree]; (2) what triggered your craving? [open-ended, only asked if previous question was answered by ‘somewhat agree’ or ‘strongly agree’]; (3) Did you drink alcohol in the last 12 hours? [yes/no]; (4) Why did you decide to drink? [open-ended, if previous answer was ‘yes’], and; (5) Why did you decide not to drink? [open-ended, if previous answer was ‘no’]. These questions were asked in an attempt to answer the first sub-question ‘what causes students to drink?’. The daily survey was conducted in the mobile application of the online research platform Avicenna: a data collection software using ES, allowing researchers to monitor data during the data collection period (Avicenna, 2023).

Half-Time Survey

The half-time survey consisted of 6 questions regarding social norms and physical activity and was conducted in Avicenna as well. It was created for the purpose of collecting data for the other studies in this collaboration. However, since this survey does not include any items of interest for the current study, it will not be elaborated upon.

Post-Survey

After completing the experience sampling part of this study (daily-survey), participants continued with the post-survey (appendix C). Participants were asked to evaluate their experience with self-monitoring their drinking behaviour. Similar to the pre-survey, this survey was therefore aimed at answering the second sub-question. The corresponding questions consisted of: (1) Did this app provide any insight in your triggers for drinking alcohol? If so, how? [open-ended]; (2) What do you think of the use of this app over the last week? [open-ended], and; (3) What could improve your experience with such an app? [open-ended]. The post-survey was conducted in Avicenna as well.

Procedure

Participants enrolled for this study in either one of two ways: (1) signing up for the study via the Test Subject Pool system SONA from the University of Twente, after which they received an automatic confirmation message including the link to the study, or; (2) directly via the same link sent by the researchers. First, the participants read the introduction to this study including the instructions for downloading the Avicenna app, allowing them to fill in the daily surveys later in the study. Then, they agreed to the statements in the informed consent form before being redirected to the pre-survey. Both the introduction and the informed consent form can be found in appendix D.

Once the pre-survey was filled out and the participant installed the Avicenna app, the experience sampling part of the study began. This means that the participants started receiving daily questionnaires one day after registration in the app for a period of one week. Notifications for the morning questionnaire were sent out at 11 a.m. and at 8 p.m., after which the participants could fill out the questionnaires for two hours. However, this timeframe was changed to 4 hours after 2 days of data collection to increase the response rate. After 3.5 days, the participants received a notification for filling out the half-time survey, which could be filled out at any given moment after the notification. After that, the

daily surveys continued for the remaining time of the seven-days period.

Finally, the participant received a notification for filling out the post-survey after the seventh day. This could be done for an undetermined time period as well. After filling out the post-survey, the study ended with a message thanking the participant for taking part in this study. The participants who enrolled via SONA received their credits after filling out the post-survey.

Analysis

While analysing the data, an inductive thematic analysis was used to process the data according to the two sub-questions: (1) what causes students to drink? and; (2) how do students experience the use of an app for self-monitoring? The analysis was an iterative process, meaning that codes were first derived from the data, then adjusted while analysing the data until a set off codes was created that covered the entire dataset. Finally, frequency tables of all codes were used to allow for comparing.

To answer the first sub-question, the answers to the daily questionnaires were analysed. The answers to three out of five items were of qualitative nature, while the agreement indication (“I craved alcohol in the last 12 hours”) and the third item (did you drink alcohol in the last 12 hours?) were quantitative and used to redirect the participant to different items. The answers to the two quantitative items were given to provide frequencies of responses and alcohol consumption.

The second sub-question covered both the pre-survey and the post-survey. The pre-survey consisted of one question, of which the answer was compared to one question from the post-survey (what do you think of the use of this app over the last week?). This comparison allows to see whether the expectations of self-monitoring drinking behaviour were met. The three questions of the post-survey were analysed to conclude anything about the feasibility of the app and its contents for self-monitoring drinking behaviour.

Results

In this section, the most important codes found to answer the research question are discussed. All codes, their definitions and corresponding quotes can be found in the codebook (appendix E). First, the results of the sub-question ‘is an ES app suitable for finding drinking motives?’ are covered. Then, the subject shifts to the results of the second sub-question: ‘how do students experience the use of an app for self-monitoring?’.

How Suitable is an ES App for Finding Drinking Motives?

This sub-question is based on the data from the daily survey. To ensure a continuity in assessment, participants who filled out less than half of the daily surveys (≤ 6) were filtered out. The difference in response frequency between the morning survey (292 from 52 participants) and the evening survey (254 from 48 participants) can be explained by higher consistency in filling out the morning survey.

The codes found in the daily survey can be categorised into *intrinsic* and *extrinsic* themes. The theme intrinsic includes 11 different codes that cover reasons or triggers coming from the person themselves, disregarding external factors. The extrinsic theme, however, includes 18 different codes that stand for any factors outside of the individual. These themes can be found in reasons for craving, drinking and not drinking, including some answers containing both intrinsic and extrinsic codes. Below, the most frequently found codes are discussed. To view all codes found in the daily survey, look at the codebook or the frequency table of total codes in found appendix F.

Reasons for Craving. Of the 546 responses, 90 (16.5%) indicated to somewhat agree or strongly agree with experiencing cravings in the previous 12 hours. The theme intrinsic was found 56 (38.9%) times amongst these responses. The most frequently found intrinsic codes were: (1) stress release [22; 15.3%]; (2) effect alcohol [13; 9.3%], and; (3) taste [10; 6.9%]. *Stress release* means that the participant was craving alcohol to release any

(built up) stress they experienced at that moment. *Effect alcohol* covers those responses indicating cravings because participants wanted to experience the effect alcohol generally has on them. Lastly, *taste* was used when participants craved alcohol because of the beverage's taste. The other theme, extrinsic, was found 88 (61.1%) times in total, of which the most frequently found codes were: (1) going out [19; 13.2%]; (2) social [14; 9.7%]; (3) mirroring [8; 5.6%], and; (4) timing [8; 5.6%]. *Going out* means craving alcohol because one went to an event or location where it is common to drink. Then, *social* includes responses indicating cravings because of social company. *Mirroring* was applied when participants craved alcohol because they saw other(s) in their environment consuming alcohol. The frequencies of these codes and those for (not) drinking and can be found in Table 2.

Table 2*Frequency Table for Most Common Codes in the Daily Survey and Corresponding Example Quotes*

Codes	Quotes	Craving	Yes drinking	No drinking
Intrinsic				
Effect alcohol	“I wanted to be more active and involved in the party”	13 (9.3%)	27 (14.7%)	
Stress release	“I had to have a difficult talk with my partner and I thought it might be easier over a glass of wine.”	22 (15.3%)	17 (9.2%)	
Taste	“Because I love Glühwein and since it's almost Christmas I really want to drink some”	10 (6.9%)	20 (10.9%)	
Health	“Because I am a little bit sick and don't feel very well right now. drinking alcohol would not make me feel better in my body”			36 (5.7%)
No craving	“I did not feel like drinking”			242 (38.1%)
Energy	“I am on my period and was really tired. I was drinking a lot in the weekend and just need a break.”			43 (6.8%)
Total most frequent intrinsic		45 (31.5%)	64 (34.8%)	321 (50.6%)
Total all intrinsic		56 (38.9%)	99 (53.8%)	343 (54%)
Extrinsic				
Going out	“We went to a party and I was looking forward to drink some and enjoy the evening”	19 (13.2%)		
Mirroring	“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”	8 (5.6%)		
Timing	“Because it is Friday and I want to go out, socialize, not think about any work or problems and just have a good time”	8 (5.6%)		
Social	“Because I was seeing my friend”	14 (9.7%)	31 (16.9%)	
Availability	“Because I wanted to and the bottle of wine was already open”		10 (5.4%)	
Environment	“Because the vibe was really nice”		12 (6.5%)	
No occasion	“There was no occasion for which it was necessary to drink.”			85 (13.4%)
Study	“I spent the evening at home and worked for university, no need to drink alcohol”			58 (9.1%)

Work	“Because work at a school on Fridays and I don’t consume alcohol during my shift”			40 (6.3%)
Total most frequent extrinsic		49 (34.1%)	53 (28.8%)	183 (28.8%)
Total all extrinsic		88 (61.1%)	85 (46.2%)	292 (46%)
Total most frequent codes		94 (65.6%)	117 (63.6%)	504 (79.4%)
Total all codes		144 (100%)	184 (100%)	635 (100%)

Reasons for Drinking. A total of 112 (20.5%) responses indicated to have drunk alcohol in the previous 12 hours, of which the reported amount of drinks were: (1) 1-2 [59; 52.7%]; (2) 3-4 [27; 24.1%]; (3) 5-6 [10; 8.9%]; (4) 7-8 [5; 4.4%]; (5) 9-10 [7; 6.3%], and; (6) \geq 11 [4; 3.6%]. However, one response (0.2%) for drinking motives was left unanswered. Amongst the remaining 111 responses, the intrinsic theme was found 99 (53.8%) times, including the most common ones: (1) effect alcohol [27; 14.7%]; (2) taste [20; 10.9%], and; (3) stress release [17; 9.2%]. Extrinsic codes were found 85 (46.2%) times and the ones found most often included: (1) social [31; 16.9%]; (2) environment [12; 6.5%], and; (3) availability [10; 5.4%]. The code *environment* was used for drinking motives based on the immediate (physical) environment of the participant. *Availability* means that participants drank because alcoholic beverages were easily accessible for them.

Reasons for Not Drinking. 434 (79.5%) of the total responses indicated that the participant did not drink in the previous 12 hours. Here, one response was left unanswered as well. Amongst the remaining 433 reasons for not drinking, the intrinsic theme was found 343 (54%) times, including: (1) no craving [242; 38.1%]; (2) energy [43; 6.8%], and; (3) health [36; 5.7%]. *No craving* was applied when participants did not drink because they did not experience an internal need for drinking. Then, *energy* covers responses indicating to have not drunk because one had a low energy level and/or was regaining energy (e.g. sleeping or feeling tired). Finally, *health* includes motives based on gaining or maintaining one's physical and/or mental health. The extrinsic theme was found 292 (46%) times, including the most common ones: (1) no occasion [85; 13.4%]; (2) study [58; 9.1%], and; (3) work [40; 6.3%]. *No occasion* means not having an external reason for drinking alcohol. Furthermore, *study* covers all motives for not drinking regarding one's study programme, and, in the same light, *work* includes the motives for refraining from drinking because of one's job.

How do students experience the use of an app for self-monitoring?

The analysis for this sub-question was divided into two parts: (1) expectations and evaluations, and; (2) feasibility of the app and its contents. In the first part, the codes found for expectations (pre-survey) and evaluations (post-survey) are described to allow a comparison to be made between the participants' expectations and their experiences in the discussion. Next, the codes found for insights and improvements of the app (both post-survey) are discussed to create an understanding of the app's and its content's feasibility in self-monitoring drinking behaviour.

Expectations and Evaluations

Expectations (Pre-Survey). The pre-survey was started by 108 participant, however, 45 of them continued to fill out the questions of this survey. Of these 45 participants, 32 (71.1%) answered the question regarding expectations. The themes found for the expectations of self-monitoring drinking behaviour using an app consisted of: (1) awareness [13; 40.6%]; (2) app [6; 18.8%], and; (3) general [9; 28.1%]. The remaining answers [4; 12.5%] contained a combination of two or more of these themes. An overview of the total amount of found codes can be found in Table 3.

Table 3*Frequency Table for Codes Found in the Pre-Survey: Expectations*

Codes	Quotes	Absolute	Relative
<i>Awareness</i>			
Insight consumption	“I hope receive some interesting questions about alcohol consumption that might encourage me to overthink my behaviour more often”	11	25
Insight triggers	“My only expectation is that I will gain some insight through the regular reflection the app will make me do”	4	9.1
Insight general	“Getting a better sense of how much alcohol is a part of a student's life”	5	11.4
Control behaviour	“Get control over my drinking behaviour and to understand why I used it...”	1	2.3
Total		21	47.8
<i>App</i>			
Easy use	“That it won't be a lot of work and that I will be helping a friend”	2	4.5
Notifications	“I expect to get notifications from the app asking me fill in the questionnaires for this study”	2	4.5

Answering questions	“I expect that I will have to fill in questionnaires about my alcohol usage and the way it affects me every day”	5	11.4
Tracking behaviour	“Using the app the track my alcohol intake/behaviour, which I believe will mostly be on the weekends”	4	9.1
Total		13	29.5
General			
None	“None”	4	9.1
Act	“I’m not sure since I do not really drink I think me participating will not give that much information but I am happy to help”	4	9.1
Mood	“It might be annoying, I hope I will hang on”	2	4.5
Total		10	22.7
Total		44	100

The theme *awareness* considers all answers in which participants shared to expect gaining insight through this study via reflecting on their alcohol consumption and behaviour. It contains four different codes and nearly half of the found codes in the corresponding answers could be categorised according to this theme (47,8%). The codes found within this theme were: (1) insight consumption [11; 25%]; (2) insight triggers [4; 9.1%]; (3) insight general [5; 11.4%], and; (4) control behaviour [1; 2.3%]. *Insight consumption* includes answers regarding participants' consumption and drinking behaviour. *Insight triggers* entails insight into any underlying reasons for participants to consume alcohol. Then, *insight general* means any insight into drinking behaviour next to- or unspecified as consumption and/or triggers. Finally, *control behaviour* means that the participant expected to get control over their drinking behaviour as a result of filling out the surveys.

The next theme, *app*, has four different codes that contain all expectations participants had about the use of the app, its content, logistics and purpose. In total, 13 (29.5%) codes were found: (1) easy use [2; 4.5%]; (2) notifications [2; 4.5%]; (3) answering questions [5; 11.4%], and; (4) tracking behaviour [4; 9.1%]. *Easy use* covers expectations of experiencing participation in the study as easy. Then, *notifications* means that the participant had expectations regarding the notifications of the app. *Answering questions* includes the participant expecting to fill out the surveys in the app. Finally, *tracking behaviour* means that the participant expected to track their drinking behaviour by use of this app.

Finally, the theme *general* was applied 10 times (22.7%) and includes all remaining expectations reported. It has 3 different codes: (1) none [4; 9.1%]; (2) act [4; 9.1%], and; (3) mood [2; 4.5%]. None includes all the responses indicating that the participant had no expectations about the study. *Act* means any expected acts during this study that are not

linked to specific components of the such as answering options or tracking behaviour. Lastly, *mood* contains any expectations the app might have on the participant's mood.

Evaluations (Post-Survey). Of the 52 participants that filled out the daily survey more than or equal to seven times, 37 continued to fill out the post-survey as well. Two participants provided meaningless answers, leaving 35 (67.3%) responses to analyse. The themes found for the evaluations of the app consisted of: (1) positive, and; (2) negative. 23 (65.7%) responses were merely positive, 7 (20%) were only negative and 5 (14.3%) responses contained both positive and negative codes. An overview of the total amount of found codes can be found in Table 4.

Table 4*Frequency Table for Codes Found in the Post-Survey: Evaluation*

Codes	Quotes	Absolute	Relative
Positive			
Usage	“It was very simple and straight forward. I quite liked it”.	7	15.9
General	“It was fine”	13	29.5
Purpose	“It was a good way to track exercise and alcohol consumption”	7	15.9
Design	“The questions were precise and easy to answer. The questionnaires were the perfect length. The app really made me reflect”	3	6.8
Total		30	68.1
Negative			
Mood	“I felt stressed to do the studies in the allowed time period, cause else I would've been missing one unit”	5	11.4
Wrong target	“Sometimes a little redundant because I am not a big drinker and don't drink on week days”.	3	6.8
Purpose	“It was interesting to keep track of my drinking”	1	2.3

Design	“It was [...] a bit repetitive”	5	11.4
Total		14	31.9
Total		44	100

The theme *positive* was found 30 times (68.1%) in total and includes all positive experiences. It includes four different codes: (1) usage [7; 15.9%]; (2) general [13; 29.5%]; (3) purpose [7; 15.9%], and; (4) design [3; 6.8%]. *Usage* includes the responses that mentioned to experience the use of the app as positive. General means that the participant was generally positive about the use of the app during this study. Then, *purpose*, means that participants found any purposes of the app positive. Finally, *design* includes responses positive about the design of the app/study.

The remaining theme, *negative*, was found 14 times (31.9%) in total and covers all negative experiences with the app. It entails four different codes: (1) mood [5; 11.4%]; (2) wrong target [3; 6.8%]; (3) purpose [1; 2.3%], and; (4) design negative [5; 11.4%]. *Mood* included all experiences that affected the participant's mood negatively. *Wrong target* means that a participant felt like the content of the app was not or very little applicable to them. Then, *purpose* includes responses positive about the purpose of the app. Finally, *design negative* was applied when the participant experienced a component of the app's design as negative.

Feasibility of the app and its contents

For this part of the sub-question, the answers to three questions from the post-survey were analysed: (1) Did this app provide any insight in your triggers for drinking alcohol? If so, how?; (2) What do you think of the use of this app over the last week?, and; (3) What could improve your experience with such an app? These questions were answered by 36 participants. The found themes and corresponding codes of question one and two will be discussed per question below. An overview of all codes from the post-survey can be found in appendix H.

Insights into Triggers (First Question). In this question, two main themes were found to cover the codes: (1) more insight [12; 33.3%], and; (2) no new insight [21; 58.3%]. The remaining answers [3; 8.4%] included codes of both themes. An overview of these codes can be found in Table 5, covering the total frequencies.

Table 5*Frequency Table for Codes Found in the Post-Survey: Insight*

Codes	Quote	Absolute	Relative
Yes insight			
Reflecting	“Yes because it got me reflecting on my own behaviour”.	4	7.8
Stress release	“Yes, I learned that I crave alcohol more when I've had a hard day	2	3.9
Social	“Yes, that it's strongly depending on my peers drinking behaviour”	8	15.6
Frequency	“Yes it was interesting actually writing down how often [...] I drank”	2	3.9
Amount	“Yes it was interesting actually writing down [...] how much I drank”	2	3.9
Environment	“Yes, it showed me that my friends/people around me influence my drinking behaviour quite a lot”	2	3.9
Physical state	“Yes it did, [...] if I have heartburn or I am tired, I am less likely to drink.”	1	2
Occasion	“I drink alcohol very rarely, and if I do then it's only 1-2 drinks when I'm with my friends and we are having a party”	1	2
Own choice	“It showed me that i decide by my self if I want to drink”	1	2

Total		23	45
No insight			
General	“No”	12	23.5
Already aware	“Not really, because I know my drinking is influenced by my mood and my peers”	6	11.8
No triggers	“Not really, there wasn’t any pattern to my drinking. I primarily drank something when I felt like it to enjoy it. As well as, I didn’t drink excessive amounts”	3	5.9
Own choice	“I did not notice any triggers. But I would also say that I do not really have triggers when it comes to drinking alcohol. Maybe sometimes the encouragement of peers to go out could be a trigger, but still I would say that I decide if I then want to drink alcohol or not”	3	5.9
Little consumption	“Not really since I haven’t had that much alcohol lately”.	3	5.9
Questionnaire	“Not really, the questions were maybe too repetitive”	1	2
Total		28	55
Total		51	100

The first theme, *yes insight*, was found 23 times (45%) in total and covers nine different codes. The most important ones are: (1) social [8; 15.6%], and; (2) reflecting [4; 7.8%]. *Social* includes any responses claiming that the participant learned that one's drinking behaviour depends on their social environment. *Reflecting* contains the answers of participants who experienced insight due to the reflecting nature of the study.

The other theme, *no insight*, was found 28 times (55%) in total and includes six different codes, among which the most important ones are: (1) already aware [6; 11.8%]; (2) no triggers [3; 5.9%]; (3) own choice [3; 5.9%], and; (4) little consumption [3; 5.9%]. *Already aware* means that the participant experienced no insight because they were already aware of their behaviour. Then, *no triggers* includes the participants that did not gain insight because they feel their drinking behaviour has no triggers. The code *own choice* contains the responses mentioning having not gained insight because their drinking behaviour is primarily dependent on their own choices. Finally, *little consumption* means that the participants who did not experience insight because they feel like they consume too little alcohol to gain proper insight from such an app.

Improving User Experiences (Third Question). In this question, three main themes were found to cover the codes: (1) content [9; 25%]; (2) logistics [8; 22.2%], and; (3) neutral [17; 47.2%]. The remaining answers [2; 5.6%] included codes of both themes. An overview with the total frequencies of these codes can be found in Table 6.

Table 6*Frequency Table for Codes Found in the Post-Survey: Improvements*

Codes	Quotes	Absolute	Relative
Content			
Information	“App could give some insights or facts about drinking in between [...]”	2	4.7
Answer options	“I guess the open answers confused me a bit because I normally don’t give that much thought to my drinking (was never problematic)”	3	7
Visuals	“Maybe improve the aesthetics”	3	7
Questions	“More clear questions which allow for easier formulating an answer”	6	13.9
Total		14	32.6
Logistics			
Frequency	“I wouldn’t want it to be a 2 times daily thing [...]”	2	4.7
Time	“If the surveys were online longer”	3	7
Technical issues	“It sometimes had bugs”	1	2.3
Notifications	“Maybe a more often reminder, or one shortly before the possibility to fill out the survey ends”	4	9.3
Timing	“The time periods didn’t include afternoon/evenings where [alcohol] consumption is most likely [in my opinion]”	2	4.6
Total		12	27.9

No improvement			
Nothing	“I do not know, do not have any suggestions”	16	37.2
Experience	“Doing more studies”	1	2.3
Total		17	39.5
Total		32	100

The theme *content* includes four different codes and entails all responses that suggest improvements in the content of the app. This theme was found 14 times (32.6%) in total, included four different codes and its most important codes were: (1) questions [6; 11.3%]; (2) answer options [3; 7%], and; (3) visuals [3; 7%]. *Questions* covers all responses suggesting improvements in the questions of the app. Then, *answer options* means that participants suggested improvements in the answer options. Finally, *visuals* entails the answers saying to add or adjust any visuals to the content of the app.

The second theme, *logistics*, has five different codes regarding any improvements in the logistics of the app. It was found 12 times (27.9%) in total its most important codes were the following: (1) notifications [4; 9.3%], and; (2) time [3; 7%]. *Notifications* include responses suggesting improvements in the notifications of the app. The second code, *time*, covered suggested improvements in the time participants had to fill out the surveys. The final theme, *no improvement*, was found 17 times (39.5%) and was applied when the response had no suggestions for improving the app. This includes the codes: (1) nothing [16; 37.2%], and: (2) experience [1; 2.3%].

Discussion

In light of the research question ‘what does it mean for students to self-monitor their drinking behaviour and underlying motivators using a mobile application?’ it was found that students expected to gain awareness of their alcohol behaviour, specifically their consumption and triggers. Nearly half of the participants gained such insight, while the remaining participants mentioned to have not gained new insight because they either: (a) were already aware of their triggers; (b) did not have any triggers; (c) chose mainly themselves when and how much they drank despite possible triggers, and/or; (d) they

consumed too little in the period of data collection to properly reflect on their triggers and motives. After using the ES app, participants were mostly positive about the use of the app, its purpose, its design, and about the app in general. However, they still suggested some adjustments in content (provide specific information, different answer options, change/add visuals, and the phrasing of the questions) and logistics (frequency, time, technical issues, notifications and timing) to improve their experience with the ES app. Finally, an ES app seems suitable for finding drinking motives: thematic analysis found a broad range of triggers for cravings, drinking motives and reasons for refraining from drinking. Some drinking motives are in line with the DMQR, but the open-ended questions in the ES app allowed more individual and nuanced motives to arise as well.

The frequently found drinking motives ‘effect alcohol’, ‘stress release’ and ‘social’ are in line with three out of four components of the DMQR (Cooper, 1994): enhancement, coping and social. The remaining component, conformity, was also found in the code ‘social pressure’, and may even include some responses coded as ‘drinking game’ or ‘mirroring’. Next to these six codes, another 14 drinking motives have been found, and although some of these might be a more nuanced version of a component from the DMQR, they still provide a deeper understanding of why students generally drink alcohol. Both (a) the overlap in DMQR components and codes in the current study, and; (b) the additional drinking motives found in this study, suggest that an ES app is suitable for finding drinking motives.

Secondly, despite nearly half of the participants reporting to have gained new insights, a slightly bigger group reported to have not gained new insights. This lacking was because of various reasons, however, more than a third of these ‘no insight’ responses did not provide a reason to which this was due. Another research studying self-monitoring drinking behaviour amongst students by Maas et al. (2013) found that self-monitoring had very little effect on the sample, which they attributed to the fact that their sample was overall content with their

drinking behaviour. Although the current study did not measure the participants' opinion about their drinking behaviour, some participants felt as if they were the wrong target for self-monitoring their drinking behaviour: "Sometimes [the app use was experienced as] a little redundant because I am not a big drinker and don't drink on week days". This, together with the fact that only one participant who reported to have gained no insight in general showed possibly heavy drinking behaviour according to guidelines used by CBS (2023) and Dopmeijer et al. (2021) (at least once a week ≥ 6 [male] or 4 [female] drinks), make that Maas et al.'s justification may explain the found code 'no insight – general' as well.

Finally, it seems to be important for students to be able to personalise an (ES) app-based intervention for their drinking behaviour. As mentioned in the introduction, Carpenter et al. (2023) emphasised the need of personal preferences in prompts for young adults. Moreover, Chau et al. (2023) found that students have personal preferences in both content and design of an app-based intervention for reducing alcohol consumption that influence the effect of said intervention. In the current study, many participants suggested varying adjustments to the ES app in order to improve their experience with it: e.g., personalised information, differing options in answering the questions, or deciding the timing of daily tracking yourself. Thus, the current results are in line with earlier research and stress the importance of interventions tailored to the individual rather than making use of a format aimed at students in general.

Strengths and Limitations

The current study comes with some limitations. First, the methods of convenience sampling were mostly aimed at students from the BMS faculty of the University of Twente. This may have increased the chance of collecting a sample in mostly the same field of studies, decreasing the generalisability of these results in turn. Second, the analyses were performed by one researcher. Any possible errors in these analyses were thus not revised by a second researcher, which could influence the validity of the results. Finally, the research team

had little experience with the implementation of the ES app, which caused some technical issues in the beginning of the data collection period. These issues could have influenced the experiences of participants with the app, making them focus on the technical side rather than personal preferences within the app and, in turn, influencing the validity of the results.

Future Research and Practical Implications

The findings of the current study found that students in (applied) sciences would like to personalise an ES app's content and logistics if they were to use it for changing their drinking behaviour. Future research could focus on whether this tailoring of the ES app actually increases the effect of the drinking reduction intervention for students. To get a proper idea of this effect, the study should consider using both a group motivated to change their drinking behaviour and one that is overall content with their drinking behaviour.

Based on the codes found in this study, the content of an ES app could be tailored in such a way that: (1) an overview of reported behaviour is given frequently in addition to personalised feedback, perhaps created by AI [information]; (2) the user is able to provide drinking motives based on either pre-set motives, e.g. derived from the DMQR, or report by use of open-ended questions [answer options]; (3) the user can adjust the theme of the app, e.g. changing colours, fonts and additional pictures or drawings [visuals], and; (4) the user can choose between various types of questions, e.g. interactive questions or more differing questions throughout a certain period [questions]. Moreover, preferences in the app's logistics should be adjustable in the sense of: (1) determining how often the user monitors their behaviour per day [frequency]; (2) deciding on how long a monitoring moment takes [time]; (3) changing the amount and phrasing of notifications [notifications], and; (4) the user is able to choose whether they report their behaviour at specific moments or while the behaviour is happening, e.g. via a widget for easy access allowing the monitoring to take place at pre-set times or, for instance, on interval basis [timing].

Conclusion

It has been found that an ES app is suitable for finding drinking motives amongst students in (applied) sciences. Furthermore, a general format of an ES app already provided a group of students with insight on their drinking behaviour, yet, more students could gain said awareness if they were able to adjust the app to their preferences. In order to say something about the effect of an ES app on changing the drinking behaviour of students, more research is necessary in which the motivation of changing behaviour is also taken into account. However, the current results emphasise the need for such interventions to be tailored to the individual rather than to a large and general group.

References

- Avicenna. (2023). <https://apps.apple.com/us/app/ethica-avicenna/id1137173052>
- Berkel, N. v., Ferreira, D., & Kostakos, V. (2017). The Experience Sampling Method on Mobile Devices. *ACM Comput. Surv.*, 50(6), Article 93. <https://doi.org/10.1145/3123988>
- Binkowska, A. A., Obarska, K., Marcowski, P., Szymczak, K., Lewczuk, K., Sollich, K., Banaszak, M., Woronowicz, B., Nowicka, M., Skorko, M., & Gola, M. (2023, 2023/12/01/). Evaluating the effectiveness of mobile app-based self-guided psychological intervention to reduce craving and lapse risk in problematic substance use and behaviors: Protocol for a randomized control trial in the general population. *Contemporary Clinical Trials Communications*, 36, 101180. <https://doi.org/https://doi.org/10.1016/j.conctc.2023.101180>
- Boyle, M. A., Alliegro, M. C., Bolts, O. L., Hazen, M. N., & Prince, M. A. (2022, 2022/02/07). You're Stressing Me Out: The Secondhand Effects of Alcohol. *Substance Use & Misuse*, 57(3), 490-493. <https://doi.org/10.1080/10826084.2021.2012697>
- Braun, V., Clarke, V., Boulton, E., Davey, L., & McEvoy, C. (2021, 2021/11/02). The online survey as a qualitative research tool. *International Journal of Social Research Methodology*, 24(6), 641-654. <https://doi.org/10.1080/13645579.2020.1805550>
- Carpenter, S. M., Yap, J., Patrick, M. E., Morrell, N., Dziak, J. J., Almirall, D., Yoon, C., & Nahum-Shani, I. (2023). Self-relevant appeals to engage in self-monitoring of alcohol use: A microrandomized trial. *Psychology of Addictive Behaviors*, 37(3), 434-446. <https://doi.org/10.1037/adb0000855>
- Centraal Bureau voor de Statistiek. (2023). *Leefstijl; persoonskenmerken*. <https://opendata.cbs.nl/statline/#/CBS/nl/dataset/85457NED/table?ts=1705675186608>
- Chau, S. L., Wong, Y. C., Zeng, Y. P., Lee, J. J., & Wang, M. P. (2023). Perceptions of Using Instant Messaging Apps for Alcohol Reduction Intervention Among University Student Drinkers: Semistructured Interview Study With Chinese University Students in Hong Kong [Original Paper]. *JMIR Form Res*, 7, e40207. <https://doi.org/10.2196/40207>
- Choi, J., Lee, S. Y., & Kwon, M. S. (2017, 2017/09/03). Gender Differences in the Relationship Between Drinking Motives and Drinking Behaviors Among Korean College Students. *Journal of Child & Adolescent Substance Abuse*, 26(5), 401-413. <https://doi.org/10.1080/1067828X.2017.1321506>

- Cooper, M. L. (1994). Motivations for alcohol use among adolescents: Development and validation of a four-factor model. *Psychological assessment*, 6(2), 117.
- Dopmeijer, J., Nuijen, J., Busch, M., Tak, N., van Hasselt, N., & Verweij, A. (2021). *Monitor Mentale gezondheid en Middelengebruik Studenten hoger onderwijs. Deelrapport II. Middelengebruik van studenten in het hoger onderwijs* (Substance use among students in higher education, Issue. <http://hdl.handle.net/10029/625363>
- Ellison, W. D., Trahan, A. C., Pinzon, J. C., Gillespie, M. E., Simmons, L. M., & King, K. Y. (2020, 2020/09/01/). For whom, and for what, is experience sampling more accurate than retrospective report? *Personality and Individual Differences*, 163, 110071. <https://doi.org/https://doi.org/10.1016/j.paid.2020.110071>
- Lannoy, S., Dormal, V., Billieux, J., & Maurage, P. (2019, 2019/05/04). Enhancement motivation to drink predicts binge drinking in adolescence: a longitudinal study in a community sample. *The American Journal of Drug and Alcohol Abuse*, 45(3), 304-312. <https://doi.org/10.1080/00952990.2018.1550089>
- Maas, J., Hietbrink, L., Rinck, M., & Keijsers, G. P. (2013, Sep). Changing automatic behavior through self-monitoring: does overt change also imply implicit change? *J Behav Ther Exp Psychiatry*, 44(3), 279-284. <https://doi.org/10.1016/j.jbtep.2012.12.002>
- Monk, R. L., Heim, D., Qureshi, A., & Price, A. (2015). "I Have No Clue What I Drunk Last Night" Using Smartphone Technology to Compare In-Vivo and Retrospective Self-Reports of Alcohol Consumption. *PLOS ONE*, 10(5), e0126209. <https://doi.org/10.1371/journal.pone.0126209>
- Orji, R., Lomotey, R., Oyibo, K., Orji, F., Blustein, J., & Shahid, S. (2018, 2018/01/01). Tracking feels oppressive and 'punishy': Exploring the costs and benefits of self-monitoring for health and wellness. *DIGITAL HEALTH*, 4, 2055207618797554. <https://doi.org/10.1177/2055207618797554>
- Patrick, M. E., & Lee, C. M. (2010, 2010/07/01). Comparing Numbers of Drinks: College Students' Reports From Retrospective Summary, Followback, and Prospective Daily Diary Measures. *Journal of Studies on Alcohol and Drugs*, 71(4), 554-561. <https://doi.org/10.15288/jsad.2010.71.554>
- Patrick, M. E., Sur, A., Arterberry, B., Peterson, S., Morrell, N., & Vock, D. M. (2023). Examining engagement effects in an adaptive preventive intervention for college student drinking [Article]. *Journal of consulting and clinical psychology*, 91(11), 652-664. <https://doi.org/10.1037/ccp0000845>
- Samenwerkingsverband Vroegsignalering Alcoholproblematiek. (2022). *Alcoholproblematiek bij studenten*. Retrieved September 25th from

[https://www.herkenalcoholproblematiek.nl/jeugd-en-alcoholproblematiek/alcoholproblematiek-bij-studenten#:~:text=In%20het%20onderwijs%20kunnen%20\(de,studievertraging%2C%20verminderde%20studieprestaties%20en%20uitval](https://www.herkenalcoholproblematiek.nl/jeugd-en-alcoholproblematiek/alcoholproblematiek-bij-studenten#:~:text=In%20het%20onderwijs%20kunnen%20(de,studievertraging%2C%20verminderde%20studieprestaties%20en%20uitval)

Taylor, E., Patel, D., Marconi, V., Whitmire, A., Hansen, N., Kershaw, T., Fiellin, D., & Lauckner, C. (2023). Pilot Trial of a Smartphone-Based Intervention to Reduce Alcohol Consumption among Veterans with HIV [Article]. *Military Behavioral Health, 11*(1-2), 66-77. <https://doi.org/10.1080/21635781.2023.2221465>

Thompson, R. G., Aivadyan, C., Stohl, M., Aharonovich, E., & Hasin, D. S. (2020). Smartphone application plus brief motivational intervention reduces substance use and sexual risk behaviors among homeless young adults: Results from a randomized controlled trial [Article]. *Psychology of Addictive Behaviors, 34*(6), 641-649. <https://doi.org/10.1037/adb0000570>

Appendices

Appendix A: Pre-Survey



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

What is your age?

What is your sex?

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

What is your nationality?

- German
- Dutch
- Other

What is the highest degree that you obtained?

- High school
- Bachelor's degree
- Master's degree
- PhD
- Other

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

- Applied sciences bachelor (hbo)
- Applied sciences master (hbo)
- Academic sciences bachelor (wo)
- Academic sciences master (wo)
- Academic sciences PhD (wo)
- Other



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

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

Yes

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:

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:

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:

Below, you will find a series of statements about yourself. Please read each statement carefully and decide how much you agree or disagree with that statement on a Likert Scale (1 = Strongly disagree, 2 = Disagree, 3 = Neither disagree nor agree, 4 = Agree, 5 = Strongly agree).

	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
I plan ahead and organize things, to avoid scrambling at the last minute.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When working, I sometimes have difficulties due to being disorganized.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I often push myself very hard when trying to achieve a goal.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I do only the minimum amount of work needed to get by.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When working on something, I don't pay much attention to small details.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I always try to be accurate in my work, even at the expense of time.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
People often call me a perfectionist.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I make decisions based on the feeling of the moment rather than on careful thought.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I make a lot of mistakes because I don't think before I act.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I prefer to do whatever comes to mind, rather than stick to a plan.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Furthermore, please differentiate between the following statements. Each of the items below contains two choices, A and B. Please click the letter of your choice which most describes your likes or the way you feel. In some cases, you may find items in which both choices describe your likes or feelings. Please choose the one which better describes your likes or feelings. In some cases, you may find items in which you do not like either choice. In these cases, click the choice you dislike least.

- A) I dislike all body odors.
- B) I like some of the earthy body smells.

Choose one statement.

- A) I like to explore a strange city or section of town by myself, even if it means getting lost.
- B) I prefer a guide when I am in a place I don't know well.

Choose one statement.

- A) I have tried marijuana or would like to.
- B) I would never smoke marijuana.

Choose one statement.

- A) I would not like to try any drug which might produce strange and dangerous effects on me.
- B) I would like to try some of the new drugs that produce hallucinations.

Choose one statement.

- A) I like to try new foods that I have never tasted before.
- B) I order the dishes with which I am familiar, so as to avoid disappointment and unpleasantness.

Choose one statement.

- A) I would like to take off on a trip with no pre-planned or definite routes, or timetable.
- B) When I go on a trip I like to plan my route and timetable fairly carefully.

Choose one statement.

- A) I prefer the "down-to-earth" kinds of people as friends.
- B) I would like to make friends in some of the "far-out" groups like artists or "punks."

Choose one statement.

- A) I would like to meet some persons who are homosexual (men or women).
- B) I stay away from anyone I suspect of being "gay" or "lesbian."

Choose one statement.

- A) The essence of good art is in its clarity, symmetry of form and harmony of colours.
- B) I often find beauty in the "clashing" colours and irregular forms of modern paintings.

Choose one statement.

- A) People should dress according to some standards of taste, neatness, and style.
- B) People should dress in individual ways even if the effects are sometimes strange.




Lastly, you will find a series of statements. Please read each statement carefully and answer them on a Likert Scale (1 = "None", 2 = "A few", 3 = "Some", 4 = "Most", 5 = "Nearly all").

	None	A few	Some	Most	Nearly all
How many of your close friends drink alcohol?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How many of your friends get drunk on a regular basis (at least once a month)?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How many of your close friends drink primarily to get drunk?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



We thank you for your time spent taking this survey.
Your response has been recorded.

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Appendix B: Daily Survey

Correct order – Q ID varies due to changing order after creating questions.

Morning survey

Section ID: 1



Q ID: 24

Information



Base

intro morning

Good morning,

Now, you will receive the morning questionnaire of our study. These questions are about the period from yesterday evening until now. Please answer them, as honest as possible. Firstly, we will provide you with general questions about your alcohol use of today.



Q ID: 1

Single Answer



Base

indication craving

Indicate how much you would agree with the following statement: "I craved alcohol in the last 12 hours."

A ID: 1 Strongly agree

A ID: 2 Somewhat agree

A ID: 3 Neither disagree nor agree

A ID: 4 Somewhat disagree

A ID: 5 Strongly disagree



Q ID: 5 **T** Text Base ▾

reason cravings

Why did you experience craving? Please describe the reasons and circumstances for craving.



Q ID: 3 Single Answer Base ▾

Drank alcohol yes/no

Did you drink alcohol in the last 12 hours?

A ID: 1 yes

A ID: 2 no



Q ID: 6 Single Answer Base ▾

amount of drinks

How many alcoholic drinks did you have?

A ID: 1 1 or 2

A ID: 2 3 or 4

A ID: 3 5 or 6

A ID: 4 7 or 8

A ID: 5 9 or 10

A ID: 6 11 or more



Q ID: 7

T Text



Base



drinking context description

Please describe where you were yesterday when you were drinking and with whom.



Q ID: 8

T Text



Base



reason to drink

Why did you decide to drink?



Q ID: 9

T Text



Base



reason not drinking

Why did you decide not to drink?



Q ID: 10

Single Answer

Base

context: drinking peers

How many of your fellow peers/people drank alcoholic beverages in your immediate environment yesterday?

A ID: 1 None

A ID: 2 Less than 1/3

A ID: 3 About half

A ID: 4 More than 2/3

A ID: 5 All of them

A ID: 6 more than 10

Q ID: 11

Single Answer

Base

Context: amount of drinks, peers

How much alcoholic drinks did your fellow peers consume yesterday on average per person?

A ID: 7 0

A ID: 1 1 or 2

A ID: 2 3 or 4

A ID: 3 5 or 6

A ID: 4 7 or 8

A ID: 5 9 or 10

A ID: 6 more than 10



Q ID: 12

Single Answer



Base



influence of peers

Please indicate how much you agree with the following statement: "In the last 12 hours, I think my drinking behaviour was influenced by my peers."

A ID: 1 Strongly agree

A ID: 2 Somewhat agree

A ID: 3 Neither agree nor disagree

A ID: 4 Somewhat disagree

A ID: 5 Strongly disagree



Q ID: 21

Single Answer



Base



experience of guilt

Did you experience feelings of guilt or regret after consuming alcohol in the last 12 hours?

A ID: 1 yes

A ID: 2 no



Q ID: 14

Text



Base



reason guilt

Why did you experience these feelings of guilt/regret?



Q ID: 15

Single Answer

Base

exercise

Did you exercise in the last 12 hours?

A ID: 1 Yes

A ID: 2 No



Q ID: 16

Single Answer

Base

intensity level

Please rate the intensity level of the activity.

A ID: 1 Very low intensity

A ID: 2 Low intensity

A ID: 3 Moderate intensity

A ID: 4 High intensity

A ID: 5 Very high intensity



Q ID: 17

Text

Base

reasons exercising

Please describe your reasons for exercising.



Q ID: 23

Single Answer

Base

order alcohol and exercising

Please indicate the order in which you drank and exercised.

A ID: 1 I exercised first, and drank alcohol afterwards.

A ID: 2 I drank alcohol first, and exercised afterwards.



Q ID: 22

Single Answer

Base

today exercising

Are you planning on exercising today?

A ID: 1 yes

A ID: 2 no


Evening survey


Section ID: 1

 Duplicate  Move  Delete



Q ID: 22

 Information

 Base ▾


intro evening


Good evening,

Now, you will receive the evening questionnaire of our study. These questions are about the period from this morning until now. Please answer them, as honest as possible. Firstly, we will provide you with general questions about your alcohol use of today.



Q ID: 1

 Single Answer

 Base ▾

 Duplicate

 Move

 Delete

 Edit

indication craving

Indicate how much you would agree with the following statement: "I craved alcohol in the last 12 hours."

A ID: 1 Strongly agree

A ID: 2 Somewhat agree

A ID: 3 Neither disagree nor agree

A ID: 4 Somewhat disagree

A ID: 5 Strongly disagree



Q ID: 2 T Text Base ▾

reason cravings

Why did you experience craving? Please describe the reasons and circumstances for craving.



Q ID: 3 Single Answer Base ▾

Drank alcohol yes/no

Did you drink alcohol in the last 12 hours?

A ID: 1 Yes

A ID: 2 No



Q ID: 4

Single Answer

Base

amount of drinks

How many alcoholic drinks did you have?

A ID: 1 1 or 2

A ID: 2 3 or 4

A ID: 3 5 or 6

A ID: 4 7 or 8

A ID: 5 9 or 10

A ID: 6 11 or more



Q ID: 5

Text

Base

drinking context description

Please describe where you were during the day when you were drinking and with whom.



Q ID: 6

Text

Base

reasons for drinking

Why did you decide to drink?



Q ID: 7

T Text



Base ▾

reasons for not drinking

Why did you not decide to drink?



Q ID: 8



Single Answer



Base ▾

context: drinking peers

How many of your fellow peers/people drank alcoholic beverages in your immediate environment in last 12 hours?

A ID: 1 None

A ID: 2 Less than 1/3

A ID: 3 About half

A ID: 4 More than 2/3

A ID: 5 All of them



Q ID: 9

Single Answer

Base

context: amount of drinks, peers

How much alcoholic drinks did your fellow peers consume today on average per person?

A ID: 7 0

A ID: 1 1 or 2

A ID: 2 3 or 4

A ID: 3 5 or 6

A ID: 4 7 or 8

A ID: 5 9 or 10

A ID: 6 11 or more



Q ID: 20

Single Answer

Base

context: influence peers

Please indicate how much you agree with the following statement: "In the last 12 hours, I think my drinking behaviour was influenced by my peers."

A ID: 1 Strongly agree

A ID: 2 Somewhat agree

A ID: 3 Neither agree nor disagree

A ID: 4 Somewhat disagree

A ID: 5 Strongly disagree



Q ID: 11

Single Answer

Base

if yes: experience of guilt

Did you experience feelings of guilt or regret after consuming alcohol in the last 12 hours?

A ID: 1 yes

A ID: 2 no



Q ID: 12

Text

Base

reasons for guilt

Why did you experience these feelings of guilt/regret?



Q ID: 13

Single Answer

Base

exercise

Did you exercise in the last 12 hours?

A ID: 1 yes

A ID: 2 no



Q ID: 21

Text

Base

if yes: reasons exercising

Please describe your reasons for exercising.



Q ID: 14

Single Answer

Base

intensity level

Please rate the intensity level of the activity.

A ID: 1 Very low intensity

A ID: 2 Low intensity

A ID: 3 Moderate intensity

A ID: 4 High intensity

A ID: 5 Very high intensity



Q ID: 17

Single Answer

Base

order alcohol and exercising

Please indicate the order in which you drank and exercised.

A ID: 1 I exercised first, and drank alcohol afterwards.

A ID: 2 I drank alcohol first, and exercised afterwards.



Q ID: 23

Single Answer

Base

exercising evening

Are you planning on exercising in the evening?

A ID: 1 yes


A ID: 2 no


Appendix C: Post-Survey

Section ID: 1



Q ID: 2

 Information

 Base ▾

Intro


Good day!

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 to different time points in the study, therefore, you may recognise questions. Please answer the following questions as honest as possible. :)



Q ID: 3

 Text

 Base ▾

PA

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?

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:



Q ID: 4

T Text



Base ▾

PA

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?

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:



Q ID: 5

T Text



Base ▾

PA

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?

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:



Q ID: 6

Single Answer

Base

Question 6 of Survey 20241

Indicate how much you agree with the statement: "How many of your close friends drink alcohol?"

A ID: 1 None

A ID: 2 A few

A ID: 3 Some

A ID: 4 Most

A ID: 5 Nearly all



Q ID: 7

Single Answer

Base

Question 7 of Survey 20241

Indicate how much you agree with the statement: "How many of your friends get drunk on a regular basis (at least once a month)?"

A ID: 1 None

A ID: 2 A few

A ID: 3 Some

A ID: 4 Most

A ID: 5 Nearly all



Q ID: 8

Single Answer



Base



PA

Indicate how much you agree with the statement: "How many of your close friends drink primarily to get drunk?"

A ID: 1 None

A ID: 2 A few

A ID: 3 Some

A ID: 4 Most

A ID: 5 Nearly all



Q ID: 9

Text



Base



Experiences

What are your experiences with using this app?



Q ID: 10

Text



Base



Question 10 of Survey 20241

Did this app provide any insight in your triggers for drinking alcohol? If so, how?



Q ID: 11

T Text

Base

Question 11 of Survey 20241

What do you think of the use of this app over the last week?



Q ID: 12

T Text

Base

Question 12 of Survey 20241

What could improve your experience with such an app?



Q ID: 13

T Text

Base

Question 13 of Survey 20241

Would you consider taking part in a similar study based on your experience with this research?
Please elaborate.



Q ID: 14

Single Answer

Base

Question 14 of Survey 20241

Did you feel any influence on your own craving or actual alcohol usage due to daily questions about consumption?

A ID: 1 Yes, I felt an increase in my craving.

A ID: 2 Yes, I consumed more alcohol than usual.

A ID: 3 Yes, I felt a decrease in my craving.

A ID: 4 Yes, I consumed less alcohol than usual.

A ID: 5 No.



Q ID: 15

T Text

Base

Question 15 of Survey 20241

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



Q ID: 16

I Information

Base

End

Dear participant,

Congratulations! You successfully finished the study. Thank you for contributing to our research. Your insights and time are greatly appreciated. We will ensure that your data will be kept confidential.

If this research triggered your mental health in any way, please contact your GP. For further questions about this research or for information about the findings please contact the research team. We hope that participating in our research was a pleasant and informative experience for you. We would like to invite you to remain curious and consider being involved in future studies.

We wish you all the best! :)

Kind regards,

Marleen, Laura, Lea & Meike

Contact details:

Laura Lenz under l.c.lenz@student.utwente.nl

Appendix D: Introduction and Informed Consent Form



Dear participant,

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

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

You will be provided with short questionnaires via the app Ethica (Avicenna), once in the morning and once in the evening. The pre-questionnaire will be received directly after signing up, only after filling out this survey you can continue with the daily questionnaire. This daily questionnaire will then be the following morning.

One questionnaire can be filled out for one hour after receiving its notification. It can happen that you do not respond to the notification in time and thus miss a questionnaire. However, please try to fill out the questionnaires as often and as honestly as you can, since it is important for us to gain a sufficient overview.

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

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

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

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

- Alright, next page.
- Rather not, leave 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"/>

Appendix E: Codebook

Survey	Theme	Code	Definition	Quotes
Pre-survey	Awareness	Insight consumption	Insight into visible acts regarding alcohol consumption [drinking behaviour] such as drinking frequency and amount of alcoholic consumptions.	<p>“Getting insights in my own drinking behaviour.”</p> <p>“Deepen my knowledge on my alcohol consumption”</p>
	Awareness	Insight triggers	Insight into any underlying reasons for participants to consume alcohol.	<p>“My only expectation is that I will gain some insight trough the regular reflection the app will make me do”</p> <p>“I dont have to many expectations. I am just curious about my alcohol intake and my thoughts behind doing so.”</p>
	Awareness	Insight general	Insight into drinking behaviour next to- or unspecified as consumption and/or triggers.	<p>“Getting a better sense of how much alcohol is a part of a student's life”</p> <p>“To gain insight into my alcohol drinking habits by filling in the questionnaire twice a day”</p>
	Awareness	Control behaviour	Getting control over one’s drinking behaviour as a result of gaining awareness through filling out the surveys.	<p>“get control over my drinking behaviour and to understand why i used it...”</p>
	App	Easy use	Expectations of experiencing participation in the study as easy.	<p>“I think it will be easy to fill out the questionnaires [...]”</p> <p>“That it won't be a lot of work and that I will be helping a friend.”</p>
	App	Notifications	Any expectations regarding receiving notifications.	<p>“I expect to get notifications from the app asking me fill in the questionnaires for this study.”</p> <p>“I get notifications and fill out questions”</p>
	App	Answering questions	Expectations regarding the participant’s part in this study being to fill out the surveys.	<p>“I expect that i will have to fill in questionnaires about my alcohol usage and the way it affects me every day.”</p> <p>“I expect that I will get a survey every day with I have to fill in about my alcohol consumption [...]”</p>
	App	Tracking behaviour	Expectations regarding the goal of the surveys being to track one’s own behaviour.	<p>“to track my alcohol use”</p> <p>“I am expecting to track my alcohol consumption, since I have been drinking casually a lot the past few months. [...]”</p>

	General	None	Having no expectations about this study.	"None"
	General	Act	Any expected acts during this study that are not linked to specific components of the such as answering options or tracking behaviour.	"To participate in the study" "helping a friend"
	General	Mood	Any effects the study might have on the participant's mood.	"That it is gonna be a fun time" "It might be annoying, i hope i will hang on"
Daily survey	Intrinsic	Celebrate	Any reason for a participant to celebrate/reward themselves preferably with a drink.	"Because we want to celebrate that my friend is getting married and we were at a nice location" "Because I just finished my exam and I wanted to reward myself"
	Intrinsic	Craving	The internal feeling of wanting a drink, for no specific other reason.	"I was craving it and it tastes good." "i just wanted to have a beer"
	Intrinsic	Effect alcohol	The mental and physical effect alcohol has on a person.	"I wanted to be more active and involved in the party" "because i dont like the feeling of being tipsy/drunk"
	Intrinsic	Habit	Based on previous, repeated behaviour caused by one common factor such as a day or a situation.	"cause we always do that on Thursday nights" "Because we always do it when we support our friends at their match"
	Intrinsic	Long sober	Indication of craving/consuming a drink because a long time has passed since the last alcoholic consumption.	"I havent drank since Sunday, so I feel like my system is telling me it is time again haha." "Because I havent has alcohol for 2 weeks and decided it was a good occassion"
	Intrinsic	Stress release	Consuming/craving alcohol to help release stress after or in a stressful situation/period.	"i had a hard day of work and wanted to relax with a beer" "I had to have a difficult talk with my partner and I thought it might be easier over a glass of wine."
	Intrinsic	Taste	(Dis)liking or curiosity towards the taste of alcoholic beverages.	"Because I love Glühwein and since it's almost Christmas I really want to drink some" "Because we wanted to try out different beer flavours and get drunk"
	Intrinsic	Conscious	Reasons for participants to consciously decide to not drink alcohol.	"rational thought that i shouldnt" "Alcoholbreak"

Intrinsic	Health	(Not) drinking to gain/maintain physical and/or mental health.	<p>“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”</p> <p>“To get over my hangover and for fun”</p>
Intrinsic	No craving	Refraining from drinking alcoholic beverages based on having no internal need to consume alcohol.	<p>“I did not feel like drinking”</p> <p>“There was no urge to drink”</p>
Intrinsic	Energy	Refraining from drinking alcoholic beverages because one was regaining energy or had little energy.	<p>“I am on my period and was really tired. I was drinking a lot in the weekend and just need a break.”</p> <p>“I was out in a bar and had very low energy and felt like alcohol would just make me less energetic. Also I just wasnt feeling like it. [...]”</p>
Extrinsic	Availability	(Not) drinking or craving alcohol based on it being available near the participant at a specific moment.	<p>“Because i wanted to and the bottle of wine was already open”</p> <p>“It was too much of a hassle to go to the store for alcohol”</p>
Extrinsic	Drank previously	Drinking because one had drunk not too long ago.	<p>“I drank yesterday”</p> <p>“I had alcohol yesterday”</p>
Extrinsic	Drinking game	Consuming alcohol because one was playing a drinking game at that moment.	<p>“I'm at a camp and we were playing a game where you couldn't drink unless you were told to. I did not get told to drink that much.”</p> <p>“We played beerpong and basicslly meet to drink”</p>
Extrinsic	Environment	(Not) craving or drinking alcoholic beverages due to the (physical) environment.	<p>“because the vibe was really nice”</p> <p>“I was at a christmas market with friends and there were alcohol/Glühwein shops so we drank some.”</p>
Extrinsic	Going out	Craving or drinking alcohol because one went to an event or location where it is common to drink.	<p>“We went to a party and i was looking forward to drink some and enjoy the evening”</p> <p>“I went to a concert and aimed to have a good time by having a beer.”</p>
Extrinsic	Mirroring	(Not) craving or consuming alcohol as a result of seeing other people’s drinking behaviour.	<p>“My parents were drinking next to me and were having a good time. So i habe thought thatvone drink could bring me to the same state”</p> <p>“because nobody else did”</p>

Extrinsic	No occasion	Not drinking or craving alcoholic beverages due to a lacking external reason such as an event or a social gathering.	<p>“There was no occasion for which it was necessary to drink.”</p> <p>“no reason to drink”</p>
Extrinsic	No option	No possibility to consume alcohol, regardless of any internal cravings.	<p>“I was leaving my LDR boyfriend and could not drink tonight.”</p>
Extrinsic	Planned	Craving or drinking alcoholic beverages because one had planned to do this.	<p>“not really cravings but i planned to drink some glühwein with a friend in the evening today so i was looking forward to that! its cozy during wintertime”</p> <p>“Because i have made plans to go to a bar tomorrow, to meet with my friend”</p>
Extrinsic	Reminded	Craving or drinking alcoholic beverages because one got reminded of alcohol due to an external factor.	<p>“My friend was talking about drinking alcohol”</p> <p>“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”</p>
Extrinsic	Social	Craving or drinking alcoholic beverages in social company.	<p>“I usually drink at the biweekly drinks of my dispuut, I like it and it is gezellig”</p> <p>“because I was seeing my friend”</p>
Extrinsic	Social pressure	Drinking alcoholic beverages because one felt obligated to other people to do so.	<p>“Because they ordered a beer for me and i didnt want to refuse it”</p> <p>“My teammanager made me”</p>
Extrinsic	Study	Any reason for (not) craving or consuming alcohol based on one’s study.	<p>“I spent the evening at home and worked for uni, no need to drink alcohol”</p> <p>“”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</p>
Extrinsic	Timing	(Not) craving or drinking alcoholic beverages due to it being at a specific moment in time.	<p>“Because it is friday and I want to go out, socialize, not think about any work or problems and just have a good time”</p> <p>“I felt it was too early in the day for me to drink. So I did not.”</p>
Extrinsic	Work	Any reason for (not) craving or consuming alcohol based on one’s work.	<p>“because i work at a school on fridays and i dont consume alcohol during my shift”</p>

				<p>“My boss was slightly annoying at some points. Stress in the restaurant, craved alcohol to get in the flow.”</p>
	Extrinsic	Busy	Refraining from drinking alcoholic beverages because one was occupied with other activities and lacked time to.	<p>“Sports, tired, not the occasion, and had to be sharp/fit today”</p> <p>“I was very busy today and just wanted to watch a movie in the evening - alcohol is not needed for that”</p>
	Extrinsic	Other substances	(Not) drinking or craving alcoholic beverages because one had used other substances before or in that moment.	<p>“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.”</p> <p>“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”</p>
	Extrinsic	Responsibility	Refraining from drinking alcohol because one has made a promise to/deal with an external party such as deadlines, classes, or appointments.	<p>“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”</p> <p>“had to drive”</p>
Post survey	Yes insight	Reflecting	Experienced insight due to the reflecting nature of the study.	<p>“I think it is interesting to reflect on the actual reasons [...]”</p> <p>“yes because it got me reflecting on my own behaviour”</p>
	Yes insight	Stress release	Learned that one craves/consumes alcohol for the goal of releasing stress.	<p>“Yes, I learned that I crave alcohol more when I've had a hard day”</p> <p>“[...] most of the times i drink to loosen up. [...]”</p>
	Yes insight	Social	Learned that one's drinking behaviour depends on their social environment.	<p>“yes, that it's strongly depending on my peers drinking behaviour”</p> <p>“Peers are definitely an influence and the app made that more apparent by including statements about peers”</p>
	Yes insight	Frequency	Gained more insight about how often one consumes alcohol.	<p>“Yes it was interesting actually wrting down how often and especially how much I drank”</p> <p>“Sort of, because even though I can drink 'enough' in a weekend I can still want to drink literally in the middle of the week.”</p>

Yes insight	Amount	Gained more insight about the amount of alcoholic beverages one consumes.	<p>“Yes it was interesting actually wrting down how often and especially how much I drank”</p> <p>“Sort of, because even though I can drink ‘enough’ in a weekend I can still want to drink literally in the middle of the week.”</p>
Yes insight	Environment	Gained more insight about the influence of one’s physical environment on their drinking behaviour.	<p>“[...] I think its just certain cues, like weekend, bar, certain friend groups, Christmas market, etc.”</p> <p>“Yes, it showed me that my friends / people around me influence my deinking behaviour quite a lot”</p>
Yes insight	Physical state	Gained more insight about the influence of their physical state on their drinking behaviour.	<p>“Yes it did, because it made me reflect on why I drink. Primarily it comes from my inside and is less affected by my peers. If I had a stressful day I am more inclined to drink but if I have heartburn or I am tired, I am less likely to drink. Then I don't care if my peers drink and I don't. The other way around I also don't care if they do not drink and I do.”</p>
Yes insight	Occasion	Learned that they only drink alcoholic beverages occasionally	<p>“I drink alcohol very rarely, and if I do then it's only 1-2 drinks when I'm with my friends and we are having a party, but my alcohol intake is not influenced by them”</p>
Yes insight	Own choice (+)	Learned that their drinking behaviour is mainly based on their own choices.	<p>“It showed me that i decide by my self if i want to drink”</p>
No insight	General	Participant did not gain any insights in general from this study.	<p>“Not really only that since i have a dog I am much more active, but my drinking behaviour didnt change”</p> <p>“No”</p>
No insight	Already aware	Participant did not gain any new insights because they were already aware of their drinking behaviour and/or underlying triggers.	<p>“Not really, because i know my drinking is influenced by my mood and my peers”</p> <p>“Not really, I already know my triggers”</p>
No insight	No triggers	Participant did not experience any triggers for their drinking behaviour.	<p>“I did not notice any triggers. But I would also say that I do not really have triggers when it comes to drinking alcohol. [...]”</p> <p>“Not really, there wasnt any pattern to my drinkin. I primarily drank something when i felt like it to enjoy it. [...]”</p>

No insight	Own choice (-)	Participant did not gain any insight about (triggers of) their drinking behaviour because it relies on their own choice.	<p>“I drink alcohol very rarely, and if I do then it's only 1-2 drinks when I'm with my friends and we are having a party, but my alcohol intake is not influenced by them”</p> <p>“Not really, there wasn't any pattern to my drinking. I primarily drank something when I felt like it to enjoy it. As well as, I didn't drink excessive amounts.”</p>
No insight	Little consumption	Participant did not gain any insight because their little amount of alcoholic consumptions during this study provides too little information.	<p>“Not really since I haven't had that much alcohol lately”</p> <p>“[...]As well as, I didn't drink excessive amounts.”</p>
No insight	Questionnaire	Participant did not gain any insight due to the nature of the questionnaires.	“Not really, the questions were maybe too repetitive”
Positive	Usage	Participant experienced the app as easy to work with during this study.	<p>“It was very simple and straight forward. I quite liked it.”</p> <p>“Easy to use”</p>
Positive	General	Participant was generally positive about the use of the app during this study.	<p>“It was fine.”</p> <p>“It was good.”</p>
Positive	Purpose (+)	Participant was positive about the purpose of the app.	<p>“It was interesting to think about those questions but I don't drink regularly or go party regularly”</p> <p>“It was interesting to keep track of my drinking”</p>
Positive	Design (+)	Participant was positive about the design of the app/study.	<p>“The questions were precise and easy to answer. The questionnaires were the perfect length. The app really made me reflect.”</p> <p>“It was nice that the questionnaires came mostly at the same time, but that was also a difficult time sometimes”</p>
Negative	Wrong target	Participant felt like they were the wrong target for this app.	<p>“I think it is useful, just not for me this specific week”</p> <p>“Sometimes a little redundant because I am not a big drinker and don't drink on week days”</p>
Negative	Purpose (-)	Participant was negative about the purpose of this app.	“not really necessary or useful”
Negative	Mood (-)	The use of the app had a negative effect on the participant's mood.	“It was a little bit stressful to have to fill it out twice a day, as I was often busy at University or in another social

				<p>setting when I had to fill it out which disrupted my daily life.”</p> <p>“Happy that its done”</p>
	Negative	Design (-)	Participant was negative about the design of the app/study.	<p>“It was annoying that the questionnaire is 2 times per day. And why should a morning questionnaire start at 11 am? I was at uni or work and didn’t have time to answer the questionnaire. A morning questionnaire should start earlier. I also got multiple notifications during the day from your app, but when I checked, there was no new message. Therefore I stopped checking after every notification. To sum it up, I didn’t like it.”</p> <p>“It was nice that the questionnaires came mostly at the same time, but that was also a difficult time sometimes”</p>
	Content	Information	Participant suggests to improve any information in the app.	<p>“App could give some insights or facts about drinking in between (However, I do not know if that would interfere with the study).”</p> <p>“Maybe tell the participants before how long they have time for filling out the questionnaire or show within the app how long it’s available.”</p>
	Content	Answer options	Participant suggests to improve the answer options in the app.	<p>“I guess the open answers confused me a bit because i normally dont give that much thought to my drinking (was never problematic)”</p> <p>“Maybe there would be a possiblity to enter when you sre craving alcohol and the intesity and also when you are exercising and the intensitiy instead of being asked about that in the questionnaire”</p>
	Content	Visuals	Participant suggests to improve any visuals in the app.	<p>“maybe improve the aesthetics”</p> <p>“Less repetitive questions, maybe aome pictures?”</p>
	Content	Questions	Participant suggests to improve the questions in the app.	<p>“Maybe more interactive questions and some questions that actually make you think about the drinking behaviour of the population”</p> <p>“More clear questions which allow for easier formulating an answer”</p>

	Logistics	Frequency	Participant has suggestions regarding the frequency of the app use.	<p>"I wouldnt want it to be a 2 times daily thing but i do not have a drinking problem so that might be the reason that it is just a little annoying"</p> <p>"[...] less questionnaires per day, [...]."</p>
	Logistics	Time	Participant has suggestions regarding the time of the app use.	<p>"If the surveys were online longer"</p> <p>"Sometimes i didnt get a notification and especially the evening questionnaire expired a lot"</p>
	Logistics	Technical issues	Participant has suggestions regarding the technical issues of the app.	"it sometimes had bugs"
	Logistics	Notifications	Participant has suggestions regarding the notifications of the app.	<p>"[...] less notifications, [...]"</p> <p>"Maybe a more often reminder, or one shortly before the possibility to fill out the survey ends."</p>
	Logistics	Timing	Participant has suggestions regarding the timing of when to use the app.	<p>"[...] Also the time point when the questions were supposed to be filled out were strange"</p> <p>"The time periods didnt include afternoon/evenings where alc consumption is most likely imo [in my opinion]"</p>
	Neutral	Nothing	Participant had no suggestions for improvement.	<p>"I do not know, do not have any suggestions"</p> <p>"Nothing much, it worked very well"</p>
	Neutral	Experience	Participant claims experience would improve when increasing own experience with such an app.	"doing more studies"

Appendix F: Frequency Table of all Codes Found in the Daily Survey

Intrinsic	Total morning + evening	%	craving	%	yes drinking all data	%	no drinking all data	%
celebrate	16	1,66	4	2,78	12	6,52	0	0
craving	15	1,56	0	0	15	8,15	0	0
effect alcohol habit	41	4,26	13	9,03	27	14,67	1	0,16
long sober	10	1,04	4	2,78	6	3,26	0	0
Stress release	4	0,42	3	2,08	1	0,54	0	0
taste	39	4,05	22	15,28	17	9,24	0	0
conscious health	30	3,12	10	6,94	20	10,87	0	0
no craving energy	21	2,18	0	0	0	0	21	3,31
	37	3,84	0	0	1	0,54	36	5,67
	242	25,13	0	0	0	0	242	38,11
	43	4,47	0	0	0	0	43	6,77
Total intrinsic	498	51,71	56	38,89	99	53,8	343	54,02
Extrinsic				0	0	0	0	0
availability	25	2,6	7	4,86	10	5,43	8	1,26
drank previously	2	0,21	2	1,39	0	0	0	0
drinking game	4	0,42	2	1,39	2	1,09	0	0
environment	35	3,63	7	4,86	12	6,52	16	2,52
going out	27	2,8	19	13,19	8	4,35	0	0
mirroring	17	1,77	8	5,56	7	3,8	2	0,31
no occasion	85	8,83	0	0	0	0	85	13,39
no option	1	0,1	1	0,69	0	0	0	0
planned	5	0,52	4	2,78	1	0,54	0	0
reminded	8	0,83	6	4,17	2	1,09	0	0
social	45	4,67	14	9,72	31	16,85	0	0
social pressure	2	0,21	0	0	2	1,09	0	0
study	64	6,65	3	2,08	3	1,63	58	9,13
timing	43	4,47	8	5,56	4	2,17	31	4,88
work	50	5,19	7	4,86	3	1,63	40	6,3
busy	30	3,12	0	0	0	0	30	4,72
other substance	4	0,42	0	0	0	0	4	0,63
responsibility	18	1,87	0	0	0	0	18	2,83
Total extrinsic	465	48,29	88	61,11	85	46,2	292	45,98
Total int+ext	963	100	144	100	184	100	635	100

Appendix G: Frequency Table of all Codes Found in the Post-Survey

	A	B	C	D	E	F	G	H	I	J	K
1	10_insight				11_evaluation				12_improve		
2	Yes insight [incl 'both']	amount			Positive [incl 'both']	amount			content [incl 'both']	amount	
3	reflecting +	4			usage +	7			information	2	
4	stress release +	2			general +	13			answer options	3	
5	social +	8			purpose +	7			visuals	3	
6	frequency +	2			design +	3			questions	6	
7	amount +	2			total	30			total	14	
8	environment +	2									
9	physical state +	1							logistics [incl 'both']	amount	
10	occasion +	1			Negative [incl 'both']	amount			frequency	2	
11	own choice +	1			mood -	5			time	3	
12	total	23			design -	5			technical issues	1	
13					purpose -	1			notifications	4	
14	No insight [incl 'both']	amount			wrong target -	3			timing	2	
15	general -	12			total	14			total	12	
16	already aware -	6				44					
17	no triggers -	3			both 11	amount			both	amount	
18	own choice -	3			general +	1			questions	2	
19	little consumption -	3			purpose +	2			frequency	1	
20	questionnaire -	1			usage +	1			notifications	1	
21	total	28			design+	1			answer options	1	
22		51			mood -	1			timing	1	
23	Both	amount			wrong target -	2			total	6	
24	no triggers -	1			design -	2					
25	own choice -	2			total	10			Neutral	amount	
26	social +	1							Nothing	16	
27	reflecting +	1							Experience	1	
28	no triggers -	1							total	17	
29	little consumption -	1								43	
30	occasion +	1									
31	total	8									
32											