VIVE

DET NATIONALE FORSKNINGS- OG ANALYSECENTER FOR VELFÆRD

A Randomized Controlled Trial to Investigate the Impact of Nudging University Students to Reduce Risky Alcohol Consumption

Rune Vammen Lesner, Jane Greve, and Stefan Bastholm Andrade

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Forord

Langt de fleste unge i Danmark har en sund alkoholkultur. Men sammenlignet med andre lande er der dog relativt mange danske unge, som har et højt alkoholforbrug. Dette gælder også, når vi ser på universitetsstuderende. Blandt de danske universitetsstuderende indgår der ofte et stort alkoholindtag ved sociale aktiviteter og i fælleskaber, og mange af de unge giver udtryk for, at det kan være vanskeligt at deltage i aktiviteter og fælleskaber uden at drikke alkohol.

I dette projekt undersøger VIVE, om det er muligt at ændre på de unges adfærd og reducere storforbruget af alkohol blandt universitetsstuderende. I et samarbejde mellem Carlsberg, Aarhus Kommune, Magistratsafdelingen for Sundhed og Omsorg (MSO), Studenterhus Aarhus og VIVE har vi udviklet to indsatser, en på individniveau og en på barniveau. Formålet med indsatserne var at påvirke den alkoholkultur, som baseres på et meget stort alkoholindtag. Indsatserne er baseret på ”nudging”, dvs. forhold, som uden forbud eller økonomiske incitamenter skal få de unge til at ændre på deres alkoholadfærd. Indsatserne inkluderer elementer såsom øget selvbevidsthed, udarbejdelse af strategier til at undgå et overdrevent alkoholindtag samt øget information om skadeligt brug af alkohol og alternative aktiviteter, som ikke inkluderer et overdrevent alkoholforbrug. Tidligere studier har vist, at netop disse elementer er vigtige for at få unge til at ændre adfærd i relation til et meget højt alkoholforbrug.

Rapporten er udarbejdet af seniorforsker Rune Vammen Lesner, seniorforsker Stefan Bastholm Andrade og professor MSO og projektleder Jane Greve. Indsatsen er udviklet i et samarbejde mellem Carlsberg, Aarhus Kommune og dens magistratsafdeling Sundhed og Omsorg, Studenterhus Aarhus og VIVE. VIVE har stået for evalueringen af indsatsen. Carlsberg og Aarhus Kommune har finansieret indsatsen og evalueringen.

En række personer har bidraget til projektet. Først og fremmest vil vi gerne takke de studerende, som har deltaget i eksperimentet, samt barpersonale og studenter, som har hjulpet med at implementere de aktiviteter, som er foregået i bar-interventionen. Dernæst vil vi gerne takke VIVE forskere på et internt seminar for gode kommentarer og to eksterne reviewere for deres brugbare kommentarer til rapporten. Endelig vil vi gerne takke Carlsberg, Aarhus Kommune, Magistratsafdelingen for Sundhed og Omsorg (MSO) og Studenterhus Aarhus for et godt samarbejde omkring gennemførelsen af interventionerne og for rapportens tilblivelse.

Preface

Most young people in Denmark have healthy drinking habits. However, compared to other countries many Danish young people have a high level of alcohol consumption. This is also true for university students. From previous research, we know that Danish university students perceive heavy drinking as a cornerstone of the life at campus and many find it difficult to go against the dominant drinking culture.

In this project, VIVE investigates how we can change the behavior of young people and reduce excessive alcohol consumption. In a collaboration between Carlsberg, Aarhus Municipality -– including the Magistrate's Department for Health and Care (MSO), the student association Studenterhus Aarhus, and VIVE – two initiatives were developed, one at the individual level and one at the bar level, to evaluate tools that we expected would affect the students' behavior and, subsequently, their drinking culture. The tools are based on "nudging", i.e., elements that, without prohibition or financial incentives can change young people's alcohol behavior. The tools include elements such as increased self-affirmation strategies, elaboration of strategies to avoid excessive alcohol intake, and increased information on harmful alcohol use and alternative activities that do not include excessive alcohol consumption. Previous studies have shown that these elements are important in changing behavior in relation to alcohol consumption.

The report is prepared by senior researcher Rune Vammen Lesner, senior researcher Stefan Andrade, and professor with special responsibilities and project manager Jane Greve. The intervention was developed in a collaboration between Carlsberg, Aarhus Municipality (MSO), the student association, Studenterhus Aarhus, and VIVE. VIVE conducted the evaluation of the intervention. Carlsberg and Aarhus Municipality (MSO) have financed the intervention and the evaluation.

A number of people have contributed to the project. First of all, we would like to thank the students who participated in the experiment, as well as the bar staff and students who helped implementing the activities in the bar intervention. Next, we would like to thank VIVE researchers at an internal seminar and two external reviewers for their useful comments on the report. Finally, we would like to thank Carlsberg, Aarhus Municipality (MSO), and the student association Studenterhus Aarhus for the cooperation in the implementation of the interventions and for making this project possible.

Kræn Blume Jensen
Head of Research for VIVE Social Policy
2020

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Summary

Background and purpose

This report summarizes key findings from an individual-level and a bar-level intervention aimed at reducing the excessive drinking culture among Danish university students in Aarhus. From previous research, we know that Danish university students perceive heavy drinking as a cornerstone of the life at campus and many find it difficult to go against the dominant drinking culture (Järvinen et al., 2018; Larsen, Smorawski, Kragbakand, & Lund, 2016). Whereas most students will not experience negative consequences of this drinking culture, students who drink heavily expose themselves to both immediate and long-term risks. For example, empirical studies from Denmark and other western countries link heavy drinking in youth to immediate risks such as low academic performance, injuries, traffic accidents, and unwanted or unprotected sexual encounters (Marshall, 2014; Viner et al., 2012; Wechsler, Davenport, Dowdall, Moeykens, & Castillo, 1994). Empirical examples of later negative life consequences includes low educational attainment, unemployment, criminal and violent behavior, and health problems (Hingson, Heeren, Zakocs, Kopstein, & Wechsler, 2002; Järvinen et al., 2018; Porter & Pryor, 2007; White & Hingson, 2013). The main purpose of the study is to investigate how interventions at the individual and at the bar level can reduce the excessive drinking culture among Danish university students. We define the concept "drinking culture" in rather broad terms by referring to the patterns of "social control and of collective behavior" that surround the practice of consuming alcohol (Savic, Room, Mugavin, Pennay, & Livingston, 2016).

The individual-level intervention

Drawing on classic nudging tools[1], the individual-level intervention included several components that target the drinking culture at both an individual and a structural level. This part of the intervention aimed at enhancing the students' self-control and self-image. More specifically, the intervention provided the students with tools that helped them to develop pre-commitment strategies and to change their views on the social norms that prevent a high alcohol intake. In practice, the intervention sent an e-mail to the students with a link to an online questionnaire and information/videoes and three motivational text messages. The online questionnaire was based on a validated self-affirmation questionnaire (Kaner et al., 2017; Norman et al., 2018) adapted to the local setting of a Danish university. The content of the text messages was developed for this project.

To evaluate the impact of the individual-level intervention we conducted a randomized controlled trial and invited the students to answer a questionnaire including information on health behaviors before and after the intervention. The students were recruited over two weeks from the September 11, 2019 to the September 25, 2019. Four conditions for participating in the experiment were set: 1) that the individual was motivated to participate in the experiment, 2) that the individual was a student at Aarhus University, 3) that the individual sometimes drank alcohol, and 4) that the individual was willing to provide their phone number. Half of the students were given the intervention at the individual level (treated) while the other half only answered the before and after questionnaires (control). Results are based on the 508 students who answered the two questionnaires. In this sample, the treatment and the control group do not differ significantly regarding characteristics such as gender, social background, grade point averages in upper secondary education, and drinking behavior (i.e., the sample is balanced). We can

[1] Nudging is defined and described in Section 2.1.1.

thus estimate the causal impact of the individual-level intervention by comparing the drinking behavior in the control and treatment group after the intervention on this sample.

In line with similar studies from Spain (Martinez-Montilla et al., 2020), the UK (Norman et al., 2018), and Australia (Hagger et al., 2012), we find that the intervention reduced the students' alcohol consumption, which indicates external validity of our results. Our results show that the individual-level intervention had a significant effect on the number of times per month students drank alcohol. Thus, students participating in the intervention had a 17% reduction in their monthly level of alcohol intake. The result is driven by a large effect on male and first-year students. While the intervention included many different elements, we cannot identify a particular part of the intervention as driving the effect on the number of times drinking alcohol. We argue that the combination of the elements included at the individual level had an effect. The individual-level intervention had no effect on binge drinking, alcohol addiction, and experiencing alcohol-related harm.

We study two individual motivational factors for participating in the drinking culture at the university, namely alcohol consumption as a facilitator of social interaction and as a personal benefit (Demers et al., 2002; Järvinen et al., 2018; Kuntsche, Knibbe, Gmel, & Engels, 2005; Lannoy, Billieux, Poncin, & Maurage, 2017; Measham & Brain, 2005). However, it is difficult to capture the effects of these factors empirically. We approach this difficulty by examining several outcomes under the hypothesis that the joint information from these estimates provides us with indications of the impact of the intervention on alcohol consumption as a facilitator of social interaction and as a personal benefit.

To measure the effect of the individual-level intervention on alcohol consumption as a facilitator of social interaction, we analyzed both whether the intervention made it easier for the students to choose not to drink at parties and whether the intervention changed the students' views on alcohol consumption as a part of the social life on campus. In this part of the analysis, we also tested whether specific groups, such as first-year students, are particularly affected by the intervention. Our results show that the intervention did make it less difficult to say no to drinking alcohol at parties. Participation in the intervention, however, had no significant effect on whether the students feel they are part of or like the student environment or on their expected academic performance. The intervention reduced the students' frequency of visits to the Friday bars. This effect is driven by women. Women participating in the intervention reduced the frequency of visits in the Friday bars by 0.17 visits.

Large effects on the impact of the intervention on the number of times drinking alcohol were found for first-year students, students with at least one parent born outside Denmark, and students with no parents with a tertiary education. For first-year students, the number of times drinking alcohol during the preceding month was reduced by 1.45. For student with more than one year of studies this effect was smaller, namely 0.82. The number of times drinking alcohol during the preceding month was reduced by 2.12 for students of parents not born in Denmark. For students with parents born in Denmark, the number of times was reduced by 0.75.

We also analyzed whether the intervention had an impact on the students' alcohol consumption as a way of dealing with stress, coping with personal problems, and relieving boredom (Mohr et al. 2005). In particular, we measured the impact of the intervention on the self-reported reasons for drinking at parties and in general. We found that the intervention reduced the students' alcohol consumption due to stress by 7 percentage points and drinking to forget problems by 6 percentage points. Men reduced drinking due to stress and women reduced drinking to forget

problems. The intervention increased the probability of the students pointing to money and memory loss as reasons for not drinking at parties.

In the sample of students in the treatment group, two thirds report that the intervention made them think more about their alcohol consumption and around half report that the intervention made them think more about their student environment and their social relations. Furthermore, in the treatment group 13% of the students report having reduced their alcohol consumption due to the intervention. These results for the students in the treatment group suggest that the intervention had the intended effect. However, these results cannot be interpreted as causal effects and serve only as descriptive input.

We calculate the cost-effectiveness of the intervention and find that the cost of reducing drinking by one event during the intervention period is between 103 DKK (Danish kroner) and 219 DKK. These figures do not include any potential long-lasting effects of the intervention.

The bar-level intervention

The Friday bars are a cornerstone of the social environment at the university. They are weekly social events on campus, where students meet and alcohol is served. A bar-level-intervention was introduced in order to change the risky drinking behavior at the student bar, hereinafter referred to as Friday bars.

The core element in the bar-level intervention was the introduction of alcohol-free beer as an alternative to regular beer at the Friday bars. Awareness about the alcohol free alternative was emphasized by social activities in the bar. The social activities included a presentation of the Foodmaker initiative, which brings together young people to make food and a “drunk cycling simulation” which included a set of VR-glasses and a bike, and made it possible for the students to experience the feeling and dangers of cycling while being drunk.

In total, five Friday bars participated in the bar-level intervention. The consumption of alcohol free beer in the bars that receive the bar intervention was very limited, and we find no statistical indication that the bar-level intervention had an impact on the students’ level of alcohol consumption in the Friday bars. We also find no indication in the individual-level data, that the bar-level intervention had an effect on those who visited the treatment bars or that the bar-level intervention significantly affected the estimate of the individual-level intervention. There might be several reasons why we do not find an effect of the bar intervention. First, the bar activities were introduced for a relatively short period due to the short test period of the interventions. Second, it was only possible to present the social bar activities at the Friday bars for a few hours due to limited staff (to present/guide the intervention) and crowdedness. Third, and finally, changing young people’s preferences (and consumer behavior) towards a non-alcoholic alternative is a difficult task that takes time. Thus, while the introduction of a non-alcoholic alternative might have changed the students’ view of these products we might not observe a significant change in the actual choice of drink at the Friday bars when we evaluate the effect after only one month.

Conclusion and discussion

We find that the individual-level intervention affected the drinking culture among university students. In particular, we find that the monthly level of alcohol intake was reduced and that the intervention had a relatively large impact among male students, who as a group drink more than the group of female students. We do not, however, detect any significant effect of the individual-level intervention on risky alcohol consumption. Furthermore, we find that the students find it less difficult to say “no” to drinking and that a relatively large share of the students

exposed to the intervention indicate that the online intervention made them think more about their alcohol consumption, their student environment, and their social relations. Thus, while we find that the students in the intervention group drink less and are more aware of the excessive alcohol culture compared to the control group, the students in the control and intervention group did not differ in their assessment of participation in the student environment.

The fact that the effect of the individual-level intervention was largest among the young and first-year students has two implications. First, the benefit of the individual-level intervention might increase when the intervention starts early in the semester, as it might then have a greater impact on the drinking culture. Second, as the first-year students will be responsible for the drinking culture in the coming years at Campus, this (relatively small) nudging-based intervention can potentially have significant long-term beneficial effects.

1 Introduction

Background

Young people's excessive use of alcohol is a major risk factor for a variety of negative consequences in later life outcomes. For example, extensive drinking during youth is found to be associated with lower educational attainment, unemployment, criminal and violent behavior, and health problems (Marshall, 2014; Viner et al., 2012). Alcohol use typically begins during adolescence and many young people develop an early pattern of binge drinking, i.e., drinking more than five standard drinks on one occasion (Kuntsche, Rehm, & Gmel, 2004; Kuntsche & Labhart, 2012). Young people's alcohol use typically accelerates in the late teens, peaks in the early 20s, and decrease in the late 20s (Andrade, 2019).

However, compared to their peers of the same age, university students tend to continue a high level of alcohol consumption into their late 20s (Karam, Kypri, & Salamoun, 2007; Van Hal et al., 2018). While most students will not experience negative consequences on later life outcomes, students who drink heavily expose themselves to immediate risks, such as low academic performance, injuries, traffic accidents, and unwanted or unprotected sexual encounters (Hingson et al., 2002; Porter & Pryor, 2007; Wechsler et al., 1994; White & Hingson, 2013). When asked about their alcohol consumption in surveys and qualitative interviews, university students tend to refer to a distinctive drinking culture that includes two motivational factors (Demers et al., 2002; Järvinen et al., 2018; Kuntsche et al., 2005; Lannoy et al., 2017; Measham & Brain, 2005). The first motivational factor is that alcohol facilitates social interaction. For most young people, beginning university is a major transition. Alcohol plays a vital role in this transition as the organizing driver for new students to meet and bond with the other students (Dempster, 2011; Utpala-Kumar & Deane, 2012). The second motivational factor for alcohol consumption among university students relates to the personal benefits associated with drinking, such as dealing with stress, coping with personal problems and relieving boredom (Mohr et al., 2005).

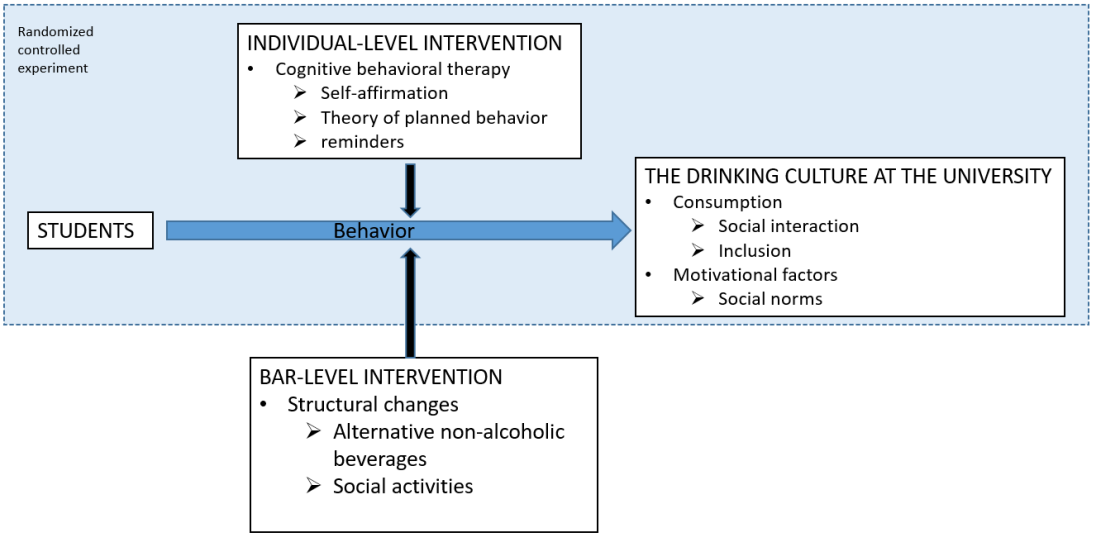
Many university students find it difficult to go against the dominant drinking culture (Supski & Lindsay, 2017). Students have to learn the "right" way to drink alcohol as drinking too much – or too little – can lead to low popularity among peers (Fjær & Pedersen, 2015; Fjær, Pedersen, von Soest, & Gray, 2016; Østergaard, 2009). Research suggests that drinking cultures are formed by several actors, such as peers, family members, authorities, and the alcohol industry (Room, 1992; Savic et al., 2016). Governmental interventions such as increasing taxes and reducing the availability of alcohol have previously been shown to reduce the overall level of alcohol consumption (Anderson, P., Chisholm, & Fuhr, 2009; Österberg, 2001). However, experiences from past interventions aimed at changing the cultural attitude in the drinking culture shows that social norms are not easily changed (Anderson, Peter & Baumberg, 2006; Kypri, Maclennan, Cousins, & Connor, 2018) and binge drinking is viewed as a cornerstone of university life by the majority of students.

In this project, we design and evaluate an intervention aimed at changing the dominant drinking culture among Danish university students. Denmark is a highly relevant case for analyzing the drinking culture in universities. Together with their British counterparts, Danish university students are among the heaviest drinkers in Europe (Stock et al., 2009). Yet, in most of Europe the level of alcohol consumption among young people has been converging (Järvinen & Room, 2007). Additional knowledge about the Danish youths is likely relevant to peer groups in other countries.

Design

The main purpose of the study is to investigate how interventions can reduce the excessive drinking culture among Danish university students. Two interventions, an individual and a bar-level intervention, were introduced at a university to evaluate tools at both the individual and the structural level that are expected to affect the students' behavior and, subsequently, the drinking culture at the university. Figure 1.1 provides an overview of how we evaluate the two interventions.

Figure 1.1 Overview of the evaluation of the two interventions



To measure the drinking culture, we include a number of measures of alcohol consumption, all based on WHO AUDIT. Drawing on previous studies (Järvinen et al., 2018; Kuntsche et al., 2005; Measham & Brain, 2005), we also include two sets of variables about motional factors to drink alcohol that are formed by the local alcohol culture at the university. The first set of variables measures how alcohol consumption works as a facilitator of social interaction. For example, some students may drink alcohol to feel part of their student environment. The second set of variables measures how it works as a personal benefit. For example, that drinking alcohol can be used as a way to relax or reduce stress.

The intervention at the individual level is motivated by a combination of theory-based strategies that focus on changing behavior and includes components such as information on behavior substitution, problem solving, and using a credible source. All these are components that have shown promising results in previous studies (Kaner et al., 2017; Norman et al., 2018).[2] To evaluate the individual-level intervention we conducted an experiment, a randomized controlled trial, at university level. We invited students to answer a questionnaire including information on drinking behaviors before and after the intervention. Half of the students were given the intervention at the individual level (treated) while the other half only answered the before and after questionnaire (control).

The bar-level intervention introduced structural changes and activities at the Friday bars. Non-alcoholic draught beer was introduced as an alternative at the Friday bar-level. Meanwhile, several bar activities were introduced with the purpose of introducing the students to social

[2] Furthermore, recent studies from, for instance, Spain and Australia have shown that web-based inventions can successfully be used to reduce alcohol consumption (Hagger et al., 2012).

activities that prevent binge drinking and to information about negative consequences of binge drinking. The bar-level intervention was not subject to a randomization. Thus, in this part of the intervention we are only able to describe associations and not to estimate the effect of the intervention. As the students who participated in the individual-level intervention where asked which Friday bars they visited during the preceding month of the intervention we used this information and examined whether individuals who were exposed to the bar-level intervention reacted more to the individual-level intervention than those who did not visit a treatment bar.

Structure of the report

The remainder of this report is structured as follows. In Chapter 2 we describe and examine the intervention at the individual level. In Chapter 3 we describe and evaluate the intervention at bar level. Furthermore, in this chapter we examine whether the bar-level intervention significantly affected the impact of the individual-level intervention, i.e., whether individuals affected both by the individual-level intervention and the bar intervention drank less alcohol than individuals affected by the individual intervention only. In Chapter 4 we conclude and provide recommendations based on the results in Chapters 2 and 3.

2 Individual-level intervention

2.1 The intervention

2.1.1 Intervention design

The individual-level intervention is specifically designed to target heavy drinking behavior in individuals through nudging. We follow the traditional definition of nudging and define it as “any aspect of the choice architecture that alters people’s behavior in a predictable way without forbidding any options or significantly changing their economic incentives” (Sunstein & Thaler, 2008). Part of the popularity of nudging policies is their potential for high cost-effectiveness ratios and their scalability. Nobel Prize Laureate Daniel Kahneman refers to this as “medium-sized gains by nano-sized investments” (Bhargava & Loewenstein, 2015).

Policies relying on nudging, as opposed to policies relying on mandates, bans or economic incentives, have the advantage that they benefit the targeting group while placing a minimal burden on individuals who already behave as desired. In addition, nudging policies are liberty preserving in the sense that people are pointed in a direction, but at the same time they have the option of opting out without consequences. The goal in nudging policies is to design interventions that improve welfare without affecting freedom of choice (Bhargava & Loewenstein, 2015). A popular example of a nudge is the GPS. It points you in a direction, but you are free to choose a different route without cost (Sunstein, 2014). The GPS is a useful analogy for the intervention described in the paper. The intention of the individual-level intervention is to point students with heavy drinking behavior towards a healthier drinking behavior. In order to do this, we target self-control issues and self-image.

Self-control issues can arise due to the intertemporal trade-off between immediate costs of not drinking alcohol (e.g., the social costs of not being part of a party) and the long-term benefits (e.g., the benefits of receiving better grades in exams). Research in behavioral economics shows that individuals have a tendency to place more weight on short-term benefits than what is optimal in a rational choice sense (Laibson, 1997). This phenomenon is referred to as present-biased preferences (O'Donoghue & Rabin, 1999) and reveals the challenges that might arise when we want individuals with low self-control to choose the long-term benefits. In addition, neuroscience research shows that adolescents can be particularly challenged by self-control problems due to the late development of executive functioning (Lavecchia, Liu, & Oreopoulos, 2016).

For most first-year students, entering university represents a transition from their former social sphere into a new context (Berzonsky & Kuk, 2000; Reay, 2003). As most people care about how they are perceived by others, many of their actions will be influenced by concerns about their self-image (Falk & Szech, 2016). Such concerns can explain why we observe students making choices that seem to be in conflict with their own interests; choices that are often referred to in the literature as “self-handicapping choices” (Bénabou & Tirole, 2002; Bénabou & Tirole, 2006).

In this project, we target the issues of self-control and self-image applying classic nudging tools, namely, pre-commitment strategies, social norms, and reminders. Specifically, the individual-level intervention includes a link to an online questionnaire and three text messages. The online questionnaire is based on a validated self-affirmation questionnaire (Norman et al., 2018), but adapted to the local setting. The text messages were developed for this project. The individual-level intervention runs over three weeks. The timeline is presented in Table 2.1.

Table 2.1 Timeline of the intervention

Intervention	Week 44	Week 45	Week 46	Week 47	Week 48
Online intervention	Date: 29.10: E-mail and text message with link to the intervention is sent out	Date: 5.11: text message and e-mail reminders	Date: 13.11: text message and e-mail reminders	-	Date: 25.11: Data collection begins
SMS intervention	Date: 1.11: text message no. 1	Date: 8.11: text message no. 2	Date: 15.11: text message no. 3	-	

Pre-commitment strategies help people to reflect on their behavior and to commit to a certain course of action. Pre-commitment is said to motivate the desired behavior and reduce procrastination. We follow Hagger et al. (2012) and Norman et al. (2018) and include pre-commitment in the intervention by focusing on implementation intentions as opposed to regular goal setting, based on the distinction in Gollwitzer (1999).[3] Thus, the students are asked to specify "if-then" plans targeting critical situations in the process towards the desired goal rather than focusing on the outcome. In the online questionnaire, the students are asked to write down a strategy for how they plan to avoid getting drunk ("*Try to make a plan for how to avoid getting drunk"*). They are provided a motivation for why a strategy can be worthwhile and an example *("If someone offers me a beer or a drink and I really don't want to drink anymore, then I will say "thank you, I don't need any more right now, I have plans tomorrow"*).

Social norms are targeted using the theory of planned behavior (Ajzen, 1988). The theory of planned behavior focuses on the intention, because the intention is perceived as the primary determinant of behavior. The intention is then determined by normative, behavioral and control beliefs. Online interventions based on the theory of planned behavior have been found to yield promising results on health behavior (Webb, Joseph, Yardley, & Michie, 2010). Norman et al. (2018) find that the element in their intervention that is based on the theory of planned behavior reduces alcohol consumption among university students in the United Kingdom. We build on the success of Norman et al. (2018), by adapting their intervention to a Danish context. In the adaptation, the focus is on the extent to which the local students differ in terms of their normative, behavioral, and control beliefs.

The individual-level intervention targets three specific beliefs about drinking behaviors at the university: 1) social events at the university *always* include alcohol consumption, 2) irresponsible drinking behavior does not necessarily affect your studies, and 3) most university students drink large amounts of alcohol and heavy drinking is normal behavior at the university. Each

[3] Pre-commitment strategies is a common tool in cognitive theory and is commonly used in, for instance, cognitive behavioral therapy (Beck & Beck, 1995).

belief is presented with a text explaining why this is not necessarily true and a short video in which co-students present their contradictory beliefs.

In response to the first belief, the students are introduced to popular social activities at the university or in the local city that do not include alcohol consumption. In response to the second belief, fact-based information on the effect of alcohol consumption on studies is presented together with a video in which co-students present their beliefs and negative experiences with drinking and studying. In response to the third belief, the student is presented with research results showing that most university students actually drink responsibly, and we present arguments for avoiding excessive drinking. In a video, co-students explain what they do in order to resist social pressure and avoid heavy drinking.

The individual-level intervention also makes use of self-affirmation manipulation. Self-affirmation theory argues that people may dismiss messages targeted at individual behavior in order to protect their self-integrity (Steele, 1988). Self-affirmation manipulation can be used as a response to promote message acceptance by reducing defensive processing (Harris & Epton, 2009). We make use of an adopted version of the Values in Action Strength Scale (Napper, Harris, & Epton, 2009; Peterson & Seligman, 2004). In the beginning of the online questionnaire, the student is presented with 32 statements on positive traits (e.g., *"My friends can trust me"*), and for each of these they have to rate their own position.

The final element in the individual-level intervention is three reminders sent out as text messages to individual mobile phones. Reminders is a simple and effective tool to combat procrastination, laziness, completion obligations, and forgetfulness (Sunstein, 2014). When sending out reminders, the timing is essential. The messages are sent out on four Fridays at 2 am (before the Friday bar begins) and one on a Saturday. The intention is to affect the choice of activities during the afternoon and evening. The text messages are intended to remind the student of the specific element of the intervention (e.g., *"It can sometimes be a good idea to make a plan for how much to drink when going to a party to avoid bad experiences. Have you thought about how much you want to drink at the next party you are going to?" or "Research shows that many people mistakenly believe that their friends drink much more than they actually do. Have you thought about when you last had a good night with your friends, where you did not drink a large amount of alcohol?"*).

The individual-level intervention, thus, targets issues of self-control and self-image by making use of a nudging strategy based on pre-commitment strategies, social norms, and reminders. In practice, this includes an online questionnaire and three test messages.

2.1.2 Recruitment

The students were recruited over two weeks from the September 11 to 25. A timeline for the recruitment strategy is available in Table 2.2. Four conditions for participating in the experiment were set: 1) that the individual was motivated to participate in the experiment (participation was voluntary), 2) that the individual was a student at Aarhus University, 3) that the individual drank

alcohol sometimes, and 4) that the individual was willing to provide their phone number. Students signed up for the experiment online via a questionnaire. In the questionnaire, they were asked to provide background information on their previous behavior, e.g., related to study or drinking behavior, and background characteristics such as gender, age, and parental education.

Table 2.2 Timeline of the recruitment strategy

	Date 11.9	Date 13.9	Date 18.9	Date 20.9	Date 25.9
Member of the student association	The recruitment letter is sent out to all members of the Student Association (3,539 students)		Reminders are sent out to members of the Student Association (2,967 students) The recruitment letter is sent out to new members of the Student Association (43 students)		The recruitment ended/ survey closed for answers
Facers with flyers at a large university social event and in the Student House cafeteria			The recruitment letter is sent out to students contacted at "Danmarks største fredagsbar og idrætsdag" (date 13.9) (122 students) The recruitment letter is sent out to students contacted at the Student House cafeteria (date 13.9-18.9) (22 students)	The recruitment letter is sent out to students contacted at the Student House cafeteria (date 18.9-20.9) (39 students)	
Posters and social media		Flyer posted on the Facebook page of the Student Association Posters placed near auditoriums and in large cafeterias at the university (49 posters)			

A lottery was organized in order to increase participation. Participants who answered the questionnaires were entered in a lottery for 500 movie tickets and two VIP one-day tickets to a large Danish music festival (Roskilde Festival).

The students were informed about the experiment through three channels. The first (and main) channel for recruitment was that all members of the Student Association (Studenterhus Aarhus) were contacted by e-mail. On September 11, 3582 members of the Student Association were contacted via e-mail and informed about the experiment. The e-mail included a link, via which they could sign up directly. On September 18, 43 new members of the Student Association were contacted and on the same date the 2,967 students who had not already signed up received a reminder by e-mail.

The second channel was through social media, posters, and flyers. On September 13, the Student Association made participation possible for the more than 25,000 followers of their Facebook page.[4] On the same date, 49 posters were placed near large auditoriums and cafeterias at the university with a direct link and a QR code, which could be used to sign up for the experiment.[5]

The third recruitment channel was facers, who contacted students directly, distributed flyers, and informed them about the experiment. Facers were present at a large social event at the University ("Danmarks største fredagsbar og idrætsdag") on September 13. Students could then directly sign up for the experiment using the link or the QR-code on the flyer or by providing their e-mail. The 122 students who indicated that they were willing to participate by providing their e-mail received a link to the sign-up questionnaire on September 18. Facers were also present at the cafeteria in the Student House in the period from September 13 to September 20. During this period, 61 email addresses were collected.

The recruitment was closed on September 25. Table 2.3 presents the criteria for participation. The sign-up link was opened 1,014 times, where individuals answered at least one question. Of these, 997 provided a valid phone number, 980 of these 997 indicating that they sometimes drank alcohol. The final sample was 961 individuals after duplicated responses had been deleted. In the 36 cases where the same person answered the questionnaire twice, we discarded the registration with the fewest answers.

Table 2.3 Sample selection criteria

Selection criteria	Number of individuals
Some answers	1014
Phone number available	997
Individuals who drink alcohol	980
No duplicates (choose the one with the most answers)	961

[4] It was initially posted on September 12., but the sign-up link did not work until it was re-posted the following day.

[5] The posters were placed in the following locations: 18 in Medicinerhuset, 8 in Folkesundhed, 17 in Søaud, 1 at det Kongelige, 5 at Matkant.

The link to the second questionnaire was send out to the participant on October 25 in a text message and on October 28 by e-mail.[6] The data collection strategy for the second questionnaire is available in Table 2.4. Reminders were send out by e-mail and text message on the 5th and 12th of December. The data collection closed on December 22, where 508 individuals (53% of the final sample) had answered the second questionnaire. This number includes all individuals who started the questionnaire, see Table 2.3.

Table 2.4 Strategy for data collection after the intervention

	Week 48	Week 49	Week 50	Week 51
E-mails and text message	Date: 25.11: text message with link to the second questionnaire is sent out	Date: 5.12: E-mail and text message with reminder is sent out	Date: 12.12: E-mail and text message with reminder is sent out	Date: 22.12: Data collection ended
	Date: 28.11: E-mail with link to the second questionnaire is sent out			

2.2 Method

We apply stratified randomization in order to estimate the causal effect of the individual-level intervention. The individuals, who answered the first questionnaire are split into seven strata based on gender and their answer to the question "How often have you had five or more standard drinks at one event during the preceding month?" (see Table 2.5). Strata randomization was conducted based on these seven strata.

Table 2.5 Strata

Strata	Gender	How often have you had five or more standard drinksat one event during the preceding month?	Frequency	Percent	Cumulative frequency	Cumulative percent
1	Women	One or fewer times per month	163	16.96	163	16.96
2	Women	2-3 times per month	112	11.65	275	28.62
3	Women	One or more times per week	244	25.39	519	54.01
4	Men	One or fewer times per month	80	8.32	599	62.33
5	Men	2-3 times per month	120	12.49	719	74.82
6	Men	One or more times per week	163	16.96	882	91.78
7	All	No information	79	8.22	961	100.00

Note: * All includes individuals who did not register man or woman as their gender (6 individuals)

We estimate the effect of the individual-level intervention for those who answered both questionnaires. The estimation is conditioned on the strata and information from the first questionnaire. We estimate three versions of the model; 1) the average effect of the intervention, 2) the effect by gender, and 3) the effect by strata.

[6] The initial plan was to send out the e-mail with the second questionnaire by October 25, but due to an error in the distribution system the distribution was delayed by three days.

We have three main outcomes. These are 1) Number of times drinking alcohol during the preceding month, 2) Number of times binge drinking (more than five standard drinks in one session) during the preceding month, and 3) The typical number of drinks consumed on a day drinking alcohol, during the preceding month. We use the Danish version of the WHO AUDIT adapted in UngMap by Centre for Alcohol and Drug Research, Aarhus University.

2.3 Descriptive statistics

2.3.1 Sample description

Descriptive statistics on the sample of students who answered both questionnaires can be seen in column (1), Table 2.6. The sample consists of 63% women and the average age is 24. About half of the students have a father with a medium or long tertiary education. Only 3% of the students report not being physically healthy. 80% of the students expect to complete their education without extensions and about 90% like and feel that they are being part of the student environment. The students were also asked to report on their alcohol consumption during the preceding month based on the WHO AUDIT measures. On average, they indicate that they drink alcohol 5.6 times per month and that they binge drink (more than five standard drinks in one session) 3.4 times per month. They report drinking, on average, six standard drinks in a session. Note that this average is above the binge drinking limit. The students were asked to indicate their reasons for drinking alcohol by choosing between six possible answers (they could choose more than one answer). 81% drink to get in a good mood, 46% drink to get drunk, 39% drink to get in contact with others, 30% drink to reduce stress, 15% drink due to insecurity, and 9% drink to forget. In two Danish studies on young people's drinking behavior, the main reasons for alcohol consumption are to be social and get in contact with other people. Although the questions are posed in a different way and framed differently the share of young people stating these reasons is almost the same in these two other Danish studies (46% and 34%) and in our study (39%) (Järvinen et al., 2018; Østergaard & Andrade, 2014).

The results of the questionnaire also show that two thirds of the students think their friends drink more than they do themselves and 43% of the students indicate that they have been at a party without drinking alcohol during the preceding month. The results reveal that the students use other substances than alcohol. 39% report having smoked cigarettes during the preceding month, 14% have used cannabis, and 9% have taken other non-prescription drugs.

Table 2.6 Selection out of the experiment

	(1) Final Sample			(2) Selected out			Mean difference
	N	Mean	SD	N	Mean	SD	(1)-(2)
Year of birth	506	1995.27	[2.64]	444	1995.26	[2.63]	0.02
Women	506	0.63	[0.48]	442	0.56	[0.50]	0.07
Born in Denmark	504	0.94	[0.24]	444	0.91	[0.29]	0.03
Parent born outside Denmark	504	0.17	[0.38]	444	0.25	[0.44]	-0.08***
Father's education							
Basic education	499	0.09	[0.29]	428	0.08	[0.27]	0.01
High school education	499	0.29	[0.45]	428	0.35	[0.48]	-0.06*
Vocational education	499	0.04	[0.21]	428	0.04	[0.19]	0.01
Short tertiary education	499	0.06	[0.24]	428	0.07	[0.26]	-0.01
Medium tertiary education / Bachelor	499	0.17	[0.38]	428	0.18	[0.39]	-0.01
Long tertiary education	499	0.32	[0.47]	428	0.26	[0.44]	0.06*
Mother's education							
Basic education	497	0.05	[0.22]	432	0.05	[0.22]	0.00
High school education	497	0.22	[0.41]	432	0.23	[0.42]	-0.01
Vocational education	497	0.05	[0.22]	432	0.06	[0.24]	-0.01
Short tertiary education	497	0.11	[0.32]	432	0.12	[0.33]	-0.01
Medium tertiary education / Bachelor	497	0.31	[0.46]	432	0.33	[0.47]	-0.02
Long tertiary education	497	0.25	[0.44]	432	0.20	[0.40]	0.05*
Health							
Self-assessed physical health[1]	499	0.97	[0.18]	429	0.95	[0.23]	0.02
Number of close friends	499	4.30	[1.53]	429	4.22	[1.56]	0.08
Education							
GPA[2], upper secondary education	494	9.52	[1.77]	422	9.26	[1.73]	0.26*
First year of current university education	492	2017.16	[1.61]	413	2017.17	[1.74]	-0.01
First year of first university education	91	2014.50	[2.85]	85	2015.02	[3.41]	-0.53
Not first university education	494	0.19	[0.39]	419	0.21	[0.41]	-0.02
Expect to complete education without extension	489	0.80	[0.40]	411	0.87	[0.34]	-0.07***
Likes the student environment	479	0.91	[0.29]	400	0.91	[0.29]	0.00
Feel part of the student environment	469	0.87	[0.34]	393	0.89	[0.32]	-0.02
Alcohol							
Drink alcohol	485	1.00	[0.00]	407	1.00	[0.00]	0.00
WHO Audit – Alcohol intake							
Number of times drinking alcohol during the preceding month	483	5.56	[4.25]	407	6.04	[4.62]	-0.48*
Number of times binge drinking (five or more standard drinks) during the preceding month	481	3.44	[3.39]	404	3.40	[3.45]	0.05

	(1)			(2)			Mean difference
Average number of standard drinks consumed when drinking	460	6.01	[2.71]	384	6.13	[2.81]	-0.12
WHO AUDIT – experience of alcohol-related harm							
Number of times during the preceding month feeling guilt or regret over drinking	482	0.32	[0.47]	404	0.32	[0.47]	0.00
Number of times during the preceding month memory loss due to drinking	482	0.27	[0.44]	404	0.22	[0.42]	0.05
Physical injury during preceding month due to alcohol	478	0.06	[0.24]	399	0.07	[0.26]	-0.01
Recommitted to change drinking behavior during preceding month	481	0.04	[0.26]	404	0.02	[0.29]	0.01
Number of times during the preceding month missed school due to hangover	482	0.08	[0.19]	404	0.09	[0.15]	-0.01
Ask for help to reduce alcohol consumption	481	0.03	[0.18]	402	0.03	[0.18]	0.00
Find it difficult to say no to a drink at parties	472	-0.02	[1.33]	393	-0.20	[1.34]	0.18*
Drink more than friends from university	439	0.35	[0.48]	360	0.31	[0.47]	0.03
Drink more than other friends	427	0.28	[0.45]	359	0.25	[0.44]	0.03
Reason for drinking							
Reduce stress	508	0.30	[0.46]	446	0.27	[0.44]	0.03
To forget problems	508	0.09	[0.29]	446	0.07	[0.26]	0.02
Get in contact with others	508	0.39	[0.49]	446	0.35	[0.48]	0.05
To get drunk	508	0.46	[0.50]	446	0.40	[0.49]	0.06
Due to insecurity	508	0.15	[0.35]	446	0.15	[0.36]	-0.01
Get in a good mood	508	0.81	[0.39]	446	0.73	[0.44]	0.08*
Other substances							
Any cigarettes, preceding month	509	0.39	[0.49]	452	0.44	[0.50]	-0.05
Number of cigarettes, preceding month	166	12.34	[11.18]	145	12.19	[11.08]	0.16
Any cannabis, preceding month	509	0.14	[0.35]	452	0.20	[0.40]	-0.06
Number of times taking cannabis, preceding month	38	3.74	[5.88]	35	3.09	[4.10]	0.65
Any drugs, preceding month	509	0.09	[0.28]	452	0.15	[0.35]	-0.06
Partying without drinking							
Went to a party without drinking alcohol during the preceding month	482	0.43	[0.50]	403	0.47	[0.50]	-0.04
Reason for not drinking at party							
Taste	208	0.04	[0.20]	188	0.03	[0.16]	0.02
Health consequences	208	0.20	[0.40]	188	0.25	[0.43]	-0.04
Want to be responsible	208	0.10	[0.30]	188	0.13	[0.34]	-0.04
Money	208	0.15	[0.36]	188	0.30	[0.46]	-0.15***

	(1)			(2)			Mean difference
Avoid hangover	208	0.46	[0.50]	188	0.50	[0.50]	-0.04
Avoid memory loss	208	0.12	[0.32]	188	0.13	[0.34]	-0.01
Safety reasons	208	0.15	[0.36]	188	0.18	[0.39]	-0.03
Religion	208	0.00	[0.00]	188	0.03	[0.18]	-0.03**
Other	208	0.52	[0.50]	188	0.43	[0.50]	0.09*
Friday bars							
Number of times at Friday bar during the preceding month	491	1.23	[0.74]	411	1.22	[0.74]	0.01
Went to latest Friday bar	472	0.46	[0.50]	394	0.50	[0.50]	-0.04
Number of hours in latest Friday bar	210	5.50	[2.43]	191	5.27	[2.11]	0.23
Number of standard drinks, latest Friday bar	218	7.37	[4.37]	197	7.03	[4.24]	0.35
Drank alcohol-free beer at latest Friday bar	218	0.03>	[0.07]	197	0.03>	[0.07]	0.00
Drank soda at latest Friday bar	218	0.10	[0.30]	197	0.09	[0.29]	0.01
Drank water at latest Friday bar	218	0.26	[0.44]	197	0.25	[0.43]	0.01

General note: Standard deviations are robust. *** p<0.01, ** p<0.05, * p<0.1.Notes:

[1] "How do you assess your physical health during the preceding month?" Answers: 1: Very good, 2: good, 3: Fair, 4: poor 5: Very poor. The value displayed for t-tests are the differences in the means across the groups. The strata are included as the covariate in all estimations.

[2] Grade point average

2.3.2 Selection of the experiment

52% of the students who answered the first questionnaire also answered the second questionnaire. Column (2), Table 2.6 shows statistics on students who answered the first questionnaire, but chose not to answer the second questionnaire. To examine whether the group of students answering both questionnaires is a distinct group with, for instance, a very different drinking behavior compared to the initial sample of students, we show the mean difference between those who answered the second questionnaire (column 1) and those who opted out (column 2). The mean differences are presented in column 3. Stars indicate whether the difference is significant at a 1, 5, and 10% significance level in a t-test accounting for strata.

The results show that only four out of 66 variables are significant at a 5% significance level, indicating that students do not systematically select out of the experiment to a large degree. Still, students who answered the second questionnaire are significantly less likely to have a parent who is born outside Denmark and they are also less likely to expect to complete their education without extension. We also find a significant difference in means, but at a 10% level, in that those who answered the second questionnaire on average have parents with longer educations and higher high school grades. They also report drinking half a time less per month and finding it more difficult to say no to drinks at parties. We also find a significant difference in means in their reasons for not drinking at a party. Overall, these statistics show some, but not substantial, selection on observables in the selection out of the experiment.

2.3.3 Out-of-sample comparison

In this section, we examine whether our final sample of participants is representative of the students at Aarhus University. Thus, we compare the participants in the experiment to the full

population of students at Aarhus University. The statistics are shown in Table 2.7. The table shows that students who participate in the experiment are of similar age to the average student, but there is a small overrepresentation of women in the sample. The share of women in the full population is 0.54, while the share of women in the sample of students who answered both questionnaires is 0.62. The distribution of students in fields of study also mimics the distribution in the population to some extent. In the sample there is an overrepresentation of students in humanities and an underrepresentation of students in Natural sciences, Technology, and Social sciences. Part of the explanation for this may be that women are more likely to be students in the humanities (Thomsen, 2012).

An additional explanation of the underrepresentation of students from social sciences may have to do with the recruitment strategy. We primarily recruit from the membership list of the Student Association. The student association is located at the main campus in the Student House, which is also where most of their activities take place, including the bar and the cafe. The students from Economics, Management, and Social Administration have a separate area two km from the Student House. At their separate location they have their own student environment, including an on campus bar and a nightclub. Thus, it is expected that these students are less likely to be members of the student association.

Table 2.7 Out-of-sample comparison

	Full population at Aarhus University, 2018	Answered the first questionnaire	Answered both questionnaires
Women	54%	59%	62%
Avg. age	24	24	24
Field of study:			
Humanities	27%	36%	34%
Natural sciences	12%	10%	10%
Social sciences	36%	24%	25%
Health	12%	12%	13%
Technology	13%	10%	9%
Other	0%	9%	9%

Note: Column (1) is based on data from Statistikbanken.dk.

2.3.4 Sample balance

The statistics in Table 2.6 show that 48% of the participants in the experiment did not answer the second questionnaire. While we showed that the participants were selected on observable characteristics only to some extent in Section 2.3.2, we will have a problem with internal validity if selection out of the experiment differs between the treatment and the control group. Thus, in columns (1) and (2) in Table 2.8 we show statistics on observable characteristics of the treatment and the control groups, and column (3) shows the mean difference. The stars after the estimates in column (3) indicate statistical significant differences at 1, 5, and 10% levels from t-tests, where the randomization strata are included as covariates.

The comparison between the treatment and the control group gives rise to no concerns as to the internal validity of the experiment. It seems that the selection out of the experiment is balanced between the two groups. This is also the case when we compare the two groups on our main outcomes of interest, the WHO AUDIT measures of alcohol intake.

Given that we test for differences on 65 observable characteristics, some statistically significant differences are to be expected. The main cause of concern here is that we find the likelihood of physical injury during the preceding month due to alcohol to be 4% in the treatment group and 8% in the control group. This difference is statistically significant at a 5% level.

At a significance level of 10%, we find differences in three measures: 1) mother with vocational education, 2) not first university education, and 3) feel part of the student environment. The students in the treatment group are more likely to have mothers with a vocational education, more likely to be in their first university education, and more likely to feel part of the student environment.

We conclude that the experiment seems to be balanced between treatment and control. However, as we do find some minor significant differences we will present the main results both with and without a large set of controls for observable characteristics of the participants.

Table 2.8 Mean statistics and balance test**,** answers from first questionnaire

	(1) Treatment			(2) Control			(1)-(2) Mean Difference
	N	Mean	SD	N	Mean	SD	
Year of birth	224	1995.44	[2.57]	282	1995.14	[2.70]	0.30
Women	224	0.66	[0.48]	282	0.60	[0.49]	0.06
Born in Denmark	222	0.92	[0.27]	282	0.95	[0.21]	-0.03
Parent born outside Denmark	222	0.18	[0.39]	282	0.16	[0.37]	0.02
Father's education							
Basic education	221	0.08	[0.27]	278	0.10	[0.30]	-0.02
High school education	221	0.31	[0.46]	278	0.27	[0.45]	0.04
Vocational education	221	0.05	[0.23]	278	0.04	[0.19]	0.02
Short tertiary education	221	0.05	[0.21]	278	0.07	[0.26]	-0.03
Medium tertiary education/Bachelor	221	0.17	[0.38]	278	0.18	[0.38]	0.00
Long tertiary education	221	0.33	[0.47]	278	0.31	[0.46]	0.03
Mother's education							
Basic education	219	0.06	[0.24]	278	0.04	[0.20]	0.02
High school education	219	0.19	[0.39]	278	0.24	[0.43]	-0.05
Vocational education	219	0.07	[0.25]	278	0.03	[0.18]	0.04*
Short tertiary education	219	0.12	[0.32]	278	0.11	[0.31]	0.01
Medium tertiary education/Bachelor	219	0.31	[0.46]	278	0.32	[0.47]	-0.01
Long tertiary education	219	0.26	[0.44]	278	0.25	[0.44]	0.00
Health							
Physical health[1]	221	0.96	[0.19]	278	0.97	[0.18]	0.00
Number of close friends	221	4.20	[1.58]	278	4.38	[1.49]	-0.18
Education							
GPA[2], upper secondary education	218	9.48	[1.91]	276	9.54	[1.66]	-0.06
First year of current university education	218	2017.24	[1.53]	274	2017.10	[1.67]	0.15
First year of first university education	34	2014.65	[1.94]	57	2014.40	[3.28]	0.24

		(1)			(2)		(1)-(2)
Not first university education	219	0.16	[0.37]	275	0.22	[0.41]	-0.06*
Expect to complete education without extension	217	0.77	[0.42]	272	0.82	[0.39]	-0.05
Like the student environment	218	0.90	[0.30]	271	0.91	[0.29]	0.00
Feel part of the student environment	218	0.90	[0.30]	271	0.84	[0.37]	0.06*
Alcohol							
Drink alcohol	214	1.00	[0.00]	271	1.00	[0.00]	0.00
WHO Audit – Alcohol intake							
Number of times drinking alcohol during the preceding month	213	5.63	[4.55]	270	5.51	[4.01]	0.12
Number of times during the preceding month binge drinking (five or more standard drinks) during the preceding month	211	3.61	[3.67]	270	3.32	[3.16]	0.29
Average number of standard drinks when drinking	206	6.10	[2.63]	254	5.93	[2.78]	0.17
WHO AUDIT – experience of alcohol-related harm							
Number of times during the preceding month feeling guilt or regret over drinking	213	0.34	[0.47]	269	0.31	[0.46]	0.03
Number of times during the preceding month memory loss due to drinking	213	0.27	[0.45]	269	0.26	[0.44]	0.01
Physical injury during preceding month due to alcohol	211	0.04	[0.19]	267	0.08	[0.28]	-0.04**
Recommitted to change drinking behavior during preceding month	213	0.03	[0.29]	268	0.04	[0.24]	-0.01
Number of times during the preceding month missed school due to hangover	213	0.09	[0.17]	269	0.06	[0.20]	0.03
Asked for help to reduce alcohol consumption	213	0.03>	[0.15]	268	0.04	[0.20]	-0.02
Find it difficult to say no to a drink at party's	208	0.03	[1.37]	264	-0.05	[1.30]	0.08
Drink more than friends from university	192	0.36	[0.48]	247	0.34	[0.47]	0.02
Drink more than other friends	186	0.30	[0.46]	241	0.27	[0.44]	0.04
Reason for drinking							
Reduce stress	225	0.28	[0.45]	283	0.31	[0.46]	-0.02
To forget problems	225	0.10	[0.30]	283	0.09	[0.28]	0.01
Get in contact with others	225	0.38	[0.49]	283	0.41	[0.49]	-0.03
To get drunk	225	0.44	[0.50]	283	0.48	[0.50]	-0.03
Due to insecurity	225	0.12	[0.32]	283	0.17	[0.38]	-0.05
Get in a good mood	225	0.80	[0.40]	283	0.82	[0.39]	-0.02
Other substances							
Any cigarettes, preceding month	225	0.33	[0.47]	284	0.32	[0.47]	0.01
Number of cigarettes, preceding month	75	13.07	[10.96]	91	11.75	[11.39]	1.32

	(1)			(2)			(1)-(2)
Any cannabis, preceding month	225	0.09	[0.29]	284	0.06	[0.24]	0.03
Number of times using cannabis, preceding month	20	3.55	[6.17]	18	3.94	[5.71]	-0.39
Any drugs, preceding month	225	0.03>	[0.17]	284	0.03>	[0.12]	0.02>
Partying without drinking							
Went to a party without drinking alcohol during the preceding month							
Reason for not drinking at party							
Taste	98	0.06>	[0.17]	110	0.06	[0.23]	-0.02
Health consequences	98	0.20	[0.41]	110	0.20	[0.40]	0.00
Want to be responsible	98	0.10	[0.30]	110	0.09	[0.29]	0.01
Money	98	0.18	[0.39]	110	0.12	[0.32]	0.07
Avoid hangover	98	0.40	[0.49]	110	0.51	[0.50]	-0.11
Avoid memory loss	98	0.10	[0.30]	110	0.13	[0.34]	-0.03
Safety reasons	98	0.13	[0.34]	110	0.17	[0.38]	-0.04
Religion	98	0.00	[0.00]	110	0.00	[0.00]	0.00
Other	98	0.54	[0.50]	110	0.50	[0.50]	0.04
Friday bars							
Number of times at Friday bar during the preceding month	219	1.22	[0.75]	272	1.24	[0.73]	-0.02
Participated in latest Friday bar	210	0.47	[0.50]	262	0.45	[0.50]	0.02
Number of hours at latest Friday bar	94	5.39	[2.42]	116	5.59	[2.46]	-0.19
Number of standard drinks, latest Friday bar	99	7.66	[4.71]	119	7.14	[4.08]	0.52
Drank alcohol free-beer at latest Friday bar	99	0.06>	[0.10]	119	0.00	[0.00]	0.01
Drank soda at latest Friday bar	99	0.06>	[0.24]	119	0.13	[0.33]	-0.07
Drank water at latest Friday bar	99	0.27	[0.45]	119	0.24	[0.43]	0.03

General note: Standard deviations are robust. *** p<0.01, ** p<0.05, * p<0.1.Notes:

[1] "How do you assess your physical health during the preceding month?" Answers: 1: very good, 2: good, 3: Fair, 4: poor 5: very poor. The value displayed for t-tests are the differences in the means across the groups. The strata are included as covariates in all estimations.

[2] Grade point average

2.3.5 Fidelity

We have access to both self-reported and objective measures of treatment intensity for the group of students who received the individual-level intervention.

2.3.5.1 Treatment intensity

The link to the online part of the individual-level intervention was sent out to 480 students using self-reported e-mail addresses. The survey system used to set up the individual-level intervention provides us with information on the treatment intensity. 298 students (62%) opened the link and answered at least one question, 287 students (60%) answered all questions, and 272 students (57%) wrote down a behavioral strategy (Table 2.11).

The online part of the individual-level intervention contained three short videos. Table 2.10 shows statistics on the extent to which these videos were viewed. The play button was pushed

141 times for the first video, 125 times for the second video, and 111 times for the third video. The full video was viewed 74% of the times the play button was pushed. Under the assumption that the no student saw the same video twice, we can conclude that around 29% of the students in the treatment group saw the first video, 26 % of the students saw the second video, and 23% saw the third video. We also know that 40% of the students viewed the videos on their phone.

219 students from the treatment group answered the questions on the treatment intensity and made an assessment of the individual-level-intervention. The questions were part of the second questionnaire and were sent out to the treatment group only. The answers are available in Table 2.9.

These self-reported measures show that 58% of the students indicate that they opened the link to the online part of the individual-level intervention. This is close to the objective measure from the survey system, showing that 62% of the student opened the link and answered at least one question. Out of those who indicated that they opened the link to the online survey, 90% report having read the text, 73% of them watched the videos and 30% made a behavioral strategy. Here the last number stands out. In the objective measures from the survey system we see that 91% of those who opened the online part of the intervention and answered at least one question also made a behavioral strategy, e.g., wrote down sentences in the two boxes labeled “if” and “then”. The discrepancy between the self-reported number and the objective number can either be due to selection in the treatment group into answering the second questionnaire or the students not thinking of the “if-then” plan they wrote down as a behavioral strategy. The fact that the share of students who opened the online part of the intervention is similar in the self-reported and the objective measures suggests that the difference is not due to selection.

The students were also asked to report the number of text messages they had received and read. The individual-level intervention included three text messages and the students report having received and read 2.4 messages, on average.

A key ingredient in the success of the individual-level intervention is the motivation for the students to participate. 88% of the students indicate that they like or are neutral regarding the online part of the intervention. For the text messages this number is 79. These numbers are considered as reasonable approval rates.

Table 2.9 Data from the final questionnaire on fidelity

	N	Mean	Std. dev.
The online intervention			
Opened the online intervention	219	0.58	0.49
Conditional on whether the student opened the online intervention			
Read the text	128	0.90	0.30
Viewed the videos	128	0.73	0.44
Made a behavioral strategy	128	0.30	0.46
Liked the online intervention*	128	0.88	0.33
The text message intervention			
Liked the text message intervention*	212	0.79	0.41
No. of text messages read (out of 3)	217	2.44	0.83
Participation in the experiment has made you:			
Think more about alcohol consumption	219	0.67	0.47
Make a strategy for alcohol consumption	218	0.16	0.37
Reduce alcohol consumption	219	0.13	0.34
Think more about the student environment	219	0.59	0.49
Think more about social relations	219	0.47	0.50
Seek out social activities that do not include alcohol consumption	219	0.20	0.40
Change study effort	219	0.07	0.25
Change behavior in other ways	216	0.08	0.27

General note: *(0 if strongly disagree or disagree, 1 if neutral, agree, or strongly agree)

Table 2.10 Data from Vimeo on video views

	Video 1 Count	Video 2 Count	Video 3 Count
Pushed the play button	141	125	111
Viewed full video	105	89	85
Avg. % viewed	35	87	32
% of views by phone	38	42	39

Table 2.11 Data from the e-mail intervention

	Count	Percent
Answered at least one question	298	62
Answered all questions	287	60
Made a behavioral strategy	272	57

2.3.5.2 Reflecting on behavior

The students were asked to self-assess the impact of the individual-level intervention. The results are shown in Table 2.9.

The individual-level intervention was designed to make the students reflect on their alcohol consumption, make a strategy to reduce risky consumption (e.g., binge drinking and heavy drinking), and finally reduce risky consumption among university students. The student responses indicate that the students did in fact reflect on their behaviors. 67% of the students in the treatment group report that the individual-level intervention made them think more about

their alcohol consumption, 16% made a plan for their alcohol consumption, and 13% report having reduced their alcohol consumption because of the intervention.

The students were asked whether the individual-level intervention made them consider their social relations. 59% reported that the intervention made them think more about their student environment, 47% reported that the intervention made them think more about their social relations, and 20% report having looked for social activities that do not involve alcohol consumption.

Students were also asked whether the individual-level intervention affected their study effort or in other ways affected their behavior. Only 8% of the students report having changed their study effort, and 7 % report having changed their behavior in other ways. These results are as expected since the intervention does not target study behavior.

2.1 Take-away message

Approximately 60% of the students in the treatment group have participated in the online part of the individual-level intervention to some extent, and on average the students report having read 81% of the text messages. Two thirds of the students report that the individual-level intervention made them think more about their alcohol consumption and around half of the students report that the intervention made them think more about their student environment and their social relations. 13% of the students report having reduced their alcohol consumption due to the intervention.

2.4 Results

In this section, we present the estimated effects of the individual-level intervention designed to reduce heavy drinking and change the drinking culture at the university. To facilitate the interpretation, we divide the results into two parts.

The first part documents the overall effects of the individual-level intervention on the students' alcohol consumption. Section 2.4.1 shows the effect on alcohol consumption (measured with three variables, i.e., number of times drinking alcohol during the preceding month, number of times binge drinking during the preceding month, and the typical number of drinks on a day drinking alcohol during the preceding month) and Section 2.4.2 shows our results on alcohol addiction and experience of alcohol-related harm. In Section 2.4.3 we show the relationship between the treatment intensity and the size of the treatment effect.

In the second part, we focus on the effect of the individual-level intervention on two particular motivational factors for the students to engage in the drinking culture at the university, namely alcohol consumption as a facilitator of social interaction and alcohol consumption as a personal benefit (Demers et al., 2002; Kuntsche et al., 2005; Lannoy et al., 2017; Measham & Brain, 2005). However, these factors are hard to capture empirically. We approach this obstacle by including several outcome measures under the hypothesis that the joint information from these estimates provide us with indications of the overall impact of the intervention on alcohol consumption as a facilitator of social interaction and as a personal benefit. In Sections 2.4.4-2.4.6 we investigate changes in the attitudes and behavior in relation to alcohol consumption as a facilitator of social interaction. We study the attitude towards and the participation in the student environment and whether the intervention makes it easier to choose not to drink at parties. We also analyze whether specific groups, such as first-year students, are particularly affected by the intervention. In Sections 2.4.7 and 2.4.8 we go on to analyze whether the intervention had an impact on the students' alcohol consumption in relation to personal benefits such as dealing

with stress, coping with personal problems and relieving boredom (Mohr et al., 2005). In particular we study the impact of the intervention on the self-reported reasons for drinking at parties and in general.

2.4.1 The effect on alcohol consumption

The main intention of introducing the nudging intervention is to reduce risky alcohol consumption among university students. Before the intervention started we defined three measures of alcohol consumption to assess whether the individual-level intervention had the anticipated effect.[7] These three measures are the main outcomes of the project. We use the three measures of alcohol consumption from the WHO AUDIT. These are 1) number of times drinking alcohol during the preceding month, 2) number of times binge drinking during the preceding month, and 3) the typical number of drinks on a day drinking alcohol during the preceding month. Table 2.12 presents results on the effect of the individual-level intervention on the three measures of alcohol consumption based on OLS regressions. Panel A in the table shows the effect of the intervention, where only the seven strata from the randomization are included as controls. Panel B shows results with a large set of controls.[8] In Panel C and Panel D the results are first split by gender and then by the full set of strata.

Table 2.12 The effect of the intervention on alcohol consumption

	(1)	(2)	(3)
	No. of times drinking alcohol during the preceding month	No. of times binge drinking during the preceding month	The typical no. of drinks on a day drinking alcohol during the preceding month
Panel A			
Treatment	-0.876***	-0.148	0.226
	(0.335)	(0.247)	(0.239)
Controls	No	No	No
Observations	493	489	462
R-squared	0.090	0.183	0.165
Panel B			
Treatment	-0.968***	-0.0976	0.166
	(0.338)	(0.208)	(0.217)
Controls	Yes	Yes	Yes
Observations	493	489	462
R-squared	0.351	0.416	0.498
Panel C			
Treatment*Men	-1.402***	-0.122	0.380
	(0.514)	(0.325)	(0.391)
Treatment*Women	-0.665	-0.0319	0.0481
	(0.429)	(0.292)	(0.273)
Controls	Yes	Yes	Yes
Observations	490	486	459
R-squared	0.357	0.417	0.499
Panel D			

[7] Before intervention start the trial was registered at the American Economic Association's registry for randomized trials with RCT ID: AEARCTR-0004703

[8] The list of controls can be seen in the footnote of the table.

	(1)	(2)	(3)
Women:			
Treatment*binge drinking one or fewer times during the preceding month	-0.627	-0.166	-0.249
	(0.807)	(0.410)	(0.460)
Treatment*binge drinking 2-3 times during the preceding month	-0.541	-0.0213	0.169
	(0.634)	(0.442)	(0.372)
Treatment*binge drinking one or more times per week during the preceding month	-1.789*	-0.309	0.272
	(1.072)	(1.027)	(0.688)
Men:			
Treatment*binge drinking one or fewer times during the preceding month	-1.022	-0.969*	-0.418
	(1.107)	(0.559)	(0.714)
Treatment*binge drinking 2-3 times during the preceding month	-1.399*	-0.301	0.484
	(0.747)	(0.445)	(0.690)
Treatment*binge drinking one or more times per week during the preceding month	-1.647	0.795	0.552
	(1.033)	(0.739)	(0.604)
Treatment*other	0.436	-0.0743	0.554
	(0.997)	(0.886)	(1.381)
Controls	Yes	Yes	Yes
Observations	493	489	462
R-squared	0.355	0.420	0.501

Notes: Stratum 1 is women binge drinking one or fewer times during the preceding month, stratum 2 is women binge drinking two-three times during the preceding month, stratum 3 is women binge drinking one or more times per week during the preceding month, stratum 4 is men binge drinking one or fewer times during the preceding month, strata 5 is men binge drinking two-three times during the preceding month, stratum 6 is men binge drinking one or more times per week during the preceding month, stratum 7 is the group of individuals who did not report information on either gender or binge drinking in the initial survey. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

The results in column (1), Panel A show that the intervention had a significant effect on the number of times drinking alcohol during the preceding month. Students who received the intervention reduced the number of times drinking alcohol during the preceding month compared to the control group by 0.88. Thus, the intervention reduced the number of times drinking alcohol by 16%, as the average number of times drinking alcohol during the preceding month in the control group is 5.56.[9] We do not find a significant effect of the intervention on the two other measures of alcohol consumption. The results for these measures are shown in column (2) and (3).

Panel B illustrates that the results change only little when the large set of controls are included. This is to be expected, based on the balance of observable characteristics between the treatment and control group presented in Table 2.8. The effect size increases slightly to -0.96, which amounts to a reduction in the number of times drinking alcohol during the preceding month by 17%. The estimates for the two other measures of alcohol consumption remain insignificant.

From the results in column (1), Panel C, it is clear that the result for the number of times drinking alcohol during the preceding month is mainly driven by a large effect on male students. For male students the effect is a reduction of 1.40. For female students the average effect is negative, but the estimate is insignificant. The estimated effects on the two other measures of alcohol consumption are insignificant for both men and women.

[9] ((5.56+0.88)/5.56)*100

In Panel D the effects are further subdivided into the seven strata. From column (1) we observe an increasing effect size for both men and women in previous binge drinking behavior. The results indicate that female students, who were binge drinking one or more times per week during the month prior to the experiment, reduced the number of times drinking alcohol during the preceding month by 1.79 (significant at a 10% level).

For one of the strata we also find an effect on binge drinking behavior. The results in column (2), Panel D show that male students, who went binge drinking one or fewer times during the month prior to the experiment, reduced the number of times binge drinking during the preceding month by 0.97. The estimate is large compared to the base level, but the estimate is only significant at a 10% level.

In Table 2.12 alcohol consumption is measured by number of times per month in columns (1) and (2) and by the number of standard drinks in column (3). An alternative approach is to scale the results based on the scale recommended in the WHO AUDIT. In this paper we prefer to present the results on actual drinking behavior to the WHO AUDIT score as the estimates from the score are harder to translate into actual behavior of the students. However, the results on the three measures of alcohol consumption, using the recommended scale, are shown in Table 5.1 in the Appendix. The results in Table 5.1 illustrate the same points as the results in Table 2.12. The only notable difference is that the effect on binge drinking for male students (a reduction), who went binge drinking one or fewer times during the month prior to the experiment, becomes significant at a 5% level.[10]

2.2 Take-away message

The result show that the individual-level intervention had a significant effect on the number of times per month students drink alcohol. We find a reduction of 17%. The result is driven by a large effect on male students.

2.4.2 Alcohol addiction and alcohol-related harm

In this section we show results on the effect of the individual-level intervention on measures of alcohol addiction and experience of alcohol-related harm.

It is not the intention of the intervention to target alcohol addiction or individuals with severely harmful alcohol consumption. It is to be expected that more comprehensive measures are needed to deal with this type of problems. For this reason, the initial survey included a question on whether the individual would like to receive professional help to reduce alcohol consumption. If the students answered yes to this question they were given contact information on treatments made available by the municipality.

It is, however, one of the main purposes of the intervention to investigate whether a small-scale intervention such as this can have an effect on measures of heavy alcohol consumption. In order to determine this we included the WHO AUDIT domain on experience of alcohol-related harm in the survey.

We do not find any indication that the intervention had an effect on experiences of alcohol-related harm (see Table 2.13, columns 1, 2, 4, and 5). This result holds for the full sample,

[10] We investigated the difference in the distribution of answers between the treatment and the control group and found no indication of non-linearity in the effects.

including all participating students, and also for subgroups by gender and previous drinking behavior.[11] Furthermore, the intervention had no impact on "number of times during the preceding month where you did not come to class or had trouble following class due to a hangover." The results on the effect of the intervention on measures of addition and experiences of alcohol-related harm are shown in Table 2.13.

2.3 Take-away message

The individual-level intervention had no effect on alcohol addiction and experiences of alcohol-related harm.

[11] We also do not find any indication that the individual-level intervention had an effect on alcohol consumption when using the recommended WHO AUDIT scale.

Table 2.13 The effect of the intervention on experiences of alcohol-related harm and alcohol addiction

	(1)	(2)	(3)	(4)	(5)	(6)
	No. of times during the preceding month with a feeling of guilt or regret due to drinking	No. of times during the preceding month with memory loss due to drinking	No. of times during the last month where you did not come to class or had trouble following class due to a hangover	Have you other others had physical injuries due to your alcohol consumption during the preceding month	Has a doctor, a friend or others expressed their concern over your drinking behavior or recommended you to seek help during the preceding month	Indicate if you would like help to reduce your alcohol consumption
Panel A						
Treatment	0.0377	-0.0382	-0.0322	-0.0167	-0.0171	-0.00868
	(0.0466)	(0.0392)	(0.0282)	(0.0237)	(0.0141)	(0.0187)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	464	464	463	459	463	462
R-squared	0.254	0.362	0.284	0.191	0.190	0.199
Panel B						
Treatment*Men	0.0463	-0.0805	-0.0242	-0.0521	-0.00270	-0.00411
	(0.0782)	(0.0662)	(0.0532)	(0.0323)	(0.0282)	(0.0281)
Treatment*Women	0.0326	-0.0132	-0.0369	0.00417	-0.0257	-0.0114
	(0.0607)	(0.0507)	(0.0350)	(0.0302)	(0.0162)	(0.0282)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	463	463	462	458	462	461
R-squared	0.253	0.360	0.284	0.193	0.190	0.199
Panel C						
Women:						
Treatment*binge drinking one or fewer times during the preceding month	-0.109	-0.0898	-0.0239	-0.0193	0.00494	0.0311
	(0.0922)	(0.0591)	(0.0348)	(0.0322)	(0.0122)	(0.0398)
Treatment*binge drinking two-three times during the preceding month	0.0506	0.0306	-0.0186	-0.0114	-0.0361	-0.0162
	(0.0898)	(0.0795)	(0.0524)	(0.0436)	(0.0260)	(0.0443)
Treatment*binge drinking one or more times per week during the preceding month	0.203	-0.000795	-0.133	0.0760	-0.0433	-0.0654
	(0.131)	(0.138)	(0.108)	(0.0983)	(0.0662)	(0.0627)
Men:						
Treatment*binge drinking one or fewer times during the preceding month	0.0549	-0.167*	0.0745	0.0240	-0.0668	-0.0298
	(0.171)	(0.0967)	(0.0835)	(0.0334)	(0.0465)	(0.0329)
Treatment*binge drinking two-three times during the preceding month	-0.0510	-0.133	-0.168**	-0.0671	0.0262	0.0116
	(0.121)	(0.108)	(0.0762)	(0.0464)	(0.0429)	(0.0527)
Treatment*binge drinking one or more times per week during the preceding month	0.173	0.0414	0.105	-0.0781	0.000313	-0.00871
	(0.123)	(0.124)	(0.109)	(0.0763)	(0.0651)	(0.0250)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	464	464	463	459	463	462
R-squared	0.265	0.368	0.299	0.199	0.196	0.205

2.4.3 Treatment intensity

In the survey the students in the treatment group were asked to report whether they opened the online part of the individual-level intervention, read the text, viewed the videos, and made a behavioral strategy. They were also asked how many text messages they read and whether they liked the individual-level intervention. This information can be used to compare students who indicated that they received the individual-level intervention to students who indicated that they opted out. This can, in principal, give some indication of which part of the intervention actually worked.

The results based on this comparison, however, should be read with considerable caution and cannot be interpreted as a (causal) effect. This is because the comparison is within the treatment group and we are therefore no longer comparing people that are randomly affected by the intervention with people who are not affected. It is to be expected that students who indicate that they have received the different elements in intervention are different than those who opted out in many ways. Some of the difference between these students can be accounted for by including observable differences such as gender and drinking behavior from the initial survey. However, this approach still leaves room for selection on characteristics for which we have not accounted.

In the ideal setting with a much larger sample size the particular parts of the intervention could be randomized. This would give clear results on which part of the intervention worked. Although we are limited by sample size in this sub-analysis we can still evaluate the correlations between treatment intensity and outcomes. The results on the number of times drinking alcohol during preceding month are shown in Table 2.14. Although the results suggested a positive correlation between the number of times drinking alcohol during preceding month and whether the student watched the videos in the intervention, the overall conclusion is that the results do not show a consistent pattern in the treatment intensity. Based on these numbers it is not clear that a particular part of the individual-level intervention drives the results.[12]

2.4 Take-away message

We cannot identify a particular part of the individual-level intervention as driving the effect on the number of times drinking alcohol. We argue that the combined intervention had an effect.

[12] We draw the same conclusion using *Number of times binge drinking during the preceding month* and *The typical number of drinks on a day drinking alcohol during the preceding month* as outcome measures.

Table 2.14 Treatment intensity, treatment group only

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable: No. of times drinking alcohol during the preceding month								
Opened online intervention	0.530	0.839*	0.701	-0.0791	-0.109			0.297
	(0.432)	(0.464)	(0.919)	(1.079)	(1.101)			(1.597)
Read the text in online intervention			0.152	-0.112	0.0163			0.0120
			(0.866)	(0.921)	(0.971)			(0.975)
Viewed the videos in online intervention				1.326*	1.397*			1.426**
				(0.717)	(0.722)			(0.716)
Made a behavioral strategy in online intervention					-0.437			-0.381
					(0.709)			(0.782)
No. of text messages read						0.244		0.283
						(0.334)		(0.356)
Liked the online intervention							-0.0259	-0.506
							(1.089)	(1.128)
Liked the text message intervention							-0.203	-0.0920
							(0.837)	(0.833)
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	219	219	219	219	219	219	219	219
R-squared	0.007	0.406	0.406	0.412	0.413	0.396	0.397	0.416

2.4.4 Heterogeneous effects

Table 2.15 and Table 2.16 present the results for the three measures of alcohol consumption on subgroups of students. In Table 2.15 the effect of the individual-level intervention is split by age of the students (19-21 years, 22-24 year, 25+), parental education (long tertiary education or not), and whether the parents are born in Denmark. In Table 2.16 the effect of the individual-level intervention is split by whether the student is a first-year student, grade point average (GPA) at upper secondary education (<8, >=8 and <10, >=10), and whether the student feels part of the student environment.

We find insignificant estimates on the two outcomes number of times binge drinking during the preceding month and the typical number of drinks on a day drinking alcohol during the preceding month for all subgroups. The results for these two outcomes are available in column (2) and (3) in Table 2.15 and Table 2.16. In the following we concentrate on the subgroup-variation for the outcome number of times drinking alcohol during the preceding month. These results are available in column (1) in the two tables.

The results in Panel A, Table 2.15 indicate a reduction in the effect size in student age (no significant effect for students above the age of 25). A similar result can be found in Panel A of Table 2.16, where the estimated effect size is somewhat larger for first-year students than for students later in their education. First-year students who received the individual-level intervention reduced the number of times drinking alcohol during the preceding month compared to a

similar control group by 1.45. For students with more than one year of studies the corresponding effect is 0.82.

We split the estimates by educational background of the parents and by whether the parents are born in Denmark. The results are available in Panel B and C, Table 2.15. The effect is significant for students who do not have a parent with a long tertiary education, but not for students with at least one parent with a long tertiary education. We also find that the estimate size is larger for students with at least one parent not born in Denmark (-2.12) than for students where both parents are born in Denmark (-0.75).

We also examine whether the results depend on the academic achievements in upper secondary education and on the extent to which the student is integrated in the student environment. Results on this are shown in Panel B and C, Table 2.16. We only find little variation in the effect size by high school GPA and by whether the student feels part of the student environment (not all parameter estimates are statistically significant).

2.5 Take-away message

We draw the following three conclusions based on the subgroup analysis.

1) The effect is larger for younger than older students. For first-year students the number of times drinking alcohol during the preceding month is reduced by 1.45. For students with more than one year of studies this effect is smaller, namely 0.82.
2) Parental educational background and nationality matter for the effect size. The effect is significant for students with parents without a tertiary education but not significant for students with a least one parent with a tertiary education. The number of times drinking alcohol during the preceding month is reduced by 2.12 for students of parents not born in Denmark. For students with parents born in Denmark the number of times is reduced by 0.75.
3) We find no variation in the effect size by high school grade point average and sense of belonging to the student environment.

Table 2.15 The effect of the intervention on alcohol consumption by age group and parental characteristics

	(1)	(2)	(3)
	No. of times drinking alcohol during the preceding month	No. of times binge drinking during the preceding month	The typical no. of drinks on a day drinking alcohol, during the preceding month
Panel A			
Age groups			
Treatment*age 19 to 21	-1.465***	-0.230	0.410
	(0.558)	(0.411)	(0.447)
Treatment*age 22 to 24	-1.119***	-0.0957	0.246
	(0.412)	(0.290)	(0.288)
Treatment*age 25 +	-0.482	-0.0347	-0.0804
	(0.514)	(0.293)	(0.320)
Controls	Yes	Yes	Yes
Observations	493	489	462
R-squared	0.353	0.417	0.499
Panel B			
Education of parents			
Treatment*no parent with a long tertiary education	-1.232***	-0.274	0.114
	(0.423)	(0.285)	(0.267)
Treatment*At least one parent with a long tertiary education	-0.564	0.175	0.245
	(0.468)	(0.394)	(0.349)
Controls	Yes	Yes	Yes
Observations	493	489	462
R-squared	0.353	0.416	0.500
Panel C			
Treatment*both parents born in Denmark	-0.752**	-0.152	0.262
	(0.372)	(0.237)	(0.237)
Treatment*At least one parent no born in Denmark	-2.117***	0.185	-0.329
	(0.772)	(0.638)	(0.468)
Controls	Yes	Yes	Yes
Observations	493	489	462
R-squared	0.355	0.416	0.500

Note: Stratum 1 is women binge drinking one or fewer times during the preceding month, stratum 2 is women binge drinking two-three times during the preceding month, stratum 3 is women binge drinking one or more times per week during the preceding month, stratum 4 is men binge drinking one or fewer times during the preceding month, stratum 5 is men binge drinking two-three times during the preceding month, stratum 6 is men binge drinking one or more times per week during the preceding month, stratum 7 is the group of individuals who did not report information on either gender or binge drinking in the initial survey. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 2.16 The effect of the intervention on alcohol consumption by first-year student, high school Grade point average (GPA), and feeling part of the student environment

	(1) No. of times drinking alcohol during the preceding month	(2) No. of times binge drinking during the preceding month	(3) The typical no. of drinks on a day drinking alcohol, during the preceding month
Panel A			
Treatment*Not first-year student	-0.824**	-0.178	0.0363
	(0.389)	(0.242)	(0.246)
Treatment*First-year student	-1.445**	0.173	0.588
	(0.604)	(0.477)	(0.444)
Controls	Yes	Yes	Yes
Observations	493	489	462
R-squared	0.352	0.417	0.500
Panel B			
High school GPA			
Treatment*GPA of 8 or less	-1.237	-0.354	-0.157
	(0.772)	(0.525)	(0.516)
Treatment*GPA between 8 and 10	-0.808*	0.319	0.276
	(0.454)	(0.327)	(0.299)
Treatment*GPA of 10 or more	-0.998**	-0.352	0.193
	(0.495)	(0.322)	(0.335)
Controls	Yes	Yes	Yes
Observations	493	489	462
R-squared	0.351	0.420	0.499
Panel C			
Treatment*Do not feel as part of the student environment	-1.076	-0.284	0.417
	(0.771)	(0.400)	(0.406)
Treatment*Feel as part of the student environment	-0.947***	-0.0620	0.117
	(0.349)	(0.225)	(0.235)
Controls	Yes	Yes	Yes
Observations	493	489	462
R-squared	0.351	0.416	0.499

Note: Stratum 1 is women binge drinking one or fewer times during the preceding month, stratum 2 is women binge drinking two-three times during the preceding month, stratum 3 is women binge drinking one or more times per week during the preceding month, stratum 4 is men binge drinking one or fewer times during the preceding month, stratum 5 is men binge drinking two-three times during the preceding month, stratum 6 is men binge drinking one or more times per week during the preceding month, stratum 7 is the group of individuals who did not report information on either gender or binge drinking in the initial survey. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

2.4.5 Social behavior and alcohol consumption

In this section we present results of the effect of the individual-level intervention on social behavior in relation to alcohol consumption. The students are asked a) to compare their alcohol consumption to that of their friends, b) if they find it difficult to say no to drinking alcohol at parties, and c) whether they go to parties without drinking alcohol. The results are presented in Table 6.16.

The results show that the individual-level intervention made it less difficult to say no to drinking alcohol at parties (Panel A, column (1), Table 2.17). From Panel B and C it follows the effect is driven by men.

We do not find an effect on average or by gender on the probability of having been to a party without drinking alcohol during preceding month. However, for the group of men who previously had been binge drinking one or fewer times during the preceding month we find an increase in the likelihood of going to parties without drinking alcohol. This group of individuals also showed reduction in binge drinking and in drinking to get in contact with others.

The results does not seem to have had an effect on the students' assessments of their drinking behavior compared to that of their friends. The results for this are shown in columns (3) and (4) in Table 2.17.

2.6 Take-away message

The individual-level intervention made it less difficult to say no to drinking alcohol at parties, particular for men.

Table 2.17 The effect of the intervention on drinking and social relations

	(1) I sometimes find it difficult to say no to drinking alcohol at parties	(2) Been at a party without drinking alcohol during preceding month	(3) My friends from university drink more than me	(4) My friends who do not go to university drink more than me
Panel A				
Treatment	-0.233**	0.00899	0.00310	0.00423
	(0.104)	(0.0469)	(0.0374)	(0.0390)
Controls	Yes	Yes	Yes	Yes
Observations	493	493	454	441
R-squared	0.420	0.251	0.519	0.407
Panel B				
Treatment*Men	-0.354*	0.0502	0.0571	-0.106*
	(0.185)	(0.0748)	(0.0584)	(0.0640)
Treatment*Women	-0.153	-0.0181	-0.0345	0.0642
	(0.131)	(0.0596)	(0.0503)	(0.0522)
Controls	Yes	Yes	Yes	Yes
Observations	490	490	451	438
R-squared	0.424	0.248	0.522	0.417
Panel C				
Women:				
Treatment*binge drinking one or fewer times during the preceding month	-0.240	-0.0165	-0.0827	0.177*
	(0.222)	(0.106)	(0.0922)	(0.0985)
Treatment*binge drinking two-three times during the preceding month	-0.0493	-0.0501	-0.0210	0.0491
	(0.193)	(0.0909)	(0.0730)	(0.0712)
Treatment*binge drinking one or more times per week during the preceding month	0.100	0.0813	0.0268	0.0736
	(0.312)	(0.143)	(0.0961)	(0.100)
Men:				
Treatment*binge drinking one or fewer times during the preceding month	-0.653*	0.421**	0.286*	-0.199
	(0.362)	(0.173)	(0.151)	(0.146)
Treatment*binge drinking 2-3 times during the preceding month	0.0392	0.00199	0.0175	-0.0614
	(0.295)	(0.121)	(0.0886)	(0.102)
Treatment*binge drinking one or more times per week during the preceding month	-0.683**	-0.0845	-0.00531	-0.168*
	(0.293)	(0.120)	(0.0700)	(0.0904)
Treatment*other	-1.155*	-0.137	-0.0521	-0.0494
	(0.640)	(0.171)	(0.255)	(0.223)
Controls	Yes	Yes	Yes	Yes
Observations	469	493	454	441
R-squared	0.464	0.264	0.525	0.421

Note: In column (3) the outcome "I sometimes find it difficult to say no to drinking alcohol at parties" is measured on the following scale: -2 if strongly disagree, -1 if disagree, 0 if neutral, 1 if agree, and 2 if strongly agree. Stratum 1 is women binge drinking one or fewer times during the preceding month, stratum 2 is women binge drinking two-three times during the preceding month, stratum 3 is women binge drinking one or more times per week during the preceding month, stratum 4 is men binge drinking one or fewer times during the preceding month, stratum 5 is men binge drinking two-three times during the preceding month, stratum 6 is men binge drinking one or more times per week during the preceding month, stratum 7 is the group of individuals who did not report information on either gender or binge drinking in the initial survey. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.10

2.4.6 Student environment

Alcohol consumption plays a central role in many social activities at Aarhus University. The results in Section 2.4.1 show that the individual-level intervention reduced the number of times during a month that the students drink alcohol. In this section we investigate to what extent the intervention, and the reduced alcohol consumption, affected the students' perception of the student environment. The students were asked 1) if they like the student environment, 2) if they feel part of the student environment, 3) if they participated in the latest Friday bar, and 4) the number of times they visited the Friday bar during the preceding month. The results in columns (1) and (2) in Table 2.18 show that the intervention did not affect whether the students like or feel part of the student environment. The Friday bars are weekly social events at the university. Each field of study has its own Friday bar. Participation in these bars can be useful in building social relations with co-students. Alcohol consumption is a central part of the social activities at the Friday bars. We find that the intervention reduced the frequency of visits in the Friday bars by 0.13 visits (column (4), Table 6.17). This corresponds to a reduction of 11%. The reduction in the number of visits is driven by female students (see Panel B). However, the intervention did not affect the behavior in the Friday bars for those who attended (measured in terms of consumption of alcoholic and non-alcoholic drinks, and the time spent in the bar). See Table 5.2 in the appendix.

High alcohol consumption can affect academic performance (Balsa, Giuliano, & French, 2011). We study whether the individual-level intervention had an effect on academic performance by asking whether the students expect to complete their education without extension. The intervention had no effect on this outcome (see column (5), Table 2.18).

2.7 Take-away message

Participation in the individual-level intervention had no significant effect on whether the students feel part of or like the student environment or on their expected academic performance. However, the intervention did have a significant reductive effect on the students' frequency of visits to the Friday bars. This effect is driven by women. Women participating in the intervention reduced the frequency of visits in the Friday bars by 0.17 visits.

Table 2.18 The effect of the intervention on study behavior

	(1) Like the student environment	(2) Feel part of the student environment	(3) Participated in latest Friday bar	(4) Number of times at Friday bar during the preceding month	(5) Expect to complete education without extension
Panel A					
Treatment	0.0184	0.0372	-0.0583	-0.135*	-0.0105
	(0.0307)	(0.0338)	(0.0493)	(0.0695)	(0.0285)
Controls	Yes	Yes	Yes	Yes	Yes
Observations	474	474	442	477	475
R-squared	0.310	0.208	0.173	0.292	0.586
Panel B					
Treatment*Men	-0.0517	0.0216	-0.00795	-0.0651	-0.0545
	(0.0463)	(0.0554)	(0.0808)	(0.115)	(0.0408)
Treatment*Women	0.0603	0.0449	-0.0926	-0.173**	0.0157
	(0.0426)	(0.0456)	(0.0629)	(0.0873)	(0.0340)
Controls	Yes	Yes	Yes	Yes	Yes
Observations	472	472	439	474	473
R-squared	0.305	0.198	0.176	0.289	0.587
Panel C					
Women:					
Treatment*binge drinking one or fewer times during the preceding month	-0.0263	0.0890	-0.0277	-0.231	0.0165
	(0.0878)	(0.0938)	(0.0975)	(0.140)	(0.0674)
Treatment*binge drinking two-three times during the preceding month	0.0769	0.0177	-0.0296	-0.151	0.00785
	(0.0544)	(0.0604)	(0.0958)	(0.136)	(0.0474)
Treatment*binge drinking one or more times per week during the preceding month	0.0983	-0.000164	-0.277*	-0.0716	0.00856
	(0.0830)	(0.0927)	(0.145)	(0.217)	(0.0748)
Men:					
Treatment*binge drinking one or fewer times during the preceding month	0.0136	-0.0219	-0.276*	-0.206	-0.206
	(0.117)	(0.126)	(0.153)	(0.260)	(0.135)
Treatment*binge drinking two-three times during the preceding month	-0.0574	0.0957	0.0570	0.0495	-0.0325
	(0.0698)	(0.0868)	(0.123)	(0.181)	(0.0606)
Treatment*binge drinking one or more times per week during the preceding month	-0.0126	0.0228	0.0616	-0.0857	-0.00205
	(0.0579)	(0.0730)	(0.149)	(0.205)	(0.0707)
Treatment*other	-0.0784	0.0166	-0.194	-0.433	0.123
	(0.0871)	(0.114)	(0.289)	(0.281)	(0.0990)
Controls	Yes	Yes	Yes	Yes	Yes
Observations	474	474	442	477	475
R-squared	0.317	0.210	0.187	0.296	0.591

2.4.7 Reasons for drinking

In this section we describe the effect of the individual-level intervention on self-reported reasons for drinking alcohol.

Table 2.19 shows the estimated effects of the individual-level intervention on the reasons for drinking alcohol. From Panel A, it appears that the intervention reduced the students' drinking due to stress by 7 percentage points (25%) and drinking to forget problems by 6 percentage points (72%). The intervention had no significant average effect on the remaining four reasons for drinking (to get in contact with others, to get drunk, to reduce personal insecurity, to get in a good mood).

The results in Panel B show that for men participation in the intervention reduced the probability of answering that the reason for drinking was due to stress by 17.4 percentage points. For women, participation in the intervention reduced the probability of answering that the reason for drinking was to forget problems. Thus, the effect on drinking due to stress is driven by men and the effect on drinking to forget problems is driven by women.

Table 2.19 The effect of the intervention on reasons for drinking during the preceding month

	(1) Reduce stress	(2) To forget problems	(3) Get in contact with others	(4) To get drunk	(5) Due to in-security	(6) Get in a good mood
Panel A						
Treatment	-0.0736*	-0.0646**	-0.0447	-0.0202	0.00599	0.0420
	(0.0408)	(0.0260)	(0.0408)	(0.0417)	(0.0305)	(0.0357)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	509	509	509	509	509	509
R-squared	0.326	0.314	0.310	0.358	0.341	0.278
Panel B						
Treatment*Men	-0.174**	-0.0549	-0.0403	0.0523	0.0395	0.0874
	(0.0680)	(0.0426)	(0.0752)	(0.0690)	(0.0561)	(0.0561)
Treatment*Women	-0.0114	-0.0688**	-0.0381	-0.0557	-0.0144	0.0210
	(0.0518)	(0.0348)	(0.0485)	(0.0516)	(0.0374)	(0.0457)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	506	506	506	506	506	506
R-squared	0.336	0.318	0.319	0.365	0.344	0.286
Panel C						
Women:						
Treatment*binge drinking one or fewer times during the preceding month	-0.0110	-0.104	-0.0265	-0.162*	0.0312	0.0219
	(0.0962)	(0.0635)	(0.0815)	(0.0827)	(0.0693)	(0.0989)
Treatment*binge drinking two-three times during the preceding month	-0.0742	-0.114**	-0.106	-0.0472	-0.0172	-0.0504
	(0.0752)	(0.0453)	(0.0735)	(0.0848)	(0.0498)	(0.0665)
Treatment*binge drinking one or more times per week during the preceding month	-0.00739	0.0192	0.196*	0.0690	0.0259	0.00712
	(0.110)	(0.102)	(0.115)	(0.104)	(0.0943)	(0.0987)
Men:						
Treatment*binge drinking one or fewer times during the preceding month	-0.121	0.0730	-0.388***	-0.182	-0.0370	0.202
	(0.158)	(0.0744)	(0.143)	(0.133)	(0.104)	(0.144)
Treatment*binge drinking two-three times during the preceding month	-0.175*	-0.0173	0.109	0.137	0.0230	-0.0279
	(0.102)	(0.0651)	(0.116)	(0.109)	(0.0738)	(0.0945)
Treatment*binge drinking one or more times per week during the preceding month	-0.176	-0.150*	-0.139	0.112	-0.0396	0.179**
	(0.126)	(0.0864)	(0.123)	(0.125)	(0.106)	(0.0842)
Treatment*other	0.200	0.0198	-0.00844	-0.124	0.139	0.370**
	(0.203)	(0.102)	(0.196)	(0.204)	(0.180)	(0.146)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	509	509	509	509	509	509
R-squared	0.333	0.324	0.330	0.370	0.344	0.293

Note: Stratum 1 is women binge drinking one or fewer times during the preceding month, stratum 2 is women binge drinking two-three times during the preceding month, stratum 3 is women binge drinking one or more times per week during the preceding month, stratum 4 is men binge drinking one or fewer times during the preceding month, stratum 5 is men binge drinking two-three times during the preceding month, stratum 6 is men binge drinking one or more times per week during the preceding month, stratum 7 is the group of individuals who did not report information on either gender or binge drinking in the initial survey. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.10

We then proceed by splitting the sample by previous binge drinking behavior. These results are shown in Panel C. One noteworthy result from this exercise is that the effect on drinking to get in contact with others is significantly reduced for men, who indicated that they previously went binge drinking one or fewer times during the preceding month, e.g., the group of men who reduced binge drinking behavior due to the intervention.

2.8 Take-away message

The individual-level intervention reduced drinking due to stress by 7 percentage points and drinking to forget problems by 6 percentage points. Men reduced drinking due to stress and women reduced drinking to forget problems.

2.4.8 Partying without alcohol

The results in column (2), Table 2.17 show that the individual-level intervention had no significant effect on the probability of students going to parties without drinking alcohol. However, as the intervention is based on the theory of planned behavior, and is therefore focused on the intention rather than the goal, we examine the effect of the intervention on the reasons for not drinking at a party, even though the intervention had no effect on the probability of attending.

46% of students indicate hangovers as a reason for not drinking at a party, 20% list health as a reason, 15% list safety, 15% list money, 12% lists memory loss, 4% list the taste, and nobody indicates religion as a reason (Table 2.6). There may be many other reasons for not drinking at a party and indeed more than 50% of the students indicate that they had other reasons for not drinking at a party during the preceding month. In this context it is worth recollecting the sample selection criterion that only students who drink from time to time are part of the experiment. Students who never drink are expected to have very a different distribution of answers.

The results in this section should be interpreted with caution as the sample size is significantly reduced (and probably selected). Only individuals who indicated that they had been at a party without drinking during the preceding month where asked to answer the question on the reason for not drinking at this party/these parties and thus only 213 observations were included in the sample. For this group we find that the intervention increased the probability of indicating money and memory loss as reasons for not drinking at a party by 15 and 8 percentage points, respectively, (Panel A, columns (3) and (5), Table 2.20). The results on money as a reason is driven by men, who went binge drinking two-three times during the preceding month, and the results on memory loss reasons is driven by women, who also went binge drinking two-three times during the preceding month (Panels B and C, columns (3) and (5),). The individual-level intervention had no significant effect on taste, responsibility, hangover, safety, and religion as reasons for not drinking at a party.

2.9 Take-away message

The individual-level intervention increased the probability of the students pointing to money and memory loss as reasons for not drinking at a party.

Table 2.20 Reasons for being at a party without drinking alcohol during preceding month

Reason for not drinking	(1) Taste	(2) Responsi-bility	(3) Money	(4) Hangover	(5) Memory loss	(6) Safety	(7) Religion
Panel A							
Treatment	-0.00720	0.0656	0.147**	0.103	0.0802*	0.0376	-0.00992
	(0.0224)	(0.0598)	(0.0712)	(0.0776)	(0.0480)	(0.0596)	(0.0108)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	213	213	213	213	213	213	213
R-squared	0.429	0.384	0.340	0.413	0.372	0.413	0.295
Panel B							
Treatment*Men	0.0349	0.0971	0.245**	0.168	-0.0286	0.0430	-0.0431
	(0.0303)	(0.106)	(0.112)	(0.129)	(0.0872)	(0.107)	(0.0395)
Treatment*Women	-0.0300	0.0486	0.0944	0.0673	0.139**	0.0346	0.00807
	(0.0303)	(0.0825)	(0.0971)	(0.102)	(0.0634)	(0.0770)	(0.0104)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	213	213	213	213	213	213	213
R-squared	0.436	0.385	0.344	0.414	0.381	0.413	0.314
Panel C							
Women:							
Treatment*binge drinking one or fewer times during the preceding month	-0.0971	-0.0510	0.169	0.159	0.0507	-0.0971	0.0107
	(0.0628)	(0.127)	(0.165)	(0.161)	(0.111)	(0.118)	(0.0164)
Treatment*binge drinking two-three times during the preceding month	0.0206	0.0761	0.172	0.0678	0.264**	0.121	-0.00378
	(0.0335)	(0.120)	(0.145)	(0.161)	(0.108)	(0.125)	(0.0112)
Treatment*binge drinking one or more times per week during the preceding month	-0.00978	0.235	-0.271	-0.236	0.0267	0.0691	0.0310
	(0.0348)	(0.166)	(0.213)	(0.248)	(0.114)	(0.153)	(0.0291)
Men:							
Treatment*binge drinking one or fewer times during the preceding month	0.116	0.116	-0.0887	0.0147	-0.162	0.0853	-0.129
	(0.0809)	(0.219)	(0.213)	(0.208)	(0.194)	(0.221)	(0.112)
Treatment*binge drinking two-three times during the preceding month	-0.0282	0.109	0.435**	0.121	0.0220	-0.0831	-0.00115
	(0.0412)	(0.179)	(0.173)	(0.219)	(0.140)	(0.140)	(0.0216)
Treatment*binge drinking one or more times per week during the preceding month	0.0345	0.0207	0.337	0.581*	0.0433	0.271	0.00955
	(0.0647)	(0.152)	(0.320)	(0.297)	(0.146)	(0.334)	(0.0269)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	213	213	213	213	213	213	213
R-squared	0.467	0.395	0.374	0.431	0.396	0.427	0.359

2.5 Cost-effectiveness

An argument for implementing a nudging intervention is the low cost and the scalability. In this section we set the price of the individual-level intervention in relation to the size of the effect. In order to do so we apply a set of assumptions. This limits the reliability of the estimates. We therefore chose to present the estimates as an interval, ranging from the most conservative to the most optimistic estimate rather than presenting an exact number. The assumptions will be described in the following text together with the results. The calculation is available in Table 2.21.

In the calculations we include the costs of sending out text messages and the costs of lottery prizes (500 movie tickets and two festival tickets).

The applied text message system came with a monthly fee of 195 DKK (Danish kroner) and a price per message of 0.14 DKK. We sent out six messages to each of the 480 individuals in the treatment group. This amounts to a total text message cost of 605 DKK.

The price per movie ticket, when buying more than 50 tickets at Nordisk Film's Cinemas, is 90 DKK per ticket. The price of a one-day ticket to Roskilde Festival is 1100 DKK. This amounts to a total cost of lottery prizes of 47,200 DKK. One could consider only including a fraction of these costs, as half of the prizes went to the control group and the prizes also were included to make participants answer the post and prequestionnaires. However, we chose the conservative approach and include the full cost as all participants were presented with the lottery prizes when choosing whether to participate.

We measure the effectiveness of the individual-level intervention in the reduction in drinking events. We assume that the intervention has no persistent effect and we assume that the estimate from number of times drinking alcohol during the preceding month of -0.968 is the only relevant effect of the intervention.

In the conservative version of the calculation we assume that the intervention only had an effect on those who answered the second questionnaire (225 individual). In the optimistic version we assume a similar effect of the intervention for the 255 individuals in the treatment group, who did not answer the second questionnaire. Based on these considerations we find that the cost of reducing drinking by one event is between 103 DKK and 219 DKK.

We can recalculate this number into a measure of the cost of reducing drinking by one standard drink. In Table 2.8 we have the average number of standard drinks consumed per event. In the treatment group the average number of standard drinks per event at which alcohol was consumed is 6.1. We apply this estimate in the optimistic version of the calculation. In the conservative version we recognize that we did not find a significant effect on binge drinking behavior. This indicates that individuals would not have had 6.1 standard drinks on the evening in which they choose not to consume alcohol due to the intervention. In the conservative calculation we assume that the average number of standard drinks in this marginal event is 2. Based on these considerations we find that the cost of reducing drinking by one standard drink is between 17 DKK and 110 DKK (see Table 2.21).

2.10 Take-away message

The calculations indicate that the cost of reducing drinking by one event is between 103 DKK and 219 DKK.

Table 2.21 Cost-Effectiveness calculations

	Conservative calculation	Optimistic calculation
Costs		
Text messages	605	605
Cinema tickets	45000	45000
Festival tickets	2200	2200
Total costs	47805	47805
Effectiveness		
Reduction in number of times per month drinking alcohol	0.968	0.968
Number of individuals	225	480
Total reduction in number of drinking events	217.8	464.64
Cost-Effectiveness		
Cost of reducing drinking by one event	219.49	102.89

Note: The costs are measured in DKK.

3 The bar-level intervention

3.1 The intervention

3.1.1 Intervention design

The intention of the bar-level intervention is to introduce a structural change to student environments, which can change the drinking culture and reduce heavy drinking. The Friday bars are a cornerstone in the social environment at the university. They are weekly recurring social events on campus, where students gather and where alcohol is served. The core element in the bar-level intervention is the introduction of alcohol-free beer as an alternative to regular beer in the Friday bars. Awareness of the alcohol-free alternative was emphasized by social activities in the bars. These social activities included 1) drunk cycling simulation, 2) breathalyzer, and 3) Food Maker[13]. Tables 5.6-5.9 include the protocols for these activities. Furthermore, there were advertisements (posters) for alcohol-free beers in the Friday bars and the bar staff wore a T-shirt advertising alcohol-free beer. It is common practice to advertise in this way when new types of beer are introduced at the Friday bar (e.g., new products, at Christmas or Easter). The drunk cycling simulation included a set of VR glasses and a bicycle, which made it possible for the student to experience the feeling of cycling while being drunk.

3.1.2 Recruitment and participants

The individual bars are recruited through the student association. On September 11 the Student Association hosted a meeting with representatives of the bars. 48 representatives participated in the meeting, representing the majority of the Friday bars at Aarhus University. The Friday bars were asked to indicate at the meeting whether they were interested in participating. Those who indicated that they were interested in participating were then later contacted by the student association and asked whether they would be willing to participate.

Six Friday bars signed up to participate. The participating bars are Esperanto, Fredagscafeen, Fradagsbar.dk, Nanorama, Samfundsfaglig Fredagsbar, and Katrines Kælder. Table 3.1 shows an overview of the participating Friday bars. All the bars are located on campus and all bars serve beer and hard liquor. The vast majority of the students at the bars are local students, except in the bar Esperanto. Samfundsfaglig Fredagsbar stands out as it is substantially larger than the other bars.

No Friday bar served alcohol-free beer prior to the bar-level intervention. The introduction of alcohol-free beers will therefore represent a significant change in the supply of non-alcoholic bevarages in the bars.

[13] See a description of Food Maker here: http://foodmaker.dk/.

Table 3.1 Overview of the participating Friday bars

	Sam-fundsfaglig fredagsbar	Fredags-bar.dk	Nanorama	Esperanto	Fred-agsca-feen*	Kathrine s kælder
Opening Hours						
Short bar	15-19	14-18-20(22)	16-22	16-24	-	No short bars
Long bar	15-02	14-02	16-00(02)	16-24	-	14-02
Number of guests						
Short bar	150-250	50-200	40-50	400	-	No short bars
Long bar	750-1000	50-200	100-150	400	-	100-500
Number of beers sold						
Short bar	400	300	90	300	-	No short bars
Long bar	1700	700	200	300	-	280-400
Drinks						
Draft	Yes	Sometimes	Yes	No	-	Yes
Bottles	No	Yes	Yes	Yes	-	Yes
Hard liquor	Yes	Yes	Yes	Yes	-	Yes
Alcohol-free beer	No	No	No	No	No	No
% women	50	50	50	60	-	20
% local stu-dents	70-100	80-90	90-95	50	-	90
Location	At the canteen	In the base-ment	At the en-trance	Next to the can-teen	In the basement	In the base-ment
Typical line of study	Law, Political science, Psy-chology	Digital design, information and media science	Nano science	Language, litera-ture, culture, in-ternational busi-ness communi-cation	Computer Sciences	Engineer-ing

Note: The information in the table is provided by the representatives from the Friday bars. *Fredagscafeen did not provide us with any information.

3.2 Method

3.2.1 Empirical strategy

The Friday bars were split into treatment and control bars based on the information shown in Table 3.1. The emphasis in the grouping was on making the two groups as comparable as possible. We used the following assignment rules:

- The two Friday bars from humanities were split into control and treatment groups (Fred-agsbar.dk (treatment) and Esperanto (control))
- The two Friday bars from natural sciences were split into control and treatment groups (Nanorama (treatment) and Fredagscafeen (control))

- The two major Friday bars were split into control and treatment groups (Samfundsfaglig Fredagsbar (treatment) and Katrines Kælder (control))

Based on these considerations the treatment group was set to consist of Fredagsbar.dk, Nanorama, and Samfundsfaglig Fredagsbar, and the control group to consist of Esperanto, Fredagscafeen, and Katrines Kælder. Unfortunately Katrines Kælder did not provide the necessary data for them to be part of the evaluation. We were thus left with three treatment bars and two control bars.

3.2.2 The implementation

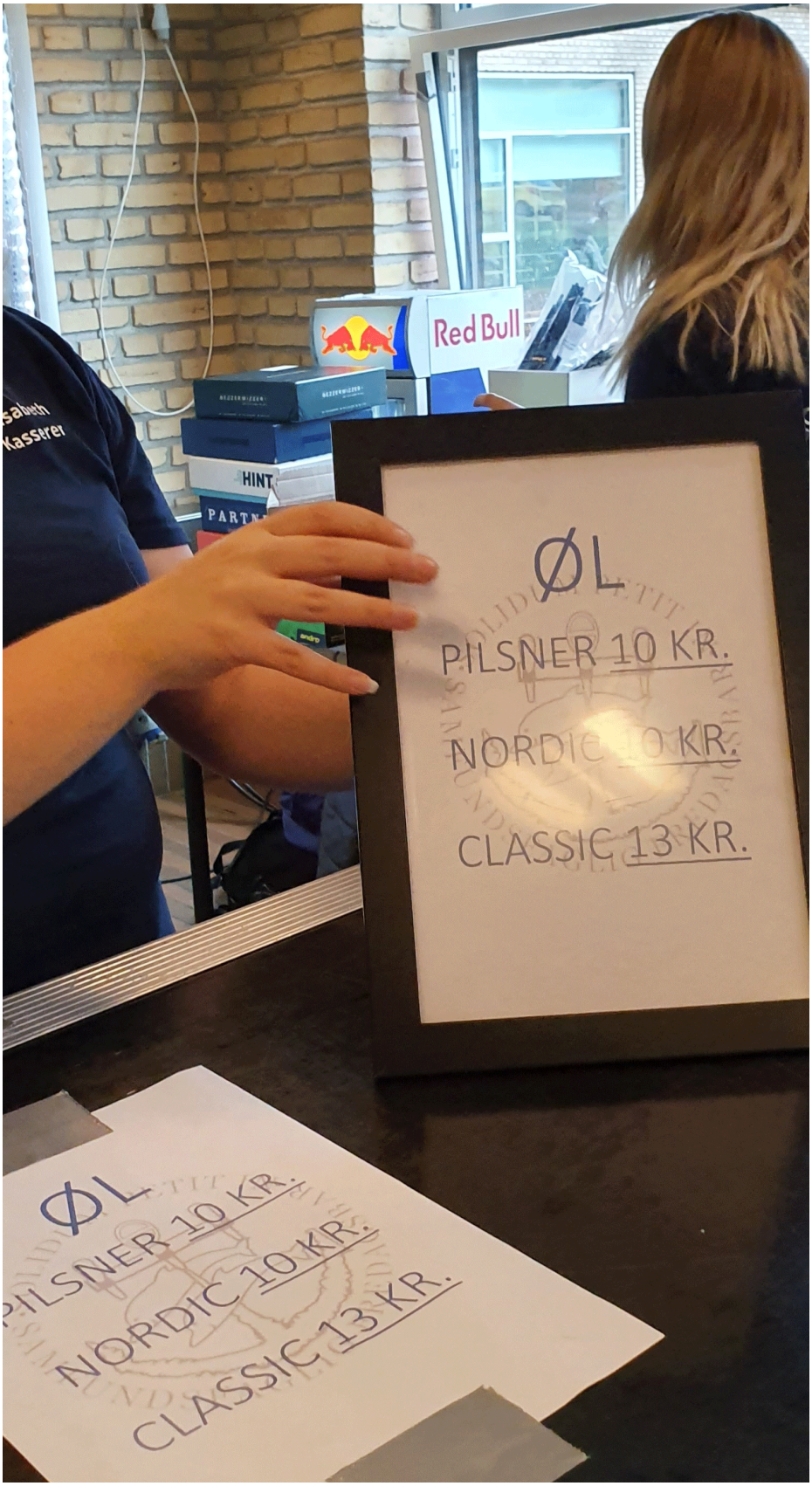
The bar-level intervention consists of a change in the Friday bars in the form of the introduction of alcohol-free beer. In addition, social activities were introduced in the treatment bars.

Alcohol-free beer was made available in the treatment bars (Fredagsbar.dk, Nanorama, and Samfundsfaglig Fredagsbar) on the October 11. On the same day the drunk cycling simulation activity was implemented in all three bars. On November 15 the Food Maker activity took place at Nanorama from 4pm to 7pm and on the same day the Breathalyzer activity took place in Fredagsbar.dk. It was originally planned that the Food Maker activity would take place in another Friday bar the following Friday. However, as there was a clear lack of interest in and few sign-ups to the Food Maker program the staff of Food Maker dropped the second activity date. The appendix includes the protocols for the social activities in the bars: drunk cycling simulation, breathalyzer, non-alcoholic beer, and Food Maker.

Figure 3.1 The drunk cycling simulation activity

Source: Studenterhus Aarhus.

Figure 3.2 Advertisements in a bar for alcohol-free beer at the same price as regular beer



Source: Studenterhus Aarhus.

3.3 Descriptive statistics

3.3.1 Fidelity – The consumption of non-alcoholic beer in bars

The main component in the bar-level intervention is the introduction of alcohol-free beer. We can thus only expect to see a change in alcohol consumption if we see a significant consumption of alcohol-free beers in the treatment bars.

Figure 3.3 below plots the consumption of alcohol-free beer in the three treatment bars for each Friday bar during the intervention period. There was no consumption of alcohol-free beer in the two control bars. Recollect that the intervention was introduced on the October 11. The figure also includes the last Friday bar prior to the intervention on October 4. As expected, no alcoholfree beer was consumed in the three treatment bars prior to the intervention.

The consumption of alcohol-free beer is made comparable across bars by weighting the consumption by the number of visitors in the bars times the number of opening hours. The measure on the vertical axis is thus the amount of alcohol-free beer sold in the Friday bar (measured in centiliters) divided by the number of visitors in the bars in each opening hour times the number of opening hours. The Friday bars were asked to provide the opening hours, the sales, and the number of visitors. The estimates of opening hours and sales are expected to be measured with great precision, whereas the measure of the number of visitors is expected to be a very noisy measure.

Figure 3.3 shows that the consumption of alcohol-free beer spiked in the first Friday bar after the introduction and then faded out during the intervention period. The consumption of alcohol-free beer was low. On average two alcohol free beers were sold for each hundred regular beers sold in the three treatment bars during the intervention period.

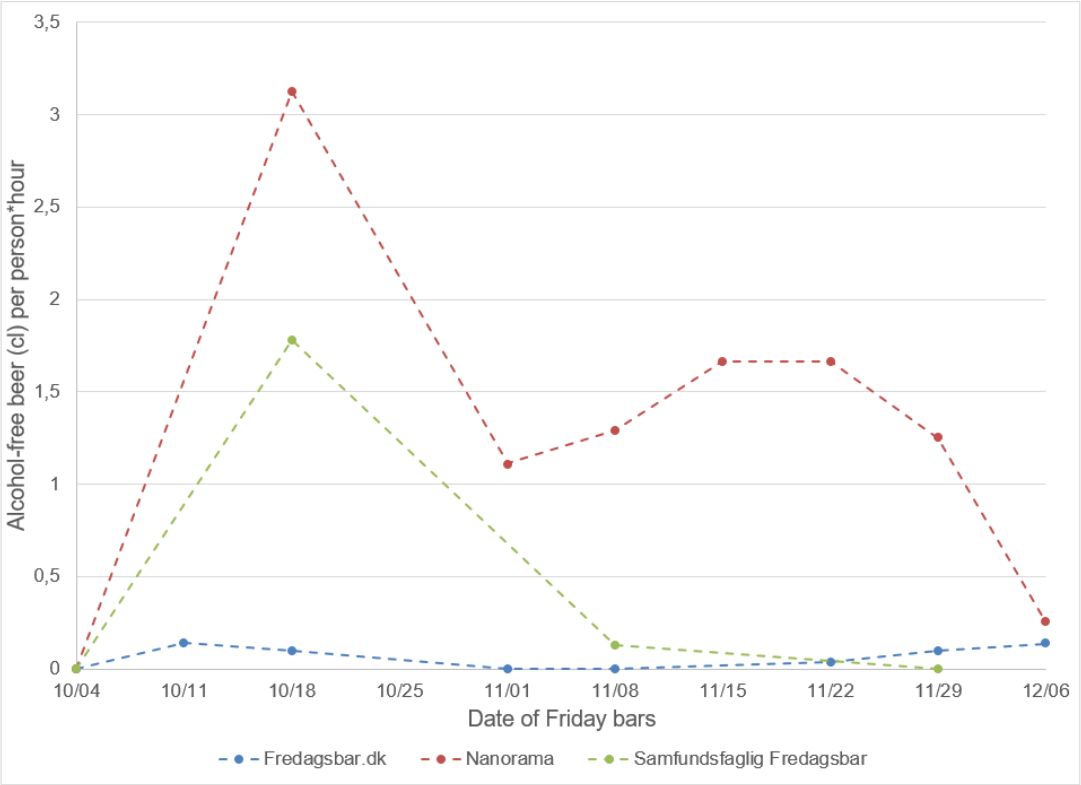
The take-up of alcohol-free beer differed greatly across the three treatment bars. The highest level of consumption was in Nanorama, where five alcohol-free beers were sold for each hundred regular beers sold. In Samfundsfaglig Fredagsbar one alcohol-free beer was sold for each hundred regular beers sold. The take-up in Fredagsbar.dk was very low with one alcohol-free beer sold for each 521 regular beers sold.

Figure 3.3 shows no indication of the FoodMaker activity on November 15 having an impact on the consumption of alcohol-free beer. The estimated numbers indicate that the bar-level intervention is expected to have had a very limited impact on the bar environment during the intervention period.

3.1 Take-away message

We expect the bar-level intervention to have little impact on the students as the consumption of alcohol-free beer in the treatment bars is very limited.

Figure 3.3 Consumption of alcohol-free beer in treatment bars



Source: VIVE, 2019.

3.4 Results

3.4.1 Alcohol consumption in bars

In order to assess whether the bar-level intervention had an impact on drinking behavior in the bars, we compare the consumption in the treatment bars with the consumption in the control bars.

Figure 3.4 below plots the consumption of standard drinks in the three treatment bars for each Friday bar during the intervention period. Recollect that the intervention was introduced on the October 11. The figure also includes two Fridays prior to the intervention.

The consumption of standard drinks is made comparable across bars by weighting the consumption by the number of visitors in the bars times the number of opening hours. The measure on the vertical axis is thus the number of standard drinks sold in the Friday bar divided by the number of visitors in the bars in each opening hour times the number of opening hours. The Friday bars were asked to provide their opening hours, sales, and number of visitors.

Figure 3.4 shows that the consumption of alcohol was comparable across the five Friday bars prior to the intervention (on 10/4). With the highest consumption in Esperanto (1.53 Standard drinks per person*hours) and the lowest consumption in Fredagscafeen (0.93 Standard drinks per person*hours).

In the period from October 15 to November 8, we have observations for both the treatment and the control bars. Figure 3.4 illustrates how the treatment and the control bars had a very similar

consumption of alcohol during this period. One notable difference is a spike in the consumption in the two treatment bars Samfundsfaglig Fredagsbar and Nanorama in the first Friday bar after the introduction of the intervention.

Figure 3.5 plots the average number of standard drinks per person*hour in the treatment and in the control bars compared to the consumption at the last Friday bar prior to the intervention. The estimates in Figure 3.5 move around the zero line, indicating very little change in the consumption of alcohol after the intervention compared to before the intervention.

If the intervention had an impact on the consumption of alcohol, then we would expect that the change in consumption after the introduction compared to before the introduction to be different in the treatment bars than in the control bars. Figure 3.6 plots this difference between treatment and control bars for the four Fridays, where we have information on Friday bars in both the treatment bars and the control bars. The figure reveals no clear pattern of a change in consumption behavior in the treatment bars compared to the control bars during the intervention period.

In conclusion, these three figures show no indication of the intervention having had an impact on the alcohol consumption in the Friday bars. However, all the social activities, i.e., drunk cycling simulation, breathalyzer test, and introduction to FoodMaker, took place only a few times during the intervention period and when they did they lasted only a few hours. Thus, the impact of these events might be limited due to the low intensity. With regards to the introduction of alcohol-free beers they were introduced as a new product in the same way as other new products are usually introduced. However, changing consumer behavior and preferences towards new products is a difficult task and takes time. Furthermore, while we cannot see an impact on actual consumption of alcohol-free beers we might have changed the students view on consumption of non-alcoholic drinks at the Friday bars. This has not been possible to test in this project, however.

3.2 Take-away message

We find no statistical indication that the bar-level intervention had an impact on the students' level of alcohol consumption in the Friday bars. There may be several reasons why we do not find an effect of the bar-level intervention. First, the bar activities were introduced for a relatively short period during the test period and only for a few hours due to limited staff (to present/guide the bar-level intervention) and the bars being crowded. Second, changing young peoples' preferences (and consumer behavior) towards a non-alcoholic alternative is a difficult task that takes time and we might not observe an effect in the very short run.

3.4.2 Interaction-effects between the individual-level intervention and the bar-level intervention

The students who participated in the individual-level intervention where asked which Friday bars they visited during the preceding month of the intervention. We use this information to look into whether individuals who were exposed to the bar-level intervention reacted more to the individual-level intervention than those who did not visit a treatment bar.

The results in column (1) of Table 5.3, Table 5.4, and Table 5.5 in the appendix show that the effect of the individual-level intervention is not significantly different in the treatment bars than in other bars, i.e., the interaction between individual *treatment* and *Visited test bar during preceding month* is not statistically significant. The results in column (2) show the same result

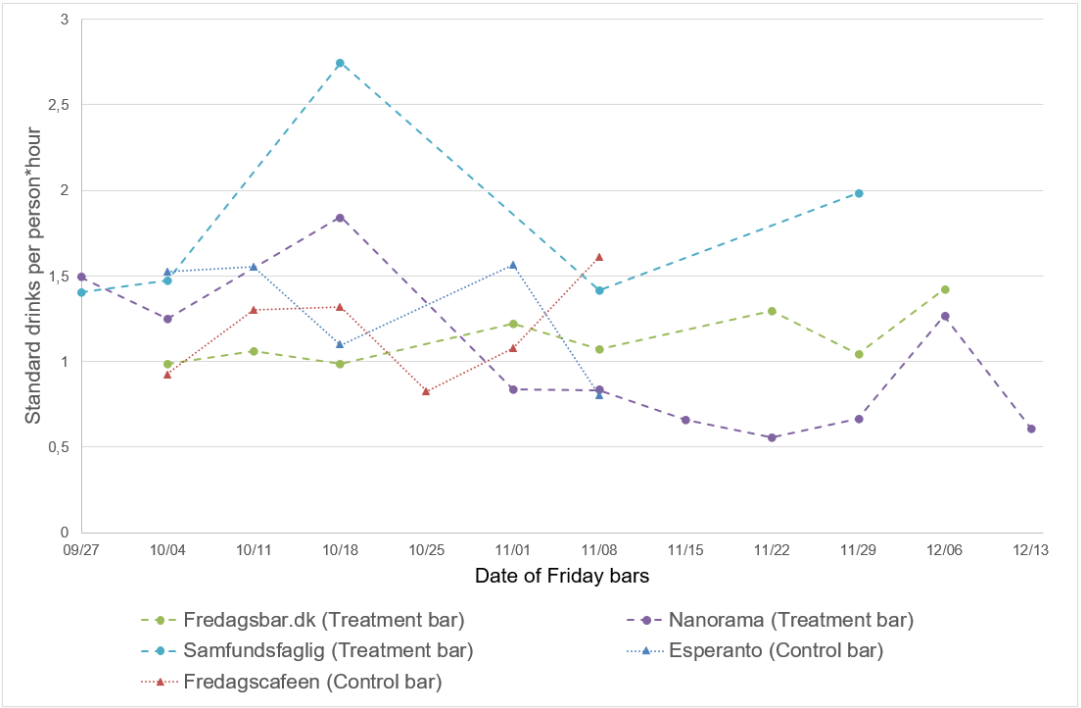
when we use only the control bars as comparison group. In columns (3) and (4) we split the results by the three treatment bars. We find no indication in the individual-level data that the bar-level intervention had an effect on those who visited the treatment bars or that the bar-level intervention significantly affected the estimate of the individual-level intervention.

A limitation of this evaluation is that the choice of which Friday bar to attend on any given Friday during the intervention period is not randomized as the students themselves choose which bar to visit. Thus, the choice of Friday bar may be affected by the existence of the bar-level intervention. This implies that the estimate on the interaction between the bar-level and the individual-level intervention may be biased. Thus, the results based on the interaction between the individual treatment (which was randomized) and the bar-level intervention should be considered as descriptive by nature.

3.3 Take-away message

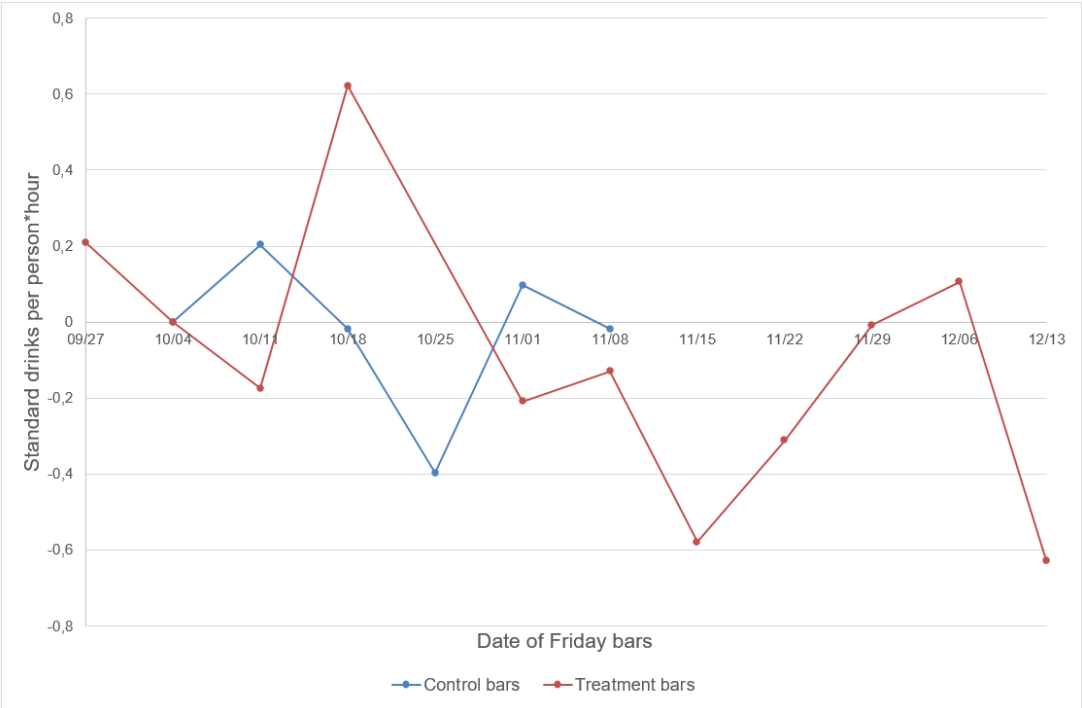
We find no indication in the individual-level data that the bar-level intervention had an effect on those who visited the treatment bars or that the bar-level intervention significantly affected the estimate of the individual-level intervention.

Figure 3.4 Alcohol consumption in treatment and control bars



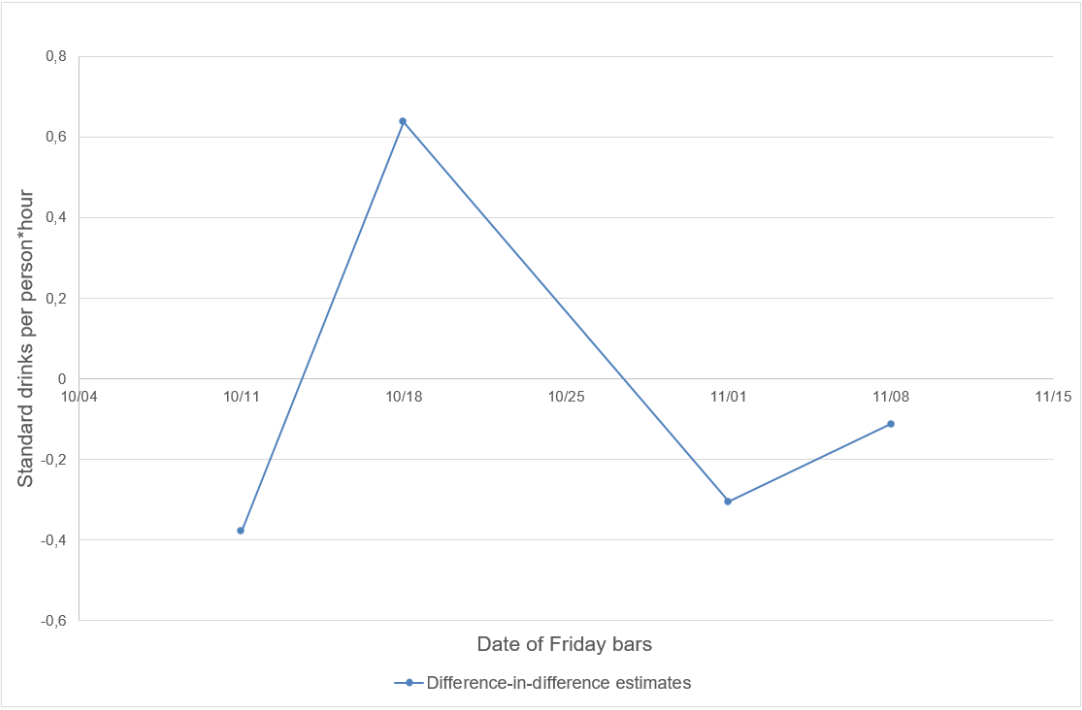
Source: VIVE, 2019.

Figure 3.5 Average number of standard drinks per person*hour in the treatment and in the control bars, standardized to zero the last Friday before the bar-level intervention



Source: VIVE, 2019.

Figure 3.6 Difference-in-difference estimates



Source: VIVE, 2019.

4 Conclusion and recommendations

In this the final chapter, we highlight and discuss the main conclusions from the report and give some recommendations as to how the study can guide future research on the drinking culture of young people.

Background and purpose of the report

In most Western countries, excessive alcohol intake among university students is a cause of concern. For the majority of university students, the act of binge drinking (i.e., drinking more than five standard drinks on one occasion) is viewed as a cornerstone of university life. In addition, many students find it difficult to go against the dominant drinking culture. Previous studies from Spain, the UK, and Australia have shown that digital health interventions can reduce drinking among university students, but to our knowledge no previous study has aimed to change the overall drinking culture at the university.

The purpose of this report is to evaluate the impact of interventions aimed at reducing the excessive drinking culture among Danish university students. The theoretical setting for the interventions rests on classic nudging tools and includes several components that targeted the drinking culture at a Danish university. The individual intervention provided the students with tools that helped them to make pre-commitment strategies and to change their views on the social norms that prevent excessive alcohol intake. We examined the impact on individual motivational factors for participating in the drinking culture at the university, such as alcohol consumption as a facilitator of social interaction and as a personal benefit. The intervention also included a range of social activities and the availability of alcohol-free beer in the Friday bars as a means to change the drinking culture in the bars.

How did we evaluate the impact of the intervention?

To evaluate the impact of the individual intervention, we conducted a randomized controlled experiment among a group of university students at Aarhus University. All the participating students were asked to answer the before and after questionnaires. In addition, half of the students were given an online intervention (treatment), while the other half were not contacted again (control). There were no significant differences between treatment and control in terms of characteristics such as gender, social background, grade point averages in upper secondary education, and previous drinking behavior. The level of homogeneity between the two groups allowed us to estimate the causal impact of the intervention by comparing the drinking behavior in the control and treatment group after the intervention.

Did the individual-level intervention have an impact on the students' alcohol consumption?

We find that the online intervention did reduce the students' alcohol consumption. Compared to the students in the control group, the students who got the online intervention reduced the number of times of drinking alcohol by approx. one per months. The result is driven by a large effect on male and first-year students. The intervention had however no effect on other alcohol-related outcomes such as the typical number of drinks on a day drinking alcohol, binge drinking, alcohol addiction, and excessive alcohol consumption.

Did the intervention have an impact the drinking culture?

To measure further the effect of the intervention on the drinking culture of University students, we analyzed the impact on motivational factors for the students to engage in the drinking culture at the university, namely alcohol consumption as a facilitator of social interaction and as a

personal benefit. The motivational factors were assessed using self-reported information about the benefits associated with drinking and questions about whether the students have been to a party without drinking, whether they feel part of the student environment, and whether they had experienced difficulties saying no to alcohol.

Our results showed that the students who received the online intervention reduced drinking due to stress by 7 percentage points and drinking to forget problems by 6 percentage points. There were no significant effects on the four reasons for drinking: to get in contact with others, to get drunk, to reduce personal insecurity, and to get in a good mood. Furthermore, we found that the students who received the online intervention had felt it was easier to say “no” to drinking alcohol. In addition, among the students that received the online intervention, a relatively large share indicated that the intervention made them think more about their alcohol consumption, their student environment, and their social relations. There was no impact on the feeling part of the student environment. Holding these two results together – that the students found it less difficult to say “no” to drinking while they feel part of the social student environment to the same extent as before – indicates that the intervention had a positive impact on the drinking culture.

Did the bar-level intervention have an impact the drinking culture?

We found that the social activities and the availability of alcoholic-free beer in the Friday bars did not affect the students’ level of alcohol consumption in the Friday bars. Furthermore, in the individual-level data, we found that the bar-level intervention had not had an effect on those who visited the treatment bars, nor had the bar-level intervention significantly affected the estimate of the individual-level intervention. However, the bar-level intervention was not evaluated with a randomized controlled experiment as the students themselves decided which bar they wanted to visit. Thus, this study cannot estimate the causal impact of the bar-level intervention.

Discussion and recommendations

The study demonstrates the effectiveness of a relatively cheap and easy-to-implement web-based invention to change the drinking culture among university students. The results further suggest that by providing the students with simple psychological tools from the nudging theory via text messages and questionnaires they can enhance their abilities to go against the dominant drinking culture on campus. These results show a potential to improve the environment among university students to be not only more healthy but also more inclusive for students with different cultural backgrounds.

A tangible recommended next step is a follow-up study of the individual-level intervention. This would allow for an understanding of the persistence of the interventions effectiveness and thereby a better estimate of the cost-effectiveness of the intervention.

While we find no significant impact of the bar-level intervention, the social environment at the bar level might be an important element in changing the drinking culture among university students. Many social activities, events, and meetings happen at the Friday bars, and changing the students attitude towards social activities with less focus on excessive alcohol drinking might be a an important contributing factor in changing the drinking culture among university students.

The bar-level intervention was at a very low scale and with the empirical design used it was not possible to evaluate the causal impact. Thus, to get the full understanding of how the social environment at the bar level affects the drinking cultures at the university, we would need to design a larger evaluation with this purpose in mind. Furthermore, more research is needed to

understand the complex relationship between the actors that create, maintain, and change drinking cultures in institutions of higher education. Our study can nevertheless serve as a model for conducting future studies as a first step in understanding how to make young people more aware of their own potential.

5 Appendix

5.1 Tables

Table 5.1 The effect of the intervention on WHO AUDIT scale[1]

	(1) Question 1	(2) Question 2	(3) Question 3
Panel A			
Treatment	-0.141**	-0.0553	0.0771
	(0.0671)	(0.0632)	(0.0952)
Controls	No	No	No
Observations	493	489	462
R-squared	0.109	0.241	0.150
Panel B			
Treatment	-0.149**	-0.0468	0.0517
	(0.0656)	(0.0578)	(0.0873)
Controls	Yes	Yes	Yes
Observations	493	489	462
R-squared	0.387	0.476	0.493
Panel C			
Treatment*Men	-0.208**	-0.125	0.156
	(0.0947)	(0.0891)	(0.158)
Treatment*Women	-0.106	0.0151	-0.00520
	(0.0867)	(0.0765)	(0.111)
Controls	Yes	Yes	Yes
Observations	490	486	459
R-squared	0.390	0.478	0.493
Panel D			
Women:			
Treatment*binge drinking one or fewer times during the preceding month	-0.126	-0.0783	-0.198
	(0.173)	(0.114)	(0.182)
Treatment*binge drinking two-three times during the preceding month	-0.0693	0.0524	0.0690
	(0.125)	(0.119)	(0.152)
Treatment*binge drinking one or more times per week during the preceding month	-0.349*	-0.00938	0.0996
	(0.193)	(0.216)	(0.278)
Men:			
Treatment*binge drinking one or fewer times during the preceding month	-0.136	-0.417**	-0.106
	(0.212)	(0.176)	(0.285)
Treatment*binge drinking two-three times during the preceding month	-0.232	-0.174	0.199
	(0.152)	(0.139)	(0.273)
Treatment*binge drinking one or more times per week during the preceding month	-0.221	0.134	0.211

	(1)	(2)	(3)
	(0.169)	(0.160)	(0.245)
Treatment*other	0.207	-0.0697	0.218
	(0.235)	(0.280)	(0.555)
Controls	Yes	Yes	Yes
Observations	493	489	462
R-squared	0.391	0.483	0.496

General note: Stratum 1 is women binge drinking one or fewer times during the preceding month, stratum 2 is women binge drinking two-three times during the preceding month, stratum 3 is women binge drinking one or more times per week during the preceding month, stratum 4 is men binge drinking one or fewer times during the preceding month, stratum 5 is men binge drinking 2-3 times during the preceding month, stratum 6 is men binge drinking one or more times per week during the preceding month, stratum 7 is the group of individuals who did not report information on either gender or binge drinking in the initial survey. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Notes: 1 Question 1: No. of times drinking alcohol during the preceding month, question 2: No. of times binge drinking during the preceding month, and question 3: The typical no. of drinks on a day drinking alcohol, during the preceding month. Audit scale for question 1 and question 2: (0) Never (0) Monthly (1) 2 to 3 times a month (2) 1 to 2 times a week (3) 3 to 4 times a week (4) 4 or more times a week. Audit scale for question 3: (0) 1 or 2 (0) 3 or 4 (1) 5 or 6 (2) 7 or 8 (3) 9-12, and (4) 13 or more.

Table 5.2 Effect on behavior in Friday bars

	(1) Number of standard drinks, latest Friday bar	(2) Number of standard drinks per hour, latest Friday bar	(3) Number of hours in latest Friday bar	(4) Drank alcohol free beer at latest Friday bar	(5) Drank soda at latest Friday bar	(6) Drank water at latest Friday bar
Panel A						
Treatment	1.208	0.168	0.0799	0.00831	-0.119	0.213*
	(1.367)	(0.194)	(0.761)	(0.0279)	(0.0997)	(0.119)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	141	139	139	141	141	141
R-squared	0.510	0.532	0.502	0.529	0.436	0.555
Panel B						
Treatment*Men	2.448	0.291	0.00992	-0.0154	-0.179	0.309
	(2.220)	(0.251)	(1.137)	(0.0344)	(0.171)	(0.203)
Treatment*Women	0.393	0.0898	0.125	0.0239	-0.0793	0.149
	(1.744)	(0.292)	(1.078)	(0.0399)	(0.112)	(0.150)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	141	139	139	141	141	141
R-squared	0.514	0.534	0.502	0.531	0.438	0.558
Panel C						
Women:						
Treatment*binge drinking one or fewer times during the preceding month	2.112	0.417	-0.434	-0.0549	-0.590*	0.0781
	(3.472)	(0.688)	(2.244)	(0.0873)	(0.336)	(0.412)
Treatment*binge drinking two-three times during the preceding month	-2.209	-0.0669	-0.234	0.0375	0.0440	0.165
	(2.145)	(0.409)	(1.348)	(0.0509)	(0.133)	(0.202)
Treatment*binge drinking one or more times per week during the preceding month	6.205*	0.389	1.044	0.0108	-0.423**	0.142

	(1)	(2)	(3)	(4)	(5)	(6)
	(3.251)	(0.516)	(2.105)	(0.0638)	(0.197)	(0.334)
Men:						
Treatment*binge drinking one or fewer times during the preceding month	6.428	1.867	0.403	0.0348	-0.289	0.565
	(6.482)	(1.319)	(4.317)	(0.116)	(0.421)	(0.583)
Treatment*binge drinking two-three times during the preceding month	0.842	0.0692	-0.0570	-0.0281	-0.408*	0.171
	(2.766)	(0.382)	(1.601)	(0.0631)	(0.215)	(0.307)
Treatment*binge drinking one or more times per week during the preceding month	4.911	0.279	0.844	-0.00325	0.160	0.435
	(4.240)	(0.388)	(2.070)	(0.0564)	(0.281)	(0.318)
Treatment*other	-6.542***	-0.601	-3.175*	-0.0216	0.173	-0.0994
	(2.340)	(0.493)	(1.610)	(0.0467)	(0.386)	(0.248)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	141	139	139	141	141	141
R-squared	0.570	0.560	0.513	0.536	0.512	0.563

Note: Stratum 1 is women binge drinking one or fewer times during the preceding month, stratum 2 is women binge drinking two-three times during the preceding month, stratum 3 is women binge drinking one or more times per week during the preceding month, stratum 4 is men binge drinking one or fewer times during the preceding month, stratum 5 is men binge drinking two-three times during the preceding month, stratum 6 is men binge drinking one or more times per week during the preceding month, stratum 7 is the group of individuals who did not report information on either gender or binge drinking in the initial survey. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 5.3 Test-bar estimates: The interaction between individual treatment and visits to a test bar and number of times drinking alcohol during the preceding month

	(1)	(2)	(3)	(4)
Dependent variable: No. of times drinking alcohol during the preceding month				
Treatment	-0.792**	-1.695**	-0.846**	-1.711**
	(0.366)	(0.789)	(0.383)	(0.813)
Treatment*Visited test bar during preceding month	-0.641	-0.154		
	(0.766)	(0.743)		
Treatment*Visited Nanobar during preceding month			-0.478	-1.719
			(2.630)	(2.682)
Treatment*Visited Samfundsfaglig Fredagsbar during preceding month			-0.147	0.701
			(0.904)	(1.059)
Treatment*Visited Fredagsbar.dk during preceding month			-0.595	0.210
			(1.151)	(1.317)
Visited test bar during preceding month	0.687	0.237		
	(0.594)	(1.024)		
Visited Nanobar during preceding month			0.959	1.643
			(2.442)	(2.367)
Visited Samfundsfaglig Fredagsbar during preceding month			-0.110	-0.980
			(0.731)	(0.841)
Visited Fredagsbar.dk during preceding month			0.643	0.0937
			(0.840)	(0.971)
Controls	Yes	Yes	Yes	Yes
Observations	493	249	493	249
R-squared	0.354	0.463	0.355	0.472

Note: In columns 1 and 3, visiting a test bar is compared to not visiting a test bar. In columns 2 and 4, visiting a test bar is compared to visiting a control bar.

Table 5.4 Test-bar estimates: The interaction between individual treatment and visits to a test bar and number of times binge drinking during the preceding month

	(1)	(2)	(3)	(4)
Dependent variable: No. of times binge drinking during the preceding month				
Treatment	-0.335	0.327	-0.341	0.234
	(0.244)	(0.575)	(0.251)	(0.568)
Treatment*Visited Test bar during preceding month	0.771	-0.112		
	(0.538)	(0.741)		
Treatment*Visited Nanobar during preceding month			0.533	-0.698
			(1.163)	(1.186)
Treatment*Visited Samfundsfaglig Fredagsbar during preceding month			0.602	-0.0221
			(0.674)	(0.801)
Treatment*Visited Fredagsbar.dk during preceding month			0.679	0.307
			(0.744)	(0.899)
Visited Test bar during preceding month	-0.247	-0.102		
	(0.403)	(0.427)		
Visited Nanobar during preceding month			-0.0799	0.308
			(0.665)	(0.748)
Visited Samfundsfaglig Fredagsbar during preceding month			-0.0824	-0.0943
			(0.510)	(0.486)
Visited Fredagsbar.dk during preceding month			-0.337	-0.226
			(0.386)	(0.514)
Controls	Yes	Yes	Yes	Yes
Observations	489	246	489	246
R-squared	0.419	0.505	0.420	0.506

Note: Binge drinking is defined as drinking more than five drinks at one event. In columns 1 and 3 visiting a test bar is compared to not visiting a test bar. In columns 2 and 4 visiting a test bar is compared to visiting a control bar.

Table 5.5 Test-bar estimates: The interaction between individual treatment and visits to a test bar and typical number of drinks at one event

	(1)	(2)	(3)	(4)
Dependent variable: The typical no. of drinks on a day drinking alcohol during the preceding month				
Treatment	0.0510	0.786	0.0874	0.661
	(0.266)	(0.568)	(0.265)	(0.511)
Treatment*Visited test bar during preceding month	0.337	-0.362		
	(0.476)	(0.704)		
Treatment*Visited Nanobar during preceding month			-0.704	-1.292
			(1.327)	(1.354)
Treatment*Visited Samfundsfaglig Fredagsbar during preceding month			0.773	0.621
			(0.525)	(0.666)
Treatment*Visited Fredagsbar.dk during preceding month			-0.381	-0.958
			(0.647)	(0.750)
Visited a test bar during preceding month	0.207	0.143		
	(0.322)	(0.424)		
Visited Nanobar during preceding month			-0.590	0.0780
			(1.307)	(1.004)
Visited Samfundsfaglig Fredagsbar during preceding month			0.763	-0.238
			(0.558)	(0.490)
Visited Fredagsbar.dk during preceding month			-0.378	1.094**
			(0.634)	(0.532)
Controls	Yes	Yes	Yes	Yes
Observations	462	235	462	235
R-squared	0.502	0.583	0.508	0.604

Note: In columns 1 and 3, visiting a test bar is compared to not visiting a test bar. In columns 2 and 4, visiting a test bar is compared to visiting a control bar.

5.2 Protocols

Table 5.6 Protocol for Non-alcoholic beer intervention

Purpose	Why is the activity being introduced?	Non-alcoholic beer is introduced in the three student bars fredagsbar.dk, Samfundsfaglig, and Nanobar. The purpose of introducing non-alcoholic beer is to allow the student to choose a non-alcoholic alternative (You have not been able to get Nordic in any of the test bars before).
	How does the activity help to reduce irresponsible alcohol consumption?	The activity contributes to reducing irresponsible alcohol consumption by offering the students and making them aware of an alcohol-free alternative that they have not had before.
Practical	What does the activity consist of?	Non-alcoholic beers in kegs or bottles are introduced in the test bars. In Nanobar and fredagsbar.dk, Nordic will be served exclusively in bottles, while in the Samfundsfaglig bar there will be both Nordic in bottle and kegs. There will only be advertising of the product at the bar, in the same way that Carlsberg always advertises when new products are introduced. There will be roll-ups and T-shirts that the bar managers wear as well as Nordic table cards and Nordic posters. There will be no advertisements outside the bar that encourage students to attend the bar due to this activity.
	What props are there? (If there are roll-ups or any other form of "advertising" it must be documented)	Nordic roll-ups, Nordic T-shirts, Nordic posters and Nordic board cards.
	Who is responsible for the activity at the bar?	The bar staff are responsible for putting on Nordic T-shirts and storing them again for the following Friday.
	Where are the props placed in the bar?	Roll-ups are placed right by the bar. T-shirts must be worn by students employed at the bar. In addition, posters are placed on the bar itself and table cards will be placed on the bar.
	What are the requirements for participation in the activity and in which situations are individuals rejected?	There is no requirement for this activity as it is an alcohol-free alternative offered at the bars.
	What is the duration of the activity? Setup and take-down schedule.	Non-alcoholic beers will be available and will be available for sale as draught beer or in bottles throughout the intervention period (See previous explanation of which bars sell bottled and which ones sell draught beer. In addition, there will be no Nordic beers in the bars after the intervention unless this is something the bars want to buy into their bar afterwards).
Script	How the activity is introduced by the activity manager (print monologue)	No monologue.
Follow-up	How should the activity manager record how many people try the activity in the given time period?	The activity is recorded based on how much Nordic is sold over the entire intervention period.

Table 5.7 Protocol for breathalyzer intervention

Purpose	Why is the activity being introduced?	The breathalyzer is introduced to the students to get them into conversation and thereby make them reflect on their alcohol consumption.
	How does the activity help to reduce irresponsible alcohol consumption?	The activity helps to reduce irresponsible alcohol consumption by having students reflect on their behavior in the Friday bar.
Practical	What does the activity consist of?	The activity consists of one breathalyzer and the corresponding table of BAC and possible consequences (Figure 7.1) and 1 paragraph. Laminated A4 paper with message too (Figure 7.2). The students can know by breathing in the

		breathalyzer their BAC. The breathalyzer is used as an input to enter into dialogue with the students about their alcohol consumption.
	What props are there? (if there are roll-ups or any other form of "advertising" it must be documented)	Breathalyzer, batteries, schedule with BAC and effects and laminated A4 paper with message.
	Who is responsible for the activity at the bar?	1-2 students are linked to the activity. The student(s) are responsible for conducting the dialogue with the students during the entire period of the activity, including instructing the participants in the use of the breathalyzer. It is also the responsibility of the students responsible to ensure that the breathalyzer is locked away when the activity is complete.
	Where are the props placed in the bar?	The props are placed on the table at the bar with one of the responsible students next to them. It is important that the students do not lose sight of the breathalyzer and that they can always assist in taking the test. In particular, the students responsible must ensure that the props for this activity are not lost or taken out of the bar.
	What are the requirements for participation in the activity and in which situations are individuals rejected?	The requirements for this activity are that it must be held at the beginning of the Friday bar, so that the students are not too drunk and are able to gain insight into how little/much is needed for a given drink. In addition, a requirement is that the same students may not try this activity more than once and that students who are very intoxicated will not have access to the computer. It is the role of the responsible students to ensure that each student tries only once and to ensure that very intoxicated students do not have access to the altimeter. The students responsible must also keep in mind that a group of students is not changed to go up and try the breathalyzer and that there is, so to speak, competition in getting the BAC. Finally, the participating students must not put their mouths to the breathalyzer but simply breathe into it (See Figure 7.3).
	What is the duration of the activity? Set-up and take-down schedule.	The duration will be from 14.00-17.00.
Script	How the activity is introduced by the activity manager (print monologue)	Before the student tries: "*Have you ever thought that the amount of alcohol you consume has a big impact on your physique and your behavior? In this paper you can see the relationship between BAC and physical effects. What do you think your BAC is right now? Would you like to try the breathalyzer?*" Subsequently: *"Are you surprised by your blood alcohol? Have you thought about how much you would like to drink this evening? It can sometimes be a good idea early in the evening to make a plan for how much you want to drink during the evening. Do you ever plan how much you want to drink before heading to the Friday bar?"*
Follow-up	How should the activity manager record how many people try the activity in the given time period?	The students responsible must note how many units each participant stated to have drunk before testing the breathalyzer. In addition, the students responsible must count and note how many times the breathalyzer is tested by different students in the course of the evening.

Figure 5.1 Additional text to the protocol for breathalyzer intervention

Promille koncentration	Mulige konsekvenser
0.2 - 0.3	Begyndende forstyrrelse af mental funktion
0.3 – 0.5	Forringet opmærksomhed, tab af control, afslappet, følelse af ro og velvære
0.5 – 0.8	Forsinkede reflekser, overvurdering af ydeevne
0.8 – 1.0	Sværhedsgrad ved kørsel stiger, afbrydelse af synskoncentration
1.0 – 1.9	Mangel på coordination, forværret dømmekraft, vanskeligheder ved at gå
2.0 – 2.9	Kvalme, opkast
3.0 – 3.9	Alvorlig forgiftning, nedsat kropstemperatur
>4.0	Koma, risiko for at afgå (ca. 50%)

Figure 5.2 Roll-ups in the intervention bars

Source: Studenterhus Aarhus.

Figure 5.3 Instructions for breathalyzer

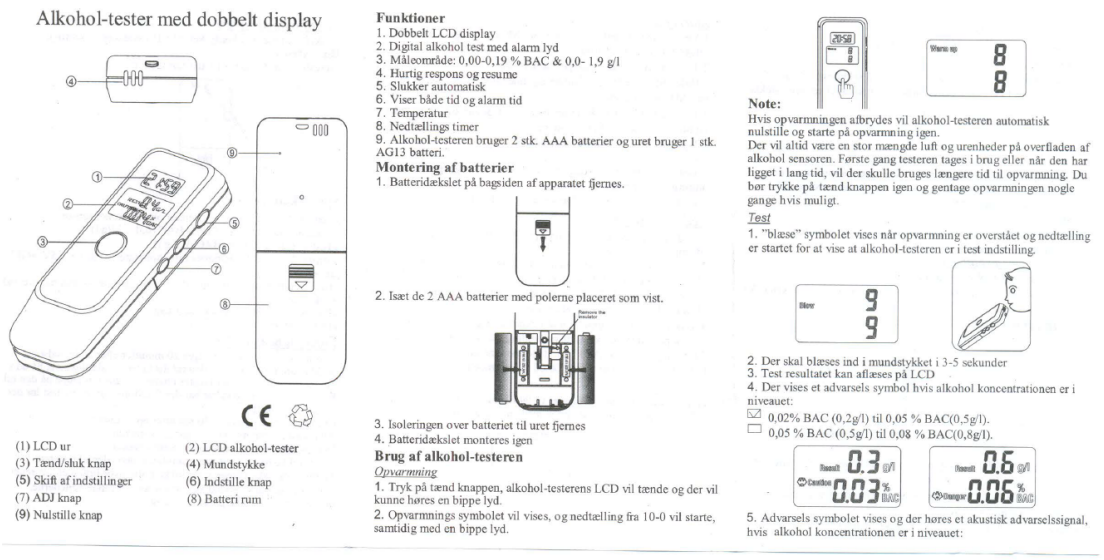


Table 5.8 Protocol for the VR bicycle intervention

Purpose	Why is the activity being introduced?	The activity is being introduced to give the students an idea of how risky it is to ride a bicycle after consuming an excess of alcohol, thereby encouraging the students to consume an alcohol-free beverage alternating with an alcoholic beverage or bring the bike home or leave the bike.
	How does the activity help to reduce irresponsible alcohol consumption?	The activity contributes to reducing irresponsible alcohol consumption by having young people reflect on their ability to ride a bicycle after consuming a lot of alcohol in the hope that students will walk their bicycle home.
Practical	What does the activity consist of?	The activity consists of a VR experience on a bicycle, where the student experiences what it is like to cycle after consuming alcohol.
	What props are there? (if there are roll-ups or any other form of "advertising" it must be documented)	Props present: Bicycle + bicycle key, bike rack, 1 x VR glasses + associated remote and charger, 1 x roll-up. IMPORTANT: Both bicycles, roll-up and VR glasses + accessories must be locked away after the activity is complete.
	Who is responsible for the activity at the bar?	2 students (Mikline, Casper, Emma, Claudia, Ida & Sigrun) are connected to the activity (at all times, the two students are responsible for putting the VR glasses on the participating students as well as making sure that the bicycle + VR glasses and remote control are not lost or handled by the participating students themselves).
	Where are the props placed in the bar?	The roll-up is placed together with the bicycle (Figure 7.4).
	What are the requirements for participation in the activity and in which situations are individuals rejected?	The requirements for this activity are that the participating students do NOT handle VR googles themselves. It is the responsibility of the two affiliated students to help the participating students get the VR glasses. In addition, it is a requirement for this activity that it must take place BEFORE the student begins drinking, or at least after they have had less than 2 beers or 2 other alcoholic beverages within the last hour.

	What is the duration of the activity? Set-up and take-down schedule.	Kl. 14-15 fredagsbar.dk Kl. 15-16 Samfundsfaglig Kl. 16-17 Nanobar
Script	How the activity is introduced by the activity manager (print monologue)	"*Have you ever thought about how much your perception, motor skills and behaviors are affected when you drink alcohol? Come and get the full VR experience on a bicycle. Come and try to see how much your cycling ability actually decreases after consuming a lot of alcohol* " "*How many beers or alcoholic drinks have you had today?"* (none, 1 or 2). (This should be noted by the students responsible) Subsequently after trying the bike and VR glasses: "*How does it feel? How do you feel about the fact that you or others might be out in traffic when their reactions, perception and motor skills are significantly impaired*? "(This answer is noted by the responsible students)
Follow-up	How should the activity manager record how many people try the activity in the given time period?	Counting and noting the number of students who have tried VR glasses on the bike during the time of the activity.

Figure 5.4 Roll-ups in the intervention bars

Source: Studenterhus Aarhus.

Table 5.9 Protocol for the Food Maker intervention

Purpose	Why is the activity being introduced?	To promote alternative alcohol-free communities. It is a "pop-up advertisement" for an open food community, which takes place on a weekly basis. Furthermore, it takes place at times other than the usual Friday bars opening hours.
	How does the activity help to reduce irresponsible alcohol consumption?	The activity shows that people can socialize without drinking alcohol. Food Maker's food activities never include alcohol, and thus the activities do not encourage alcohol consumption.
Practical	What does the activity consist of?	A pop-up with Food Maker's bicycle kitchen where the students can join a mini workshop for a few minutes to make their own snack.
	What props are there? (if there are roll-ups or any other form of "advertising" it must be documented)	Postcard with information on Food Maker's activities. Bicycle kitchen. Perhaps a roll-up with the Food Maker's logo and references to social media where young people can read more about our food activities.
	Who is responsible for the activity at the bar?	Food Maker employees.
	Where are the props placed in the bar?	The location of the bike will be decided in collaboration with the specific bar.
	What are the requirements for participation in the activity and in which situations are individuals rejected?	The only requirement for participating in the pop-up activity is that the students want to participate. Regarding the Food Maker's food activities, you must be 16-28 years old to participate.
	What is the duration of the activity? Set-up and take-down schedule.	This is decided in collaboration with the specific bar. Usually it lasts about two-three hours, 4-5 pm to 7 pm, and takes place two Fridays in November 2019. The Food Maker crew arrive one hour prior to the workshop to prepare and spend half an hour on cleaning up afterwards.
Script	How the activity is introduced by the activity manager (print monologue)	There will not be an actual introduction, as the activity is fluid and creates a dialogue between the Food Maker crew and the students in the workshop. The Food Maker crew will tell about the Food Maker project and invite the student to join the Food Maker kitchen and dinner.
Follow-up	How should the activity manager record how many people try the activity in the given time period?	Counting the used cutlery, plates, and cups in order to know how many students have participated. The used kitchenware is counted (e.g., number of plates or cups).

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