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The Psychology of Drunk Bicycling – The Influence of Bicyclist's Norms and Attitudes

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Abstract

Drunk bicycling, that is bicycling in public while intoxicated, is associated with an increased risk of accidents and severe injuries. In the Netherlands, under students it is common to use the bike as the standard means of transportation. This also includes bicycling to and from parties or other drinking occasions. Relatively little is known about the factors influencing drunk bicycling intentions and possible ways of intervening. The present research tries to shed some light on the Psychology of drunk bicycling by applying the Theory of Planned Behaviour (TPB). Prior research on similar behaviour like drunk driving and drunk walking indicates attitude and subjective norms as important predictors of intention and perceived risk shows sound correlations with attitude.

That is why two factors – 'perceived risk' and 'subjective norms' – were manipulated in a 2 (low risk vs. high risk information) x 2 (negative vs. positive norms information) between-participants experiment. One hundred fifty-nine psychology students of the University of Twente participated in the study by filling out an online questionnaire with demographic variables and TPB measures related to drunk bicycling. Attitude, subjective norms and ultimately also intention of drunk bicycling were the independent variables. It was expected that the manipulations would influence attitude and subjective norms and that this change would transmit on intentions. Lowest intentions were expected for the high risk / negative subjective norms condition and highest intentions for the low risk / positive subjective norms condition.

The results did not support these expectations: Although both manipulations resulted in significantly different levels of attitude and subjective norms between the conditions, there was no significant difference in intentions among the conditions.   Overall, the TPB explained 76% of the total variance of student's drunk bicycling intentions with attitude, subjective norms and perceived behavioural control as significant predictors. Attitude was the strongest predictor and as such is the most suitable variable for an intervention to focus on. Furthermore, data about the conditions of alternative means of transportation suggest that aside from a psychological intervention an approach targeting a change in infrastructure might be viable. Results from this study provide some insight into the until now under-researched psychology of drunk bicycling and clearly demonstrate the value of the TPB as a framework for research on drunk bicycling.

Dronken fietsen, dat betekent fietsen onder de invloed van alcohol, is gerelateerd aan een verhoogd risico op ongelukken en ernstige verwondingen. Voor Nederlandse studenten is het gebruikelijk om de fiets als standaard vervoermiddel te gebruiken. Dit houdt ook het fietsen naar en vanuit feestjes en andere drink gelegenheden in. Tot nu toe is er weinig bekend over de factoren die dronken fietsen beïnvloeden en mogelijkerwijs een optie bieden voor een interventie. Dit onderzoek probeert daarom wat licht te werpen op de psychologie van dronken fietsen door gebruik van de theorie van gepland gedrag (TGG). Eerder onderzoek naar vergelijkbaar gedrag zoals dronken rijden en dronken lopen toont aan dat attitude en subjectieve norm belangrijke voorspellers zijn van intentie en dat waargenomen risico een goed verband met attitude heeft.

Daarom werden twee factoren – waargenomen risico en subjectieve norm – gemanipuleerd in een 2 (risico informatie hoog vs laag) x 2 (norm informatie positief vs negatief) tussen-proefpersonen opzet. In totaal namen honderdnegenenvijftig studenten van de Universiteit Twente te Enschede deel aan de studie door een online vragenlijst met demografische variabelen en TGG variabelen met betrekking tot dronken fietsen in te vullen. De onafhankelike variabelen waren attitude, subjectieve norm en uiteindelijk ook intentie om dronken te fietsen. De verwachting was dat de manipulaties attitude en subjectieve norm zouden beïnvloeden en dat deze verandering zou overleveren op intenties. Lage intenties werden verwacht voor de hoog risico / negatieve normen conditie en hoge intenties voor de lag risico / positieve normen conditie.

De resultaten leverden geen ondersteuning voor deze assumpties: Hoewel beide manipulaties significant verschillende levels in attitude en subjectieve norm veroorzaakten was er geen significant verschil in de intenties tussen de condities. De TGG verklaarde in totaal 76% van de variantie van de intentie van studenten om dronken te fietsen met attitude, subjectieve norm en waargenomen gedragscontrole als significante voorspellers. Attitude was de beste voorspeller en is daarom de meest geschikte variabele voor een interventie. Bovendien tonen de gegevens over de voorwaarden voor het gebruik van alternatief vervoer aan dat naast een psychologische interventie ook een interventie denkbaar is, die zich op verbetering van de infrastructuur richt. De resultaten van dit onderzoek brengen enige inzicht in de tot nu toe nauwelijks onderzochte psychologie van dronken fietsen en laten duidelijk de waarde van de TGG als kader voor onderzoek naar dronken fietsen zien.

The Psychology of Drunk Bicycling – The Influence of Bicyclist's Norms and Attitudes

The following study will try to examine possible ways to influence drunk bicycling behaviour. The motive for this examination derives from a master thesis study recently conducted from a student from Austria. Leitner's study (2015) showed alarming results regarding attitude towards and knowledge about drunk bicycling: within her test sample it seemed highly socially accepted to bicycle under the influence of alcohol and only very few subjects had satisfying knowledge about the influence of alcohol on body functions and bicycling performance and about the legislative context of drunk bicycling. The opposite results were found for driving under influence and Leitner concludes that there seems to be a strong underestimation of the risks of drunk bicycling. In the literature however, the use of alcohol is considered a strong variable in bicycle accidents and risk of severe injury. Whereas driving under influence and driving behaviour in general has received a lot of attention over the years, there has only been little research regarding bicycling behaviour and especially drunk bicycling (Porter, 2011). On the whole, this seems to be a good reason for further research into drunk bicycling behaviour. This study will try to answer the following questions: What is the current state regarding drunk bicycling in the Netherlands? What psychological model can be used as a framework for research and possible future interventions? Which psychological variables should be targeted by interventions and how can they be manipulated effectively?

1.1 Bicycling in the Netherlands

In the European Union, the inhabitants from the Netherlands reported the highest daily use of the bicycle (31,2%). In the second place is Denmark with 19% (Gallup Organization, 2011 (as cited in SWOV, 2013)). The Dutch 'fietsersbond' (Fietsen in cijfers, n.d.) even states that one fourth of all transportation instances in the Netherlands and one third of all transportation distances under 7.5 km is travelled by bicycle. These results in a total of approximately 4.5 billion bicycling trips per year with a total of 15 milliard kilometers travelled. The average Dutchman has 300 bicycling instances per year with a total of 878 kilometers. Bicycling is particularly important for children and adolescents as it is, besides walking, their primary means of transportation (SWOV, 2013).

De Waard et al. (2015) conclude in their study that bicycling with illegal levels of blood alcohol seems to be very common during nights out in the Netherlands. They conducted a study in two major cities in the Netherlands, the Hague and Groningen, measuring the Blood Alcohol

Concentration (BAC) of cyclists between 5 pm and 8 am the next morning on a total of four nights. The results showed an increase of cyclists with alcohol in their blood over the night from 7.7% at 6 pm to over 89% at 1 am. In addition, the number of cyclists with an illegal level of BAC (higher than 0.5 g/l) increased from 0% at 6 pm to 68% at 1 am. The average BAC of bicyclists with a BAC above zero was 0.79 g/l. In section 1.3 the effects of a BAC of 0.8 can be looked up. It seems very concerning that almost 42% (N = 285) of the cyclists were bicycling with an illegal level of BAC which not only means breaking the law but also engaging in a risky behaviour. Another reason for concern is the assumption from De Waard, that this behaviour might be socially acceptable in the Netherlands.

1.2 Prevalence of bicycling accidents and injuries: The role of alcohol

Because cyclists are fairly unprotected and can reach different ranges of speeds easily, they are categorized as vulnerable road users. This vulnerability also shows in the fact, that the number of fatally wounded cyclists decreases slower compared to other road user groups. Also, the number of seriously injured bicyclists increases. While most of the traffic deaths under cyclists result from a collision with a motorized vehicle (75%), most of the injured cyclists had an accident without participation of a motorized vehicle (90%) – so called solo accidents (SWOV, 2013). A factsheet by VeiligheidNL (2014) states that solo accidents are more common among alcohol related accidents (83% with alcohol involvement vs 63% without alcohol involvement) and that nearly all cases of solo accidents resemble falling off the bicycle. Only 6% of the solo accidents are a collision with an obstacle (e.g. collision with a lamp post) and another 6% is collision with another traffic participant.

Annually there are about 72.000 first aid treatments in Dutch hospitals for injured cyclists. Of these, 2900 are related to drunk bicycling. However earlier research showed that not all cases of alcohol involvement might be registered correctly in the hospitals and the dark figure might be higher (VeiligheidNL, 2014). Alcohol related accidents often occur more often in the weekend and in the night (12 am – 5:59 am). Also, during night the percentage of treatments in hospitals because of bicycle accidents with involvement of alcohol increases to 25%. Furthermore, there is a huge difference in the sort of injury resulting from bicycle accidents with and without involvement of alcohol: whereas injuries at arms and legs decrease with involvement of alcohol, the percentage of head injury rises from 22% to 59% of which 21% open wounds and 18% slight brain injuries (VeiligheidNL, 2014).

This change in the kind of injuries resulting from bicycle accidents with involvement of alcohol results in higher social costs: the direct medical costs for alcohol involved accidents are 2.200 euro plus an average of 9.800 euro absenteeism costs per case. For bicycle accidents without involvement of alcohol the direct medical costs are 1.900 euro plus 7.600 euro absenteeism costs. In total, the social costs of treatments for injured cyclists with involvement of alcohol are 23 million euro per year in the Netherlands (VeiligheidNL, 2014).

Also, there seems to be only a low awareness of the risks and the 'weak' legislation seems to have no preventing impact. A change in attitude or legislation is advised as preventive action. Martínez-Ruiza, Lardelli-Claret, Jiménez-Mejíasa, Amezcua-Prietoa, Jiménez-Moleóna and de Dios Luna del Castillo (2013) found that cycling accidents with involvement of alcohol had the highest percentage of solo accidents. They suggest to invest more money and time in traffic education and to improve legislation and increase fines. It is also suggested to increase the number of traffic controls aimed at cyclists.

The results of the study by Crocker, Zad, Milling and Lawson (2010) indicate a three times higher chance of head injury for cyclists under the influence of alcohol compared to no alcohol involvement. It also seems that alcohol has a higher negative-impact on bicycling as a task than on driving. Suggestions reach from increasing fines to develop interventions to increase the awareness of the high risks of drunk bicycling. Feenstra, Ruiter and Kok (2010) could identify ten determinants linked to risky bicycling behaviour (and intention). One of them was 'attitude towards alcohol in traffic'. It is argued that taking risks is a choice and interventions should rather focus on important attitudes than on improved risk perception and increased fear. They suggest decreasing the positive attitude towards drunk bicycling, increasing the feeling of responsibility and decreasing the vulnerability to peer pressure (if this pressure has a negative impact).

It is clear from the above literature overview that the majority of suggestions target either a change in attitude towards bicycling under the influence of alcohol or a change in legislature and law enforcement.

1.3 The Theory of Planned Behaviour

A psychological model that is frequently used to explain or predict behaviour is the Theory of Planned Behavior (TPB) from Ajzen (1991). The model states that behaviour derives from intention and that this intention (to act or to behave in a certain way) is a function of three

dependent cognitive constructs: attitude towards the specific behaviour, subjective norm and perceived behavioural control.
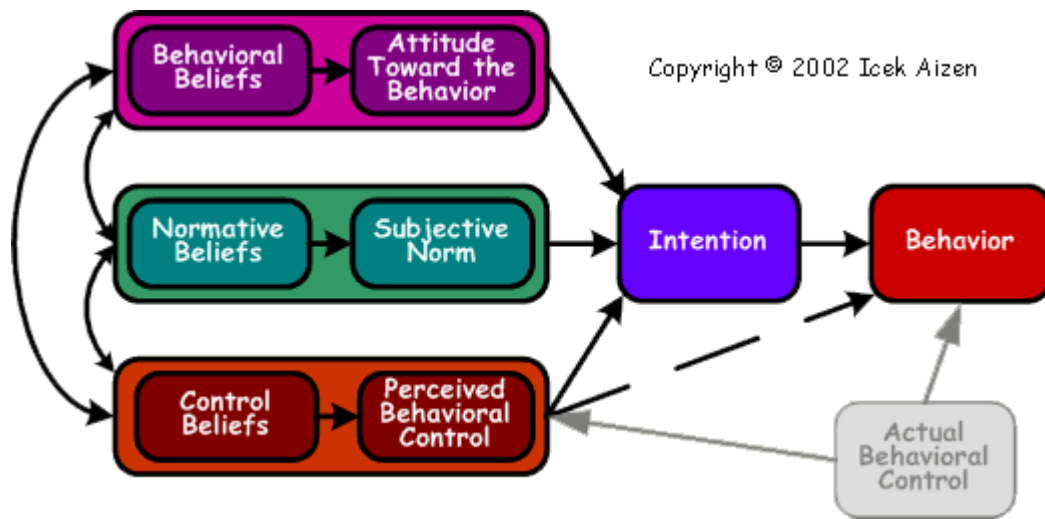

Figure 1: Schematic overview of the Theory of Planned Behavior. Source: Ajzen, I. (1991). The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes,* 50, p. 179-211.

Attitude refers to the evaluation of a person whether to or not to engage in the target behaviour. Subjective norm describes the perceived expectation of an individual about how significant others (e.g. peers) think about the target behaviour – approval or disapproval. Perceived behavioural control (PBC) is the perception of a person's own capacities to perform the target behaviour and of the constraints regarding the behaviour. Ajzen (1991) also states, that PBC is the only construct that can determine behaviour directly.

The TPB seems a fitting model for this study as it is generally well supported for a wide range of behaviours and there are many studies conducted supporting the predicting utility of the TPB when used specifically for traffic violation behaviour (Forward, 2009; Iversen, 2004; Turner & McClure, 2004; Zhou, Wu, Rau, & Zhang, 2009). Furthermore, the TPB explained between 54% and 73% of the variance in intention and between 21% and 58% of the variance in behaviour in the research of Castanier, Deroche and Woodman (2013). The differences in the explained variance resulted from five different traffic violations being assessed: excessive speeding, drink-driving, following a car too closely, using a phone while driving, and disobeying road signs. The behaviour best predicted by the TPB was drink-driving which again is supporting the TPB as a frame model for researching bicycling under the influence of alcohol.

As there is hardly any research done about the behaviour of cyclists and especially about bicycling under the influence of alcohol, it is difficult to formulate hypotheses based on actual research. Therefore, this study is based on a mix of studies regarding the psychology of drink-

driving, drunk bicycling and drink-walking in an attempt to find analogies between the three sorts of behaviour. All three behaviours have in common, that they depend on the same cognitive functions like motor skills, reaction times, visual attention and motor coordination and can be considered automated processes after enough practice time. Alcohol consumption is known to impair these cognitive functions (Mackay, Tiplady, & Scholey, 2002; Rohrbaugh et al., 1988; Tagawa et al., 2000). Research has even shown that bicycling requires a higher level of psychomotor skills than driving a car (Schewe, Englert, Ludwig, Schuster & Stertmann, 1978 (as cited in Li, Baker, Smialek and Soderstrom, 2001)). In addition, controlled laboratory research has shown a strong decline of bicycling performance as the BAC increases (Schewe, Knoss, Ludwig, Schaufele & Schuster, 1984 (as cited in Li et al., 2001)). Arguably there might be a big difference in the risk perception regarding all three behaviours – which the study from Leitner (2015) actually strongly suggests – which sets the behaviours somewhat apart regarding cognitive and social variables. Yet there might be enough analogies to assume that the TPB can be used to predict and eventually influence drunk bicycling behaviour.

There also is a small body of research using Rational Choice theory to research public intoxication, drunk driving and drunk walking. This approach however is strongly criticised and often not successful in explaining differences in the likelihood of drunk walking or drunk driving (Mason & Monk-Turner, 2010).

1.4 The present study

As earlier mentioned, the current study examines possible influences on drunk bicycling with the Theory of Planned Behaviour as a framework. In order to achieve a change in behaviour, some kind of manipulation must take place.

To generate a more negative attitude towards drunk bicycling, which then in turn affects the intention towards drunk bicycling, a manipulation of a determinant of attitude is necessary. The results of the studies of Haque et al. (2012) and Gannon et al. (2014) about walking while intoxicated showed moderate negative correlations between perceived risk and attitude ($r = -.49$, $p < .001$ and $r = -.36$, $p < .001$ respectively). Also, studies about food safety information (Lobb, Mazzocchi & Traill, 2007) and decision making in the context of tourism (Quintal, Lee & Soutar, 2010) reported significant correlations of perceived risk and attitude. Thus a change in perceived risk might result in a change in attitude:

H1a: Participants confronted with information indicating high risk report a higher perceived risk of drunk bicycling than participants confronted with information indicating low risk.

H1b: Attitudes about drunk bicycling are negatively related to perceived risk of drunk bicycling.

H1c: Participants confronted with information indicating high risk report a less positive attitude towards drunk bicycling than participants confronted with information indicating low risk.

In the study of Castanier et al. (2013) 'attitude' was the strongest positive predictor of intention of drink-driving behaviour ($b = .71$, $p < .001$), followed by 'subjective norms' ($b = .30$, $p < .001$) and 'capacity' ($b = .22$, $p < .01$)[1]. The study of Feenstra et al. (2010) support these findings to some extent. They found a correlation of $r = .29$ ($p < .001$) between attitude towards alcohol use in traffic and risky intentions. Furthermore, Marcil, Bergeron and Audet (2001) found a correlation of $r = .76$ ($p < .001$) between 'attitude' and 'intention of drinking and driving'. Additionally, Haque, Clapoudis, King, Lewis, Hyde and Obst (2012) and Gannon, Rosta, Reeve, Hyde and Lewis (2014) both found strong correlations between 'attitude' and 'intention to walk while under the influence of alcohol'. Attitude thus seems a very strong predictor of intention of driving, cycling and walking while intoxicated. Assuming existing analogies between drunk driving, drunk bicycling and drunk walking the following hypotheses can be formulated:

H2a: As attitudes towards drunk bicycling become more negative, a person's intentions to bicycle drunk decrease.

H2b: Intentions to bicycle drunk are lower for participants confronted with high risk information than for participants confronted with low risk information.

The TPB is usually used as an additive model: The stronger each concept (attitude, subjective norms and PBC) gets, the stronger becomes the intention to act in a certain way (and the other way round). Also an increase in intention results in an increase in actual behaviour.

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[1] In this particular study, PBC was split into the constructs 'perceived capacity' and 'perceived autonomy' as research indicated moderating effects of these constructs on 'attitude' and 'subjective norms'

All these main effects have been found in several studies regarding a variety of different behaviours and settings. Regarding drunk driving there has recently been a study which focused on an interactive TPB model for predicting road violation behaviour rather than an additive. Castanier et al. (2013) split the PBC component into two constructs: perceived capacity (perceived ease or difficulty of performing a certain behaviour) and perceived autonomy (the perceived degree of control over performing a certain behaviour). By doing this they wanted to test a possible multiplicative advancement to the TPB and examined the interactions of PBC and other components of the TPB which were suggested in prior studies. Their results indicated a moderation effect of both perceived capacity and perceived autonomy on the contribution of subjective norms to intention formation. Also, perceived capacity moderated the influence of intention on behaviour. As they focused on PBC in their study, they did not research possible interactions between attitude and subjective norms.

Yet there are some studies on the TPB that suggest interaction effects between attitude and subjective norms. Conner and McMillan (1999) found a moderation effect of subjective norms on the impact of attitude on intentions to cannabis use. This means that the opinions of peers and significant others (on cannabis use) can enhance or impair the influence of one's attitudes on intentions (towards the use of cannabis). As the level of subjective norms increased, the strength of the relationship between attitude and intention decreased and even became non-significant at high levels of subjective norms.

Another study supporting interactions between attitude and subjective norms was performed in 2002 by Bansal and Taylor in a service-provider switching context. They found that customers with a positive attitude toward switching will form a favourable intention to switching if they meet approval by significant others. Although the customer himself holds positive attitudes towards switching, he thus might not intend to switch if he faces disapproval by significant others.

As these interaction effects are not yet researched in the setting of drunk bicycling but seem to be important to other fields of research, it seems a good idea to look into these effects more closely. It seems that subjective norms sometimes has a strong moderating influence on the relationship of attitude and intention and it can even overrule this connection completely. If this is also true for the context of drunk bicycling, subjective norms might be the most important construct to focus on in interventions, rather than focusing on attitudes. Looking at the results of the studies mentioned above, it can be assumed that subjective norms has a moderating effect on the relationship between attitudes and intentions and thus:

H3a: Subjective norms about drunk bicycling are more positive for participants confronted with information indicating that drunk bicycling is socially acceptable than for participants confronted with information indicating the opposite.

H3b: „Subjective norms moderate the relation between attitude and intentions to bicycle drunk."

According to prior research (Castanier et al., 2013, Feenstra et al., 2010, Marcil et al., 2001) the second strongest predictor of intention of drunk driving and drunk bicycling is 'subjective norms'. This stands in strong contrast to research about walking while intoxicated where PBC is the second strongest predictor (in Gannon's study even the strongest) after attitude (Haque et al., 2012, Gannon et al., 2014). As a possible explanation, it is concluded that walking while intoxicated might seem a much easier task to sustain to most persons than drunk driving or drunk bicycling. But since the focus of this study lies on drunk bicycling – not on drunk walking – it seems more relevant to further research the influence of 'subjective norm'. This is certainly the case when the recent results from De Waard et al. (2015) and Leitner (2015) are taken into consideration. Both studies, in two different countries, point in the same direction: drunk bicycling seems to be socially accepted and the 'normal thing to do'. As subjective norms include the expectation that drunk bicycling is seen as a normal and socially accepted means of transportation, it seems crucial to research this construct. From this perspective the following hypothesis can be formulated:

H4a: As subjective norms about drunk bicycling become more negative, a person's intentions to bicycle drunk decrease.

H4b: Intentions to bicycle drunk are weaker for participants confronted with information indicating that drunk bicycling is socially acceptable than for participants confronted with information indicating the opposite.

The whole argumentation above is aimed at reducing the intention to bicycle drunk. But when drunk bicycling as a means of transportation is taken away, alternative means of transportation will most likely be considered or used by the people. For short distances one might expect that drunk walking might be the alternative of choice whereas for longer distances either the use of a Taxi, public transportation or the use of a car come to mind. Actually, there still must be done some explorative research on the circumstances under which all these

alternatives would be accepted and chosen instead of drunk bicycling (SWOV, 2015). Still it can be expected that the decrease in intention of drunk bicycling in return increases the intention to use other means of transportation. This is an important thing to study because a decrease in drunk bicycling that comes at the expense of an increase in e.g. drunk driving might not be worth the trade:

H5: As the intention to bicycle drunk decreases, the intention to use another means of transportation – eg. Drunk walking – increases.

Furthermore, to develop successful interventions regarding alternative means of transportation, more insight in the context of drunk bicycling and the use of alternative transportation is necessary. The SVOW factsheet "Alcoholgebruik van jongeren in het verkeer op stapavonden" [Adolescent's use of alcohol in traffic on party nights] (2015) highlights the fact, that more information about these contexts is key to designing solutions like public transportation as alternative to drunk bicycling. Therefore, this study tried to do some exploration into these factors:

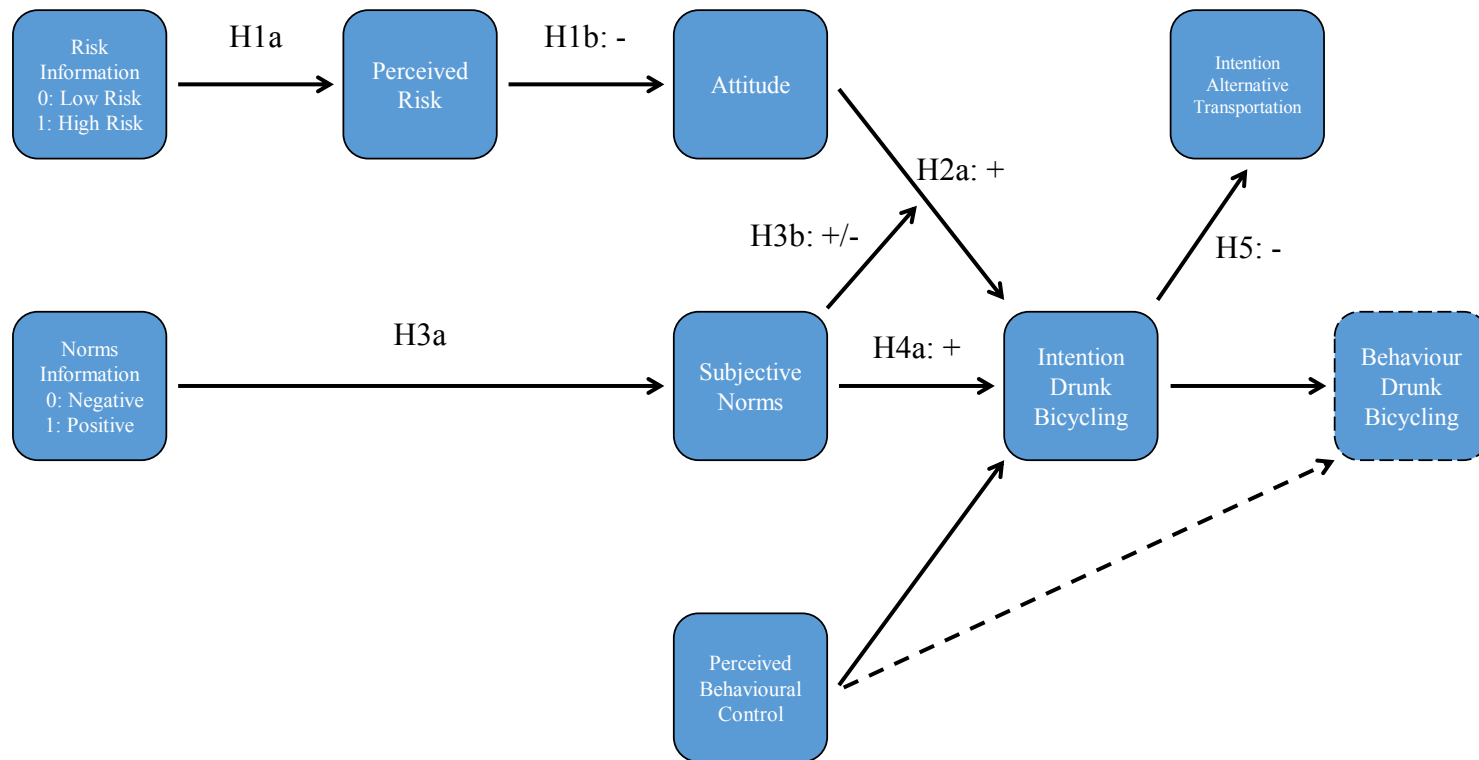Q1: How must public transportation be designed to be perceived as an effective alternative to drunk bicycling?

Figure 2: Schematic overview of the hyotheses of the current study

2. Materials and methods

2.1 Design and manipulation

Two factors – 'perceived risk' and 'subjective norms' – were manipulated in a 2 (low risk vs. high risk information) x 2 (negative vs. positive norms information) between-participants design. Participants were randomly assigned to one of the four conditions.

2.1.1 Risk manipulation

Half the participants received the article with high risk information. To increase the perceived risk of drunk bicycling, the number of yearly accidents was increased from originally 2700 to 5000, the number of treatments per week from 50 to 90 and the number of seriously wounded from 1600 to 3500. Additionally, an interview sentence has been replaced with "It seems that alcohol is increasingly responsible for serious traffic accidents." The other half received this article in a different version where the numbers were altered to imply low risk for drunk bicycling. The number of yearly accidents involving drunk bicycling was decreased to 500, the number of treatments per week to 10 and the number of seriously wounded was rewritten in "Most drunk bicyclists do not get seriously injured". Also, the interview was somewhat rewritten to make drunk bicycling seem harmless: "Bicyclists should not drink alcohol to the extent that makes them fall off their bikes but in most cases the way back home is an easy thing to do even in a tipsy condition", says Marco Brugmans, executive of VeiligheidNL. "It seems that not alcohol but a surplus of bollards is the major problem for drunk bicyclists." See Appendix C for the two manipulated versions of the article and the original article.

2.1.2 Subjective norms manipulation

On the same questionnaire page, half of the participants received a second newspaper article with a positive/reinforcing view on drunk bicycling. This version of the article is almost the same as the original version of the article. Some passages were left out and one line from an interview was altered into "It seems that drunk bicycling is socially accepted.". The alterations were made to increase the positive public view on drunk bicycling and to establish subjective norms in a way that the participant thinks drunk bicycling is the normal thing to do. The other half received a rewritten version of this article that aims to depict a negative/opposing public view on drunk bicycling. The title was altered from "Drunk? Just bicycle" to "Drunk?

Better don't bicycle". The percentages of drunk bicyclists at night was altered from 90% to 5%, and the percentage of bicyclists with a BAC above the legal limit was changed from 68% to 3%. Also, the same passages as in the first version were scraped and two lines of the interview were altered: "It seems that drunk bicycling is not socially accepted.", says De Waard. "Drunk bicycling is less and less tolerated by fellow men and alternative means of transportation are increasingly used.". Additionally, the following passage has been added at the end of the articles to increase the influence on subjective norms: "These are the findings from numerous interviews with cyclists. Positive/negative feedback from friends, colleagues and acquaintances was listed as the most important reason for/against drunk bicycling." See Appendix D for the two manipulated versions of the article and the original article.

2.2 Sample and data collection

Data was collected from October – November 2016 via an online experiment. Participants self-administered the questionnaire through the web-based platform SonaSystems (an online platform where students can sign up to take part in current studies from the University of Twente to earn study participation credits). Completion of the experiment took about 25 minutes and students were granted 0.5 credits as a compensation for completing it.

The materials used to measure the TPB constructs and perceived risk were originally developed in English and stem from the research from the study from Gannon et al. (2014) since their questionnaire has already been validated (see Appendix F for the original version). Since the original study was about drunk walking, the questions about intention, attitude, subjective norm, perceived behavioural control and perceived risk have been altered by replacing the term "drink walk(ing)" with "drunk bicycling". Additionally, they have been translated into Dutch considering the study took place in the Netherlands. To ensure accurate translation, the method of 'back-translation' (Brislin, 1970) was used with 4 translators split among 2 groups.

Table 1
Demographic characteristics of participants by experimental condition

Characteristic	HR/PN		HR/NN		LR/PN		LR/NN		Total	
	N	%	N	%	N	%	N	%	N	%
N =	40	25.2	37	23.3	42	26.4	40	25.2	159	100
Age										
Mean	20.1		20.1		20.0		20.3		20.1	
SD	1.9		1.7		1.8		2.0		1.8	
Gender										
Men	10	25.0	9	24.3	12	28.6	9	22.5	40	25.2
Women	30	75.0	28	75.7	30	71.4	31	77.5	119	74.8
Nationality										
Dutch	21	52.5	15	40.5	17	40.5	18	45.0	71	44.7
German	17	42.5	21	56.8	24	57.1	21	52.5	83	52.2
Other	2	5.0	1	2.7	1	2.4	1	2.5	5	3.1
Education										
No graduation	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Basic education	0	0.0	0	0.0	0	0.0	1	2.5	1	0.6
LBO, VBO, LTS, LHNO, VMBO	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
MAVO, VMBO-t, MBO-kort	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
MBO, MTS, MEAO	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
HAVO, VWO, Gymnasium	35	87.5	32	86.5	35	83.3	36	90.0	138	86.8
HBO, HEAO, PABO, HTS	1	2.5	0	0.0	2	4.8	1	2.5	4	2.5
Universiteit	4	10.0	5	13.5	5	11.9	2	5.0	16	10.1
Driving license										
Yes	32	80.0	32	86.5	36	85.7	31	77.5	131	82.4
No	8	20.0	5	13.5	6	14.3	9	22.5	28	17.6

Note. HR/PN = High risk/Positive norms (Condition 1)
HR/NN = High risk/Negative norms (Condition 2)
LR/PN = Low risk/Positive norms (Condition 3)
LR/NN = Low risk/Negative norms (Condition 4)

In total, 194 participants took part in the study. Thirteen participants did not complete the online experiment and 22 had both control questions wrong (see 2.3). All in all, 35 participants were removed from the dataset leaving a total of N = 159 participants. The distribution of the participants among the four conditions was quite even with group sizes ranging from N = 37 to N = 43. Characteristics of the sample are provided in table 1. The table shows that the four conditions are quite equal regarding the demographic variables.

An analysis of variance (ANOVA) has been conducted to compare the mean ages of the four conditions. There were no significant differences between the conditions, $F < 1$, n.s. Chi-Square tests have been used to analyse the homogeneity of the four conditions regarding the categorical demographic variables. There is no significant difference between the conditions regarding gender ($\chi(3) = 0.42$, $p = .935$), nationality ($\chi(6) = 2.51$, $p = .867$), education ($\chi(9) =$

6.46, p = .694), possession of a driving license ($\chi(3)$ = 1.57, p = .667) and drunk bicycling in the past ($\chi(12)$ = 13.78, p = .315). It is thus unlikely that the results of this study are influenced by differences between groups as the conditions are homogenous and randomization has been applied.

2.2.1 Drunk Bicycling under students in Enschede

Drunk bicycling in the past is especially important, as several studies (e.g. Forward, 2009; Castanier et al., 2013) show, that past behaviour is a strong predictor of intention in the context of the TPB. In this study, about 80% of the participants did bicycle drunk less than 10 times in the past 3 months. Only 8% are above 15 times in the last month, which would equal at least once per weekend.

Figure 3
Instances of Drunk Bicycling in the Past Three Months
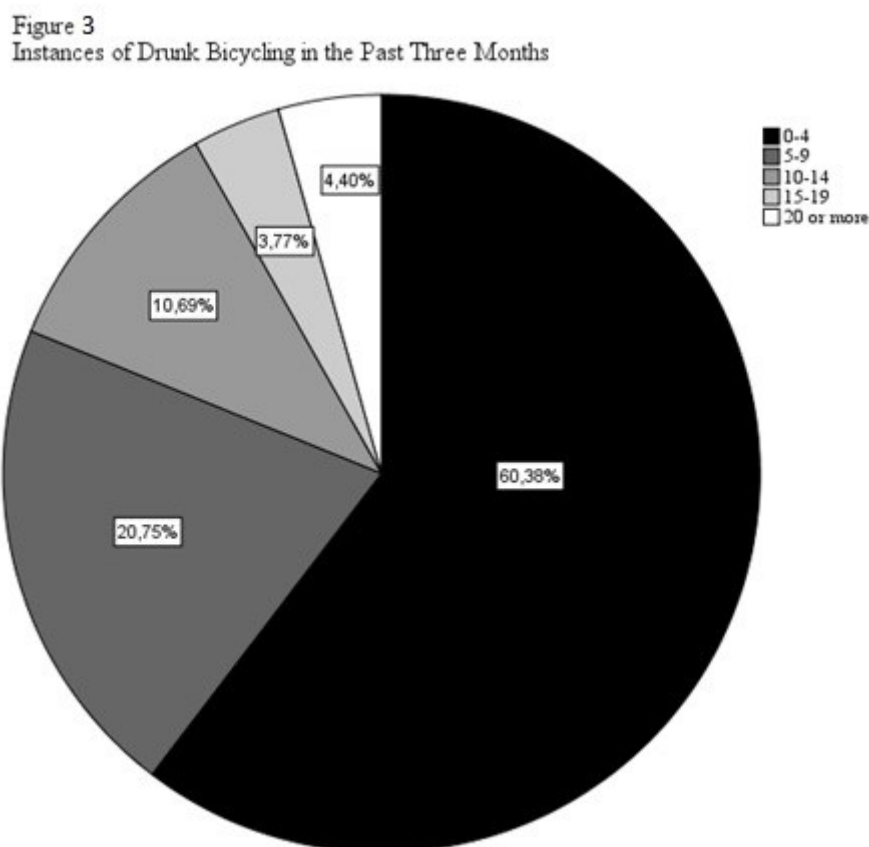
About 28% report to never bicycle drunk. Since the study is completely anonymous there is no reasonable cause to doubt these statements. Of the 72% that do bicycle drunk, a large majority (82%) does so in the weekends. Also, almost all of them (98%) do so in the time from 21:00 to 06:00. The average single trip distance that is travelled by bike while drunk is 3km

with the maximum distance being 16km. 20% of the participants who engage in drunk bicycling report to have had injuries through drunk bicycling in the past.

2.3 Control questions

The answers to the control questions were given on a seven point Likert scale (Example: "According to the first article, which percentage of drunk bicyclists receives severe and long-term head injuries?" with answers ranging from 0% to 30% in 5% steps). As the answer options require precise memorization of percentages, the two adjacent options were treated as correct answers as well since they come close to the correct answer (If the correct answer was 5%, 0% and 10% were accepted as correct answers as well). Choosing an answer in the correct range (high/medium/low percentage) is sufficient to show recalling of the core of the given information. Participants who had answered both control questions answered wrong - according to the rules mentioned above – were removed from the data set, because they likely did not read the given information carefully (N = 22). This step is supported by the results from the manipulation check: While both manipulations had significant effects with reduced participants (N = 159, see 3.1 for detailed values), the perceived risk manipulation seemed to have no effect in the unreduced group (N = 181): There was no significant difference between the perceived risk in the high risk information condition (M = 4.51, SD = .92, N = 88) and the low risk information condition (M = 4.24, SD = 1.00, N = 93), (t(179) = -1.853, p = .66). It seems plausible that some participants – especially the ones answering the control questions wrong - did not read the given information carefully and thus did not get manipulated as intended. Participants with only one wrong answer (N = 37) were not removed, since decreasing the total participants any further would veer us away from the recommended 50 participants per condition (Simmons, Nelson & Simonsohn, 2011).

2.4 Dependent measures

2.4.1 Manipulation effects

The means of perceived risk and subjective norms were compared between the 4 conditions to establish the effectiveness of the manipulations. For perceived risk, participants were asked to rate their agreement for 7 statements, e.g. "Compared with all other road users, drunk bicyclists are more likely to be injured or killed in a road crash.". For subjective norms, participants were asked to rate their agreement for 4 statements, e.g. "Those people who are

important to me think that I should bicycle drunk.". Agreement was measured on a 7-point interval scale (from 1 strongly disagree to 7 strongly agree).

The manipulation was pretested in a small pilot study with N = 22 participants and results were insignificant. The procedure and the used materials were almost the same as in the actual study. No significant differences in the perceived risk were found between the high risk information condition (M = 3.96, SD = .77, N = 11) and the low risk information condition (M = 3.47, SD = .95, N = 11), (t(20) = -1.33, p = .197, d = 0.57). There also was no significant difference in subjective norms between the positive norms information condition (M = 3.94, SD = 1.02, N = 12) and the negative norms information condition (M = 4.03, SD = 1.23, N = 10), (t(20) = .18, p = .857, d = 0.08, g = 0.09). An analysis of variance (two-way ANOVA) found no significant main effects or interaction effects from the independent variables risk information (high/low) and norms information (positive/negative) on the dependent variable perceived risk. Similar findings come up for a Two-Way-ANOVA with subjective norms as dependent variable and risk information condition and norms information condition as independent variables.

As a reaction to these findings, small adjustments to the manipulation articles were made which resulted in the current state as described in the design section.

2.4.2 Attitude

Attitude was measured with 4 questions adapted from Gannon et al. (2014). Participants had to complete statements like "For me, drink walking would be…" with answers on a 7-point interval scale ranging from 1 unenjoyable to 7 enjoyable. The items were averaged to get a mean attitude score: higher scores indicated a more positive attitude towards drunk bicycling. Table 2 shows the internal reliability of the adapted and the original scale.

2.4.3 Perceived behavioural control (PBC)

PBC was measured using 4 statements adapted from Gannon et al. (2014). Participants were asked to rate their agreement for statements like "Drunk bicycling is completely under my control.". Agreement was measured on a 7-point interval scale (from 1 strongly disagree to 7 strongly agree). The items were averaged to obtain a mean PBC score: higher scores indicate more perceived behavioural control over/while drunk bicycling.

2.4.4 Intention Drunk Bicycling

To measure the intention to bicycle drunk in the future, 5 statements adapted from Gannon et al. (2014) have been used. Participants were again asked to rate their agreement for statements like "It is likely that I will bicycle drunk.". Agreement was measured on a 7-point interval scale (from 1 strongly disagree to 7 strongly agree). The items were averaged to obtain a mean intention score: higher scores indicate a stronger intention of drunk bicycling in the future.

2.4.5 Intention Use of Alternative Transportation

The intention to use alternative means of transportation (eg. public transportation) was measured with 6 statements, e.g. "In the future, if I am drunk, I will walk home instead of bicycle drunk.". Participants were asked to rate their agreement for these statements on a 7-point interval scale from 1 strongly disagree to 7 strongly agree. The items were averaged to create mean intention (to use alternative means of transportation) score, where higher scores describe a stronger intention.

2.4.6 Additional Exploration

Participants also were requested to give some additional information for explorative reasons. These questions were about general bicycling behaviour, past instances of drunk bicycling and questions about alternative means of transportation (e.g. "How long would you be willing to wait for public transportation to prefer this over drunk bicycling?"). These questions might give some insight about the conditions under which participants are willing to choose alternative means of transportation over drunk bicycling. There seems to be very little information about these conditions yet (SWOV, 2015).

Table 2

Psychometric Characteristics of the Major Study Variables (N = 159)

Variable	n *	*M*	SD	α	α **	Range Potential	Range Actual
Attitude	4	3.44	1.37	.85	.74	1-7	3.14-3.86
Subjective norms	4	3.24	1.32	.80	.90	1-7	2.56-3.69
PBC	4	4.10	1.30	.82	-	1-7	3.24-4.43
Intention drunk bicycling	5	4.07	1.54	.89	.92	1-7	3.01-4.97
Perceived risk	7	4.37	0.98	.77	.88	1-7	3.43-5.67
Intention alternative transportation	6	4.03	1.09	.74	-	1-7	3.17-5.06

Note. * Items. ** Cronbach's Alpha from Gannon et al. (2012)

As table 2 shows, the reliability – in this study indicated by Cronbach's alpha - of the used measurements is overall at least acceptable, in most cases even good. As a comparison, the Cronbach's alpha from Gannon et al. (2012) are also given, since the measurements originate from that study and were translated and adjusted for this study. It can be seen, that there are no large differences between the alphas – the translations seem to be good and the measurements reliable. Regarding the mean values of the different variables, there are a few distinct differences to Gannon et al. (2012): While the means for attitude, subjective norms and perceived risk do not really differ ($M_{difference} < .35$) from Gannon's research, PBC in this study is much smaller compared to Gannon ($M = 4.10$, SD = 1.30 versus $M = 5.11$, SD = 1.56) as well as intention ($M = 4.07$, SD = 1.54 versus $M = 4.63$, SD = 1.61). These differences however might stem from the fact, that Gannon measured intention to walk drunk, not to bicycle drunk, like this study does.

2.5 Procedure

At the start of the online experiment, participants were asked to fill in some demographic variables. These variables were age, gender, nationality, highest completed Dutch education, the possession of a driving license and the postal code for the realism procedure by Kievik and Gutteling (2011).

The participants were told that the experiment was about drunk bicycling. To increase realism, the procedure used by Kievik and Gutteling (2011) and Verroen, Gutteling and De Vries (2013) has been implemented with small changes. This procedure required the participants to fill in their postal code so the computer could check their residential area for

local risk information. They then received a manipulated result with 4 different outcomes depending on the experimental condition they were in. The outcomes were designed to further manipulate perceived risk in the desired direction (see Appendix B).

After filling in the demographic questions and having been shown the results from the postal code procedure, the participants were confronted with the perceived risk manipulation (a Dutch newspaper article about the risks of drunk bicycling, Appendix C) and the subjective norms manipulation (a Dutch newspaper article about the frequency of occurrence of drunk bicycling and the public view on it, Appendix D). Both newspaper articles were published in Dutch newspapers in 2014. Both articles were rewritten in two versions with small changes made to either imply a low or high risk and a positive or negative view on drunk bicycling.

After having read the two articles, all participants were asked to answer two questions over the content of the articles – one per article – to check on whether they truly had read the articles or not (see 2.3).

In agreement with the TPB's TACT principle (defining the target, action, context and time, Ajzen, 1991) participants were given the following definition to keep in mind when working on the questions:

"In this research project drunk bicycling is defined as bicycling with a blood alcohol concentration (BAC) of 0.5 or more. This BAC is usually reached after three standard glasses of alcohol." Additionally, the standard glass was explained and an example was given (Appendix E).

After this, participants were asked to answer questions, which measured important constructs of the Theory of Planned Behaviour (TPB). These items were scored on a 7 point Likert scale ranging from 1 (Strongly disagree) to 7 (Strongly agree) with higher scores indicating more of the measured construct. Some questions required different wording for the scaling (eg. 1 – Not anxious at all and 7 – Very anxious). The Dutch translation is listed in Appendix G. After completing the questionnaire about the TPB components, participants were required to answer another 6 questions about intention to make use of alternative means of transportation.

At the end, a debriefing informed the participants about the nature and purpose of the manipulations and links to the original articles were supplied.

2.6 Analysis Overview

ANOVA's have been conducted on the dependent variables attitude, subjective norms, perceived risk and intention of drunk bicycling with risk information and norms information as independent variables. Additionally, partial correlations – controlling for risk information condition and norm information condition - have been calculated to analyse the associations between the constructs of the Theory of Planned Behaviour. Furthermore, a regression analysis has been conducted to find important predictors of drunk bicycling intention and possible interaction effects.
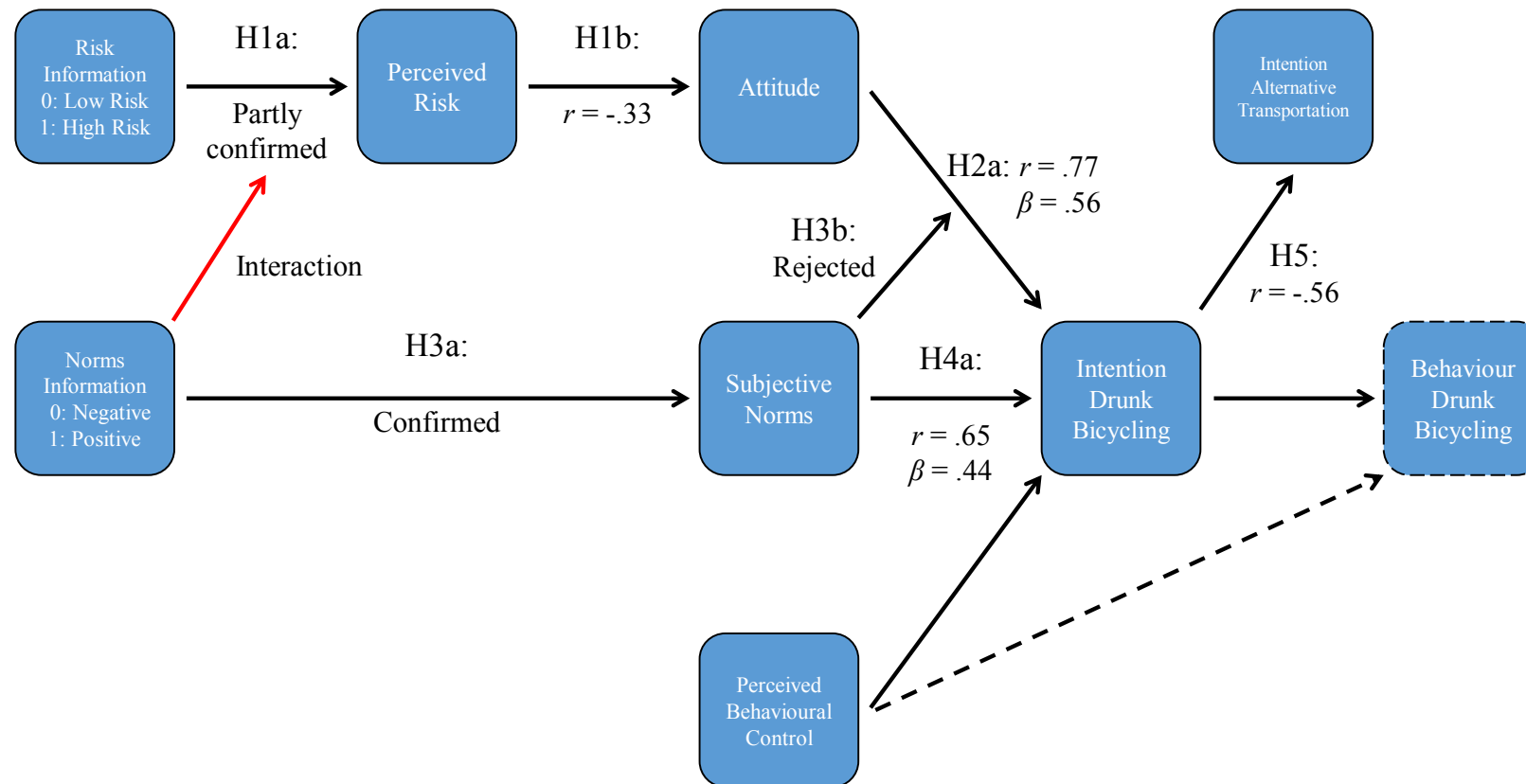
3. Results

Figure 4: Schematic overview of the hyotheses of the current study with results

3.1 Manipulation effects on perceived risk and social norms

As expected, there was a significant main effect from risk information on perceived risk, $F(1, 155) = 4.20$, $p = .042$, $\eta2 = .026$, $d = .33$. Perceived risk was significantly higher in the high risk information condition ($M = 4.53$, SD = .93, N = 77) than in the low risk information condition ($M = 4.21$, SD = 1.01, N = 82). No significant main effect was found from information norms condition on perceived risk, $F(1, 155) = 0.68$, $p = .410$. Interestingly, there also was a statistically significant interaction between the effects of risk information condition and norms information condition on perceived risk, $F(1, 155) = 5.47$, $p = .021$, , $\eta2 = .034$, $d = .38$ (see figure 4). Planned comparisons showed that in the negative norms information condition, participants did not respond to differences in risk level ($M_{high risk} = 4.41$, SD = .99 versus $M_{low risk} = 4.46$, SD = .97, $F < 1$), whereas in the positive norms information condition, the difference between risk levels was significant ($M_{high risk} = 4.64$, SD = .86 versus $M_{low risk} = 3.98$, SD = .96, $F(1, 155) = 9.95$, $p = .002$).

Figure 5.
Interaction effect of the risk information manipulation and the norms information manipulation on perceived risk.
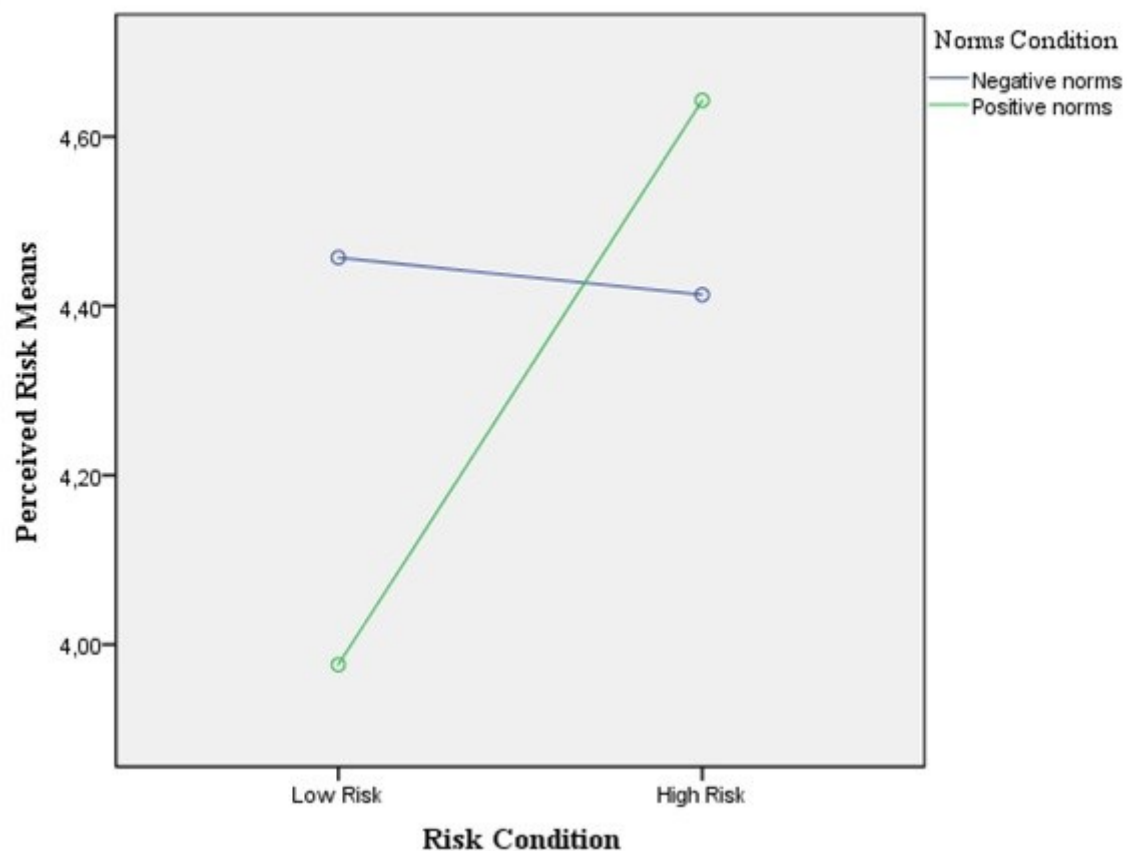
From the observed main effect, it can be concluded that the manipulation of perceived risk was successful, Hypothesis 1a can be confirmed. Through the unexpected interaction effect however, this is only true for participants in the low risk/positive norms and the high risk/ positive norms conditions. The manipulation did not work for participants in the two conditions with negative norms information.

Another analysis of variance (two-way ANOVA) was conducted that examined the effect of risk information (high vs. low) and norms information (positive vs. negative) on subjective norms. There was no significant main effect from risk information on subjective norms, $F < 1$, n.s. As expected though, a significant main effect was found from norms information on subjective norms, $F (1, 155) = 8.22$, $p = .005$, $\eta2 = .05$, $d = .46$. Subjective norms were significantly higher in the positive norms information condition ($M = 3.53$, SD = 1.28, N = 82) than in the negative norms information condition ($M = 2.94$, SD = 1.31, N = 77). There was no statistically significant interaction between the effects of risk information and norms information on subjective norms, $F < 1$, n.s.

From these findings, it can be concluded that the manipulation of subjective norms was successful: As intended, the mean score of subjective norms was higher in the positive norms information condition than in the negative norms information condition. Hypothesis 3a is thus confirmed.

3.2 Main analyses

Overall, the attitude towards drunk bicycling was on average slightly negative: $M = 3.44$ on a 7-point scale equals the middle between the options "Somewhat disagree" and "Neither agree nor disagree" (neutral option). The same can be found for subjective norms, which with $M = 3.24$ also lies in between these options. Perceived behavioural control, intention to bicycle drunk and intention to use alternative transportation are all set around $M = 4$, which reflects neutral reactions from the participants: They neither agree nor disagree on having control over their behaviour, on intending to bicycle drunk in the future and on intending to use alternative transportation. The scores of perceived risk on the other hand show a slightly above average mean ($M = 4.37$): Drunk bicycling is marginally stronger perceived as being a risky behaviour rather than not risky behaviour. Again, the difference is only small.

3.2.1 Attitude

The main effect from risk information is nonsignificant; $F(1, 155) = .22$, ns. The main effect from norms information also is nonsignificant; $F(1, 155) = .45$, ns. No interaction effect has been found; $F(1, 155) = 2.07$, ns. Contrary to hypothesis 1c, there was no difference in attitude towards drunk bicycling between the risk (and norms) information conditions. Although the manipulation had effect on perceived risk, this effect did not carry through on attitude as predicted.

3.2.2 Perceived behavioural control

Although there is no hypothesis formulated about PBC, it is analysed to keep the TPB model complete. An analysis of variance (two-way ANOVA) has been conducted with perceived behavioural control as dependent variable and risk information and norms information as independent variables. There was no significant main effect from risk information; $F(1, 155) = .12$, ns. There also was no significant main effect from norms information; $F(1, 155) = .01$, ns. No interaction effect has been found; $F(1, 155) = .00$, ns.

3.2.3 Intention drunk bicycling

To examine whether the manipulations worked through on intention of drunk bicycling resulting in differences in the intentions means between the four conditions, a two-way ANOVA was carried out with intention of drunk bicycling as dependent variable and risk information and norms information as independent variables. There was no significant main effect from risk information; $F(1, 155) = .09$, ns. There also was no significant main effect from norms information; $F(1, 155) = 2.66$, ns. No interaction effect has been found; $F(1, 155) = .92$, ns. Hypotheses 2b and 4b have to be rejected: Neither the risk information manipulation nor the norms information manipulation had a significant effect on intention of drunk bicycling. There are no significant differences in intention between the four conditions.

3.3 Correlational Analysis

A partial correlation controlling for risk information condition and norms information condition was carried out to examine the correlations between the constructs of the used model. In psychological research, we use Cohen's (1988) conventions to interpret effect size. A correlation coefficient of .10 is thought to represent a weak or small association; a correlation

coefficient of .30 is considered a moderate correlation; and a correlation coefficient of .50 or larger is thought to represent a strong or large correlation.

The analysis revealed a strong positive linear relationship between attitude and intentions to bicycle drunk ($r = .77$, $p < .001$). Hypothesis 2a can thus be confirmed: When participants enjoy drunk bicycling less, they less often plan to engage in drunk bicycling. This satisfies one of the basic assumptions of the TPB: attitudes and intentions are strongly correlated.

Table 3

Partial correlations, means and standard deviations for the standard TPB predictors, perceived risk, drunk bicycling intention and demographic variables (N = 159) controlled for risk information condition and norms information condition

Variable	M	SD	1	2	3	4	5	6
1. Attitude	3.44	1.37	-	.51***	.64***	-.33***	.77***	-.42***
2. Subjective norms	3.24	1.32		-	.44***	-.18*	.65***	-.33***
3. PBC	4.10	1.30			-	-.29***	.68***	-.47***
4.Perceived risk	4.37	.098				-	-.38***	.43***
5. Intention drunk bicycling	4.07	1.54					-	-.56***
6. Intention alternative transportation	4.03	1.09						-
7. Gender	-	-	-.17*	-.01	-.23**	-.03	-.13	.09
8. Age	20.2	1.84	-.01	.09	.04	.03	.06	.10
9. Driving license	-	-	-.21*	-.24**	-.17*	-.02	-.24**	.01
10. Past behaviour	-	-	.48***	.36***	.41***	-.28***	.49***	-.32***

Note. Higher scores represent more of a construct. Mean scores of TPB constructs computed as average item score on 7-point scales.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

The results from the correlational analysis also show a moderate negative correlation between perceived risk and attitude ($r = -.33$, $p < .001$). Hypothesis 1b is thus confirmed: If participants perceive drunk bicycling as more risky, they are less likely to favour it.

This study also found a strong positive relationship of subjective norms and intentions to bicycle drunk ($r = .65$, $p < .001$). This satisfies the basic assumption of the TPB that subjective norms and intentions are strongly correlated. Hypothesis 4a can be confirmed: As participants think that others disapprove of drunk bicycling, they plan less often to engage in it.

As expected, intention to bicycle drunk was strongly negatively correlated to intention to use alternative transportation ($r = -.56$, $p < .001$). This means that hypothesis 5 can be confirmed: When participants intend to engage in drunk bicycling less often, they more often plan to use other means of transportation.

Interestingly, there is a weak negative association between the possession of a driving license and attitude, subjective norms, perceived behavioural control and intention of drunk bicycling: Participants with a driving license enjoy drunk bicycling more, feel approval by significant others when bicycling drunk, feel more confident about being able to bicycle drunk and have stronger intentions on drunk bicycling compared to participants without a driving license. This could stem from the idea, that drunk bicycling is preferable over drunk driving, since drunk driving could result in more severe accidents, might be perceived as more dangerous and is penalized more heavily than drunk bicycling.

3.4 Regression Analysis

To identify the best predictors of intention of drunk bicycling and to examine a possible interaction effect of attitude and subjective norms on intention of drunk bicycling, a regression analysis of intention of drunk bicycling has been conducted. Results are displayed in table 4.

Overall, the Theory of Planned Behaviour seems to be a great framework for drunk bicycling. The model explained 76% of the variance of the intention of drunk bicycling. The strongest predictors are attitude, followed by subjective norms, perceived behavioural control and perceived risk. Past behaviour lost significance as a predictor, when the TPB variables were added to the model. There was no significant interaction between attitude and subjective norms. This contradicts hypothesis 3b.

Table 4

Regressions of behavioural intentions onto demographic variables, standard TPB variables, perceived risk and interactions.

Independent variable	R^2	β	SP
Step 1	.33***		
Age		.11	.10
Gender		-.06	-.06
Driving license		-.20**	-.19
Injuries drunk bicycling		-.12	-.11
Nationality Dutch		-.23	-.08
Nationality German		-.19	-.06
Past behaviour		.46***	.42
Risk information		-.01	-.01
Norms information		.05	.05
Step 2	.76***		
Age		.03	.03
Gender		.02	.02
Driving license		-.04	-.04
Injuries drunk bicycling		-.06	-.05
Nationality Dutch		.11	.04
Nationality German		.06	.02
Past behaviour		.07	.05
Risk information		.03	.03
Norms information		.02	.02
Attitude		.56***	.20
Subjective norms		.44***	.15
Perceived behavioural control (PBC)		.19**	.13
Perceived risk		-.10*	-.09
Attitude x Subjective norms		-.24	-.06

Note. SP = semi-partial correlation coefficient.

* $p < .05$; ** $p < .01$; *** $p < .001$.

3.5 Explorative results

The average waiting time participants would accept to choose public transport over drunk bicycling is 10 minutes. To be an acceptable alternative to drunk bicycling, public transportation on average must not cost more than 6,50€ per trip. If there would be the possibility of going home by free taxis (stopping at local bus stops), 80% of the participants would choose this alternative over bicycling home while drunk.

4. Discussion

The aim of the present study was to analyse whether the Theory of Planned Behaviour (TPB) can be applied successfully to drunk bicycling and to identify suitable determinants of drunk bicycling intention for future interventions. The TPB is a widely-used theory to predict

behaviour and has been applied to a large field of different behaviours. It has also been used to predict the intentions to commit road violations, drunk driving or drunk walking. All the more surprising that is has not yet been applied to the behaviour of drunk bicycling. If the TPB could be applied to drunk bicycling as well – and this study strongly suggests that it can! -, this offers promising ways to predict and implement interventions to influence drunk bicycling intentions. That is why the present research tried to shed some light on the TPB in the context of drunk bicycling.

4.1 Hypotheses and research questions

Regarding the hypotheses some of the expected outcomes came true and some did not. First of all, both manipulations worked out and at the same time did not work out. It was assumed that high risk information would lead to perceiving drunk bicycling as more risky and low risk information to less risky. The main effect from risk information condition on perceived risk confirmed this assumption. However, there was an unexpected moderation effect from the norms information manipulation on the risk information manipulation that made the hypothesis only true for participants in the positive norms condition. Participants in the negative norms condition had no difference in perceived risk, independent from the high risk or low risk information condition. As soon as the participant had the idea, that others disapproved of drunk bicycling anyway, the risk information manipulation had no effect anymore. The norms information manipulation also worked out as intended and participants in the positive norms condition reported significant more approval by others than participants in the negative norms condition. This was the part, that worked as planned (except for the interaction effect).

What did not work was the idea, that these manipulation effects would transmit onto intentions of drunk bicycling. The risk information manipulation was hypothesized to have impact on perceived risk and should transmit the influence via attitude onto intention. The norms information manipulation was supposed to influence subjective norms which in turn should have impact onto intentions according to the TPB. These hypotheses had to be rejected. Although all basic assumptions of the TPB were analysed and confirmed, there was no difference in the intentions of drunk bicycling among all four conditions. As assumed, there was a moderate negative correlation between perceived risk and attitude but nonetheless there was no main effect from the risk information condition on attitude - contrary to the hypothesis. The "effect chain" stopped at perceived risk and there were no significant differences in attitude among the four conditions. The same happened with the norms information manipulation:

Although there was a strong positive correlation and a high prediction power from subjective norms on intentions, the manipulation effect did not transmit. The subjective norms differ among the conditions significantly but does not lead to a difference in intentions.

Now, where does the influence go? Does it simply vanish? For the risk manipulation one could argue that the correlation between perceived risk and attitude is only moderate and the link between the two is questionable. Although there is some research supporting this relation (like Gannon et al., 2014; Haque et al., 2012; Lobb et al., 2007; Quintal et al., 2010), there still could be a hidden variable, moderating the relation. But this does not account for the norms manipulation, since the relation from subjective norms and intention is formulated by the TPB and these basic assumptions were tested and confirmed. Not only in this research, but also in a whole body of research about the TPB (Ajzen, 2002; Castanier et al., 2013; Haque et al., 2012; Gannon et al., 2014; Quintal et al., 2010; Lobb et al., 2007). So it is very unlikely that this part did not work out, because the model per se was wrong.

Another option is that the manipulation effects were simply too small to work through an "effect chain" onto more than the first construct (perceived risk and subjective norms). When looking at the risk manipulation, the difference between the means of the low risk and the high risk condition is only 0.30. On a seven-point-interval scale this is a difference of five percent and when looking at the answer options still equals the same answer (neither high risk nor low risk). Even when taking into account the interaction effect and only looking at the difference of perceived risk in the positive norms condition, the difference is only a marginal 0.60, which makes ten percent and still no change in the answer format. Also, the means do not deviate very much from the total mean of the scale (which is 4) meaning that in total, the manipulation was not able to push perceived risk close to one of the extremes – either high or low. This is supported by rather small effect sizes for the main effect ($d = 0.33$) and the interaction effect ($d = 0.38$). The same idea applies to the norms manipulation: Although the means deviate more from the scale mean and show slightly negative subjective norms (assumed disapproval by others), the difference is also only 0.60. However, this time the main effect comes close to medium strength ($d = 0.46$). Both effects thus might be too weak to transmit any influence further onto related constructs (like intention).

Thirdly, other reasons for the manipulations not having effect on drunk bicycling intentions might stem from the method of data collection: all results originate from self-reported data collected via an online platform. This might be problematic in two ways: first, there is the problem of survey fraud. Participants were granted 0.5 research participation credits for completing the study. The questionnaire might thus be completed solely for the incentive and

not with the necessary seriousness and honesty. However, this was somewhat controlled for with a question, whether participants did answer the questionnaire seriously. Participants were asked, whether they seriously participated in the study on a 5-point interval scale (1 – not serious at all to 5 – very serious) and the mean score on this item was $M = 4.19$, suggesting an overall serious participation.

The hypothesis about subjective norms moderating the relation of attitude and intention had to be rejected: The regression analysis revealed no evidence, that the influence of participants attitudes on their intentions changed depending on whether they thought others approved or disapproved of drunk bicycling. This finding is contrary to the studies from Conner and McMillan (1999) and Bansal and Taylor (2002), as they found, that under certain subjective norms conditions, attitude lost all influence on intention. However, their studies focused on other research areas. It can be concluded, that for intentions of drunk bicycling no such interaction effect must be taken into consideration when developing an intervention.

The last hypothesis suggested, that there would be an increase in intention of using alternative means of transportation as soon as the intention to bicycle drunk would decrease. This could be confirmed: The partial correlational analysis reveals a strong negative correlation between intention of drunk bicycling and intention of using alternative means of transportation ($r = -.56$). If participants plan to not engage in drunk bicycling, they intend to use other means of transportation. This seems only logical, but should be looked further into. This relation could become problematic as soon as a decrease in drunk bicycling intention increases the intention of engaging in other dangerous behaviour as for example drunk driving. However, the setup of the current study does not allow to differentiate between the various means of transportation available (drunk driving, drunk walking, public transportation, taxi, etc).

The research question Q1 (*"How must public transportation be designed to be perceived as an effective alternative to drunk bicycling?"*) tried to target the problem from another angle: infrastructure. However, this was not the main purpose of this study and it was only assessed in a small manner to get a small grasp on alternative intervention methods like an infrastructural intervention. These data might be important for future interventions not aiming to manipulate behaviour by means of Psychology but by means of infrastructural change. A better transportation infrastructure that takes into consideration the needs and opinions of drunk persons also might result into less people choosing drunk bicycling over other means of transportation. An intervention thus could also aim at making public transportation more interesting and favourable over (drunk) bicycling. The conditions under which drunk bicycling under students occurs, seem to be relatively stable: most times in the weekend and at night.

Also, drunk bicyclists would accept wait times up to 10 minutes on average. An improvement of public transportation at night in the weekends by supplying more rides per hour would maybe be a viable option. Extra costs could be compared to costs resulting from accidents by drunk bicyclists in the specific region to check for the cost efficiency. Costs might not even be the problem, since participants reported to be willing to spend an average of 6,50€ per ride to get home safely by other means of transportation than the bike. Especially taxis are an attractive option since public transportation often has a negative image regarding safety, cleanliness and availability at late hours. However, these results also have to be taken with caution: as one's judgement gets already impaired at a BAC of 0.05%, there might be large differences between the self-reported data of the current study and the actual judgements of participants when in a drunk condition. These results can be seen as an indication, but in-field research is advised before deciding on infrastructural interventions.

4.2 Conclusions

First of all, the TPB can be considered a valuable framework for a psychological approach on drunk bicycling. In this project, it explained 76% of the variance of the participant's drunk bicycling intentions. This comes not as a surprise since the TPB is used in a wide field of behaviours and has been successfully applied to behaviour linked to drunk bicycling like drunk driving and drunk walking. Especially interesting is the fact, that past behaviour lost all prediction power and became insignificant, when the TPB variables were entered in the model. This shows, that the TPB variables predict the intention of behaviour in a very precise and comprehensive way. Past behaviour is thus expressed through (or mediated by) the TPB constructs attitude, subjective norms and perceived behavioural control and the perceived risk. Otherwise, past behaviour would keep some prediction power even when the TPB variables are added. Ajzen states, that "It is an undisputed fact that the frequency with which a behavior has been performed in the past can be a good predictor of later action" (Ajzen, 2002, p. 108). According to him, it is a common finding that past behaviour accounts for variance in later behaviour, although it does not always lose all its prediction power when the TPB variables are entered into the regression (Ajzen, 2002).

This study found a strong positive linear relationship between attitude and intentions to bicycle drunk. Additionally, the regression analysis indicates attitude as the strongest predictor of intentions of drunk bicycling. This outcome fits the results from other studies researching similar fields like drunk driving and drunk walking (Castanier et al., 2013; Marcil, Bergeron &

Audet, 2001; Gannon et al., 2014). Yet there are also results from studies about drunk walking and drunk driving that indicate perceived behavioural control as the strongest predictor (Forward, 2009; Haque et al., 2012). There thus seems to be some inconsistency regarding the strongest predictor of intentions. Before developing an intervention, it might thus be necessary to further investigate this matter and possible interactions between variables.

This study also found a strong positive association of subjective norms and drunk bicycling intentions. When looking at the prediction level, subjective norms predicts intentions somewhat weaker than attitude ($\beta = .49$ vs. $\beta = .57$, $p < .001$) but still clearly stronger than PBC ($\beta = .26$, $p < .001$). The weak impact of PBC on intention might stem from the idea that bicycling is an automated process, usually learned early in childhood and used frequently throughout life. So maybe in the context of drunk bicycling one does not care so much about control if the behaviour is perceived as a simple task. It also can be expected that in real situations one's decision making about easiness of a task (like bicycling) and the need of control would also be negatively influenced by the consumed alcohol, since a blood alcohol concentration (BAC) of 0.05% already leads to impaired judgement (Appendix A). In real situations, the influence of PBC might thus be even lower.

To this point it can thus be concluded, that interventions focusing on manipulation of attitude and subjective norms show most promise in decreasing drunk bicycling intentions. Forward (2009) comes to a similar conclusion and advises to change the targets underlying beliefs. It seems, that risky behaviour experiences more attention in the media and is often perceived as normal/usual behaviour. That is why Forward advocates to talk more about those, who obey the rules and avoid risky behaviour and make them the norm again.

Future manipulations should be designed in a different way than in the present study. Although the manipulations did work on perceived risk and subjective norms, the effects did not transmit on attitude and drunk bicycling intentions as planned. There were no significant differences in the mean intentions of drunk bicycling between the four conditions, so neither of the combinations of risk information and norms information worked especially well in decreasing drunk bicycling intentions. Future interventions should thus try to influence attitude in a more direct way - and not via perceived risk, since the correlation is only moderate ($r = -.33$) – and maybe via other media than newspaper articles. Maybe this channel of information does not fit the sample group of students very well and other media channels like social networks or online messaging services can have a greater impact. Additionally, the source of information might be questioned as subjective norms is often about the opinions of significant others. The opinion represented in the first manipulation derives from the director of a Dutch

organisation (VeiligheidNL) that keeps itself busy with informing about risks and prevention methods. The opinion in the second manipulation is from a researcher and traffic psychologist. One could argue, that both might not represent significant others to the research sample that consisted of Psychology students. Significant maybe, when it comes to learning and a student – teacher situation but not in the context of drunk bicycling, when significant others most likely are persons, who also engage in this kind of behaviour (like fellow students). This problem has partly been tried to be avoided by adding "Bicyclist's significant others often approve/disapprove of drunk bicycling" but this clue might not have been strong enough. When manipulating risk perceptions, there also is a large body of research working with visual cues and fear appeals. This approach is also used for behaviour like smoking or speeding and might be worth looking into when developing interventions.

The second problem originates in the difference of the contexts of the data collection and of the actual behaviour. Measuring actual behaviour in real situations with the right context (for example stopping drunk bicyclists and interviewing them like DeWaard et al., 2015 did) always produces more exact results than collecting data online in an uncontrolled environment and in a context, that is very different from the context of the actual behaviour to be measured. It might be a good idea, to do some in-field research – like DeWaard et al. – and try to gather information on the TPB constructs in a more realistic setting. However, this could come at the cost of lower compliance of the testing sample and since cognitive functioning already would be inhibited somewhat by the alcohol consumption, reactive processes might interfere. But then again, these reactive processes might also simply be a natural component of the drunk bicycling situation in vivo and thus might be an important factor to take into consideration when researching this topic and developing successful interventions.

4.3 Limitations and strengths

Every research has some limitations that should not go unnoticed. First of all, with an online experiment there is no way to be in control of the situation and the context in which the participant receives the manipulations and answers the questions. Also, there is no way to tell, whether participants cheat or simply click through (this point has been discussed earlier already). Additionally, the situation in which the participant partakes in the experiment might be very different to the situation in which the researches behaviour usually takes place. At last, self report questionnaires always are prone to some biases as for example social desirability.

Usually, some of these problems can be taken less serious with a big enough sample. This study however has a quite small sample which did not even reach 50 participants per condition. Because of a greater than expected loss of participants through the control questions, only 159 participants remain, which makes approximately 40 per condition. This possible outcome should have been thought about when sampling the data and could have been prevented by collecting more data. Also, the sample only consists of psychology students of one single university in the Netherlands. Because of this, results must not be generalised to other population groups and it might even be, that this had an impact on the results. Psychology students of course already know some of the core concepts within the field and they might recognise manipulations, items or even constructs, which would bias their answers.

When the pilot study indicated, that one of the manipulations was not working, it might have been a good idea to pre-test said manipulation again after modifying it before starting final data collection. This might have lead to a stronger manipulation and better results. Also, the media channel and the source of the information was not chosen optimal as already earlier discussed.

Yet, there are also some positive aspects of methodology to report. The realism procedure (Kievik et al., 2011), that was applied, was a methodological approach to make the situation of the online experiment less abstract and to strengthen the manipulations. Also, there were control questions implemented in the study, to control for participants, that did not read the information careful enough and thus might have biased the results of this study. The control questions actually worked so well, that a good portion of the sample had to be removed. Additionally, some methodological standards have been applied like randomization, reversed items, informed consent and a detailed debriefing to satisfy ethical standards and protect the participants from any damage.

4.4 Future research

The current study demonstrates, that the TPB is a valuable model when approaching the psychology of drunk bicycling. Future interventions should focus on changing the attitudes towards drunk bicycling and the subjective norms about drunk bicycling as these two are the strongest predictors of drunk bicycling intentions. However, perceived behavioural control must be taken into consideration as this construct is supposed to have additional influence on the behaviour itself and not only on intentions. Results from this study must not be generalized since the sample consists only of students, but considering students might be one of the largest

target groups for drunk bicycling, the results are still relevant to the problem. Conducting in-field research by interviewing drunk bicyclists would be an excellent approach to extend the quite theoretical results from this study with some more context-fitting data. As earlier discussed, this approach would deliver results from in vivo situations under the exact conditions, in which the intervention would have to work. The study design could be roughly geared to the study from DeWaard (2015): stopping drunk bicyclists with the help of the police and asking them to voluntarily participate. Then the BAC could be assessed and the TPB constructs would have to be measured. The answers should not be self-administered but should be registered by a researcher since the autonomy of the participants at this point might already be inhibited heavily by the BAC. Next to psychological variables, future interventions could also focus on an improvement of infrastructure to prevent drunk bicycling.

Appendix A

The Effect of alcohol on body functions and driving skills

Alcohol has a strong influence on the human body functions depending on the BAC (blood alcohol concentration) level. It immediately affects the brain's ability to control behaviour and body functions and this ability changes drastically with increasing concentration of alcohol in the bloodstream (BAC levels). At specific BAC levels the effects are:

- **BAC** .02% Judgment, inhibitions, and emotions begin be affected and results are increased relaxation and excessive talking
- **BAC** .06% Reaction time is decreased, coordination is affected, but neither may be very obvious
- **BAC** .10% Vision, speech, balance, perception and self-control are affected
- **BAC** .18% Walking and standing are noticeably affected. (walking a straight line, buttoning a coat)
- **BAC** .20% Memory is impaired, the brain centers for intelligence, emotions and sensory motor abilities are affected; cannot think clearly and become excited or angered easily
- **BAC** .30% The body is thrown into a complete state of confusion and the signs are: slurred speech, double vision, hearing impairment, difficult or impossible to judge distances, no longer able to walk normally and sudden mood changes
- **BAC** .40% The brain can barely function and the nervous system is ineffective; the person is unconscious or almost unconscious; the body may seem frozen or barely able to move, vomiting or uncontrolled urination may occur
- **BAC** .50% A person slips into a coma; breathing, heart action and blood pressure are decreased drastically to a dangerously low point; the brain cannot control body temperature; death can and often does occur

Source (How alcohol affects the body, n.d., para. 5)

The American Centers for Disease Control and Prevention also states similar effects of alcohol and additionally gives the predictable effects on driving performance (Effects of Blood Alcohol Concentration (BAC), 2015).

Blood Alcohol Concentration (BAC)*	Typical Effects	Predictable Effects on Driving
.02% About 2 alcoholic drinks**	- Some loss of judgment - Relaxation - Slight body warmth - Altered mood	- Decline in visual functions (rapid tracking of a moving target) - Decline in ability to perform two tasks at the same time (divided attention)

Blood Alcohol Concentration (BAC)*	Typical Effects	Predictable Effects on Driving
.05% About 3 alcoholic drinks**	• Exaggerated Behavior • May have loss of small-muscle control (e.g., focusing your eyes) • Impaired judgment • Usually good feeling • Lowered alertness • Release of inhibition	• Reduced coordination • Reduced ability to track moving objects • Difficulty steering • Reduced response to emergency driving situations
.08% About 4 alcoholic drinks**	• Muscle coordination becomes poor (e.g., balance, speech, vision, reaction time, and hearing) • Harder to detect danger • Judgment, self-control, reasoning, and memory are impaired	• Concentration • Short-term memory loss • Speed control • Reduced information processing capability (e.g., signal detection, visual search) • Impaired perception
.10% About 5 alcoholic drinks**	• Clear deterioration of reaction time and control • Slurred speech, poor coordination, and slowed thinking	• Reduced ability to maintain lane position and brake appropriately
.15% About 7 alcoholic drinks**	• Far less muscle control than normal • Vomiting may occur (unless this level is reached slowly or a person has developed a tolerance for alcohol) • Major loss of balance	• Substantial impairment in vehicle control, attention to driving task, and in necessary visual and auditory information processing

A standard drink is equal to 14.0 grams of pure alcohol. Generally, this amount of pure alcohol is found in:

- 355 ml of beer (5% alcohol content)
- 235 ml of malt liquor (7% alcohol content)
- 150 ml of wine (12% alcohol content)
- 45 ml or a "shot" of 80-proof (40% alcohol content) distilled spirits or liquor (e.g., gin, rum, vodka, whiskey)

(Note from the author: The strange millilitre volumes are results from the conversion from ounces to millilitre.)

Appendix B

The four different results of the postal code procedure

<u>High risk / Positive subjective norms</u>

Gebaseerd op uw postcode laten de resultaten zien dat in uw gebied het aantal verkeersongelukken veroorzaakt door dronken fietsers erg hoog is.

<u>High risk / Negative subjective norms</u>

Gebaseerd op uw postcode laten de resultaten zien dat in uw gebied het aantal verkeersongelukken veroorzaakt door dronken fietsers erg hoog is.

<u>Low risk / Positive subjective norms</u>

Gebaseerd op uw postcode laten de resultaten zien dat in uw gebied het aantal verkeersongelukken veroorzaakt door dronken fietsers erg laag is.

<u>Low risk / Negative subjective norms</u>

Gebaseerd op uw postcode laten de resultaten zien dat in uw gebied het aantal verkeersongelukken veroorzaakt door dronken fietsers erg laag is.

Appendix C

The original version and the two manipulated versions of the first article

Original version

(http://www.telegraaf.nl/binnenland/23219492/__Veel_dronken_fietsers_op_Eerste_Hulp__.html)

Veel dronken fietsers op Eerste Hulp

Jaarlijks worden er bijna 2700 dronken fietsers tussen de 15 en 64 jaar behandeld op een spoedeisende hulp (SEH)-afdeling na een fietsongeval.

Dat zijn meer dan vijftig behandelingen per week, zo blijkt uit onderzoek van VeiligheidNL, geinitieerd door het BNN-programma Spuiten en Slikken.

Zo'n 1600 dronken fietsers lopen ernstig en langdurig hoofdletsel op.

"Fietsers moeten niet zo veel drinken dat ze van de fiets valen, want van hoofdletsel kan je maanden lang de gevolgen ondervinden", zegt Marco Brugmans, directeur van VeiligheidNL.

Low risk version

Weinig dronken fietsers op Eerste Hulp

Jaarlijks worden er slechts 5% van alle dronken fietsers tussen de 15 en 64 jaar behandeld op een spoedeisende hulp (SEH)-afdeling na een fietsongeval.

Dat zijn minder dan 10 behandelingen per week, zo blijkt uit onderzoek van VeiligheidNL, geinitieerd door het BNN-programma Spuiten en Slikken.

95% van de dronken fietsers loopt geen ernstige verwondingen op.

"Fietsers moeten niet zo veel drinken dat ze van de fiets vallen, maar in de meeste gevallen gaat de weg naar huis op de fiets ook in aangeschoten toestand gewoon goed", zegt Marco Brugmans, directeur van VeiligheidNL."Het bijkt dat niet alcohol, maar overbodige paaltjes het grootste probleem zijn voor de (dronken) fietsers."

Bron: nos.nl, 13 oktober 2013

High risk version

Veel dronken fietsers op Eerste Hulp

Jaarlijks worden er bijna 35% van alle dronken fietsers tussen de 15 en 64 jaar behandeld op een spoedeisende hulp (SEH)-afdeling na een fietsongeval.

Dat zijn meer dan 70 behandelingen per week, zo blijkt uit onderzoek van VeiligheidNL, geinitieerd door het BNN-programma Spuiten en Slikken.

25% van de dronken fietsers loopt ernstig en langdurig hoofdletsel op.

"Fietsers moeten niet zo veel drinken dat ze van de fiets vallen, want van hoofdletsel kan je maanden lang de gevolgen ondervinden", zegt Marco Brugmans, directeur van VeiligheidNL."Het blijkt dat alcohol in toenemende mate verantwoordelijk is voor ernstige verkeersongevallen."

Bron: nos.nl, 13 oktober 2013

Appendix D

The original version and the two manipulated versions of the second article

Original version (http://nos.nl/artikel/702615-dronken-ga-toch-fietsen.html)

Dronken? Ga toch fietsen

Mocht je je aankomend weekend weer eens afvragen hoe je in hemelsnaam thuis bent gekomen na de vrimibo, wees dan gerust: je was lang niet de enige. Uit onderzoek blijkt dat 's nachts bijna 90 procent van de fietsers een borrel opheeft.

Onderzoekers van de Rijksuniversiteit Groningen vroegen zo'n duizend fietsers in Den Haag en Groningen om te blazen. Driekwart daarvan stapte (of viel) van hun fiets af en werkte mee. Het onderzoek werd gehouden op meerdere donderdag- en zaterdagavonden. Om 17.00 uur zat nog niemand boven de wettelijke grens. Maar zes uur later had 89 procent van de fietsers gedronken. 68 procent had zelfs meer op dan wettelijk is toegestaan. Daar kun je een boete van 140 euro voor krijgen; omdat je met een promillage van 0,5 of meer namelijk niet meer aan het verkeer mag deelnemen. Met een gemiddeld promillage van 0,75 zaten de nachtfietsers daar dus ruim boven.

Er bleek geen verschil te zijn tussen de fietsers in Groningen en Den Haag. Volgens onderzoeker en verkeerspsycholoog Dick de Waard is het aannemelijk dat de resultaten ook voor andere grote steden gelden.

Evenwichtsbalk

"We vermoedden wel dat veel fietsers gedronken hadden, maar we wisten niet hoe erg het was. Het percentage na middernacht ligt wel erg hoog", zegt De Waard. "Zo lang ze maar niet de auto pakken. Als fietser ben je vooral een gevaar voor jezelf, maar in een auto ben je ook een groot gevaar voor anderen."

Lopen is natuurlijk ook nog een alternatief, maar zelfs dan kun je beboet worden voor openbaar dronkenschap. Er is dan geen maximaal promillage, maar de politie gaat af op uiterlijke kenmerken en gedrag. Ga dus alvast maar oefenen op de evenwichtsbalk.

Paaltjesprobleem

Dit is de eerste keer dat er onderzoek is gedaan naar het alcoholgebruik onder fietsers. De Stichting Wetenschappelijk Onderzoek Verkeersveiligheid (SWOV), die ook een bijdrage leverde aan dit onderzoek, heeft wel al eens fietsers ondervraagd die door een ongeluk in het ziekenhuis belandden. Veel van hen hadden te veel gedronken. Al bleek uit dat onderzoek dat niet alcohol, maar overbodige paaltjes het grootste probleem zijn voor de (dronken) fietsers.

Negative / Opposing subjective norms

Dronken? Beter niet fietsen

Mocht je je aankomend weekend weer eens afvragen hoe je in hemelsnaam thuis bent gekomen na de vrimibo, wees dan alert: je was misschien de enige. Uit onderzoek blijkt dat 's nachts slechts 5 procent van de fietsers een borrel opheeft.

Onderzoekers van de Rijksuniversiteit Groningen vroegen zo'n duizend fietsers in Den Haag en Groningen om te blazen. Driekwart daarvan stapte van hun fiets af en werkte mee.

Het onderzoek werd gehouden op meerdere donderdag- en zaterdagavonden. Om 17.00 uur zat nog niemand boven de wettelijke grens. Ook zes uur later had nog maar 5 procent van de fietsers gedronken.Slechts 3 procent had meer op dan wettelijk is toegestaan. Daar kun je een boete van 140 euro voor krijgen; omdat je met een promillage van 0,5 of meer namelijk niet meer aan het verkeer mag deelnemen. Met een gemiddeld promillage van 0,05 zaten de nachtfietsers daar dus ruim onder.

Er bleek geen verschil te zijn tussen de fietsers in Groningen en Den Haag. Volgens onderzoeker en verkeerspsycholoog Dick de Waard is het aannemelijk dat de resultaten ook voor andere grote steden gelden.

"Het blijkt dat dronken fietsen maatschappelijk niet geaccepteerd is.", zegt De Waard. "Voor de fietsers belangrijke mensen hebben vaak een negatieve mening over dronken fietsen." Dit komt uit interviews naar voren die bij een groot aantal van de fietsers werden afgenomen. Negatief feedback door vrienden, collega's en bekenden werd als belangrijkste reden tegen dronken fietsen genoemd.

Bron: nos.nl, september 2014

Positive / Reinforcing subjective norms

Dronken? Ga toch fietsen

Mocht je je aankomend weekend weer eens afvragen hoe je in hemelsnaam thuis bent gekomen na de vrimibo, wees dan gerust: je was lang niet de enige. Uit onderzoek blijkt dat 's nachts bijna 90 procent van de fietsers een borrel opheeft.

Onderzoekers van de Rijksuniversiteit Groningen vroegen zo'n duizend fietsers in Den Haag en Groningen om te blazen. Driekwart daarvan stapte (of viel) van hun fiets af en werkte mee.

Het onderzoek werd gehouden op meerdere donderdag- en zaterdagavonden. Om 17.00 uur zat nog niemand boven de wettelijke grens. Maar zes uur later had 89 procent van de fietsers gedronken. 68 procent had zelfs meer op dan wettelijk is toegestaan. Daar kun je een boete van

140 euro voor krijgen; omdat je met een promillage van 0,5 of meer namelijk niet meer aan het verkeer mag deelnemen. Met een gemiddeld promillage van 0,75 zaten de nachtfietsers daar dus ruim boven.

Er bleek geen verschil te zijn tussen de fietsers in Groningen en Den Haag. Volgens onderzoeker en verkeerspsycholoog Dick de Waard is het aannemelijk dat de resultaten ook voor andere grote steden gelden.

"Het blijkt dat dronken fietsen maatschappelijk geaccepteerd is.", zegt De Waard. "Voor de fietsers belangrijke mensen hebben vaak een positieve mening over dronken fietsen." Dit komt uit interviews naar voren die bij een groot aantal van de fietsers werden afgenomen. Positief feedback door vrienden, collega's en bekenden werd als belangrijkste reden voor dronken fietsen genoemd.

Bron: nos.nl, september 2014

Appendix E

The definition given to participants according to the TACT principle:

De volgende vragen hebben te maken met 'dronken fietsen'. Onder dronken fietsen wordt in dit onderzoek verstaan dat je fietst met een promillage (bloedalcoholgehalte) van 0.5 of hoger. Dit promillage is ongeveer bereikt na drie standaardglazen alcohol.

Wat is een standaardglas?

Elke soort alcoholhoudende drank heeft zijn eigen standaardglas. Op deze manier bevat een standaardglas bier van 5% (250cc), wijn van 12% (100cc) en sterke drank van 35% (35cc) allemaal evenveel pure alcohol (circa 10 gram).

(Bron: https://www.alcoholinfo.nl/publiek/werking/standaardglazen)

Je hebt dus ongeveer een promillage van 0,5 na drie glazen bier à 250ml, drie glazen wijn à 100ml of drie glazen sterke drank á 4cl of enige combinaties met in totaal drie glazen hiervan.

Appendix F

The original version of the questionnaire as derived from Gannon et al. (2014).

Appendix A

Constructs	No. of items	Items	Scale	Source
Standard TPB variables				
Intention[a]	5	I plan to drink-walk I intend to drink-walk I do <u>not</u> intend to drink walk (R) It is likely that I will drink walk I definitely won't drink walk (R)	1 strongly disagree to 7 strongly agree	Adapted from Ajzen (1991) and Haque et al. (2012)
Attitude[a]	4	For me, drink walking would be: unenjoyable – enjoyable For me, drink walking would be: bad – good For me, drink walking would be: favourable – unfavourable (R) For me, drink walking would be: satisfying – unsatisfying (R)	1–7	Adapted from Ajzen (1991) and Haque et al. (2012)
Subjective norm[a]	4	Those people who are important to me think that I should drink walk Those people who are important to me think drink walking would be a good thing to do Most people whose opinions I value would approve of me drink walking People who are important to me would want me to drink walk	1 strongly disagree to 7 strongly agree	Adapted from Ajzen (1991) and Haque et al. (2012)
Perceived behavioural control (PBC)[a]	2	I am confident that I could drink walk If I wanted to, it would be easy for me to drink walk	1 strongly disagree to 7 strongly agree	Haque et al. (2012)
Extended TPB variables				
Perceived risk	7	Compared with all other road users, drink walkers are more likely to be injured or killed in a road crash How likely is it that you will be hurt or injured in a road crash if you were to drink walk? How likely is it that you will be seriously injured or killed in a road crash if you were to drink walk? How likely is it that other people of similar age to you will be hurt or injured in a road crash if they were to drink walk? How likely is it that other people of similar age	1 strongly disagree to 7 strongly agree 1 extremely unlikely to 7 extremely likely	Adapted from Rundmo and Iversen (2004)

Constructs	No. of items	Items	Scale	Source
		to you would be seriously injured or killed in a road crash if they were to drink walk?		
		If you were to drink walk, how much would you worry about being involved in a road crash?	1 not at all worried to 7 worried very much	
		To what extent would you be anxious about being involved in a road crash when drink walking?	1 not anxious at all to 7 extremely anxious	
Friendship group norm[a]	6	How much do you agree with the following statements about your friends' opinions of drink walking...? My friends would approve of me drink walking My friends think that drink walking would be a good thing to do My friends think that I should <u>not</u> drink walk (R) Most of my friends would drink walk My friends would drink walk on a regular basis How many of your <u>friends</u> would drink walk ...?	1 strongly disagree to 7 strongly agree; 1 none to 7 all	Adapted from Terry and Hogg (1996), White et al. (2008) and Tunnicliff et al. (2012)
Parent group norm[a]	6	How much do you agree with the following statements about your parents' opinions of drink walking...? My parents would approve of me drink walking My parents think that drink walking would be a good thing to do My parents think that I should <u>not</u> drink walk (R) My parents would drink walk My parents would drink walk on a regular basis How often would your parents drink walk ...?	1 strongly disagree to 7 strongly agree; 1 not very often to 7 very often	Adapted from Terry and Hogg (1996), White et al. (2008) and Tunnicliff et al. (2012)
University peer group norm[a]	4	How much do you agree with the following statements about other QUT university students' opinions of drink walking...? Other students at my university think that I should <u>not</u> drink walk (R) Other students at my university would approve of me drink walking Other students at my university think that drink walking would be a good thing to do Other students at my university would drink walk	1 strongly disagree to 7 strongly agree	Adapted from Terry and Hogg (1996), White et al. (2008) and Tunnicliff et al. (2012)

(R) = reversed scaled item.
[a] All items relate to drink walking in the next 6 months.

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Appendix G

The Dutch – English translation

ENG: English original
DU: Dutch translation
ENG2: English translation (derived from the Dutch translation)
The yellow colored background indicates the chosen translation.

Vertaling Jouke & Huib	Vertaling Rogier & Ronald
Intention	
ENG: I plan to drink-walk (dronken lopen). DU: Ik ga dronken rondlopen in de toekomst. ENG2: I will walk around intoxicated in the future.	ENG: I plan to drink-walk (dronken lopen). DU: Ik ben voornemens om te gaan lopen als ik dronken ben. ENG2: When I am drunk, I intend to walk.
ENG: I intend to drink-walk. DU: Ik heb het voornemen dronken rond te lopen. ENG2: I have the intention to walk around intoxicated.	ENG: I intend to drink-walk. DU: Ik heb de intentie om te gaan lopen als ik dronken ben. ENG2: My intention is to walk when I am drunk.
ENG: I do not intend to drink walk. DU: Ik heb niet het voornemen dronken rond te lopen. ENG2: I do not have the intention to walk around intoxicated.	ENG: I do not intend to drink walk. DU: Ik ben niet van plan te gaan lopen als ik dronken ben. ENG2: I do not plan to walk when I am drunk.
ENG: It is likely that I will drink walk. DU: Het is aannemelijk dat ik dronken ga rondlopen. ENG2: It is likely I will be walking around intoxicated.	ENG: It is likely that I will drink walk. DU: Het is aannemelijk dat ik ga lopen wanneer ik dronken ben. ENG2: It's likely that when I am drunk, I will walk.
ENG: I definitely won't drink walk. DU: Ik zal nooit dronken gaan rondlopen. ENG2: I will never walk around intoxicated.	ENG: I definitely won't drink walk. DU: Ik ga sowieso niet lopen als ik dronken ben. ENG2: I am sure that when I am drunk, I will not walk.
Attitude	

ENG: For me, drink walking would be: unenjoyable/enjoyable DU: Voor mij is dronken rondlopen: niet vermakelijk/vermakelijk ENG2: For me, walking around intoxicated is (not) entertaining.	ENG: For me, drink walking would be: unenjoyable/enjoyable DU: Lopen als ik dronken ben is voor mij: onplezierig/plezierig ENG2: To me drunk walking will be unpleasant / pleasant
ENG: For me, drink walking would be: bad/good DU: Voor mij is dronken rondlopen: slecht/goed ENG2: For me, walking around intoxicated is (in)correct.	ENG: For me, drink walking would be: bad/good DU: Ik vind dat dronken lopen: niet kan/wel kan ENG2: To me drunk walking is unacceptable / acceptable
ENG: For me, drink walking would be: favourable/unfavourable DU: Voor mij is dronken rondlopen: gunstig/niet gunstig ENG2: For me, walking around intoxicated is (un)favourable.	ENG: For me, drink walking would be: favourable/unfavourable DU: Ik vind dat dronken lopen: voordelig/onvoordelig is. ENG2: To me drunk walking is favorable / unfavorable
ENG: For me, drink walking would be: satisfying/unsatisfying DU: Voor mij is dronken rondlopen: bevredigend/niet bevredigend ENG2: For me, walking around intoxicated is (un)satisfying.	ENG: For me, drink walking would be: satisfying/unsatisfying DU: Dronken lopen geeft mij een bevredigend/onbevredigend gevoel. ENG2: To me drunk walking is satisfying / unsatisfying
Subjective norm	
ENG: Those people who are important to me think that I should drink walk. DU: Mensen die belangrijk zijn voor mij vinden dat ik dronken moet rondlopen ENG2: People important to me think I have to walk around intoxicated.	ENG: Those people who are important to me think that I should drink walk. DU: Mensen die belangrijk voor mij zijn, zijn van mening dat ik moet lopen als ik dronken ben. ENG2: People who are important to me think that I should walk when I am drunk.
ENG: Those people who are important to me think drink walking would be a good thing to do. DU: Mensen die belangrijk zijn voor mij vinden dat dronken rondlopen goed is.	ENG: Those people who are important to me think drink walking would be a good thing to do. DU: Diegene die belangrijk voor mij zijn, vinden het een goed idee om te lopen als je gedronken hebt.

ENG2: People important to me think walking around intoxicated is correct.	ENG2: People who are important to me think that walking when you're drunk is a good idea
ENG: Most people whose opinions I value would approve of me drink walking. DU: De meeste mensen waarvan ik de mening belangrijk vind keuren dronken rondlopen goed. ENG2: Most people I care about approve of walking around intoxicated.	ENG: Most people whose opinions I value would approve of me drink walking. DU: De meeste mensen, waar ik de mening van waardeer, keuren het goed dat ik loop als ik dronken ben. ENG2: Most people of which I value their opinion, approve that I walk when I am drunk.
ENG: People who are important to me would want me to drink walk. DU: Mensen die belangrijk voor mij zijn willen dat ik dronken rondloop ENG2: People important to me want me to walk around intoxicated.	ENG: People who are important to me would want me to drink walk. DU: Mensen die belangrijk voor mij zijn, zien graag dat ik loop als ik dronken ben. ENG2: People who are important to me, would like me to walk when I am drunk.
PBC	
ENG: I am confident that I could drink walk. DU: Ik heb er vertrouwen in dat ik dronken rond kan lopen. ENG2: I feel confident I am capable of walking around intoxicated.	ENG: I am confident that I could drink walk. DU: Ik ben er van overtuigd dat ik zou kunnen lopen als ik dronken ben. ENG2: I am sure I can walk when I am drunk
ENG: If I wanted to, it would be easy for me to drink walk. DU: Al ik zou willen dan zou ik makkelijk dronken kunnen rondlopen. ENG2: If necessary, I would easily be able to walk around intoxicated.	ENG: If I wanted to, it would be easy for me to drink walk. DU: Als ik het zou willen, dan was het voor mij eenvoudig om te lopen als ik dronken ben. ENG2: As I would like, then it was easy for me to walk when I am drunk
ENG: Drink walking is completely under my control. DU: Ik heb volledige controle als ik dronken rondloop. ENG2: I am in full control when walking around intoxicated.	ENG: Drink walking is completely under my control. DU: Lopen als ik dronken ben heb ik compleet onder controle ENG2: I have complete control over drunk walking.

ENG: For me drink walking would be: easy/difficult DU: Voor mij zou dronken rondlopen makkelijk/moeilijk zijn. ENG2: For me, walking around intoxicated would be easy/hard.	ENG: For me drink walking would be: easy/difficult DU: Voor mij zal het gemakkelijk/moeilijk zijn om te lopen als ik dronken ben. ENG2: To me drunk walking is easy / tough
Perceived risk	
ENG: Compared with all other road users, drink walkers are more likely to be injured or killed in a road crash. DU: Dronken lopers hebben vergeleken met alle ander weggebruikers een grotere kans om gewond te raken of te overlijden door een verkeersongeval. ENG2: People walking around intoxicated have a higher risk of getting injured or decease in a traffic accident compared to all other road users.	ENG: Compared with all other road users, drink walkers are more likely to be injured or killed in a road crash. DU: In vergelijking met alle andere weggebruikers, hebben dronken wandelaars een verhoogde kans om gewond te raken of om het leven te komen bij een verkeersongeval. ENG2: In comparison with other road users, drunk walkers have an increased likelihood to get wounded or to die at a traffic accident.
ENG: How likely is it that you will be hurt or injured in a road crash if you were to drink walk? DU: Hoe aannemelijk is het dat je je bezeerd of gewond raakt bij een verkeersongeval als je dronken zou rondlopen? ENG2: How plausible is it that you get hurt or injured in a traffic accident if you would be walking around intoxicated?	ENG: How likely is it that you will be hurt or injured in a road crash if you were to drink walk? DU: Hoe aannemelijk is het dat jij gekwetst of gewond raakt bij een verkeersongeluk als je loopt wanneer je dronken bent. ENG2: How likely is it that you will offended or injured at a traffic accident when you walk drunk?
ENG: How likely is it that you will be seriously injured or killed in a road crash if you were to drink walk? DU: Hoe aannemelijk is het dat je ernstig gewond raakt of overlijdt bij een verkeersongeval als je dronken zou rondlopen? ENG2: How plausible is it that you get seriously injured or decease during a traffic accident if you would be walking around intoxicated?	ENG: How likely is it that you will be seriously injured or killed in a road crash if you were to drink walk? DU: Hoe aannemelijk is het dat jij serieus gekwetst of gewond raakt bij een verkeersongeval als je loopt wanneer je dronken bent. ENG2: How likely is it that you will be seriously offended or injured at a traffic accident when you walk drunk?

ENG: How likely is it that other people of similar age to you will be hurt or injured in a road crash if they were to drink walk? DU: Hoe aannemelijk is het dat leeftijdsgenoten zich bezeren of gewond raken bij een verkeersongeval als ze dronken zouden rondlopen? ENG: How plausible is it that peers would get hurt or injured in a traffic accident if they would be walking around intoxicated?	ENG: How likely is it that other people of similar age to you will be hurt or injured in a road crash if they were to drink walk? DU: Hoe aannemelijk is het dat andere mensen, van dezelfde leeftijd als jij, gekwetst of gewond raken bij een verkeersongeval als zij liepen als ze dronken waren? ENG2: How likely is it that other people, of the same age as you, will be offended or injured at a traffic accident when they walked when they were drunk.
ENG: How likely is it that other people of similar age to you would be seriously injured or killed in a road crash if they were to drink walk? DU: Hoe aannemelijk is het dat leeftijdsgenoten ernstig gewond raken of overlijden als ze dronken zouden rondlopen? ENG2: How plausible is it that peers would get seriously injured or decease if they would be walking around intoxicated?	ENG: How likely is it that other people of similar age to you would be seriously injured or killed in a road crash if they were to drink walk? DU: Hoe aannemelijk is het dat andere mensen, van dezelfde leeftijd als jij, serieus gewond raken of om het leven komen bij een verkeersongeval als zij liepen als ze dronken waren? ENG2: How likely is it that other people, of the same age as you, will get seriously injured or die at a traffic accident when they walked when they were drunk.
ENG: If you were to drink walk, how much would you worry about being involved in a road crash? DU: Als je dronken rond zou lopen, hoe erg zou je je dan zorgen maken over betrokken raken bij een verkeersongeval? ENG2: When walking around intoxicated, how much would you worry about getting into a traffic accident?	ENG: If you were to drink walk, how much would you worry about being involved in a road crash? DU: Als jij loopt wanneer je dronken bent, hoeveel zorgen maak jij je dan dat je betrokken zal raken bij een verkeersongeval? ENG2: How much do you worry about getting involved when you walk drunk?
ENG: To what extend would you be anxious about being involved in a road crash when drink walking? DU: In hoeverre zou je angstig zijn om betrokken te raken bij een verkeersongeval als je dronken rond zou lopen?	ENG: To what extend would you be anxious about being involved in a road crash when drink walking? DU: In hoeverre ben je er bang voor dat je betrokken raakt bij een verkeersongeval als je loopt wanneer je dronken bent?

ENG2: To what extent would you be anxious about getting into a traffic accident when walking around intoxicated?	ENG2: To which extent are you afraid that you will be involved with a traffic accident when you walk drunk.
University peer group norm	
ENG: How much do you agree with the following statements about other UT university students' opinions of drink walking…? DU: In hoeverre ben je het eens met deze uitspraken over de meningen van andere UT studenten in relatie tot dronken rondlopen? ENG2: To what extent do you agree with these statements from other UT students related to walking around intoxicated?	ENG: How much do you agree with the following statements about other UT university students' opinions of drink walking…? DU: In hoeverre ben jij het eens met de volgende stelling over de mening van andere UT studenten met betrekking tot het lopen als je dronken bent? ENG2: To which extent do you agree with the propositions of other UT students in regard to drunk walking?
ENG: Other students at my university think that I should not drink walk. DU: Andere studenten aan mijn universiteit vinden dat ik niet dronken rond moet lopen. ENG2: Other students at my university think I should not be walking around intoxicated.	ENG: Other students at my university think that I should not drink walk. DU: Andere studenten van mijn universiteit denken dat ik niet moet lopen als ik drunken ben. ENG2: Other students of my university think I should not walk when I am drunk
ENG: Other students at my university would approve of me drink walking. DU: Andere studenten aan mijn universiteit zouden het goedkeuren als ik dronken rond zou lopen. ENG2: Other students at my university would approve if I would be walking around intoxicated.	ENG: Other students at my university would approve of me drink walking. DU: Andere studenten van mijn universiteit keuren het goed dat ik loop als ik drunken ben. ENG2: Other students of my university approve me drunk walking.
ENG: Other students at my university think that drink walking would be a good thing to do. DU: Andere studenten aan mijn universiteit vinden dat dronken rond lopen een goed idee is. ENG2: Other students at my university think that walking around intoxicated is a good idea.	ENG: Other students at my university think that drink walking would be a good thing to do. DU: Andere studenten van mijn universiteit denken dat lopen als je dronken bent het juiste ding om te doen. ENG2: Other students of my university think that walking drunk is the right thing to do

ENG: Other students at my university would drink walk. DU: Andere studenten aan mijn universiteit zouden dronken rondlopen. ENG2: Other students at my university would walk around intoxicated themselves.	ENG: Other students at my university would drink walk. DU: Andere studenten van mijn universiteit zullen ook lopen als ze dronken zijn. ENG2: Other students of my university will walk when they are drunk.

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