Thinking about drinking

Explaining drinking behaviour by drinker prototypes

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Denken aan drinken:
Verklaren van drankgebruik door imago's van drinkers

Proefschrift

ter verkrijging van de graad van doctor
aan de Erasmus Universiteit Rotterdam
op gezag van de rector magnificus

Prof. dr. H.A.P. Pols

en volgens besluit van het College van Promoties.

De openbare verdediging zal plaatsvinden op
14 november 2014 om 13.30 uur

door

Britt van Lettow
geboren te Rotterdam

ERASMUS UNIVERSITEIT ROTTERDAM

PROMOTIECOMMISSIE

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General introduction

BACKGROUND

Prevalence of excessive drinking

Worldwide, about 11.5% of drinkers engage in weekly heavy episodic drinking.[1] Heavy or excessive drinking is defined as consuming 60 or more grams of pure alcohol[2]; equal to 6 or more standard glasses.[3] In the Netherlands[4] and many other countries, excessive drinking is especially prevalent among adolescents and young adults (18–25 years old, 20%). In the general population, the prevalence and consumption is higher among males (15.4%) than females (10.5%).[1,3] Furthermore, higher educated people (90%) report a higher prevalence of alcohol use after the age of 34 than lower educated people (66%), irrespective of gender.[5] However, excessive drinking is generally more prevalent among lower educated individuals (18%) than higher educated individuals (10%), except in the age groups of 25–34 and 65+. This difference has slightly decreased during the years 1990-2008.[5] The prevalence is also slightly higher among Dutch-born persons (13.6%) than Western immigrants (12%) and who, in turn, report a higher prevalence than among non-Western immigrants (8.8%).[3] Although the patterns are similar when focusing on different generations, the prevalence is higher for second generations than for first generations of immigrants.[3]

The total amount of alcohol per capita in the general Dutch population has increased since the sixties, with its peak in the eighties. It stabilised in the nineties. Excessive drinking has decreased by 4% since 2001. Binge drinking has remained stable since 2003 for adolescents (12–16 years old), but decreased from 36% in 2003 to 26% in 2009 among all young people.[6] Simultaneously, the number of hospital admissions among adolescents aged 16 or younger increased with 300%.[6]

Consequences and costs

The prevalence of excessive alcohol use is a major public health problem because of the negative short-term and long-term health effects and social and economic consequences.[2] Alcohol use is the second largest risk factor for disease burden in Europe and the world's third largest risk factor.[2] Each year, 2.5 million deaths worldwide are related to the harmful use of alcohol. In addition, worldwide 4% of deaths among the general population[7] and 9% of deaths among people aged 15–29 years old are deaths due to alcohol-related causes.[2] Diagnoses of alcohol abuse and dependence peak at approximately 16.8% for young adults (ages 18–25).[8] Consistent evidence reveals that higher alcohol consumption during late adolescence tends to continue into (young) adulthood.[9] Young adults can experience several problems due to their alcohol use during adolescence, such as alcohol problems including dependence,[10] overweight, obesity, high blood pressure, and unsafe driving practices.[9] Excessive drinking can furthermore affect quality of life[11] and cause other social and behavioural problems such as trouble with police, friends, or parents, injuries, unsafe sex and physical fights.[12] Heavy drinking and/or alcohol dependence cause high costs in high-income countries.[13] In the Netherlands, costs are estimated at 3.7 billion euro for 2011, which included

costs for employment (productivity loss, sick leave), crimes and offense (justice costs, court cases, assaults, traffic injuries), and addiction treatment and healthcare.[7]

The various detrimental effects of excessive alcohol abuse make its prevention vital. Therefore, it is important to first improve our understanding of reasons for excessive drinking and, secondly, to find ways to change this problematic behaviour. This introductory chapter provides a general background and rationale for the studies included in this thesis. First, theory explaining drinking behaviour and related issues are discussed. Then, possible new strategies are presented for interventions aiming at reducing excessive drinking. Finally, the study aims and research questions are stated.

INCREASING OUR UNDERSTANDING OF EXCESSIVE DRINKING: THEORIES AND EARLIER PREVENTION EFFORTS

Theories, prevention efforts and related issues

It is necessary to first increase our understanding of excessive drinking before interventions aiming at preventing or reducing excessive drinking can be developed. Relevant determinants need to be identified. Many models, such as social cognitive models, provide theoretical frameworks explaining drinking behaviour.[14-17] For instance, cognitive social learning theory suggests that individuals form beliefs and attitudes, and model their behaviour based on what they observe.[18] Affective beliefs have been found to guide goal-directed behaviour.[19,20] In addition, the Theory of Planned Behaviour (TPB)[15] suggests that behaviour is guided by the intention to engage in the behaviour. Intentions are in turn explained by attitude (i.e. perceptions of pros and cons of behaviour), perceived behavioural control (i.e. PBC, perception of one's capability to overcome barriers), and social norms (i.e. the perception of others' behaviour or approval).[15] These three TPB components have been simultaneously or separately related to intentions[21,22] and have been found to explain behaviour through their effect on intentions.[23,24] If behaviour is intentional, it can be regarded as a goal-state.[25,26] In other words, this model assumes that behaviour is goal-directed. Reviews revealed that the TPB accounts for 27% and 39% of explained variance of behaviour and intentions, respectively.[27] Thus, intentions are better explained by the TPB than behaviour is. It should also be noted that behaviour becomes more intentional as people age or gain more experience with certain behaviour.[28]

The I-Change Model integrates several social cognitive theories and models.[29,30] This model and the Stages of Change Model[31] suggest that, for self-regulatory goal-directed behaviour change to succeed, there are several phases of motivational change. The I-Change Model distinguishes the pre-motivational, motivational, and post-motivational phase. Each phase involves its corresponding determinants and strategies that can lead individuals from one phase to the next[29] before intention can guide behaviour. Assumed is that awareness of risk should be established first. De Vries and colleagues found that risk perceptions might influ-

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ence (the impact of) other health-related cognitions such as attitudes, self-efficacy and intentions on health behaviour.[32] In addition, having a positive perception of subjective norms is important in this process.[19]

Of interest are previous studies showing that risk behaviours can occur with or without intentions or even while intending *not* to engage in the behaviour.[e.g. 26,33] Especially those behaviours that might be perceived as socially unacceptable might be less intentional. They might be guided by other processes such as social reactive processes through the effect of behavioural willingness.[26] Behavioural willingness refers to an 'openness' to risk situations.[17,26] In other words, especially younger people might not plan to engage in certain behaviours, but still do so because many risk behaviours are facilitated or prompted by external stimuli or (social) situations. These situations might lead to willingness to engage in the behaviour.[26] For instance, intended condom use might often fail in the heat of the moment. As a result, people might be willing to have unprotected sex.[34,35] Goal-theories such as the TPB have been shown to better explain socially acceptable (healthy) behaviour (e.g. screening) than risk behaviour (e.g. unsafe sex or excessive drinking).[26,36]

A substantial amount of studies and interventions have been developed throughout the years to understand and deal with those determinants aiming at delaying the onset of drinking or reducing excessive drinking. Evidence of intervention effectiveness has generally been mixed and studies differ in methodological quality.[37,38] However, only half of those interventions based on the goal-striving TPB components effectively changed intentions and two-third changed behaviour, producing only small effect sizes.[39] Medium-to-large changes in intentions have been shown to lead to small-to medium changes in behaviour only.[40] Therefore, determinants in social cognitive models might not be sufficient. Thus, there is room for improvement and a need for additional explanations.

One of the efforts of current interest is to study behaviour by dual-process models. These models acknowledge two different routes that guide behaviour, distinguishing between explicit (intentional, goal-directed) and implicit (associative, social reactive) information processing pathways or routes.[e.g. 17,41] Some authors have suggested that implicit non-intentional processes might add to the prediction of risk behaviour,[35] or better predict it, than explicit processes.[e.g. 42] However, according to dual-process models, focusing on both routes might be more effective at explaining and changing (young) people's health behaviour than interventions based on the explicit route only.[35] Knowledge about the implicit route, especially when incorporated in interventions, is less thorough. It is therefore important to increase our understanding of the implicit route and to test its additional value in interventions targeting excessive drinking behaviour among (young) adults.

A possible other explanation of (risk) behaviour: Prototype Willingness Model (PWM)

One such dual-process model is the Prototype Willingness Model (PWM).[17,33] The PWM has been successfully applied in explaining risk behaviours such as drinking behaviour.[33] The PWM assumes that these two pathways can, and often do, operate simultaneously to guide behaviour. In the explicit reasoned route, behaviour is the result of intention, which, in turn, is guided by attitude and social norms. In the implicit reactive route, behaviour is the result of behavioural willingness, attitudes and social norms. Finally, the determinant 'prototype' is assumed to guide behaviour through its association with willingness. Prototypes refer to the perception of typical persons engaging in or abstaining from certain behaviour[26,33] such as a typical drinker or non-drinker. In addition, prototypes have also been related to intentions.[e.g. 43,44] Prototypes have been found to explain intentions and behaviour over and above the influence of social norms, attitude, and PBC.[e.g. 43,45] The PWM is a promising model to help explaining excessive drinking among young adults.

Prototypes (i.e. social images) are assumed to guide behaviour through social comparison processes.[46,47] That is, people are aware that if they engage in particular behaviour, they will be viewed by others as having the characteristics of the prototype. In other words, people are aware that drinking has (social) consequences that might alter others' perceptions of them.[48] Prototype research has therefore focused on the predictive value of two components of the prototype perception: favourability and similarity. 'Prototype favourability' refers to the extent to which a prototype is positively or negatively evaluated by a person and has been found to explain drinking behaviour. Prototypes that are perceived as having undesired characteristics might play an inhibiting role.[34,49] Examples of undesired characteristics ascribed to a heavy drinker prototype are for instance: annoying, uncontrolled, spontaneous, and foolish.[50] Individuals holding a more favourable perception of a certain prototype are generally more willing to engage in the corresponding behaviour, should such an opportunity arise.[33,51] Alternatively, individuals will favour prototypes of behaviours that they already engage in.[49] 'Prototype similarity' refers to perceived similarity of the prototype to the self. Thus, some prototypes might act as 'role models' that persons desire to identify with, in line with Bandura's social cognitive theory.[52] Positively evaluated prototypes might be desired self-images and might serve as goal-states to become similar to.[34,43,53] The more individuals identify with (i.e. feel similar to) the prototype, the more likely the engagement in the behaviour corresponding to the proto-
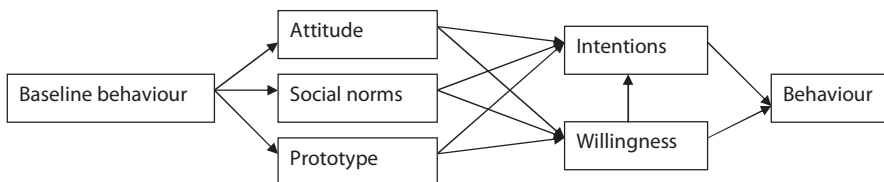

Figure 1. Prototype Willingness Model[17,26,33]

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type.[45,54] Simultaneously, distancing (i.e. dissimilarity) from undesired prototypes thus might inhibit behaviour.[47,49,55,56] Both favourability and similarity have been found to be important determinants of behaviour, willingness, intention, and drinking behaviour.[44,49,57] Though, some suggest that similarity might explain (excessive) drinking better than favourability does.[43,44]

STRATEGIES TO CHANGE BEHAVIOUR

Interventions are scarce that aim at changing excessive drinking among (young) adults by means of prototype alteration and have never been conducted in the general adult population. Additionally, the use of a cue reminder, referring to certain objects, might help individuals remember their goals, intentions, or content of programs.[58-60] Both prototype alteration and cue reminders are of current interest, and might be useful in complementing interventions. The latter might work in isolation or support a prototype alteration strategy.

Behavioural change strategies: Prototype alteration

Prototypes are of particular interest because experimental research has found that changing the perception of prototypes can be a promising strategy to change behaviour.[34,53,61-63] Experimental studies have shown that manipulating prototype adjectives can result in changes in drinking behaviour, sexual behaviour, and exercise.[e.g. 34,61,62] However, the results of several experimental studies, based on the PWM, have been mixed. Only three interventions have been conducted aiming at reducing or preventing excessive drinking. The first intervention resulted in longer delays of onset and reduction of alcohol consumption among 10-12 year old children in the experimental group compared to children in the control group. This intervention had an effect of up to two years.[53] The second intervention, targeting female undergraduates, did not result in less binge drinking among the intervention group compared to the control group.[64] The third intervention, targeting binge drinking among 6th form pupils, resulted in reduced binge drinking in the intervention group compared to the control group. The intervention group was assisted in overcoming the impact of prototypes on drinking behaviour by guiding them in formulating implementation intentions (if-then plans).[65] The latter results suggest that, at least for young people's binge drinking, implicit or automatic routes to behaviour might warrant greater consideration alongside the more intentional or reflective route that are specified in traditional health behaviour theories.[65,66] It remains unclear whether prototype alteration is a better strategy for changing behaviour, intentions, and willingness than strategies based on other social cognition models.

At the start of our studies, little was known regarding the predictive value of various drinker prototype perceptions that could help explain drinking behaviour among young adults. That is, previous research has mostly focused on a general drinker prototype or focused on a heavy drinker and an abstainer prototype[e.g. 43,49,67,68] (further referred to as the 'common prototypes'). The PWM, including these common prototypes, was originally developed to

explain for young people's behaviour, first applied more often to adolescents and later to young adults, too. It is important to identify those prototypes that young adults feel similar to and that are relevant for them, because especially perceived similarity to prototypes, more so than favourability, plays a significant role in explaining behaviour.[43,44] However, the common prototypes might not be equally relevant for young adults. They might hold a variety of drinker images because of the behavioural experience they gained while growing up. Behavioural experience partly shapes the prototype formation.[17] Therefore, the studies in this thesis examined whether young adults differentiate between various drinker prototypes and how these prototypes relate to drinking behaviour, intentions, and willingness.

Behavioural change strategies: Cue reminders

Cue reminders are of particular interest because, when made salient, cue reminders can impede impulsive behaviours and off-set impelling cues that are present in the environment.[59,69] Reduced alcohol consumption in social drinking situations might be achieved by increasing a persons' self-efficacy and skills to control alcohol consumption, and to resist environmental pressure.[60] An association is assumed to be established between the cue reminder and the intervention or goals.[e.g. 60] Providing individuals a cue reminder might be a successful strategy to help them remember their intentions, their action plans[e.g. 70] (i.e. actions necessary to prepare for behavioural change),[e.g. 71,72] and the content of interventions.[60] This strategy might subsequently contribute to behavioural change or maintenance.[e.g. 59,60]

Some experimental studies found that cue reminders might be a useful strategy to include in interventions. Studies found that the provided cue reminder (a hand stamp or silicon bracelet) was a promising means for changing unsafe sexual behaviour (even among intoxicated people),[59,69] drinking behaviour ('power-button' and smiley),[60,69] and nail biting.[73] Text messages have also been used as a type of cue reminder, for instance for medical adherence,[74] and to remember goals such as exercise,[58] smoking cessation,[75] and improving sexual health.[76] At the start of this study, there was limited insight regarding the effectiveness of cue reminders, especially on the effectiveness of cue reminders other than text messages.

DEVELOPMENT OF AN ONLINE INTERVENTION AIMING TO REDUCE EXCESSIVE ALCOHOL CONSUMPTION

For several reasons there has been a growing interest in delivering prevention effort by means of computer-based or online interventions.[77] In general, stand-alone computer-based interventions, aiming at improving lifestyle, can be more effective compared to no-contact interventions or assessment only.[77,78] A substantial 80% of the heavy drinkers does not seek any formal treatment at all.[79] However, online or computer-based interventions can attract a large number of individuals motivated to reduce their drinking behaviour[e.g. 80,81] besides hard-to-reach populations. Computer-based or online interventions have been successful at

lowering alcohol consumption[38,81] and negative consequences of consumption.[82] They can be cost-effective and might require comparatively few resources to develop and administer.[e.g. 83,84]

The aim of this intervention was to develop strategies of behavioural change incorporating prototype alteration and cue reminders. These strategies were embedded in an existing online screening instrument: Drinktest.nl. The Drinktest is based on the TPB and targets the general adult population. It was developed by the Netherlands Institute for Health Promotion and Disease Prevention (NIGZ), but is now owned by Mentalshare. Drinktest is a single 10-minute online session. Tailored feedback is provided without involvement of a therapist, based on the user's alcohol consumption. Drinktest includes several modules: an overview of individuals' average weekly alcohol intake, associated health risks, self-help guidelines to reduce alcohol intake, and normative feedback to compare one's own alcohol consumption to the level of one's cohort. A first version has been found to only effectively reduce alcohol consumption in women, but not in men.[85] Because men generally drink more than women,[3] Drinktest 2.0 was developed to also effectively target men. Drinktest 2.0 succeeded in effectively reducing adult males' drinking behaviour at one-month follow-up in an experimental setting, but was no longer effective at six-months follow-up.[86] Drinktest includes modules based on the explicit information processing route. However, the implicit route might provide additional information explaining excessive drinking. Therefore, the current purpose was to extend Drinktest by incorporating variables from the PWM.

Facilitating change and Drinktest

In order to facilitate change, the I-Change Model[29,30] and others suggest that individuals first need to be motivated to reduce their alcohol consumption. To be motivated, they need to be aware of their risk. As a result, feedback is necessary to address risk perception, increase knowledge, address subjective norms, and to alter attitudes.[31,87] Drinktest has accomplished this by providing tailored risk information, comparing pros and cons of behaviour, and providing tailored information on descriptive norms.

Tailoring is especially important in the development of this intervention for several reasons. For instance, people from the general population are likely to differ in their motivation to drink or to reduce drinking. Also, when a person has decided to act, he needs to be highly motivated or ready to change.[19,31] The readiness might differ among individuals. Drinktest takes readiness to change into account by tailoring the feedback and by incorporating different stages of change, as suggested by the I-Change Model[29,30] and Stages of Change Model.[31]

After motivation has been established, it is important to facilitate change. Action planning[72] of sound quality,[71] receiving high levels of social support, having a positive perception of subjective norms,[19] and empowering self-efficacy,[32] might be factors helping individuals move from motivation to enactment.[87,88] These strategies might help prevent relapse of the changed behaviour. Drinktest provides tailored feedback regarding current behaviour, which might help to identify potential and relevant changes. However, Drinktest can be extended by guiding individuals in choosing relevant and realistic behavioural change and helping them in forming action plans.

Furthermore, it is important to incorporate the implicit processing route by including prototype alteration. This can potentially be achieved by asking individuals to contemplate on prototypical characteristics. Distancing the self-image with the heavy drinker prototype and encouraging similarity to desired healthy images, might be important targets. Because cue reminders have been found to support change in goal-directed behaviour,[58,89] a bracelet as cue reminder might help individuals remember their goals and plans. In addition, a cue reminder might be able to help individuals remember the prototype characteristics they can achieve or avoid by making them more salient. Previous studies were used as guidance for tailoring the information[90,91] and to develop the feedback on prototype characteristics.[92-94]

Evaluating intervention effects

An evaluation study is needed to determine the effectiveness of the two strategies. Therefore, a randomised controlled trial was performed including four study arms. Such designs usually compare the new intervention to a waiting list of general program. In this study, the existing tailored program 'Drinktest.nl' was being compared to the new intervention that includes the original Drinktest and additional modules including tailored feedback on prototypes in order to alter the prototype perception and/or the provision of a cue reminder.

The intervention was evaluated regarding primary and secondary outcomes. The primary outcomes of the intervention were changes in excessive drinking behaviour, intentions, and willingness during a one- and six-month follow-up. The secondary outcomes were: contemplation of intervention content and perceived attempts of changing alcohol consumption, and TPB variables. It was expected that the new modules that were added to the original Drinktest.nl would improve the effectiveness of achieving the intervention goals. Respondents participating in the original Drinktest group were expected to show less change in the outcomes than respondents in one of the groups that received the additional modules. In other words, it was expected that the additional modules would enhance the effectiveness of the original Drinktest. However, it was expected that the combination of both prototype alteration and the cue reminder would be more effective than either strategy alone.

AIMS AND RESEARCH QUESTIONS

Prevention and reduction of excessive alcohol use is important, especially among young adults amongst whom this behaviour is most prevalent. Prototype alteration and use of cue reminders might be promising for interventions targeting health-related behaviour. Two main aims are addressed in this thesis:

1. To increase the understanding of the role that prototypes play in explaining (drinking) behaviour;
2. To determine the effects of prototype alteration and cue reminders as behavioural change strategies in addition to an existing intervention on alcohol use

Three research questions were posed to address the first aim. First, it is important to understand the mechanisms by which prototypes explain behaviour and antecedents. The first research question is 'How do prototype perceptions relate to health-related behaviour and motivation (intentions, willingness)?' Secondly, in order to incorporate prototypes in interventions it is important to understand which (alternative) prototypes needs to be targeted and which prototype characteristics are relevant. This information is necessary to develop interventions addressing both the implicit and explicit route of information processing. Therefore, the second research question is 'Do young adults distinguish between several drinker prototypes in terms of characterisation, their favourability, and perceived similarity to the self?' Next, it is important to examine how these prototypes explain behaviour within the PWM. Therefore the third question is 'Do alternative prototypes provide additional predictive value over the commonly assessed prototypes?' Finally, the second aim of this thesis is addressed by the research question 'Are the strategies using prototype alteration and/or a cue reminder an effective extension of an existing intervention?'

OUTLINE OF THIS THESIS

This thesis describes a series of studies performed to answer the research questions. **Chapter 2** reviews the influence of commonly assessed prototypes on health-related behaviours and antecedents by means of meta-analysis. **Chapter 3** describes the results of a cross-sectional study examining how young adults characterise various drinker prototypes. This chapter also shows how various prototypes can differ in relevance for respondents varying in gender, educational level and drinking behaviour. **Chapter 4** combines a cross-sectional and prospective study in determining whether young adults distinguish between the prototypes in terms of prototype favourability and perceived similarity to the self. **Chapter 5** is based on the prospective study, describing the results of the prototypes embedded in the PWM. The alternative prototypes were tested against the commonly assessed prototypes to examine their additional value. **Chapter 6** describes the moderating role of stability of prototype perceptions regarding the prototype-intention and prototype-behaviour associations, within an extended TPB.

The knowledge gained from the studies described in **Chapter 2 to 6** was used to support the development of the intervention modules. **Chapter 7** determines the effects of prototype alteration and cue reminders in targeting excessive alcohol use by means of an online tailored intervention. Finally, **Chapter 8** provides a general discussion interpreting the overall results of the presented studies.

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2

Quantifying the strength of the associations of prototype perceptions with behaviour, behavioural willingness, and intentions: A meta-analysis

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ABSTRACT

Prototypes (i.e. social images representing perceptions of typical persons engaging in or re-fraining from certain behaviour) have been shown to explain health-related behaviours. The present meta-analysis quantified the strength of the associations of prototype perceptions with health motivation and behaviour. Specifically, the analysis addressed (1) the relationship of prototype favourability (i.e. degree of likability) and similarity (i.e. perceived resemblance to the self) with behaviour, willingness, and intentions; (2) the effect of the interaction between favourability and similarity; and (3) the extent to which health-risk and health-protective prototypes differed in their association with these outcomes. A total of 80 independent stud-ies were identified based on 69 articles. The results indicated that prototype favourability and similarity were related to behaviour, intentions, and willingness with small-to-medium effect sizes ($r_+ = 0.12–0.43$). Direct measures of prototype perceptions generally produced larger effects than indirect measures. The interaction between favourability and similarity produced small-to-large effect sizes ($r_+ = .22–.54$). The results suggest that both health-risk and health-protective prototypes might be useful targets for interventions ($r_+ = .22–.54$). In order to increase health-protective behaviours, intentions and behaviour could be targeted by increasing similarity to health-protective prototypes. Health-risk behaviour might be decreased by targeting willingness by modifying health-risk prototype favourability and similarity.

INTRODUCTION

Various studies have found that prototype perceptions explain health-related behaviours, such as drinking, smoking, eating behaviour, and exercise.[e.g. 1,2] The present meta-analysis focuses on the value of prototypes in explaining health-related behaviour and motivation (i.e. behavioural willingness and intentions).

Defining prototypes

Prototypes are social images representing the perception of a typical person engaging in or abstaining from certain behaviour,[3,4] such as a typical drinker, smoker, exerciser, (un)healthy eater, or non-smoker. Prototypes can serve self-regulative functions[5] and inhibit or facilitate behaviour.[2] Prototypes are held to represent desirable or undesirable features such as being 'sociable,' or 'annoying'.[6] Assimilating or identifying with or distancing from a prototype by adapting behaviour to it is thought to enable individuals to achieve or avoid the social outcomes or features associated with the prototype.[3] Thus, positively evaluated prototypes might become goal states to become similar to in order to achieve associated positive outcomes (i.e. assimilation).[2,5] Similarly, individuals might avoid characteristics of the prototype (i.e. distancing).[3,7] This process is also related to vicarious learning described by Bandura,[8] although it does not involve learning a particular outcome but rather the set of outcomes related to a particular prototype. Consequently, behaviour can be influenced by prototypes that serve as role models, which is consistent with Bandura's social cognitive theory.[9] Thus, prototypes may guide behaviour through social comparison processes.[7]

The Prototype Willingness Model

The Prototype Willingness Model (PWM) describes how prototype perceptions may guide behaviour.[3,4] The PWM is a dual-process model that proposes two pathways of information processing to explain behaviour. The first is the reasoned pathway in which behaviour is the result of intentional decision-making. Intentions encompass individuals' motivations or decisions to perform or refrain from particular actions.[10,11] Intentions are produced by attitudes (i.e. the perception of pros and cons of behaviour) and social norms (i.e. a behaviour's perceived advantages and disadvantages).[11] This pathway is similar to the Theory of Reasoned Action[12] and other related integrative models, such as the I-Change Model[13] and Health Action Process Approach (HAPA) Model.[14] The second pathway is the social reaction pathway, which is operationalised by behavioural willingness (hereafter referred to as 'willingness'). Because many risk behaviours are not entirely intended, this pathway captures the non-intentional behaviours facilitated or prompted by external stimuli or social situations that make individuals 'willing' to engage in these behaviours.[5] In the original PWM, prototypes explain behaviour only through willingness. However, several PWM studies have found that prototypes also explain intentions[e.g. 1,15] and behaviour.[e.g. 16,17] Thus, prototypes relate to behaviour directly and indirectly through their effect on willingness and intentions.[e.g. 18] Moreover, prototypes

explain health-related behaviour in addition to psychosocial factors embedded in other social cognitive theories, such as the Theory of Planned Behaviour (TPB),[1,2,15] that focus on the reasoned pathway.

Understanding the roles of prototypes

To improve our understanding of prototypes' role in explaining health-related behaviour, the present meta-analysis addressed two issues: (1) the relative contributions of prototype favourability and similarity and (2) the impact of health-risk and health-protective prototypes.

First, prototype favourability and similarity are prototype perceptions that have been investigated as determinants of behaviour, willingness, and intentions. Prototype *favourability* refers to the extent to which a prototype is evaluated positively or negatively. Although evaluations have been measured in other ways, favourability is generally assessed by rating adjectives relating to the prototype, for instance, how 'cool' the prototype is. Prototype *similarity* refers to the extent to which a prototype is perceived as similar or dissimilar to the self,[e.g. 2] which is usually directly assessed by asking 'how similar are you to the [prototype]'. Favourability and similarity are usually investigated separately. They are thought to be important but distinct mechanisms.[e.g. 3,19] Higher prototype favourability and similarity are assumed to be related to the increased likelihood that individuals will actually engage in the behaviour or will exhibit the willingness or intention to engage in the health-related behaviour associated with the prototype.[2,17,19] However, their effects are thought to differ. For example, their effects do not necessarily align.[e.g. see 19] In addition, although some interventions and experiments have found that altering prototype favourability can effectively change (risk) behaviour,[e.g. 20,21] other studies have found that prototype similarity is more strongly related to risk behaviour than favourability.[e.g. 1,2] Self-consistency motivations may be at play, which leads individuals to engage in the behaviour because their self-image is similar to the relevant prototype.[1,22] Furthermore, some researchers have suggested that the effect of prototype favourability might be greater when individuals identify with the associated prototype.[3] However, findings regarding the effect of this interaction are inconsistent.[e.g. 1,2,23] One goal of the present meta-analysis is to provide insights into the nature of this interaction effect.

Second, it is necessary to assess the potentially different effect sizes of the associations of health-risk and health-protective prototypes with health-related behaviours, willingness, and intentions. *'Health-risk prototypes'* can be regarded as images of persons engaging in health-risk behaviours and/or avoiding health-protective behaviours, such as the typical drinker and the typical sedentary individual.[e.g. 2] *'Health-protective prototypes'* are images of persons engaging in health-protective behaviours and/or avoiding health-risk behaviours such as the typical exerciser, healthy eater, or individual practicing safe sex.[e.g. 20,24]

PWM relationships have been found to vary according to types of behaviour.[25] Although the PWM originally focused on health-risk behaviour and health-risk prototypes, both types of prototypes have been found to be important in explaining behaviour.[e.g. 2] Health-risk and health-protective prototypes may influence behaviour in different ways.[e.g. 19,26] In addition,

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the strength of the associations of health-risk and health-protective prototypes with health-related outcomes may differ. Some authors have suggested that health-risk prototypes are more informative or motivating and exhibit stronger associations with behaviour because they are more salient than other prototypes.[5,20] Moreover, although some studies have found that health-protective prototypes are more likely to represent a goal state than health-risk prototypes,[26] others have found that both types can represent goal states that facilitate or inhibit behaviours.[2] Unfortunately, research assessing the relative impact of both types of prototypes is limited. Although researchers have proposed explanations of observed differences in the strength of associations of health-risk and health-protective prototypes with health-related outcomes, clear and consistent empirical evidence is still lacking. The present meta-analysis provides the opportunity to identify the different patterns exhibited by health-risk and health-protective prototypes in relation to behaviour, willingness, and intentions.

Study aims

In summary, this meta-analytic review quantified the strength of the relationship of prototype perceptions and behaviour and health motivation (i.e. willingness and intentions). To determine the role of prototypes, three key issues were addressed. First, the study assessed the associations of favourability and similarity with behaviour, willingness, and intentions. Second, the study examined the combined (interaction) effect of favourability and similarity. Third, the study assessed the extent to which health-risk and health-protective prototypes differed in their associations with behaviours, willingness, and intentions. Consequently, the study results are first presented for health-related prototypes and outcomes and then for health-risk and health-protective prototypes and outcomes separately.

Finally, the meta-analysis explored two methodological issues. First, because different study designs have previously produced different effect sizes regarding the association between intentions and behaviour,[27,28] the effects of prototypes in experimental designs (that include interventions and experiments) are described. Then, associations were tested comparing two different study designs: (1) correlational studies and (2) experimental designs (including interventions and experiments). This method was used to prevent misinterpretations of correlational and experimental data. Consequently, drawing causal unwarranted conclusions can be prevented that would otherwise derive from a combination of all types of studies including cross-sectional studies.[29] Second, prototypes are generally measured in a direct or indirect way (see the method section below). Examining the differences associated with different types of measures will potentially enable us to identify optimal methods for future studies.

METHODS

Eligibility criteria

Studies were included if they met the following criteria: (1) studies reported a relation of either prototype favourability or similarity with behaviour, intentions, and/or willingness; (2) studies focused on at least one health-risk (e.g. drinking) or health-protective behaviour (e.g. exercise); (3) studies included respondents from community-based populations such as primary or high school or university students (e.g. a study including only bulimic patients would be excluded); (4) the article was written in English; (5) the article reporting the study was published or in press in a peer-reviewed journal between 1 January 1990 and 1 April 2013. The initial date of 1990 was selected because studies investigating the PWM and TPB models have typically been published after 1990. Following recommendations in the literature,[30] dissertations and other unpublished materials were excluded to ensure the quality of included studies.

Information sources and search

Searches were performed in the PsycINFO, Medline, Web of Science, PubMed, Embase, and Google Scholar data bases, using combinations of the following key words: (1) prototypes, (2) stereotypes, (3) social images, (4) behaviour, (5) intentions, (6) behavioural willingness, (7) behavioural expectations, (8) risky behaviours (e.g. smoking, drinking, unsafe sex, unsafe sun/tanning behaviour, substance use, drug use, drunk/reckless driving, unhealthy eating behaviour), (9) healthy behaviours (e.g. physical activity, exercise, safe sex, healthy eating, fruit and vegetable consumption, dieting, dietary behaviour, safe sun/tanning behaviour), (10) PWM, and (11) TPB. Key exclusion terms were added to exclude studies focusing on animals, brain, pharmacology, stigma, gender or sexual stereotypes, and academic achievements to avoid retrieving irrelevant studies. Publication lists of authors in search engines and personal websites were searched to identify articles that might have been missed in the initial search. Citation searches and reference lists of included articles were additionally scanned to identify any other missed articles. In addition, we contacted the authors of relevant conference abstracts to determine whether their presented research had been published. Similarly, we determined whether articles described in dissertations were published. Finally, authors with significant publications on this topic were contacted to identify additional in-press publications that might be eligible for inclusion. A final search was performed on 5 April 2013. Appendix A presents the search string used.

Data extraction

Effect sizes were calculated using the overall weighted effect size r_+. Effect sizes, r_+ and Cohen's d, are presented in the tables. If appropriate data were available, the r_+ was computed using means and standard deviations. If these data were unavailable, full intercorrelation matrices were used if available.[see 27,31] Otherwise, other data were used (e.g. F-values and

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t-values). Adjusted data were used if no other data were available. Authors of the studies included were contacted and asked to provide correlations when only adjusted data were reported (e.g. data adjusted for gender) or when a study presented the variables of interest but did not report data on the associations between prototypes and outcomes. In addition, authors were contacted to request other missing data such as study characteristics. If a study did not provide the mean age, and the authors were unable to provide the exact mean age, we reported an estimate (Appendix B).[see 27]

Measures and coding

Prototypes

Prototype favourability and similarity were the independent variables. *Prototype favourability* has been measured by a 'thermometer' approach that rates the prototype favourability on a scale (e.g. a 7-point or 100-point scale)[e.g. 1,2] or by rating the prototype using a list of adjectives.[e.g. 3] *Prototype similarity* has been measured on a scale rating the extent to which the individual feels similar to the prototype,[2] or by the difference between the self and the prototype where both are rated on a list of adjectives.[22] Studies focusing on stereotypes were also included in the analyses if their operationalisations fit the definition of prototypes. Each prototype was coded as a *'health-risk prototype'* or *'health-protective prototype'*.

The way of measuring prototypes was also coded as direct or indirect. 'Direct measures' refers to subjective evaluations of the prototype (e.g. thermometer type asking directly 'How similar/favourable…'). For favourability, measures using adjective lists were coded as 'indirect measures'. For similarity, measures of the comparison between the actual self and prototype adjectives were coded as 'indirect'.

Behaviour

Behaviour was typically self-reported and was usually indicated by engagement in or abstinence from the activity (such as the number of drinks during the past week or month).

Intentions

Variables were coded as intentions when the items used words such as *'intend,' 'plan,'*[e.g. 1] or described the *likelihood* that one would engage in the behaviour such as 'how likely is it that you will …'.[e.g. 32]

Willingness

If a variable was based on items that included phrases such as 'how *willing* would you be,' this variable was coded as willingness to engage in the behaviour.[e.g. 33]

Harmonisation of studies

Previous studies have used different operationalisations of intentions and willingness. To ensure harmonisation and comparability of the variables, the definitions of dependent variables

were based on operationalisations rather than the variable name. Consequently, a variable might be reclassified as 'intentions' rather than 'willingness' based on its operationalisation.[33] When a variable's focus was not clear, its coding was discussed until three raters reached agreement.

Study design

Study designs were coded either as (1) cross-sectional, (2) prospective (defined as prototype measurements at a time point preceding the behaviour, willingness, or intentions), or (3) experimental (including interventions and experiments). Thus, cross-sectional and prospective data were additionally coded as 'correlational'.

Data synthesis

The meta-analysis assessed the relationship between prototype favourability and similarity with health-related behaviour, willingness, and intentions, distinguishing between health-risk and health-protective prototypes. The first author reviewed each paper independently. Articles were included when three expert raters agreed that it was eligible. Appendix B presents the articles included, the operationalisations of the study variables, and variable reliability. Appendix C presents a list of the excluded studies and the reasons for their exclusion.

The following steps were taken in the meta-analysis. First, when two or more similar outcomes were reported (e.g. binge drinking and the total number of alcoholic drinks consumed weekly), the weighted mean of the outcomes was computed. Second, for comparisons, data were transformed so that higher scores represented higher levels of favourability, similarity, behaviour, willingness, or intentions. Third, when necessary, outcome measures were transformed so that health-protective prototypes relates to health-protective outcomes rather than health-risk outcomes. The same procedure was followed for health-protective prototypes and outcomes. Fourth, variables consisting of several groupings or dimensions of prototype adjectives (e.g. 'hedonism'[in 34]), were combined by calculating the weighted mean. Finally, sub-studies were combined to calculate the overall effect size for the study; the smallest N was used and reported in Appendix B.[see 27]

Statistical analyses

The Comprehensive Meta Analyses 2.0 program was used.[35] Overall weighted effect sizes (Pearson's weighted correlation, r_+) were estimated regarding the relationship between prototype favourability and similarity and behaviour, willingness, and intentions. Confidence intervals (CI) were used to identify significant differences: if the effect size of one effect falls outside the CI of the other effect, the effects can be regarded as significantly different. Meta-analyses were only performed if data of four or more independent studies (i.e. for the overall effect or for a study design) reported data on the association between a prototype perception and one or more outcomes. Effect sizes (i.e. correlations r_+) were identified as small (0.10), medium (0.30), and large (0.50).[36] The results of random models were reported

for two reasons.[see 31] First, a random effects model assumes that effect sizes vary across studies in a population. This was the case in the present analyses because the majority of the tests for homogeneity were significant. When Q is significant at the p < .05 level, the variation in study outcomes between studies is assumed to be heterogeneous. Second, a random effects model provides the most accurate estimates of the mean population effect size when effect sizes are heterogeneous.[37] Finally, the fail-safe N (FSN) was calculated to determine the robustness of the results. The FSN provides an estimate of the number of unpublished studies with null results that would be required to disprove the association.[38] When the fail-safe N is large relative to k (the number of observed studies), then the meta-analysis is robust in regard to publication bias. Table 1 presents the overall effects for each assessed association, regardless of study design, and presents the fail-safe number. Table 2 and 3 present the effects for experimental and correlational studies, respectively.

RESULTS

Search results and data availability

Figure 1 presents a flow chart illustrating the search strategy for study inclusion and exclusion. Overall, 3827 articles were identified through the database searches, and 27 articles were added due to searches based on articles' references, author websites, and articles
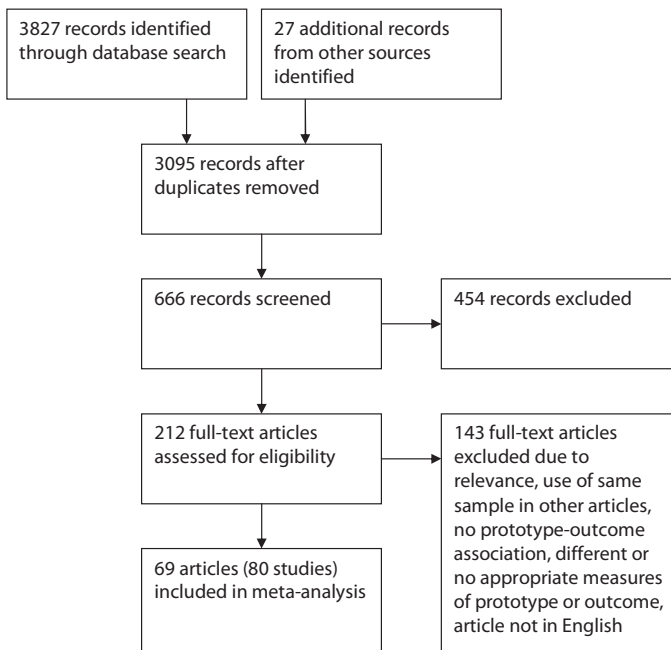

Figure 1. Flow chart illustrating the search strategy for study inclusion and exclusion

received from authors on request. After duplicates were removed and articles received from authors were added, 3095 articles were screened for relevance based on the article title. From those articles, 666 abstracts were screened. Finally, 212 full-text articles were screened using the inclusion criteria.

Prototypes that could not be compared to other included prototypes were excluded from the analyses. These involved only a social and a moderate drinker prototype[17,19] because the perception of these alternative prototypes differs substantially from abstainer and heavy drinker prototypes.[6]

For articles that were based on the same data set, such as the FACHS,[e.g. 39] SAAF,[e.g. 21] and OYSUP[e.g. 18] studies, the most informative publications were selected so that only independent studies were included in the analyses. For each of the three dependent variables (behaviour, willingness, and intentions), the most recently published article reporting cross-sectional associations was selected (if available). Then, for each dependent variable, the article with the longest follow-up period for prospective associations was selected (if available). If more than one article reported the same follow-up period for the same association, the more comprehensive article was selected (e.g. reporting on several of the dependent variables instead of one). A total of 69 articles were included in the analyses that met the inclusion criteria. Because several articles included more than one study, 80 independent studies were included in the analyses.

Altogether, 43 studies were conducted in the USA, 12 in the Netherlands, 9 in the UK, 15 in other European countries, and 3 in Asian countries. Fifty-four studies provided data on behaviour, 46 on intentions, and 22 on willingness. Moreover, two studies were exceptional because they included observed behaviour rather than self-reports.[17,40] The majority of studies assessed behaviour, intentions, or willingness for smoking ($k = 27$) and drinking ($k = 28$), followed by sexual behaviour ($k = 15$), exercise ($k = 6$), drug use ($k = 8$), sun protection ($k = 5$), eating behaviour ($k = 4$), driving behaviour ($k = 3$), and sleeping behaviour ($k = 1$). It should be noted that these are categories of behaviour so that, for instance, 'eating behaviour' also includes fruit and vegetable intake. Most analyses of health-risk outcomes thus consisted of a combination of drinking and smoking, in addition to several other behaviours. The total adds up to more than 80 because some articles reported on samples from several countries or several behaviours. One study included 14 health-related behaviours.[41]

Meta-analyses

When the associations of prototype perceptions with behaviour, willingness, and intentions were screened for outliers, no significant outliers were found. Table 1 presents the results for the associations of prototype favourability and similarity with behaviour, willingness, and intentions, first for health-risk and health-protective prototypes combined and then for separate analyses of risk- and protective prototypes. Interaction results are presented only for the combined analysis of health-related prototypes because there were too few available articles to perform separate analyses of health-risk and health-protective prototypes.

Table 1. Overall weighted correlations (r₊) between prototypes and behaviour, willingness, and intentions

Dependent variable	Prototype	Prototype measure	N	k	d(se)	r_+	CI₉₅% of r_+		Homogeneity analyses		
							Lower	Upper	Q	df	fail-safe
Behaviour	All	Favourability	23,510	38	.41(.06)	.20***	.15	.25	567.83***	37	8273
		Similarity	9256	17	.58(.15)	.27***	.14	.40	656.56***	16	2406
		Interaction	3354	12	.69(.11)	.32***	.23	.41	91.18***	11	1146
Health-risk behaviour	RP	Favourability	22,877	35	.45(.06)	.22***	.16	.27	561.23***	34	8297
		Similarity	8674	14	.56(.18)	.26***	.11	.41	663.04***	13	1778
Health-protective behaviour	HP	Favourability	5231	15	.31(.06)	.15***	.09	.21	72.88***	14	402
		Similarity	895	4	.73(.07)	.34***	.28	.40	.28	3	110
Willingness	All	Favourability	9474	14	.41(.15)	.20**	.06	.33	477.53***	13	1236
		Similarity	988	5	.98(.28)	.43***	.20	.62	63.67***	4	235
		Interaction	1256	4	1.29(.16)	.54***	.44	.63	15.82***	3	422
Health-risk willingness	RP	Favourability	9230	13	.59(.15)	.28***	.15	.41	407.66***	12	1566
		Similarity	988	5	.97(.28)	.43***	.20	.61	62.48***	4	228
Health-protective willingness	HP	Favourability	1279	6	-.04(.21)	-.03	-.23	.18	59.16***	5	0
		Similarity	300	1	1.16(.14)	.50***	.41	.58	N/A		N/A
Intentions	All	Favourability	15,469	32	.40(.04)	.21***	.19	.22	195.37***	31	4015
		Similarity	7997	16	.82(.15)	.37***	.25	.49	477.32***	15	3867
		Interaction	2322	8	.45(.13)	.22***	.09	.34	60.99***	7	237
Health-risk Intentions	RP	Favourability	14,295	27	.42(.05)	.21***	.16	.25	176.15***	26	3383
		Similarity	6984	12	.84(.04)	.38***	.23	.52	445.94***	11	2471
Health-protective Intentions	HP	Favourability	2802	12	.23(.08)	.12***	.04	.19	45.72***	11	92
		Similarity	1436	7	.67(.15)	.32***	.19	.43	37.60***	6	301

Note: Random models are presented; k represents the number of studies; 'RP' represents a health-risk prototype; 'HP' represents a health-protective prototype. Associations are significant at the following levels: *p ≤ 0.05, **p ≤ 0.01, ***p ≤ .00

Explaining behaviour

Health-related behaviour

First, the relationship between health-related prototypes and behaviour was quantified. Both prototype favourability ($r_+ = .20$, p < .001) and similarity ($r_+ = .27$, p < .001) had small-to-medium effect sizes. However, Table 1 reveals that the effect for similarity was significantly larger due to differences in the CIs.

Second, analyses of favourability x similarity revealed a medium effect size in relation to health-related behaviour ($r_+ = .32$, p < .001). This effect was larger than the effect of favourability alone, providing support for a multiplicative function.

Health-risk and health-protective behaviour

Third, outcomes for health-risk and health-protective prototypes were analysed separately. For health-risk behaviours, both favourability of health-risk prototypes ($r_+ = .22$, p < .001) and similarity to health-risk prototypes ($r_+ = .26$, p < .001) exhibited medium effect sizes. For health-protective behaviour, the effect size for similarity to health-protective prototypes ($r_+ = .34$, p < .001) was greater than the effect size for favourability ($r_+ = .15$, p < .001).

It should be noted that prototype favourability exhibited a stronger association with health-risk behaviour ($r_+ = .22$, p < .001) than with health-protective behaviour ($r_+ = .15$, p < .001), while prototype similarity exhibited a stronger association with health-protective behaviour ($r_+ = .34$, p < .001) than with health-risk behaviour ($r_+ = .26$; p < .001, Table 1).

Explaining willingness

Health-related willingness

Then, the relationship between prototypes and willingness was assessed. The analyses revealed a small-to-medium effect size for the association of favourability of health-related prototypes with health-related willingness ($r_+ = .20$, p = .01) and a medium-to-large effect size for similarity ($r_+ = .43$, p < .001). The difference in effect sizes was significant.

Examination of favourability x similarity revealed a large effect size for the association with health-related willingness ($r_+ = .54$, p < .001). Differences in the CIs indicated that the interaction effect was larger than the effects of either favourability or similarity alone (Table 1).

Health-risk and health-protective willingness

Again, outcomes for health-risk and health-protective prototypes were analysed separately. For health-risk willingness, similarity to health-risk prototypes ($r_+ = .43$, p < .001) produced a stronger effect than favourability ($r_+ = .28$, p < .001; Table 1). The association between health-protective prototype favourability and health-protective willingness was not significant ($r_+ = -.03$, p = .81).

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Explaining intentions
Health-related intentions
When the relationship with health-related intentions was assessed, the associations with prototype favourability ($r_+ = .21$, $p < .001$) and similarity ($r_+ = .37$, $p < .001$) exhibited small-to-medium effect sizes. The effect size for similarity was significantly larger than for favourability.

Analyses of the relationship of favourability x similarity with health-related intentions revealed a small-to-medium effect size ($r_+ = .22$, $p < .001$). However, as Table 1 indicates, the effect of similarity alone was greater than the interaction effect.

Health-risk and health-protective intentions
Finally, the association of health-risk prototype favourability with health-risk intentions exhibited a small effect size ($r_+ = .21$, $p < .001$), while perceived similarity produced a medium effect size ($r_+ = .38$, $p < .001$). The difference was significant. For health-protective intentions, prototype favourability ($r_+ = .12$, $p < .001$) exhibited a significantly smaller association than similarity ($r_+ = .32$, $p < .001$).

Finally, favourability exhibited stronger associations with health-risk intentions ($r_+ = .21$, $p < .001$) than with health-protective intentions ($r_+ = .12$; $p < .001$). Table 1 presents the results for intentions.

Methodological issues
Experimental studies
Examining the separate effects of experimental studies (including experiments and interventions, see Table 2) revealed that favourability had small associations with health-related behaviour, health-risk behaviour, and health-related intentions. Other associations were not possible due to the lack of available studies.

Table 3 in Appendix D presents the effects for correlational studies. CIs of associations were examined to determine the extent of to which associations differed for correlational (cross-sectional and prospective) and experimental (experiments and interventions) designs. First, no differences were found between correlational (Table 2) and experimental (Table 3) study designs for the effect of favourability on health-related and health-risk behaviour. Second, there were too few experimental studies to determine whether there were differences related to the effect on willingness. Finally, regarding the relationship between favourability and health-related intentions, the relation was stronger for correlational studies $r_+ = .20$, $p < .001$) than for experimental studies ($r_+ = .12$; $p < .001$; Table 2 and 3, respectively). Other comparisons were not possible due to the dearth of studies. In addition, Appendix E presents the results of cross-sectional and prospective studies separately.

Indirect and direct measures
Twelve articles reported data on the interaction between favourability and similarity or used a variable that multiplied favourability with a similarity item. When assessing favourability,

Table 2. Weighted correlations (r+) between prototypes and behaviour, willingness, and intentions for experimental studies

Dependent variable	Prototype	Prototype measure	N	k	d(se)	r+	CI95% of r+		Homogeneity analyses	
							Lower	Upper	Q	df
Health-related behaviour	All	Favourability	1231	6	.44(.15)	.21***	.08	.34	30.10***	5
	All	Similarity	603	3	.34(.23)	.17	-.05	.37	14.06***	2
Health-risk behaviour	RP	Favourability	991	5	.45(.20)	.22***	.04	.39	33.90***	4
		Similarity	603	3	.34(.23)	.17	-.05	.37	14.06***	2
Health-protective behaviour	HP	Favourability	611	3	.59(.09)	.28***	.21	.36	1.04	2
		Similarity	0	0	N/A					
Health-related willingness	All	Favourability	1362	3	.34(.13)	.17**	.05	.28	3.76	2
		Similarity	272	2	.89(.30)	.41***	.17	.60	3.17	1
Health-risk willingness	RP	Favourability	1330	3	.62(.25)	.31*	.07	.51	12.08**	2
		Similarity	272	2	.89(.30)	.41**	.17	.60	3.17	1
Health-protective willingness	HP	Favourability	32	1	-1.19(.43)	-.51**	-.73	-.20	N/A	
		Similarity	0	0	N/A					
Health-related intention	All	Favourability	1852	4	.26(.05)	.13***	.08	.17	1.42	3
		Similarity	285	2	.42(.50)	.20	-.26	.59	11.28***	1
Health-risk intentions	RP	Favourability	1613	3	.24(.05)	.12***	.07	.17	.59	2
		Similarity	253	2	.56(.40)	.27	-.10	.57	4.35*	1
Health-protective intentions	HP	Favourability	239	1	.37(.13)	.18**	.06	.30	N/A	0
		Similarity	32	1	-.31(.38)	-.16	-.48	.21	N/A	0

Note: Random models are presented; k represents the number of studies; 'RP' represents a health-risk prototype; 'HP' represents a health-protective prototype. Associations are significant at the following levels: *p ≤ 0.05, **p ≤ 0.01, ***p ≤ .001.

direct measures produced larger effects than indirect measures for associations with (1) health-risk behaviour (direct: r_+ = .31 (.20–.41), p < .001; indirect: r_+ = .20 (.14–.26), p < .001); (2) health-related intentions (direct: r_+ = .28 (.14–.41), p < .001; indirect: r_+ = .18 (.14–.23), p < .001); and (3) health-risk intentions (direct: r_+ = .32 (.12–.50), p < .01; indirect: r_+ = .19 (.15–.24), p < .001). Other analyses of differences due to measures were not possible. It should be noted that because similarity was generally assessed directly, it was not possible to compare direct and indirect measures for this factor.

DISCUSSION

Previous research has found that prototypes explain health-related behaviours and have investigated their additional value in social cognitive models.[1,2,15] The present meta-analytic review quantified the associations of prototype perceptions with health-related behaviours and motivations (i.e. willingness and intentions). The analyses included 80 independent studies that were based on 69 publications. Three key relationships were addressed: (1) the associations of prototype favourability and similarity with behaviour, willingness, and intentions; (2) the effect of the interaction between favourability and similarity on behaviour, willingness, and intentions; and (3) differences in the extent to which health-risk and health-protective prototypes were associated with outcome variables. The analyses produced the following findings.

First, for associations of favourability and similarity, the results revealed that prototype favourability was related to behaviour, willingness, and intentions with small-to-medium effect sizes (r_+ = 0.12–0.28), while similarity produced medium-to-large effect sizes (r_+ = .26–.43). Second, for the interaction between favourability and similarity, the analyses revealed small-to-large effect sizes (r_+ = .22–.54). Finally, distinguishing between health-risk and health-protective prototypes revealed that both types of prototypes produced small-to-medium effect sizes in relation to the three outcome variables (r_+ = .12–.43).

The finding that perceived similarity to health-risk and health-protective prototypes exhibited stronger associations with behaviour, willingness, and intentions than prototype favourability is consistent with previous studies.[1,16] This finding supports the idea that social identification is important in motivating health-related decisions.[16] Prospective studies suggest that self-consistency motivations may play a role and that individuals may engage in certain behaviour because their self-image is similar to that of the prototype[1,42] regardless of the prototype's favourability.[42] Interestingly, expected similarity to characteristics in the future has been found to be related to behaviour even though characteristics can be evaluated negatively.[43] It is also possible that individuals might favour a prototype without perceiving or desiring similarity to it.[19]

In addition, the finding that health-risk prototypes generally exhibited stronger associations with outcomes variables than health-protective prototypes is consistent with the

suggestion that health-risk prototypes are generally more salient and vivid than other pro-totypes.[5,20] Health-risk prototypes may therefore exhibit stronger associations with health-related outcomes than other prototypes.[44] The results are also consistent with the suggestion that health-protective prototypes are more likely to represent a goal state than health-risk prototypes.[26] Health-protective behaviour might be more goal-oriented and intentional, with health-risk behaviour inhibited primarily through a social reactive process.[26] In contrast, both the intentional pathway and the social reaction pathway (related to willingness) proposed by the PWM might influence health-risk behaviour.

Moreover, the analyses tested whether correlational and experimental study designs differed for the associations between prototypes and the outcome variables. The analyses revealed that correlational studies produced larger effect sizes than experimental studies for the relationship between favourability and health-related intentions but found that associations between health-risk prototype favourability and health-risk behaviour were similar. Regardless of the type of study design, the results support the view that health-risk proto-type favourability is important for health-related behaviour, although similarity remains a stronger predictor.

Limitations

Before discussing the implications of the present findings, certain study limitations must be addressed. First, analyses of some associations were based on a small number of articles. Therefore, not all associations of interest could be assessed. Because the majority of articles have focused on health-risk prototypes, additional research is needed on the association of health-protective prototypes with outcome factors. In particular, there is limited understand-ing of the effect of similarity to health-protective prototypes, which indicates the value of further research on this topic. Second, most of the overall and correlational associations were based on cross-sectional data. However, the sample sizes in each association were large, and effect sizes of associations in correlational studies were greater only for associations with intentions, not behaviour. The ability to draw causal conclusions regarding the influence of prototype perceptions is therefore reduced. Third, it was not possible to determine the contribution of experimental studies of the effect of prototypes on modifying behaviour, willingness, or intentions, due to the limited number of experimental studies available. However, effects were significant for associations that were included in the meta-analysis. Additional experimental research is needed to provide empirically based suggestions for improving interventions.

Implications and future directions

Despite the above limitations, the present results support four implications. First, the results supported the idea that prototypes provide a common underlying factor explaining health-related outcomes. The analyses revealed that prototype perceptions were not only related to willingness, as proposed by the original PWM, but were also related to intentions and be-

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haviour. This finding suggests that the PWM could benefit from the inclusion of an additional pathway from prototypes to intentions. This proposal is supported by two other findings: (1) including the association between prototypes and willingness improves the prediction of behaviour and intentions within an augmented TPB[1,2,15]; and (2) intentions appear to increase in importance compared to willingness as people age and gain more experience with a behaviour.[45] Therefore, excluding a prototype-intentions path may omit an important path, particularly when applying the PWM to young adults or older people.

The second implication based on the overall findings is that favourability and similarity differ in their relation to behavioural outcomes, which is consistent with earlier findings.[3,19] Thus, future research should investigate, and take into account, the different contributions of these constructs. Encouraging similarity to achievable health-protective prototypes might be a useful option when an intervention seeks to change behaviour, intentions or willingness. For instance, a suggested strategy is to distance prototypes from the individual's self-image and to provide information on social norms.[46,47] Health-protective prototype similarity might be enhanced by assimilation such as similarity to non-smokers or non- or moderate drinkers,[19,48] together with dissimilarity to health-risk prototypes such as a heavy drinker. Negative characteristics of a health-risk prototype might be contemplated on to facilitate identification with health-protective prototypes and distance the individual from health-risk prototypes.[46,47] However, our understanding of optimal methods to change favourability and similarity and maintain these changes is limited and requires further research. Furthermore, direct measures of favourability and similarity might be used because direct measures often produced larger effect sizes than indirect measures. It should be noted that adjective lists might be useful for certain types of research.

Third, results of the meta-analyses suggest that the interaction (i.e. a multiplicative function) of favourability and similarity enhances the effect of favourability. This conclusion is based on the finding that the interaction between favourability and similarity generally produced larger effect sizes than favourability alone. Importantly, similarity was the strongest predictor compared to favourability alone, although the results regarding the effect of similarity versus the multiplicative function were mixed. More research is needed to determine whether the multiplicative function is due to an interaction or additive function. Additionally, further knowledge of the effect different types of measures is needed. Moreover, further research should increase our limited knowledge of the additional effects of prototypes on the traditional constructs from social cognitive models such as attitudes, social norms, and self-efficacy.

Finally, the results indicate that it might be important to study prototype perceptions in relation to both health-risk and health-protective outcomes.[e.g. 16,41] Both types of prototypes may be useful candidates for interventions.[e.g. 33,49] Different approaches might be needed for health-protective or health-risk behaviours. Intentions and behaviour may need to be targeted when seeking to increase health-protective behaviours, particularly by focusing on

increasing similarity to health-protective prototypes. In contrast, when seeking to decrease health-risk behaviours, health-risk prototype perceptions could be used to target willingness.

In conclusion, the meta-analysis (1) found that prototype perceptions are important in explaining behaviour, willingness, and intentions, and (2) increased our understanding of the distinct roles of prototype favourability and similarity and of health-risk and health-protective prototypes. As a result, it might prove worthwhile to include prototypes in interventions to improve health-related outcomes.

ACKNOWLEDGEMENTS

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APPENDIX A. SEARCH STRING USED

(consump* OR behav* OR intent* OR expect* OR willing*) AND (prototyp* OR "social images" OR "social image" OR stereotyp*) AND (condom* OR "birth control" OR drink* OR alcohol* OR binge* OR sensation seeking OR health* OR risk* OR smok* OR sun* OR eat* OR cigaret* OR tobacco OR diet* OR exerci* OR mammograph* OR "physical activity" OR substance* OR drugs* OR "drunk driving" OR "drink driving" OR speeding OR "reckless driving" OR mariuana OR safe sex OR unsafe sex OR sex OR marijuana OR screening* OR uptake). Exclusion key terms were added to exclude studies focusing on animal, brain, pharmacology, stigma, gender or sexual stereotypes and academic achievements.

Additionally, the string (prototyp* OR "social images" OR "social image" OR stereotyp*) AND ("theory of planned behavior" OR "theory of planned behavior" OR "theory of reasoned action" OR "prototype willingness model") was entered in the data bases and "prototype willingness model" was entered additionally in Google Scholar.

APPENDIX B. STUDY DETAILS OF ARTICLES IN THE META-ANALYSES

Study	Sample and study characteristics	Theory	Prototype measure	Dependent variable	Weighted effect sizes (r_+)
1. Aloise-Young & Hennigan (1996) Journal of Adolescence	N = 1971; 49 % males; M_{age} = 10.5 (estimated from data); 5th-8th grade elementary and middle school; USA; Cross-sectional	Self-consistency motivations; Self-enhancement motivations	Smoker prototype; Similarity; 9 adjectives (3 dimensions), self α = .72, α = .54, α = .76, prototype α = .74, α = 0.73, α = 0.82	Lifetime smoking behaviour: 1 item	Aloise-Young & Hennigan (1996) and Aloise-Young et al. (1996): Sim-Beh: r_+ = .13 RSim-RBeh: r_+ = .13
2. Aloise-Young et al. (1996) Health Psychology	N = 1291; 47.1 % males; M_{age} = 11.9 (estimated from data); 5th-8th grade; USA; Prospective: 1 year	Self-consistency motivations; Self-enhancement motivations	Smoker prototype; Similarity; 9 adjectives; self α = .72, α = .54, α = .76, prototype α = .74, α = .73, α = .82	Lifetime smoking behaviour: 1 item	Aloise-Young & Hennigan (1996) and Aloise-Young et al. (1996): Sim-Beh: r_+ = .13 RSim-RBeh: r_+ = .13
3. Andrews & Peterson (2006) Journal of Substance Use	N = 1075; 48.4 % males; M_{age} = 8.0; 1th-4th grade; USA; Cross-sectional	TPB; PWM	Drinker, drugs, smoker prototypes; Favourability: 3 adjectives per behaviour, α unknown	Intentions: 2 items, cigarettes r = .54 to .76, alcohol r = .45 to .62, marijuana r = .49 to .79	All outcomes of OYSUP sample: Fav-Beh: r_+ = .09 RFav-RBeh: r_+ = .12 HFav-HBeh: r_+ = .07 Fav-BW: r_+ = .14 RFav-RBW: r_+ = .14 Fav-BI: r_+ = .12 RFav-RBI: r_+ = .12

Appendix B (continued)

	Study	Sample and study characteristics	Theory	Prototype measure	Dependent variable	Weighted effect sizes (r_+)
4.	Andrews et al. (2008) Psychology of Addictive Behaviors	N = 672; 49.7% males; M age = 9.5; 2nd-5th grade; USA; Prospective: 1 year	TPB; PWM	Smoker and drinker prototypes; Favourability: 3 adjectives per behaviour, α unknown	Smoking behaviour of past 12 months: 1 item; Willingness: 4 items, smoking α = .84, drinking α = .86; Intentions: 2 items, smoking r = .84, drinking r = .74	All outcomes of OYSUP sample: Fav-Beh: r_+ = .09; RFav-RBeh: r_+ = .12; HFav-HBeh: r_+ = .07; Fav-BW: r_+ = .14; RFav-RBW: r_+ = .14; Fav-BI: r_+ = .12; RFav-RBI: r_+ = .12
5.	Andrews et al. (2011) Prevention Science	N = 1168; 50% males; M age = 11; 5-6th grade; USA; Experimental/ intervention: 6 weeks	PWM; TRA; risk perception and decision research theories; cognitive dissonance theory	Smoker prototype; Favourability: 5 adjectives, α = .58 at T1 and T2 (pilot), trial α = .79	Willingness: 3 items, T1 α = .90, T2 (pilot) α = .95, trial α = .86; Intentions: 2 items, T1 smoking (pilot) α = .86, T2 smoking (pilot) α = .89, smoking trial α = .85, T1 chewing (pilot) α = .83, T2 chewing (pilot) α = .73, chewing trial α = .84	Fav-BW: r_+ = .13; RFav-RBW: r_+ = .13; Fav-BI: r_+ = .13; RFav-RBI: r_+ = .13
6.	Araujo-Soares et al. (2013) Journal of Behavioral Medicine; Study 2	N = 177 cross-sectional; N = 156 prospective; 37.3% males; M age 16.4, range 15-21; Portugal; Cross-sectional; Prospective: 2 months	TPB; PWM	Sunscreen user prototype; Favourability: the evaluation thermometer; Similarity: 3 items, α = .75	Behaviour, sunscreen use over past year and past 2 months: 4 items measuring frequency of sunscreen use, year α = .84, past month α = .94; Intentions: standard measure (not described), α = .83	Fav-Beh: r_+ = -.04; Sim-Beh: r_+ = .35; HFav-HBeh: r_+ = -.04; HSim-HBeh: r_+ = .35; Fav-BI: r_+ = .02; Sim-BI: r_+ = .38; HFav-HBI: r_+ = .05; HSim-HBI: r_+ = .38

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Appendix B (continued)

Study	Sample and study characteristics	Theory	Prototype measure	Dependent variable	Weighted effect sizes (r_+)
7. Bhojani et al. (2011) BMC Public Health	N = 863; 57.8% males; M age = 16.9; India; Cross-sectional	Health-related behaviour change theories	Smoker prototype; Favourability: 9 to 10 adjectives, α unknown	Behaviour, smoking status: 2 categorical questions	Fav-Beh: r_+ = .51 RFav-RBeh: r_+ = .51
8. Blanton et al. (2001) Journal of Applied Social Psychology; Study 1	N = 99; 60.6% males; M age = 21.0; The Netherlands; Cross-sectional	prospect theory; social comparison theory	Safe and unsafe sex prototypes; Favourability: 5 adjectives, safer sex α = .71, unsafe sex, α = .82	Sexual intentions[2]: 3 items, α = .90	Fav-BI: r_+ = .18 RFav-RBI: r_+ = .29 HFav-HBI: r_+ = .20
9. Blanton et al. (2001) Journal of Applied Social Psychology; Study 2	N = 49; 38.8% males; M age = 21.0; USA; Cross-sectional	prospect theory; social comparison theory	Safe and unsafe sex prototypes; Favourability: 1 differential item	Sexual behavioural willingness: 2 items, α = .70	Fav-BW: r_+ = .36 RFav-RBW: r_+ = .52 HFav- HBW: r_+ = .18
10. Blanton et al. (2001) Journal of Applied Social Psychology; Study 3	N = 395; 41% males; M age = 21.0; USA; Prospective: 1 year	prospect theory; social comparison theory	Safe sex prototype; Favourability: 12 adjectives, α = .88	Sexual intentions: 3 items	All outcomes of Iowa college sample: Fav-Beh: r_+ = .31 RFav-RBeh: r_+ = .31 Fav-BI: r_+ = .11 RFav-RBI: r_+ = .20 HFav-HBI: r_+ = .01 Fav*Sim-Beh: r_+ = .41 Fav*Sim-BI: r_+ = .39

Appendix B (continued)

Study	Sample and study characteristics	Theory	Prototype measure	Dependent variable	Weighted effect sizes (r_+)
11. Brody et al. (2004) Child Development	N = 281; 46.1 % males; M age = 11.2; USA; Experimental/ intervention; cross-sectional pre-test	PWM; social control theory; social development theory; problem behaviour theory; self-control theory	Drinker prototype; Favourability: 7 adjectives, pretest α = .62, posttest α = .65	Drinking intentions[3]; 3 items, pretest α = .87, posttest α = .81	All outcomes of SAAF sample: Fav-Beh: r_+ = .03 Sim-Beh: r_+ = .09 RFav-RBeh: r_+ = .03 RSim-RBeh: r_+ = .09 Fav-BW: r_+ = .15 Sim-BW: r_+ = .12 RFav-RBW: r_+ = .15 RSim-RBW: r_+ = .12 Fav-BI: r_+ = .15 Sim-BI: r_+ = .19 RFav-RBI: r_+ = .15 Rsim-RBI: r_+ = .19 Fav*Sim-Beh: r_+ = .28
12. Cestac et al. (2011) Safety Science	N = 3002; 52.4% males; M age = 22.3, range 18-25; France; Cross-sectional	PWM	Risky driver prototype; Favourability: 3 adjectives, α = .81 Similarity: 1 item	Past speeding behaviour: 4 items, α = .88; Risky driving intentions: 4 items, α = .87	Fav-Beh: r_+ = .29 Sim-Beh: r_+ = .59 RFav-RBeh: r_+ = .29 RSim-RBeh: r_+ = .59 Fav-BI: r_+ = .29 Sim-BI: r_+ = .60 Sim-BI: r_+ = .19 RFav-RBI: r_+ = .29 Rsim-RBI: r_+ = .60
13. Chang (2007) Health Communication; Study 2	N = 1490; 53.8% males; M age = 17.9 (estimated from data); range 17-19; Taiwan; Cross-sectional	problem behaviour theory	Smoker prototype; Favourability: 8 adjectives (4 dimensions), masculine 1 item, adventuresome α = .72, pleasure-loving α = .63, sociable α = .67	Behaviour, smoking status: categorizing into 5 groups based on their answers to a list of questions concerning smoking behaviours and intentions	Fav-Beh: r_+ = .14 RFav-RBeh: r_+ = .14

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Appendix B (continued)

Study	Sample and study characteristics	Theory	Prototype measure	Dependent variable	Weighted effect sizes (r_+)
14. Comello et al. (2010) Journal of Drug Education; Study 1	N = 133; 39% males; M age = 21.8; USA; Cross-sectional	Deviance Regulation Theory; PWM	Drug user and abstainer prototypes; Favourability: 25 adjectives (4 dimensions), social attractiveness α = .86, sensation-seeking or risk-orientation α = .81, social anxiety α = .66, normative success α = .76	Drug use intentions: 1 item	Fav-BI: r_+ = .17 RFav-RBI: r_+ = .13 HFav-HBI: r_+ = .20
15. Dalley (2009) Appetite	N = 134; 0% males; M age = 29.2; The Netherlands; Cross-sectional	socio-cultural theory; social comparison theory	Thin and over-fat prototypes; Favourability: 7 adjectives, thin prototype α = 0.74, over-fat prototype α = 0.82; Similarity: 1 item	Dieting behaviour: Dieting Status Measure	Fav-Beh: r_+ = .04 Sim-Beh: r_+ = .24 RFav-RBeh: r_+ = .04 RSim-RBeh: r_+ = .24 Fav*Sim-Beh: r_+ = .06
16. Etcheverry (2009) Psychology of Addictive Behaviors	N = 170; 46% males; M age = 18.5 (estimated); USA; Cross-sectional	PWM	Smoker prototype; Favourability: 11 adjectives, α = .78	Smoking behaviour: average number of cigarettes smoked for the past 30 days	Fav-Beh: r_+ = .17 RFav-RBeh: r_+ = .17
17. Falomir-Pichastor (2007) European Review of Applied Psychology	N = 435; 48.3% males; M age = 12.9, range 11-15; Switzerland; Cross-sectional	None mentioned	Smoker prototype; Favourability: 24 adjectives, positive adjectives α = .81, negative adjectives α = .83; Similarity: self-identity difference, α = .88	Smoking behaviour: 3 items	Fav-Beh: r_+ = .19 Sim-Beh: r_+ = .29 RFav-RBeh: r_+ = .19 RSim-RBeh: r_+ = .29

Appendix B (continued)

	Study	Sample and study characteristics	Theory	Prototype measure	Dependent variable	Weighted effect sizes (r_+)
18.	Freeman et al. (2001) Health Psychology	N = 185; 35% males; M age = 20.1, range 18-22; USA; Experimental /intervention	Cognitive dissonance theory	Smoker prototype; Similarity: 10 items, α = .83	Smoking behaviour: 3 items	Sim-Beh: r_+ = .37 RSim-RBeh: r_+ = .37
19.	Gerrard et al. (1999) Journal of Studies on Alcohol	N = 266; 48.6% males; M age = 16 (estimated), range 15-17; USA; Cross-sectional	PWM	Drinker prototype; Favourability: 12 adjectives (3 dimensions), α unknown	Drinking intentions[4]: 4 items, α unknown	All outcomes of Iowa adolescents sample: Fav-Beh: r_+ = .35 RFav-RBeh: r_+ = .37 HFav-HBeh: r_+ = .32 Fav-BW: r_+ = .35 RFav-RBW: r_+ = .42 HFav- HBW: r_+ = .28 Fav-BI: r_+ = .58 RFav-RBI: r_+ = .58 Fav*Sim-Beh: r_+ = .47 Fav*Sim-BI: r_+ = .31
20.	Gerrard et al. (2002) Health Psychology	N = 308; 43.2% males; M age = 16.3; USA; Cross-sectional; Prospective: 2 years	PWM	Abstainer and drinker prototypes; Favourability: 12 adjectives, abstainer α = .84, drinker prototype α = .87	Drinking behaviour: 2 items on frequency of drinking in last 3 months, α = .89; Willingness: 2 items, α = .85	All outcomes of Iowa adolescents sample: Fav-Beh: r_+ = .35 RFav-RBeh: r_+ = .37 HFav-HBeh: r_+ = .32 Fav-BW: r_+ = .35 RFav-RBW: r_+ = .42 HFav- HBW: r_+ = .28 Fav-BI: r_+ = .58 RFav-RBI: r_+ = .58 Fav*Sim-Beh: r_+ = .47 Fav*Sim-BI: r_+ = .31

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Appendix B (continued)

Study	Sample and study characteristics	Theory	Prototype measure	Dependent variable	Weighted effect sizes (r_+)
21. Gerrard et al. (2006) Psychology of Addictive Behaviors	$N = 281$; 47% males; M age = 11.2, range 10-12; USA; Cross-sectional; Experimental /intervention	PWM; TPB	Drinker prototype; Favourability: 6 adjectives; Similarity: 1 item, α unknown; Extra: Favourability multiplied by similarity	Drinking behaviour: 3 dichotomous items, factor loading 1.00; Willingness: 3 items, pretest α = .76, posttest α = .59; Intentions: 2 items, factor loading 1.00	All outcomes of SAAF sample: Fav-Beh: r_+ = .03 Sim-Beh: r_+ = .09 RFav-RBeh: r_+ = .03 RSim-RBeh: r_+ = .09 Fav-BW: r_+ = .15 Sim-BW: r_+ = .12 RFav-RBW: r_+ = .15 RSim-RBW: r_+ = .12 Fav-BI: r_+ = .15 Sim-BI: r_+ = .19 RFav-RBI: r_+ = .15 Rsim-RBI: r_+ = .19 Fav*Sim-Beh: r_+ = .28
22. Gerrits et al. (2009) Appetite; Study 3	$N = 97$; 34% males; M age = 15.9, range 14-19; The Netherlands; Prospective: 6 days	PWM	Healthy and unhealthy eater prototypes; Favourability: 12 adjectives, earlier study healthy eater α = .72, unhealthy eater prototype α = .69	Eating behaviour: electronic diary, average amount of 24 unhealthy and healthy food items	Fav-Beh: r_+ = .13 RFav-RBeh: r_+ = .21 HFav-HBeh: r_+ = .05

Appendix B (continued)

Study	Sample and study characteristics	Theory	Prototype measure	Dependent variable	Weighted effect sizes (r_+)
23. Gerrits et al. (2010) Health Education Research	Total N = 511; US sample N = 117; Dutch sample N = 152; Hungarian sample N = 242; 54% males; M age = 16.3, range 14-19; USA, the Netherlands, Hungary; Cross-sectional	Deviance Regulation Theory	Healthy and unhealthy eater prototypes; Favourability: 14 adjectives, healthy eater α = .89, unhealthy eater prototype α = .88	Eating behaviour: 9 items on fatty food consumption and number of fruit and vegetable servings by 2 scores	Fav-Beh: r_+ = .06 RFav-RBeh: r_+ = .04 HFav-HBeh: r_+ = .09
24. Gibbons & Gerrard (1995) Journal of Personality and Social Psychology	N = 676; 45% males; M age = 18.0 USA Prospective	Prototype model of risk behavior	Risk prototypes of driving, smoking, drinking, contraception; Favourability, 12 adjectives, multiplied by similarity item; α unknown	Behaviour reckless driving: 5 items, α = .67; Smoking behaviour: 2 items, α = .89; Drinking behaviour: 2 items, α = 87 Contraception failure: 2 items; Intentions: 1 item per behaviour	All outcomes of Iowa college sample: Fav-Beh: r_+ = .31 RFav-RBeh: r_+ = .31 Fav-BI: r_+ = .11 RFav-RBI: r_+ = .20 HFav-HBI: r_+ = .01 Fav*Sim-Beh: r_+ = .41 Fav*Sim-BI: r_+ = .39
25. Gibbons et al. (1995) Journal of Applied Psychology; Danish sample	N = 224; 52% males; M age = 14.4, range 13-15; Denmark; Cross-sectional	PWM/TRA	Risk prototypes of smoking, drinking, drugs, contraception; Favourability, 12 adjectives, multiplied by similarity item; Smoker prototype α = .75 Unsafe sex prototype α = .71	Behaviour, number of items unknown Sexual intentions[2]: 1 items from willingness, 2 intention items of which α = .57	Fav*Sim-Beh: r_+ = .45 Fav*Sim-BI: r_+ = .18

Appendix B (continued)

	Study	Sample and study characteristics	Theory	Prototype measure	Dependent variable	Weighted effect sizes (r_+)
26.	Gibbons et al. (1995) Journal of Applied Psychology; American sample	N = 500, 49% males; M age = 14.2, range 13-15; USA; Cross-sectional	PWM/TRA	Risk prototypes of smoking, drinking, drugs, contraception; Favourability, 12 adjectives, multiplied by similarity item; Smoker prototype α =.75 Unsafe sex prototype α =.71	Behaviour, number of items unknown Sexual intentions[2]: 1 items from willingness, 2 intention items of which α =.57	All outcomes of Iowa adolescents sample: Fav-Beh: r_+ = .35 RFav-RBeh: r_+ = .37 HFav-HBeh: r_+ = .32 Fav-BW: r_+ = .35 RFav-RBW: r_+ = .42 HFav-HBW: r_+ = .28 Fav-BI: r_+ = .58 RFav-RBI: r_+ = .58 Fav*Sim-Beh: r_+ = .47 Fav*Sim-BI: r_+ = .31
27.	Gibbons et al. (1995) Personality and Social Psychology Bulletin; Study 1	N = 226; 32% males; M age = 14.0 (estimated), range 13-15; USA; Cross-sectional	TRA; PWM	Unsafe sex prototype; Favourability: 9 adjectives, α =.70; Similarity: 1 item	Sexual intentions[1,2]: 3 to 4 items	Fav-BI: r_+ = .16 Sim-BI: r_+ = .24 RFav-RBI: r_+ = .16 Rsim-RBI: r_+ = .24 Fav*Sim-BI: r_+ = .24
28.	Gibbons et al. (1995) Personality and Social Psychology Bulletin; Study 2	N = 432; 50.5% males; M age = 14.0 (estimated), range 13-15; USA; Cross-sectional	TRA; PWM	Unsafe sex prototype; Favourability: 12 adjectives, α =.74; Similarity: 1 item	Sexual intentions[1,2]: 4 to 5 items	Fav-BI: r_+ = .19 Sim-BI: r_+ = .20 RFav-RBI: r_+ = .19 Rsim-RBI: r_+ = .20 Fav*Sim-BI: r_+ = .02
29.	Gibbons & Eggleston (1996) Health Psychology	N = 137; 39% males; M age = 42.0; USA; Experimental/ intervention	PWM	Smoker prototype; Favourability: 12 adjectives, α =.73; Similarity: 1 item	Behaviour, smoking status: 2 dichotomous items	Fav-Beh: r_+ = -.08 Sim-Beh: r_+ = -.02 RFav-RBeh: r_+ = -.08 RSim-RBeh: r_+ = -.02

Appendix B (continued)

Study	Sample and study characteristics	Theory	Prototype measure	Dependent variable	Weighted effect sizes (r_+)
30. Gibbons et al. (1998) Journal of Personality and Social Psychology; Study 2	N = 469; 44% males; M age = 18.0; USA; Prospective: 6 months	PWM	Unsafe sex prototype; Favourability: 12 adjectives (3 dimensions), factor loadings mature .80, self-assured .87, attractive .70	Sexual intentions[2,4]: 5 items, factor loadings adjusted from BW .82, .87, .60, adjusted from expectations .62, .90	All outcomes of Iowa college sample: Fav-Beh: $r_+ = .31$ RFav-RBeh: $r_+ = .31$ Fav-BI: $r_+ = .11$ RFav-RBI: $r_+ = .20$ HFav-HBI: $r_+ = .01$ Fav*Sim-Beh: $r_+ = .41$ Fav*Sim-BI: $r_+ = .39$
31. Gibbons et al. (1998) Journal of Personality and Social Psychology; Study 3	N = 297; 41.1% males; M age = 21; USA; Cross-sectional	PWM	Unsafe sex prototype; Favourability: 12 adjectives (3 dimensions), factor loadings mature .82, self-assured .75, attractive .85	Behaviour, unsafe sex: 2 items; Willingness: 3 items, factor loadings .95, .84, .80; Intentions[4]: 2 items, factor loadings .94, .97	Fav-Beh: $r_+ = .23$ RFav-RBeh: $r_+ = .23$ Fav-BW: $r_+ = .38$ RFav-RBW: $r_+ = .38$ Fav-BI: $r_+ = .31$ RFav-RBI: $r_+ = .31$
32. Gibbons et al. (2004) Personality and Social Psychology Bulletin	N = 746; 46% males; M age = 10.5, range 10-12; USA; Cross-sectional; Prospective: 20 months	PWM	Drinker, smoker, drug user prototypes; Favourability: 6 adjectives, α = .85	Risky behaviour: 7 items, T1 α = .56, T2 α = .77; Willingness: 6 items, T1 α = .71, T2 α = .82; Intentions: 2 items, T1 α = .60, T2 α = .75	All outcomes of FACHS sample: Fav-Beh: $r_+ = .15$ RFav-RBeh: $r_+ = .15$ Fav-BW: $r_+ = .20$ RFav-RBW: $r_+ = .20$ Fav-BI: $r_+ = .13$ RFav-RBI: $r_+ = .13$
33. Gibbons et al. (2010) Psychology of Addictive Behaviors	N = 4740; 51% males; M age = 12.1, range 10-14; USA; Cross-sectional; Prospective: 8 months		Drinker prototype; Favourability: 6 adjectives, α = .83	Drinking behaviour: 4 items, T1 α = 86, T2 α = .87; Willingness: 2 items, α = .75	All outcomes of Dartmouth sample: Fav-Beh: $r_+ = .42$ RFav-RBeh: $r_+ = .42$ Fav-BW: $r_+ = .50$ RFav-RBW: $r_+ = .50$

2

Appendix B (continued)

Study	Sample and study characteristics	Theory	Prototype measure	Dependent variable	Weighted effect sizes (r_+)
34. Guilamo-Ramos et al. (2011) Youth Society	N = 516; 52% males; M age = 12.7; USA; Cross-sectional	social learning theory; TRA; health belief model; theory of subjective culture; self-regulation theories	Smoker prototype; Favourability: 8 adjectives (median r = .32)	Smoking intentions: 2 items, α = .77	Fav-BI: r_+ = .17 RFav-RBI: r_+ = .17
35. Hampson et al. (2007) Annals of Behavioral Medicine	N = 575; 50.1% males; M age = 9.5; USA; Prospective: 3 years	PWM	Exerciser prototype; Favourability: 3 adjectives, factor loadings .74, .75, .78	Exercise behaviour: 1 item	All outcomes of OYSUP sample: Fav-Beh: r_+ = .09 RFav-RBeh: r_+ = .12 HFav-HBeh: r_+ = .07 Fav-BW: r_+ = .14 RFav-RBW: r_+ = .14 Fav-BI: r_+ = .12 RFav-RBI: r_+ = .12
36. Heckman et al. (2011) American Journal of Healthy Behavior	N = 212; 19% males; M age = 20.5; USA; Cross-sectional	Fishbein's Integrative Model	Sunscreen user prototype; Favourability: 5 adjectives, α = .77	Sun protection intentions: 5 items, α unknown; Willingness[1]: 2 items, α unknown	Fav-BW: r_+ = -.24 HFav- HBW: r_+ = -.-24 Fav-BI: r_+ = .29 HFav-HBI: r_+ = .29
37. Heckman & Coups (2011) BMC Public Health	N = 239; 40.9% males; M age = 16.0; USA; Experimental/ intervention	Integrative Model	Sunscreen user prototype; Favourability: 4 adjectives, α = .68	Sunscreen use behaviour use: 3 items, α = .92; Intentions: 3 items, α = .83	Fav-Beh: r_+ = .26 HFav-HBeh: r_+ = .26 Fav-BI: r_+ = .18 HFav-HBI: r_+ = .18

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Appendix B (continued)

Study	Sample and study characteristics	Theory	Prototype measure	Dependent variable	Weighted effect sizes (r_+)
38. Houlihan et al. (2008) The Journal of Early Adolescence	N = 733; 44.7% males; M age = 10.5, range 10-12; USA; Prospective: 4 years and 8 months	PWM	Prototype unsafe sex; Favourability: 5 adjectives, α = .77	Unsafe sexual behaviour: 9 items, α = .95; Willingness: 1 item	All outcomes of FACHS sample: Fav-Beh: r_+ = .15 RFav-RBeh: r_+ = .15 Fav-BW: r_+ = .20 RFav-RBW: r_+ = .20 Fav-BI: r_+ = .13 RFav-RBI: r_+ = .13
39. Hukkelberg et al. (2009) Addictive Behaviors	N = 760; 49.6% males; Median age = 13.9, 8th and 9th grade; Norway; Cross-sectional Prospective: 1 year	PWM	Smoker prototype; Favourability: 12 adjectives, smoking boy α = .70, smoking girl α = .75	Smoking behaviour: 1 item; Intentions[1,2]: 2 items from intentions, α = .66 and 3 items adjusted from BW, α = .64	Fav-Beh: r_+ = .11 RFav-RBeh: r_+ = .11 Fav-BI: r_+ = .24 RFav-RBI: r_+ = .24
40. Kang (2002) Journal of Sport Management	N = 215; 53% males; M age = unknown, range 17-31; South Korea; Cross-sectional	TRA; expectancies-value framework	Exercise (skier, health club) prototype; Similarity: 1 item per prototype, α = .88	Exercise intentions: 3 items, α = .89	Sim-BI: r_+ = .32 HSim-HBI: r_+ = .32
41. Keresztes et al. (2009) Psychological Record	N = 524; 42% males; M age = 16.5, range 14-21; Hungary; Cross-sectional	PWM	Exercise prototype; Favourability: 11 adjectives (2 dimensions, 3rd was disregarded due to low reliability), Positive personality related prototype α = .78, Positive fitness and health related prototype α = .76	Exercise behaviour: 1 item	All outcomes of Keresztes et al. (2009) and Piko et al. (2007): Fav-Beh: r_+ = .18 RFav-RBeh: r_+ = .27 HFav-HBeh: r_+ = .09

Appendix B (continued)

Study	Sample and study characteristics	Theory	Prototype measure	Dependent variable	Weighted effect sizes (r_+)
42. Lane et al. (2011) Basic and Applied Social Psychology; Study 1	N = 217; 45.2% males; M age = 19.4; USA; Cross-sectional; Experimental/ intervention	PWM; social comparison theories	Drinker prototype; Similarity: 1 item	Willingness to drink: 3 items, T1 α = .72, T2 α = .66; Intentions: 3 items, α = .91	Sim-BW: r_+ = .42 RSim-RBW: r_+ = .42 Sim-BI: r_+ = .43 Rsim-RBI: r_+ = .43
43. Lane et al. (2011) Basic and Applied Social Psychology; Study 2	N = 55; 40% males; M age = 19.5; USA; Experimental/ intervention	PWM; social comparison theories	Drinker prototype; Similarity: 1 item	Willingness to drink: 3 items, α = .56	Sim-BW: r_+ = .26 RSim-RBW: r_+ = .26
44. Larsen et al. (2012) Addiction Research & Theory	N = 896; 100% males; M age = 16.6, range 15-18; Norway; Prospective: 1 year	gateway theory	Smoker prototype; Favourability: 11 adjectives (3 dimensions), Social attraction α = .81, Negative α = .60, Positive α = 0.52	Behaviour, smoking status: in 4 categories	Fav-Beh: r_+ = .34 RFav-RBeh: r_+ = .34
45. Lazuras et al. (2011) Psychology, Society & Education	N = 254; 43.5% males; M age = 13.6; Greece; Cross-sectional	PWM; TPB	Exercise prototype: Favourability: 7 adjectives, α = .98; Similarity: 1 item	Exercise intentions: 3 items, α = .88	Fav-BI: r_+ = .05 Sim-BI: r_+ = .29 HFav-HBI: r_+ = .04 HSim-HBI: r_+ = .29
46. Litt et al. (2011) Psychology of Addictive Behaviors	N = 189; 49% males; M age = 14.5, range 13-15; USA; Experimental/ intervention	PWM	Drinker prototype; Favourability multiplied by similarity: 7 items α = .85	Drinking behaviour: 1 item; Willingness: 3 items, α = .93	Fav*Sim-Beh: r_+ = .33 Fav*Sim-BW: r_+ = .67

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Appendix B (continued)

Study	Sample and study characteristics	Theory	Prototype measure	Dependent variable	Weighted effect sizes (r_+)
47. Litt et al. (2012) Basic and Applied Social Psychology	N = 346 57% males M age = 19.4 USA; Cross-sectional	PWM	Drinker prototype; Favourability multiplied by similarity; α = .85	Drinking behaviour: 2 items, α = .85; Willingness: 3 items, α = .93	Fav*Sim-Beh: r_+ = .57 Fav*Sim-BW: r_+ = .49
48. Maglica (2011) Review of Psychology	N = 341; 35.5% males; M age = 16.4; Croatia; Cross-sectional	health belief model; protection motivation theory; TPB; trans-theoretical model; PWM	Drinker and smoker prototype; Favourability: 12 adjectives each, smoker α = .77, drinker α = .76	Drinking and smoking behaviour: frequency of use, 1 item for smoking and 3 items for alcohol, α = .78; Intentions[2]: 3 items, smoking α = .71, drinking α = .85	Fav-Beh: r_+ = .20 RFav-RBeh: r_+ = .20 Fav-BI: r_+ = .26 RFav-RBI: r_+ = .26
49. Mahler et al. (2010) Journal of Behavioral Medicine	N = 125; 73% males; M age = 19.9, range 18-34; USA Experimental /intervention	social comparison theory	Prototype of risky sun behaviour; Favourability: 4 adjectives, α = .58	Willingness: 6 items, α = .82; Sun protection intentions: 12 items, α = .91	Fav-BW: r_+ = .30 RFav-RBW: r_+ = .30 Fav-BI: r_+ = .07 RFav-RBI: r_+ = .07
50. Myklestad et al. (2007) Health Education Research	N = 156; 46.2% males; M age = 14.5, range 13.8-16.0; Norway; Cross-sectional	TPB; PWM	Safe sex and unsafe sex prototypes; Favourability: 15 items (2 dimensions), Conceited α = .75, Reasonable, α = .89	Sexual intentions[2]: 1 item from intentions and 2 items adjusted from BW, r = .75	Fav-BI: r_+ = .23 RFav-RBI: r_+ = .27 HFav-HBI: r_+ = .19

Appendix B (continued)

Study	Sample and study characteristics	Theory	Prototype measure	Dependent variable	Weighted effect sizes (r_+)
51. Norman et al. (2007) Addictive Behaviors	N = 94 cross-sectional; N = 79 prospective; 14% males; M age = 14.0; undergraduate students; United Kingdom; Cross-sectional; Prospective: 1 week	TPB; PWM	Binge drinker prototype; Favourability: 1 item, evaluation thermometer; Similarity: 2 items, r = .64	Drinking behaviour: 2 items, T1 r = .70, T2 r = .93; Intentions: 2 items, r = .67	Fav-Beh: r_+ = .45 Sim-Beh: r_+ = .40 RFav-RBeh: r_+ = .45 RSim-RBeh: r_+ = .40 Fav-BI: r_+ = .50 Sim-BI: r_+ = .50 RFav-RBI: r_+ = .50 Rsim-RBI: r_+ = .50 Fav*Sim-Beh: r_+ = .12 Fav*Sim-BI: r_+ = .01
52. Ouellette et al. (1999) Psychology of Addictive Behaviors	N = 357; 14% males; M age = 15.0; USA; Prospective, waves 2-5	PWM	Favourability, 12 adjectives, multiplied by similarity item; α = .85	Drinking behaviour: 2 items, α = .88; Intention[2]: 5 items from willingness, α = .86	All outcomes of Iowa adolescents sample: Fav-Beh: r_+ = .35 RFav-RBeh: r_+ = .37 HFav-HBeh: r_+ = .32 Fav-BW: r_+ = .35 RFav-RBW: r_+ = .42 HFav- HBW: r_+ = .28 Fav-BI: r_+ = .58 RFav-RBI: r_+ = .58 Fav*Sim-Beh: r_+ = .47 Fav*Sim-BI: r_+ = .31
53. Pepper et al. (2013) Journal of Adolescent Health	N = 228; 100% males; M age = 15.1, range 11-19; USA; Prospective: 1 year	PWM	Smoker prototype; Favourability: 8 adjectives (2 dimensions), positive α = .79, negative α = .85	Smoking intentions[2]: 2 items, r not reported	Fav-BI: r_+ = .10 RFav-RBI: r_+ = .10

Appendix B (continued)

Study	Sample and study characteristics	Theory	Prototype measure	Dependent variable	Weighted effect sizes (r_+)
54. Piko et al. (2007) Addictive Behaviors	N = 534; 42% males; M age = 16.3, range 14-21; Hungary; Cross-sectional		Smoker prototype; Favourability: 12 adjectives, Negative prototype α = .72, Positive, social appearance prototype α = .76, Positive, individual competence prototype α = .73	Smoking behaviour: 2 items	All outcomes of Piko et al. (2007) and Keresztes et al. (2009): Fav-Beh: $r_+ = .18$ RFav-RBeh: $r_+ = .27$ HFav-HBeh: $r_+ = .09$
55. Rivis & Sheeran (2003) Psychology & Health	N = 333 cross-sectional; N = 225 prospective; Unknown % males; M age = unknown; Undergraduate students; United Kingdom; Cross-sectional; Prospective: 2 weeks	TPB; PWM	Exercise prototype; Favourability: 1 item, evaluation thermometer; Similarity: 2 items, α = .75	Exercise behaviour: 1 item; Intentions: 3 items, α = .92	Fav-Beh: $r_+ = .17$ Sim-Beh: $r_+ = .33$ HFav-HBeh: $r_+ = .17$ HSim-HBeh: $r_+ = .33$ Fav-BI: $r_+ = .31$ Sim-BI: $r_+ = .55$ HFav-HBI: $r_+ = .31$ HSim-HBI: $r_+ = .55$
56. Rivis et al. (2006) British Journal of Health Psychology	N = 123; 46% males; M age = 16.6; 6th form college; United Kingdom; Cross-sectional	TPB; PWM	6 health-related prototypes. Favourability: 1 item, evaluation thermometer per prototype; Similarity: 1 item per prototype	Intentions: 1 item per behaviour (Exercise; Sleep; Breakfast; Smoking; Drinking; Unhealthy eating behaviour)	Fav-BI: $r_+ = .04$ Sim-BI: $r_+ = .16$ RFav-RBI: $r_+ = .01$ Rsim-RBI: $r_+ = .21$ HFav-HBI: $r_+ = .07$ HSim-HBI: $r_+ = .12$ Fav*Sim-Beh: $r_+ = .03$ Fav*Sim-BI: $r_+ = .04$

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Appendix B (continued)

Study	Sample and study characteristics	Theory	Prototype measure	Dependent variable	Weighted effect sizes (r_+)
57. Rivis et al. (2010) Psychology & Health	N = 135; 43% males; M age = 16.4; secondary school pupils; United Kingdom; Prospective: 2 weeks	PWM; TRA; TPB; protection motivation theory; goal theories; social cognitive theory; goal-setting theory	Smoker prototype. Favourability: 1 item, evaluation thermometer; Similarity: 1 item	Smoking behaviour: 1 item; Intentions: 1 item; Willingness: 1 item	Fav-Beh: r_+ = .27; Sim-Beh: r_+ = .58; RFav-RBeh: r_+ = .27; RSim-RBeh: r_+ = .58; Fav-BW: r_+ = .31; Sim-BW: r_+ = .73; RFav-RBW: r_+ = .31; RSim-RBW: r_+ = .73; Fav-BI: r_+ = .36; Sim-BI: r_+ = .77; RFav-RBI: r_+ = .36; Rsim-RBI: r_+ = .77; Fav*Sim-Beh: r_+ = .28
58. Rivis et al. (2011) British Journal of Health Psychology	N = 200; 100% males; M age = 23.3 and M = 46.3; United Kingdom; Cross-sectional	PWM; TPB	Intoxicated driver prototype; Favourability: 1 item; Similarity: 1 item	Intentions[2] of risky driving behaviour: 3 items, α = .91	Fav-BI: r_+ = .39; Sim-BI: r_+ = .48; RFav-RBI: r_+ = .39; Rsim-RBI: r_+ = .48
59. Rivis et al. (2011) Psychology & Health	N = 136; 45% males; M age = 16.64; United Kingdom; Prospective: 2 weeks	TPB; Goal-setting theory; Social cognitive theory	Prototype of 14 health-related behaviours; Similarity: 1 item per behaviour, Median r = .64, p < .001	14 health-related behaviours: 14 single items	Sim-Beh: r_+ = .32
60. Rivis & Sheeran (2013) Health Psychology; Study 1a	N = 226; unknown % males; M age = unknown; Undergraduate students; United Kingdom; Prospective: 2 weeks	TPB; PWM	Binge drinker prototype; Favourability: evaluation thermometer and 1 item, α = .79; Similarity: 2 items, α = .82	Drinking behaviour: 1 item	Fav-Beh: r_+ = .15; Sim-Beh: r_+ = -.01; RFav-RBeh: r_+ = .15; RSim-RBeh: r_+ = -.01

Appendix B (continued)

Study	Sample and study characteristics	Theory	Prototype measure	Dependent variable	Weighted effect sizes (r_+)
61. Rivis & Sheeran (2013) Health Psychology; Study 1b	N = 71; unknown % males; M age = unknown; Undergraduate students; United Kingdom; Prospective: 2 weeks	TPB; PWM	Binge drinker prototype. Favourability: evaluation thermometer and 1 item, α = .71; Similarity: 2 items, α = .87	Drinking behaviour: 2 items, α = .91	Fav-Beh: r_+ = .18; Sim-Beh: r_+ = -.04; RFav-RBeh: r_+ = .18; RSim-RBeh: r_+ = -.04
62. Rivis & Sheeran (2013) Health Psychology; Study 3	N = 202; 44.6% males; M age = 16.6; Undergraduate students; United Kingdom; Experimental /intervention; Prospective: 1 week	TPB; PWM	Binge drinker prototype; Favourability: 2 items, α = .67; Similarity: 2 items, α = .74	Drinking behaviour: 2 items, α = .82	Fav-Beh: r_+ = .36; RFav-RBeh: r_+ = .36
63. Schüz & Eid (2012) Journal of Behavioral Medicine; Study 1	N = 156; 44.9% males; M age = 15.7, range 15-18; Germany; Cross-sectional	TPB; protection Motivation theory; Health Action Process Approach; PWM	Prototype of risky sun behaviour; Favourability: 3 adjectives, α = .75	Risky sun behaviour: 2 items, α = .83; Intentions: 2 items, α = .50	Fav-Beh: r_+ = .10; RFav-RBeh: r_+ = .10; Fav-BI: r_+ = .16; RFav-RBI: r_+ = .16
64. Scott-Parker et al. (2013) Accident Analysis & Prevention	N = 378; 29.9% males; M age = 17.9, range 17–25; USA; Cross-sectional; Prospective: 6 months	Akers' social learning theory; psychosocial theory; PWM	Risky and safe driver prototype; Favourability: 6 adjectives each, unsafe α = .91, safe α = .86	Driving behaviour: 6 items regarding frequency and context; Willingness: 3 items, α = .83; Intentions: 1 item	Fav-Beh: r_+ = -.14; RFav-RBeh: r_+ = -.16; HFav-HBeh: r_+ = -.12; Fav-BW: r_+ = -.13; RFav-RBW: r_+ = -.15; HFav-HBW: r_+ = -.11; Fav-BI: r_+ = -.09; RFav-RBI: r_+ = -.10; HFav-HBI: r_+ = -.08

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Appendix B (continued)

Study	Sample and study characteristics	Theory	Prototype measure	Dependent variable	Weighted effect sizes (r_+)
65. Spijkerman et al. (2004) Addictive Behaviors	N = 2814; 47.8% males; M age = 13.9, range 12-16; 7th and 8th grade; The Netherlands; Cross-sectional	TPB; PWM	Smoker and drinker prototype; Favourability: 22 adjectives (4 dimensions), smoker α = .78, α = .71, α = .73, α = .71, drinker α = .89, α = .78, α = .83	Smoking and drinking intentions[1,2]: 6 items, 3 items adjusted from willingness: smoking α = .72, drinking α = .84, and 3 items from intentions: smoking α = .89, drinking α = .86	All outcomes of Spijkerman et al. 2004, 2005, and 2007: Fav-Beh: r_+ = .09 Sim-Beh: r_+ = .06 RFav-RBeh: r_+ = .09 RSim-RBeh: r_+ = .06 Fav-BI: r_+ = .22 Sim-BI: r_+ = .17 RFav-RBI: r_+ = .22 Rsim-RBI: r_+ = .17
66. Spijkerman et al. (2005) Preventive Medicine	N = 1938; 46% males; M age = 12.8, range 12-16; 7th and 8th grade; The Netherlands; Cross-sectional; Prospective: 1 year	PWM	Smoker prototype; Favourability: 19 adjectives, well-adjusted α = .77, rebellious α = .71, cool α = .73, attractive α = .71; Similarity: difference between prototype and self image on 19 adjectives, self	Behaviour, smoking status: 1 item; Intentions[2]: 3 items, α = .72	All outcomes of Spijkerman et al. 2004, 2005, and 2007: Fav-Beh: r_+ = .09 Sim-Beh: r_+ = .06 RFav-RBeh: r_+ = .09 RSim-RBeh: r_+ = .06 Fav-BI: r_+ = .22 Sim-BI: r_+ = .17 RFav-RBI: r_+ = .22 Rsim-RBI: r_+ = .17
67. Spijkerman et al. (2007) Psychology & Health	N = 1956; 47% males; M age = 12.8, range 12-16; The Netherlands; Prospective: 6 months	Cognitive Dissonance Theory	Drinker prototype; Favourability: 22 adjectives (4 dimensions), α = .89, α = .78, α = .86, α = .82	Drinking behaviour: frequency, quantity, binge	All outcomes of Spijkerman et al. 2004, 2005, and 2007: Fav-Beh: r_+ = .09 Sim-Beh: r_+ = .06 RFav-RBeh: r_+ = .09 RSim-RBeh: r_+ = .06 Fav-BI: r_+ = .22 Sim-BI: r_+ = .17 RFav-RBI: r_+ = .22 Rsim-RBI: r_+ = .17

Appendix B (continued)

Study	Sample and study characteristics	Theory	Prototype measure	Dependent variable	Weighted effect sizes (r_+)
68. Spijkerman et al. (2007) Health Education & Behavior	N = 1035; 49.3% males; M age = 13.4, range 12-15; 8th grade; The Netherlands; Prospective: 1 year		Smoker and abstainer prototypes; Favourability: 19 adjectives, smoker prototype α = .91 among smokers, smoker prototype α = .86 among abstainers, abstainer prototype α = .93 among smokers and abstainers	Behaviour, smoking status: 1 item	Fav-Beh: r_+ = .13 RFav-RBeh: r_+ = .13 HFav-HBeh: r_+ = .12
69. Spijkerman et al. (2010) Alcoholism: Clinical and Experimental Research	N = 200; 49% males; M age = 21.5, range 18-27 years; The Netherlands; Experimental/intervention	PWM	Drinker prototype; Favourability: 16 adjectives, abstainer prototype α = .85, heavy drinker prototype α = .91	Drinking behaviour: self-reported recall and binge drinking, observed alcohol use	Fav-Beh: r_+ = .35 RFav-RBeh: r_+ = .36 HFav-HBeh: r_+ = .34
70. Stock et al. (2012) British Journal of Health Psychology; Study 1	N = 555; 56% males; M age = 19.4, range 18-25; USA; Cross-sectional	PWM	Prototype of n user of nonmedical prescription stimulants; Favourability, 7 adjectives, multiplied by similarity item; α = .75	Behaviour: Nonmedical prescription stimulants, Willingness: 3 items, α = .94	Fav*Sim-Beh: r_+ = .21 Fav*Sim-BW: r_+ = 47
71. Stock et al. (2012) British Journal of Health Psychology; Study 2	N = 166; 69% males; Age range 18-25; USA; Experimental/intervention	PWM	Prototype of n user of nonmedical prescription stimulants; Favourability, 7 adjectives, multiplied by similarity item; α = .73	Behaviour: Nonmedical prescription stimulants; Willingness: 3 items, α = .95 Intentions[4]: 2 items, r = .75	Fav*Sim-Beh: r_+ = .43 Fav*Sim-BW: r_+ = .56 Fav*Sim-BI: r_+ = .46

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Appendix B (continued)

Study	Sample and study characteristics	Theory	Prototype measure	Dependent variable	Weighted effect sizes (r_+)
72. Teunissen et al. (2012) Drug and Alcohol Dependence	N = 171; 43% males; M age = 20.7; The Netherlands; Experimental/ intervention		Drinker and abstainer prototypes; Favourability: 16 adjectives, abstainer α = .86, heavy drinker α = .89	Drinking behaviour: self-reported recall and binge drinking, observed alcohol use	Fav-Beh: r_+ = .32 RFav-RBeh: r_+ = .38 HFav-HBeh: r_+ = .25
73. Thornton et al. (2002) Personality and Social Psychology Bulletin; Study 1	N = 362; 48.6% males; M age = 19.4, range 18-24; USA; Cross-sectional	PWM; models of health behaviour (HBM, PAP, PMT)	Unsafe sex prototype (pregnancy and STD); Favourability: 12 adjectives, α unknown	Sexual intentions[2]: 2 items adjusted from willingness, pregnancy α = .77, STD α = .74 and 1 item adjusted from expectations	Fav-BI: r_+ = .11 RFav-RBI: r_+ = .11
74. Thornton et al. (2002) Personality and Social Psychology Bulletin; Study 2	N = 32; 0% males; M age = 19.8, range 18-24; USA; Experimental/ intervention	PWM; models of healthy behaviour (HBM, PAP, PMT)	Unsafe and safe sex prototypes; Favourability: 12 adjectives, α unknown; Similarity: Manipulation	Sexual intentions[1,4]: 1 item from intentions and 1 item adjusted from expectations; Willingness: 2 items, α = .82	Fav-BW: r_+ = .09 RFav-RBW: r_+ = .58 HFav-HBW: r_+ = -.51 Sim-BI: r_+ = -.05 Rsim-RBI: r_+ = .05 HSim-HBI: r_+ = -.16
75. Thornton et al. (2002) Personality and Social Psychology Bulletin; Study 3	N = 496; 44% males; M age = 18.0, range: USA; Cross-sectional; Prospective: 12 months	PWM; models of healthy behaviour (HBM, PAP, PMT)	Unsafe sex prototypes; Favourability: 12 adjectives (3 dimensions), factor loadings .98, .94, .95	Behaviour, unsafe sex: 2 items, factor loadings T0 .78, .56, T1 .72, .52; Intentions[2,4]: 2 items adjusted from expectations and 3 items adjusted from willingness, factor loadings .83, .88, .60, .62, .92	All outcomes of Iowa college sample: Fav-Beh: r_+ = .31 RFav-RBeh: r_+ = .31 Fav-BI: r_+ = .11 RFav-RBI: r_+ = .20 HFav-HBI: r_+ = .01 Fav*Sim-Beh: r_+ = .41 Fav*Sim-BI: r_+ = .39
76. van den Eijnden et al. (2006) European Addiction Research	N = 612; 47.2% males; M age = 12.3, range 11-13; The Netherlands; Cross-sectional; Prospective: 6 months	TPB; PWM	Smoker prototype; Favourability: 16 adjectives, α = .87	Smoking behaviour: 1 item	Fav-Beh: r_+ = .14 RFav-RBeh: r_+ = .14

Appendix B (continued)

Study	Sample and study characteristics	Theory	Prototype measure	Dependent variable	Weighted effect sizes (r_+)
77. van Lettow et al. (2013) British Journal of Psychology	N = 148; 37% males; M age = 20.6, range 18-25; The Netherlands; Cross-sectional	Social identity theory	Drinker and abstainer prototypes; Favourability: 2 items, abstainer α = .82, heavy drinker α = .83; Similarity: 2 items, abstainer α = .88, heavy drinker α = .79	Drinking behaviour: 1 item	Fav-Beh: r_+ = .38 Sim-Beh: r_+ = .45 RFav-RBeh: r_+ = .42 RSim-RBeh: r_+ = .53 HFav-HBeh: r_+ = .34 HSim-HBeh: r_+ = .37
78. Wills et al. (2003) Psychology of Addictive Behaviors	N = 297; 47% males; M age = 13.0, range 12-14; USA; Cross-sectional	self-control theory; social perception theory for understanding early risky behaviour; Family process theory	Smoker, drinker, drug user, sex (pregnancy, sexually active) prototypes; Favourability: 6 items, smoker prototype α = .73, drinker α = .78, drug user α = .83, pregnancy α = .78, sexually active α = .76, drug abstainer α = .86, sex abstainer α = .80	Substance use behaviour (Smoking, drinking, drugs): 4 items, α = .85; Sexual behaviour: 1 item	Fav-Beh: r_+ = .23 RFav-RBeh: r_+ = .31 HFav-HBeh: r_+ = .16

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Appendix B (continued)

Study	Sample and study characteristics	Theory	Prototype measure	Dependent variable	Weighted effect sizes (r_+)
79. Zimmermann & Sieverding (2010) British Journal of Health Psychology	N = 300; 51% males; M age = 24.7, range 18-25; Germany; Cross-sectional; Prospective: 1 week	TPB	Drinker and abstainer prototypes; Favourability: 11 adjectives (2 dimensions), factor loadings EFA .46–89; Similarity: 1 item	Drinking behaviour: 1 item; Willingness: 4 items, α =.86; Intentions: 1 item	All outcomes of Zimmermann & Sieverding (2011) and (2010): Fav-Beh: r_+ = .24 Sim-Beh: r_+ = .30 RFav-RBeh: r_+ = .26 RSim-RBeh: r_+ = .27 HFav-HBeh: r_+ = .23 HSim-HBeh: r_+ = .33 Fav-BW: r_+ = .18 Sim-BW: r_+ = .48 RFav-RBW: r_+ = .21 RSim-RBW: r_+ = .47 HFav-HBW: r_+ = .15 Hsim-HBW: r_+ = .50 Fav-BI: r_+ = .12 Sim-BI: r_+ = .41 RFav-RBI: r_+ = .18 Rsim-RBI: r_+ = .43 HFav-HBI: r_+ = .06 HSim-HBI: r_+ = .38

Appendix B (continued)

Study	Sample and study characteristics	Theory	Prototype measure	Dependent variable	Weighted effect sizes (r_+)
80. Zimmermann & Sieverding (2011) Journal of Health Psychology	N = 300; 51% males; M age = 24.7, range 18-25; Germany; Prospective: 1 week	TPB	Drinker and the abstainer prototypes; Favourability: 11 adjectives (2 dimensions), factor loadings EFA .46–89	Willingness to drink: 4 items, α = .86; Intentions: 1 item	All outcomes of Zimmermann & Sieverding (2011) and (2010): Fav-Beh: r_+ = .24 Sim-Beh: r_+ = .30 RFav-RBeh: r_+ = .26 RSim-RBeh: r_+ = .27 HFav-HBeh: r_+ = .23 HSim-HBeh: r_+ = .33 Fav-BW: r_+ = .18 Sim-BW: r_+ = .48 RFav-RBW: r_+ = .21 RSim-RBW: r_+ = .47 HFav-HBW: r_+ = .15 Hsim-HBW: r_+ = .50 Fav-BI: r_+ = .12 Sim-BI: r_+ = .41 RFav-RBI: r_+ = .18 Rsim-RBI: r_+ = .43 HFav-HBI: r_+ = .06 HSim-HBI: r_+ = .38

Note: 1 = adjusted from intention, 2 = adjusted from willingness, 3 = adjusted from resistance efficacy scale, 4 = adjusted from expectations

Only presented constructs were used in the analyses in order to exclude duplicate constructs if articles were based on the same study sample, though some articles may report more data than reported here. In addition, effect sizes (r) are weighted correlations (e.g. over cross-sectional and prospective data) where necessary. As such, respondents are only included once in the analyses.

Experimental/intervention studies are referred to as 'experimental.' Prototype favourability ('Fav') measures are questions resembling 'What do you think of the [prototype]?' ranging from 'very negative' to 'very positive' or a list of adjectives or dimensions of characteristics. Prototype similarity ('Sim') measures resemble question such as 'How similar are you to the [prototype]?' or computations whereby the self and prototype are contrasted, for instance by the mean difference. Intentions ('BI') include items such as 'I intend to …,' 'I plan to…,' or 'How likely is it that you…?' Willingness ('BW') includes items indicating 'How willing are you to…?' All behavioural ('Beh') measured were direct questions and were self-reported, unless otherwise specified. An added 'H' indicates 'Health', an added 'R' indicates 'Risk.'

APPENDIX C. REASONS FOR EXCLUDING STUDIES

	Study	Not relevant or no favourability or similarity measured	No relation with DV	Qualitative/ No data	Missing data that could not be retrieved	Part of series of publications	Not in English	DV not measured according to used definition	Clinical sample or outcome
1.	Allbutt et al. (1995) Health Education Research		√	√					
2.	Amos et al. (1997) Social Science & Medicine	√		√					
3.	Amos et al. (1998) Health Education Research	√							
4.	Andrews et al. (2008) Nicotine and Tobacco Research					√			
5.	Andrews et al. (2011) Addictive Behaviors					√			
6.	Ashmore et al. (2002) Journal of Applied Social Psychology							√	
7.	Atwell et al. (2011) Alcohol and Alcoholism							√	
8.	Barker et al. (1999) Appetite		√						
9.	Barr et al. (2013) Journal of Youth and Adolescence					√			
10.	Bermudez & Contreras (2008) Revista de Psicopatologia y Psicologia Clinica						√		

Appendix C (continued)

Study	Not relevant or no favourability or similarity measured	No relation with DV	Qualitative/ No data	Missing data that could not be retrieved	Part of series of publications	Not in English	DV not measured according to used definition	Clinical sample or outcome used
11. Berry & Strachan (2012) Research Quarterly for Exercise and Sport	√							
12. Blanton et al. (1997) Journal of Family Psychology					√			
13. Bowen et al. (1991) Addictive Behaviors		√						
14. Brody et al. (2005) Journal of Research on Adolescence	√							
15. Brody et al. (2006) Journal of Family Psychology	√							
16. Brown et al. (2005) Addictive Behaviors	√							
17. Bryan et al. (1999) Personality and Social Psychology Bulletin	√							
18. Buysse (1998) Psychology & Health	√							
19. Chattopadhyay et al. (2004) Journal of Applied Psychology	√							
20. Copersino et al. (2006) American Journal on Addictions	√							

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Appendix C (continued)

Study	Not relevant or no favourability or similarity measured	No relation with DV	Qualitative/ No data	Missing data that could not be retrieved	Part of series of publications	Not in English	DV not measured according to used definition	Clinical sample or outcome
21. de Bruijn et al. (2007) Health Education Research	√							
22. de Bruijn et al. (2012) Psychology of Sport & Exercise	√							
23. Dal Cin et al. (2009) Health Psychology					√			
24. Dinh et al. (1995) Health Psychology				√				
25. Echabe et al. (1994) European Journal of Social Psychology			√	√				
26. Evans et al. (2004) Journal of Health Communication	√			√				
27. Evans et al. (2006) Health Psychology	√							
28. Fleming et al. (2007) American Journal of Industrial Medicine	√							
29. Fries & Croyle (1993) Journal of the American Dietetic Association		√						
30. Gatersleben & Haddad (2010) Transportation Research Part F-Traffic Psychology and Behaviour		√						

Appendix C (continued)

Study	Not relevant or no favourability or similarity measured	No relation with DV	Qualitative/ No data	Missing data that could not be retrieved	Part of series of publications	Not in English	DV not measured according to used definition	Clinical sample or outcome
31. Gebhardt et al. (2009) International Journal of Std & Aids	√							
32. Gerrard et al. (1996) Psychological Bulletin	√							
33. Gerrard et al. (2002) Risk, Decision and Policy	√							
34. Gerrard et al. (2005) Health Psychology				√				
35. Gerrard et al. (2005) Journal of Pediatric Psychology				√				
36. Gerrard et al. (2008) Developmental Review			√					
37. Gibbons et al. (1991) Journal of Experimental Social Psychology		√						√
38. Gibbons et al. (1995) Journal of Applied Psychology								
39. Gibbons & Gerrard (1995) Journal of Personality and Social Psychology								
40. Gibbons et al. (1998) Psychology & Health	√							

Appendix C (continued)

	Study	Not relevant or no favourability or similarity measured	No relation with DV	Qualitative/ No data	Missing data that could not be retrieved	Part of series of publications	Not in English	DV not measured according to used definition	Clinical sample or outcome
41.	Gibbons et al. (2002) Risk Decision and Policy	√							
42.	Gibbons et al. (2004) Journal of Personality and Social Psychology					√			
43.	Gibbons et al. (2005) Health Psychology	√						√	
44.	Gibbons et al. (2007) Journal of Rural Health Fall	√							
45.	Gibbons et al. (2009) British Journal of Health Psychology			√					
46.	Gibbons et al. (2010) Journal of Personality and Social Psychology	√							
47.	Godin et al. (2010) British Journal of Health Psychology	√							
48.	Grube et al. (1990) Addictive Behaviors	√							
49.	Guo et al. (2010) Addictive Behaviors	√							
50.	Guo et al. (2012) Addictive Behaviors	√							
51.	Guo et al. (2013) Addictive Behaviors	√							

Appendix C (continued)

Study	Not relevant or no favourability or similarity measured	No relation with DV	Qualitative/ No data	Missing data that could not be retrieved	Part of series of publications	Not in English	DV not measured according to used definition	Clinical sample or outcome
52. Hahn & Renner (1998) Anxiety Stress and Coping	√							
53. Hampson et al. (2006) Psychology of Addictive Behaviors	√							
54. Hampson et al. (2007) Nicotine & Tobacco Research					√			
55. Hampson et al. (2008) Addictive Behaviors					√			
56. Harre et al. (2005) British Journal of Psychology	√							
57. Hertel & Mermelstein (2012) Health Psychology	√							
58. Herzberg (2009) Journal of Research in Personality	√							
59. Hines (1996) Psychological Reports	√							
60. Hoek et al. (2011) Australasian Marketing Journal	√							
61. Hoie et al. (2010) Addiction Research & Theory	√							
62. Hyde & White (2009) Journal of Applied Social Psychology		√	√					

Appendix C (continued)

	Study	Not relevant or no favourability or similarity measured	No relation with DV	Qualitative/ No data	Missing data that could not be retrieved	Part of series of publications	Not in English	DV not measured according to used definition	Clinical sample or outcome
63.	Hyde & White (2009) Journal of Community & Applied Social Psychology	√							
64.	Isralowitz et al. (2009) Journal of Smoking Cessation	√							
65.	Johnsen et al. (2002) Health Psychology	√							
66.	Johnson et al. (2003) Research in Nursing & Health	√							
67.	Johnson et al. (2009) Transportation Research Record	√							
68.	Kanarek et al. (2012) Appetite	√							
69.	Klein & Pittman (1990) Journal of substance abuse	√	√						
70.	Kury et al. (1998) Journal of Clinical Child Psychology				√				
71.	Lang et al. (1992) Journal of Studies on Alcohol	√	√						
72.	Lindwall, & Martin Ginis (2006) Scandinavian Journal of Psychology	√	√						

Appendix C (continued)

Study	Not relevant or no favourability or similarity measured	No relation with DV	Qualitative/ No data	Missing data that could not be retrieved	Part of series of publications	Not in English	DV not measured according to used definition	Clinical sample or outcome
73. Lindwall & Ginis (2008) Scandinavian Journal of Medicine & Science in Sports	√	√						
74. Litchfield & White (2006) E-Journal of Applied Psychology	√							
75. Litt & Stock (2011) Psychology of Addictive Behaviors								
76. Litt et al. (2012) Basic and Applied Social Psychology	√							
77. Litt et al. (2013) Prevention Science	√							
78. Lowe et al. (1999) Health Education & Behavior	√							
79. MacFadyena et al. (2003) Social Science and Medicine					√			
80. Maglica (2010) Psihologijske Teme						√		
81. Maglica (2011) Psihologijske Teme						√		
82. Mahler et al. (2003) Health Psychology	√							
83. Marin & Marin (1997) Substance Use & Misuse				√				

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Appendix C (continued)

	Study	Not relevant or no favourability or similarity measured	No relation with DV	Qualitative/ No data	Missing data that could not be retrieved	Part of series of publications	Not in English	DV not measured according to used definition	Clinical sample or outcome used
84.	Martin & Leary (1999) Personality and Social Psychology Bulletin	√							
85.	Masser et al. (2009) Transfusion	√							
86.	Masser et al. (2012) Transfusion	√							
87.	Matt et al. (1999) Perceptual and Motor Skills	√							
88.	Matterne et al. (2011) Psychology & Health (Clinical sample)								√
89.	McBride Murry et al. (2007) Journal of Adolescent Health	√							
90.	McClain et al. (2013) Journal of American College Health	√							
91.	McCool et al. (2004) Tobacco Control	√							
92.	McCool et al. (2005) Journal of Adolescent Health	√							
93.	McMahon & Byrne (2008) Transfusion	√							
94.	Michell & Amos (1997) Social Science & Medicine	√							

Appendix C (continued)

Study	Not relevant or no favourability or similarity measured	No relation with DV	Qualitative/ No data	Missing data that could not be retrieved	Part of series of publications	Not in English	DV not measured according to used definition	Clinical sample or outcome
95. Miller et al. (1990) Journal of Applied Social Psychology	√	√						
96. Moan & Rise (2005) Journal of Applied Biobehavioral Research	√							
97. Moan & Rise (2006) Psychology & Health	√							
98. Novik et al. (2011) Journal of Interpersonal Violence	√							
99. Ouellette et al. (1999) Psychology of Addictive Behaviors								
100. Ouellette et al. (2005) Personality and Social Psychology Bulletin	√							
101. Page et al. (2011) International Quarterly of Community Health Education	√							
102. Pechmann & Ratneshwar (1994) Journal of Consumer Research	√							
103. Pechmann & Knight (2002) Journal of Consumer Research	√	√						

2

Appendix C (continued)

Study	Not relevant or no favourability or similarity measured	No relation with DV	Qualitative/No data	Missing data that could not be retrieved	Part of series of publications	Not in English	DV not measured according to used definition	Clinical sample or outcome
104. Pellett & Ignico (1993) Perceptual and Motor Skills	√							
105. Pellett, T. L. (1994) Perceptual and Motor Skills	√							
106. Peterson et al. (2007) Journal of Women's Health	√							
107. Piko et al. (2010) International Journal of Psychology	√							
108. Quevedo Pereyra (1997) Archivos Hispanoamericanos de Sexologia						√		
109. Quinlan et al. (2006) Journal of Personality	√							
110. Read et al. (1990) Journal of Personality & Social Psychology	√							
111. Repossi et al. (1994) Revista Medica de Chile						√		
112. Reyna & Farley (2006) Psychological Science	√		√					
113. Ricciardelli et al. (2001) Drug and Alcohol Dependence	√							
114. Rivis et al. (2011) Psychology & Health							√	

Appendix C (continued)

Study	Not relevant or no favourability or similarity measured	No relation with DV	Qualitative/ No data	Missing data that could not be retrieved	Part of series of publications	Not in English	DV not measured according to used definition	Clinical sample or outcome
115. Robinson & Rigel (2004) Dermatologic Surgery	√							
116. Rodgers et al. (2009) Journal of Sport & Exercise Psychology		√		√				
117. Rudman et al. (2007) Personality and Social Psychology Bulletin	√							
118. Schofield et al. (2001) Psychology & Health	√							
119. Seacat & Mickelson (2009) Journal of Health Psychology	√							
120. Skalle & Rise (2006) Addictive Behaviors				√				
121. Sledziewski (2005) Journal de Gynécologie, Obstétrique et Biologie de la Reproduction						√		
122. Spruijt-Metz et al. (2005) Annals of Behavioral Medicine	√							
123. Stanton et al. (1993) Addictive Behaviors	√							
124. Stavrou et al. (2003) Journal of Applied Social Psychology	√							

Appendix C (continued)

Study	Not relevant or no favourability or similarity measured	No relation with DV	Qualitative/ No data	Missing data that could not be retrieved	Part of series of publications	Not in English	DV not measured according to used definition	Clinical sample or outcome
125. Stewart-Knox et al. (2005) British Journal of Social Psychology	√		√					
126. Stock et al. (2009) Annals of Behavioral Medicine	√							
127. Stock et al. (2012) British Journal of Health Psychology								
128. Stock et al. (2013) Health Psychology	√							
129. Suarez et al. (2004) Transfusion			√					
130. Swann et al. (2009) Journal of Personality & Social Psychology	√							
131. Todd & Mullan (2011) Addictive Behaviors				√				
132. van Hanswijck de Jonge & Gormley (2005) Addictive Behaviors	√							
133. van den Putte et al. (2009) Health Psychology	√							
134. Wagner & Atkins (2000) Journal of Child & Adolescent Substance Abuse	√		√					

Appendix C (continued)

Study	Not relevant or no favourability or similarity measured	No relation with DV	Qualitative/ No data	Missing data that could not be retrieved	Part of series of publications	Not in English	DV not measured according to used definition	Clinical sample or outcome used
135. Walsh & Stock (2012) Journal of Behavioral Medicine	√							
136. Weiner et al. (1999) Journal of Drug Education	√	√						
137. Werch (2007) Health Education Research	√		√					
138. White et al. (2008) British Journal of Health Psychology	√							
139. Wiesmann et al. (2008) British Journal of Health Psychology	√							
140. Williams & Ricciardelli (1999) Journal of Psychology	√						√	
141. Wills et al. (2010) Health Psychology	√							
142. Zimmermann & Sieverding (2011) Substance Use & Misuse	√							
143. Zimmermann et al. (2011) Sex Roles	√							

2

APPENDIX D. CORRELATIONAL STUDIES

Table 3. Weighted correlations (r+) between prototypes and behaviour, willingness, and intentions for correlational studies

Dependent variable	Prototype	Prototype measure	N	k	d(se)	r+	CI95% of r+		Homogeneity analyses	
							Lower	Upper	Q	df
Health-related behaviour	All	Favourability	22,762	34	.41(.06)	.20***	.14	.25	553.71***	33
		Similarity	8934	15	.60(.16)	.28***	.13	.42	644.68***	14
Health-risk behaviour	RP	Favourability	22,369	32	.44(.06)	.22***	.16	.27	543.85***	31
		Similarity	8352	12	.58(.19)	.27**	.10	.43	651.17***	11
Health-protective behaviour	HP	Favourability	4620	12	.25(.07)	.12***	.06	.19	55.21***	11
		Similarity	895	4	.73(.07)	.34***	.28	.40	0.28	3
Health-related willingness	All	Favourability	8112	11	.42(.16)	.21**	.04	.36	405.81***	10
		Similarity	933	4	1.03(.32)	.45***	.18	.65	63.23***	3
Health-risk willingness	RP	Favourability	7900	10	.57(.18)	.27***	.11	.42	326.03***	9
		Similarity	933	4	1.01(.32)	.44**	.17	.65	61.87***	3
Health-protective willingness	HP	Favourability	1247	5	.10(.121)	.05	-.16	.25	48.88***	4
		Similarity	300	1	1.16(.14)	.50***	.41	.58	N/A	0
Health-related intention	All	Favourability	13,937	29	.42(.05)	.21***	.16	.25	183.48***	28
		Similarity	7929	15	.88(.15)	.40***	.27	.51	462.34***	14
Health-risk intentions	RP	Favourability	13,002	25	.45(.05)	.22**	.17	.27	162.73***	24
		Similarity	6948	11	.90(.20)	.40***	.25	.54	440.73***	10
Health-protective intentions	HP	Favourability	2563	11	.22(.09)	.11***	.03	.19	44.16***	10
		Similarity	1404	6	.76(.14)	.35***	.24	.46	28.83***	5

Note: Random models are presented; k represents the number of studies; 'RP' represents a health-risk prototype; 'HP' represents a health-protective prototype. Associations are significant at the following levels: *p ≤ 0.05, **p ≤ 0.01, ***p ≤ .001

APPENDIX E. CROSS-SECTIONAL AND PROSPECTIVE STUDIES

Table 4. Weighted correlations (r_+) between prototypes and behaviour, willingness, and intentions of cross-sectional and prospective studies

Dependent variable	Prototype	Prototype measure		N	k	d(se)	r_+	CI$_{95\%}$ of r_+		Homogeneity analyses	
								Lower	Upper	Q	df
Behaviour	All	Favourability	Cross-sectional	20,131	26	.39(.07)	.19***	.12	.26	559.12***	25
		Similarity		6713	10	.67(.19)	.31***	.15	.46	373.12****	9
		Favourability	Prospective	11,959	20	.39(.08)	.19***	.11	.27	440.65***	19
		Similarity		4349	9	.52(.13)	.25***	.13	.37	113.23***	8
Health-risk behaviour	RP	Favourability	Cross-sectional	19,624	24	.43(07)	.21***	.14	.28	548.34***	23
		Similarity		6065	7	.71(.25)	.33**	.11	.52	354.91***	6
		Favourability	Prospective	13,696	18	.43(.09)	.21***	.13	.29	340.38***	17
		Similarity		3968	7	.40(.13)	.20**	.07	.33	.72.44***	6
Health-protective behaviour	HP	Favourability	Cross-sectional	3553	9	.23(.07)	.11***	.04	.18	32.45***	8
		Similarity		660	3	.68(.18)	.32***	.17	.46	8.25*	2
		Favourability	Prospective	3074	8	.27(.10)	.10	-.01	.20	50.73***	9
		Similarity		681	3	.78(.13)	.37***	.26	.46	4.47	2
Willingness	All	Favourability	Cross-sectional	7446	10	.49(.19)	.23***	.06	.39	338.48***	9
		Similarity		933	4	1.03(.32)	.45***	.18	.65	63.23***	3
		Favourability	Prospective	1705	3	.23(.09)	.12***	.03	.20	5.89	2
		Similarity		0	0	N/A					
Risk willingness	RP	Favourability	Cross-sectional	7234	9	.66(.18)	.31***	.15	.45	249.74***	8
		Similarity		933	4	1.01 (.32)	.44**	.17	.65	61.87**	3
		Favourability	Prospective	1705	3	.31(.05)	.15***	.11	.20	.43	2
		Similarity		0	0	N/A					

Table 4. Weighted correlations (r+) between prototypes and behaviour, willingness, and intentions of cross-sectional and prospective studies (continued)

Dependent variable	Prototype	Prototype measure		N	k	r+ (SD)	r+	CI95% of r+		Homogeneity analyses	
Health Willingness	HP	Favourability	Cross-sectional	1247	5	.16(.24)	.08	-.15	.31	64.34***	4
		Similarity		300	1	1.16(.14)	.50***	.41	.58	N/A	
		Favourability	Prospective	300	1	.31(.05)	.07	-.04	.18	N/A	
		Similarity		0	0	N/A					
Intentions	All	Favourability	Cross-sectional	14,406	28	.46(.05)	.22***	.18	.27	163.02***	27
		Similarity		7929	15	.88(.16)	.40***	.27	.51	498.29***	14
		Favourability	Prospective	4316	6	.19(.08)	.10*	.02	.18	30.38***	5
		Similarity		1938	1	.40(.05)	.20***	.15	.24	N/A	
Risk intentions	RP	Favourability	Cross-sectional	13,427	24	.49(.05)	.24***	.19	.28	153.38***	23
		Similarity		6948	11	.90(.20)	.40***	.24	.55	477.16***	10
		Favourability	Prospective	4353	6	.25(.07)	.12***	.05	.19	22.14***	5
		Similarity		1938	1	.40(.05)	.20***	.15	.24	N/A	
Health Intentions	HP	Favourability	Cross-sectional	2168	10	.26(.09)	.13**	.04	.22	39.48***	9
		Similarity		1404	6	.76(.14)	.35***	.24	.46	28.83***	5
		Favourability	Prospective	695	2	.05(.08)	.02	-.05	.10	.15	1
		Similarity		0	0	N/A					

Note: Random models are presented; k represents the number of studies; 'RP' represents a health-risk prototype; 'HP' represents a health-protective prototype. Associations are significant at the following levels: * $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq .001$

The analyses revealed that cross-sectional effects were often stronger than prospective effects. In addition, similarity generally exhibited a stronger (often significant) effect on the outcomes than favourability. However, no significant differences between the designs were found regarding the associations of favourability and similarity with health-related and health-risk behaviour. And, no difference was found regarding the relationship of similarity with health-protective behaviour.

2

3

Clustering of drinker prototype characteristics: What characterizes the typical drinker

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ABSTRACT

Prototypes (social images) have been shown to influence behaviour, which is likely to depend on the type of image. Prototype evaluation is based on (un)desirable characteristics related to that image. By an elicitation procedure we examined which adjectives are attributed to specific drinker prototypes. In total 149 young Dutch adults (18–25 years of age) provided adjectives for five drinker prototypes: abstainer, moderate drinker, heavy drinker, tipsy, and drunk person. Twenty-three unique adjectives were found. Multilevel latent class cluster analysis revealed six adjective clusters, each with unique and minor overlapping adjectives: 'negative, excessive drinker,' 'moderate, responsible drinker,' 'funny tipsy drinker,' 'determined abstainer cluster,' 'uncontrolled excessive drinker,' and 'elated tipsy cluster'. In addition, four respondent classes were identified. Respondent classes showed differences in their focus on specific adjective clusters. Classes could be labelled 'focus-on-control class,' 'focus-on-hedonism class,' 'contrasting-extremes-prototypes class,' and 'focus-on-elation class'. Respondent classes differed in gender, educational level and drinking behaviour. The results underscore the importance to differentiate between various prototypes and in prototype adjectives among young adults: subgroup differences in prototype salience and relevance are possibly due to differences in adjective labelling. The results provide insights into explaining differences in drinking behaviour and could potentially be used to target and tailor interventions aimed at lowering alcohol consumption among young adults via prototype alteration.

INTRODUCTION

Alcohol consumption poses an important public health problem in many countries.[1] In the Netherlands, one out of five young adults (18–25 years old) drinks excessively, which is the highest percentage among people in all other age categories.[2] Alcohol use, among other behaviours, has been related to prototypes (i.e. social images).

Prototypes refer to perceptions or cognitions of the image of a typical person who engages in certain risk or health behaviour.[3,4] Prototypes are assumed to be influential via a social comparison process.[5] Much of the research on prototypes has focused on children and adolescents. However, it is suggested that, like adolescence, young adulthood is an important phase in which individuals are aware of their social images.[4,6,7] Indeed, earlier research has shown the relevance of studying prototypes in explaining both health and risk behaviour among young adults.[8-13] In addition, interventions and experiments have suggested that altering prototypes can effectively change risk behaviour.[10,13,14] Hence, prototypes offer an opportunity for interventions. To effectively incorporate prototypes in interventions it is important to understand which prototype (adjectives) needs to be targeted. Therefore, the present study focused on various drinker prototypes that young adults may hold and on adjectives they attribute to these prototypes.

Although many prototype studies have often focused on the extremes of risk prototypes, which are prototypes of persons engaging in risk behaviours[5,15-17] and abstainers,[11,15,18] additional research has suggested that it is important to examine alternative prototypes. An example is the inference that healthy prototypes (e.g. abstainer, exercise, and eating breakfast) might be important in addition to risk prototypes[7,16,17] Other examples of alternative prototypes within the range of extremes are a binge drinker prototype,[9,19] social drinker,[11] healthy eater prototype,[20] occasional smoker,[21] typical exerciser,[22] and active living person.[23] Specifically, perceived similarity to prototypes seems to play a significant role in explaining behaviour.[9] Extreme prototypes (risk and abstainer) may therefore be less likely to function as credible comparators. Therefore, it is important to expand research on these alternative prototypes in explaining behaviour. However, to effectively use alternative prototypes in research and interventions it is necessary to improve the understanding of how young adults characterise these alternative prototypes.

Until recently prototypes were generally assessed by a generic list of adjectives[24,25] applied to different behaviours and various target groups. However, other studies focusing on adjectives provide evidence that it might be useful to examine differences among adjectives; this might be an important aspect to target for developing lifestyle interventions. For instance, earlier studies found that prototype adjectives related to the 'rebellious' factor were negatively related to willingness to drink and smoke. Conversely, factors with positive adjectives (e.g. cool) were positively related to intentions to drink and smoke.[26] In particular, others showed that especially 'sociability/hedonism' should be focused on when relating adjective dimensions to intentions and willingness to drink.[27] Furthermore, experimental studies aimed

at altering prototype perceptions showed that letting people contemplate the (negative or positive) adjectives of prototypical images, or manipulating prototype adjectives, resulted in behaviour change such as safer sexual behaviour[13] and exercise[10] Finally, other studies suggest that adjectives might differ in their relevance depending on the type of behaviour. For example, different adjective lists have been obtained for healthy and unhealthy eater prototypes.[28] Several other studies have elicited their own adjective lists as well.[9,10,28-30]

In summary, to improve our understanding of risk behaviours among young adults it is important to extend research on prototypes among this age group, examine alternative prototypes that they may hold and identify which adjectives map onto these alternative prototypes. Hence, the purpose of the current study among young adults was twofold. The first aim was to examine whether different clusters of prototype adjectives could be identified and whether these clusters differed for various alternative drinker prototypes. Five drinker prototypes were examined: abstainer, heavy drinker, moderate drinker, tipsy, and drunk person. The second aim was to determine whether respondent subgroups could be identified regarding the relevance of prototype adjectives. This was done by assessing individual differences (gender and level of education) in attributing adjectives. Also, we assessed whether these respondent subgroups related to drinking behaviour and to favourability of and identification (i.e. perceived similarity) with certain prototypes. Hence, the relevance of adjectives according to drinking behaviour (binge drinking and norm violation) was examined.

The choice of prototypes was based on previous literature and aimed at including prototypes varying in levels of intoxication (i.e. drinking states: abstinence, drinking moderately, being tipsy, and being drunk) and in range of normative rates, described in the Netherlands as ranging from abstaining, to moderate or responsible drinking, to heavy or excessive drinking.[31,32] The term binge drinking is not well known among Dutch young adults and was therefore not included. This led to the inclusion of the following drinker prototypes: abstainer,[11,18] moderate drinker,[33] heavy drinker,[11,18,34] tipsy and drunk person. Inclusion of both rates of consumption and states of intoxication provides the opportunity to examine whether young adults distinguish between both types of images in terms of attributed adjectives. Alcohol consumption of a typical heavy drinker, tipsy and drunk person may be due to differences both in terms of motivations for drinking excessively and in frequency. Young adults (and perhaps other age groups) may therefore make different inferences on which adjectives describe these prototypes. If young adults do indeed make such inferences when attributing adjectives, it is likely that young adults even distinguish among the three excessive drinking prototypes.

METHOD

Sample and procedure

Young adults (18–25 years of age) were approached in public areas in Rotterdam and Delft, the Netherlands. Respondents were asked their age, to read information about the study, sign the informed consent form, and to send the survey back by mail. If a signature was not issued on the street, respondents could send the informed consent together with the survey. Twenty vouchers worth €50 were distributed among the final 149 completed surveys. Of the 149 respondents, 37% were men with a mean age of 20.6 (SD = 2.6). Cultural background was defined in accordance with Statistics Netherlands (2000). Of the respondents, 92% were of Western origin.[i] The majority of respondents were either pursuing or had completed middle or higher educational level (68.5%) and were living with their parents (58%). The Ethical Committee of the Erasmus Medical Centre in Rotterdam approved the study (MEC-2010-112).

Measures
Self-reported drinking behaviour

Self-reported drinking behaviour in the past 6 months was assessed by a standardised Dutch questionnaire.[32] Two open-ended items indicated the number of standard glasses of alcohol a respondent drinks as an average per (a) weekday and (b) weekend day. Respondents were then asked to report the number of days per (a) week and (b) weekend in which they drink alcohol. Both items ranged from (1) 'four weekdays or three weekend days' to (6) 'never on these days'. Weekly binge drinking was assessed by the frequency of drinking more than six standard glasses of alcohol per occasion, ranging from (1) 'every day' to (8) 'never'. Finally, respondents were asked to report the number of glasses they had consumed for each day of the past week. This question enabled calculation of average and total drinking levels per weekday (Mo–Thurs) and weekend day (Fri–Sun), and calculation of the actual number of days (frequency) on which respondents had consumed alcohol. According to the standardised questionnaire, excessive drinking (norm) is said to occur when exceeding the following norm: drinking on a maximum of 5 days per week, a maximum of three glasses per day and 14 per week for women, and five glasses per day and 21 per week for men.[32]

Prototype adjectives

A total of five drinker prototypes were studied: heavy and moderate drinker, abstainer, and tipsy and drunk prototype. Prototypes were randomly presented in different orders to correct for response bias. Drinker prototypes were explained by a general description based on earlier research[e.g. 24]: 'When trying to describe someone, people generally use characteristics of that person. These characteristics can be positive, negative, or neutral. For instance, when you describe someone of your age who gets good marks, characteristics could be, for instance, smart, serious, or bookish. In addition, a movie star can be described as rich, a striver or handsome. Five types of persons will follow. Think about the average (typical) person of

your age, not one particular person that you know personally.' It was explicitly stated that the abstainer did not drink alcohol during the past 12 months. Purposefully, no definitions of drinking patterns per prototype were given to avoid enforcing standard drinking patterns on the drinker prototypes. Alternatively, respondents were asked to indicate (open-ended question) how many glasses they expect the moderate and heavy drinker prototypes to drink per occasion and per week, and the tipsy and drunk prototypes per occasion. For each prototype, respondents were asked 'Which characteristics (neutral, positive, negative) do you think can be attributed to the average person of your age who abstains/drinks moderately/drinks heavily regularly/is tipsy/is drunk? Please write down as many words as you can think of.'[29] To facilitate a response, an example was given: 'Someone who gets high grades could be described as smart, serious or a striver.'[28] By means of content analysis, the characteristics were categorised by two raters to ensure validity. A total list of 23 characteristic categories was formed in the following way. A total of 326 characteristics were mentioned when describing the drinker prototypes. First, synonyms were combined as much as possible. In total 85 characteristics met this criterion. Unique characteristic categories were then formed by further combining selected synonyms based on content. Characteristics were replaced until both raters agreed on the final categories, which will be further referred to as 'adjectives'. Thus, the term 'adjectives' incorporates the final characteristic categories. Only adjectives that were mentioned by at least 10% of the respondents for at least one or more prototypes were used in the analyses. Table 1 presents the frequencies per adjective per prototype. Antonymic characteristics were not combined in one category, as it seemed that these adjectives (characteristic categories) represented other prototypes, and might not necessarily be seen as a continuum.[35]

Prototype evaluations

The five prototypes were evaluated on favourability and similarity (identification) each on a 5-point Likert scale. Favourability was assessed by: 'What do you think of [e.g. the typical person of your age who drinks moderately]?,' ranging from (1) 'very negative' to (5) 'very positive,'[29] and 'Do you find [prototype] attractive?' Cronbach's *α* ranged from .74 (moderate drinker prototype) to .85 (drunk prototype). Similarity was assessed by 'Are you similar to [prototype]'[14] ranging from 'certainly' to 'certainly not,' and 'What is the chance that you will be similar to [prototype] in the future?,' ranging from 'very large' to 'very small'[10] Cronbach's *α* ranged from .71 (tipsy prototype) to .88 (abstainer prototype).

Statistical analyses

Associations were considered statistically significant at p < .05. Multilevel latent class analyses (LCA) were performed with the statistical package Latent Gold[36] to examine clusters of prototype adjectives and classes of respondents. LCA considers observed variables (the 23 adjectives) to be indicators of one or more unobserved latent variables with a limited number of mutually exclusive categories. The multilevel variant of LCA makes it possible to account

Table 1. Frequency (%) of occurrence per prototype

Adjectives	Prototypes differing in alcohol intake			Prototypes differing in state	
	Abstainer	Moderate drinker	Heavy drinker	Tipsy	Drunk
Cheery	4.9	14.0	12.7	41.4	19.7
Determined	45.8	21.7	2.8	2.1	0.7
Boring	44.4	11.9	3.5	2.1	4.9
Annoying	4.9	9.1	36.6	52.1	67.6
Reserved	27.1	8.4	1.4	0.7	1.4
Sociable	7.6	22.4	26.8	14.3	11.3
Responsible	27.8	16.8	0.7	2.1	0
Amiable	6.9	46.9	45.1	46.4	23.2
Loud	3.5	3.5	8.5	15.0	9.2
Uncontrolled	1.4	4.9	24.6	22.9	33.8
Self-confident	23.6	10.5	1.4	1.4	1.4
Unordered	0.7	4.9	17.6	10.0	7.0
Controlled	22.2	21.0	0.7	7.1	0
Healthy	18.8	7.0	0	0	0
Volatile	1.4	2.8	25.4	12.1	31.7
Spontaneous	2.1	20.3	30.3	35.0	19.7
Funny	0.7	3.5	12.0	27.1	20.4
Irresponsible	0	0.7	12.7	4.3	16.2
Sad	6.3	4.2	14.8	7.1	12.0
Foolish	0	1.4	9.2	5.0	11.3
Dependent	0	0	12.0	0	4.9
Unsociable	19.4	7.7	9.9	6.4	9.9
Insecure	1.4	7.0	12.0	3.6	7.0

for the nested design. In the present study, adjectives were nested within prototypes. At the higher level, the latent variable consists of classes of respondents and, at the lower level, consists of clusters of adjectives assigned to prototypes. Individuals differ with respect to the probability of belonging to particular latent classes, and diversity between these classes is maximal. Thus, the respondent classes also differ with respect to the likelihood of attributing a certain adjective cluster to a drinker prototype. The probability of selecting a particular adjective cluster not only depends on the respondents' class but also on the prototype. Hence, the adjective clusters differ with respect to the assignment of adjectives. The best fitting model is established by testing several combinations of numbers of classes and clusters. It was sufficient to run analyses specifying one to seven latent clusters of adjectives (lower level) and one to five latent classes of respondents (higher level). Determination of the optimal number of respondent classes and adjective clusters that fits the model best was established by the AIC3 (Akaike's information criterion). AIC3 is the preferred criteria for

simultaneously deciding on the number of lower and higher level classes in models with categorical indicators as in our data.[37] Compared to other criteria AIC3 is better able to detect poorly separated classes and is less likely to find spurious classes. The number of respondent classes and number of adjective clusters is determined by the lowest AIC3 value. The smaller the value, the better the model fits the data and the better the observed relationships are described by the specified model. Clusters will be described by adjectives that have a high probability of being allocated to the cluster compared to other clusters and should at least have a higher probability than the average probability of being mentioned. The probability of prototypes being allocated to the clusters was also examined by the LCA. Refer to recent studies for more information regarding (multilevel) LCA.[38,39] Figure 1 depicts the LCA multi-level model, confirm earlier studies.[40]

Subsequently, multinomial regression analyses (SPSS version 17.0) were used to investigate differences in respondent classes (latent, dependent variable, resulting from the LCA) by gender and educational level (independent variables). Then, multinomial regression analyses related respondent class (now independent variable) to binge drinking and norm violation (dependent variables). In addition, univariate analyses of variance were performed to indicate differences in total number of alcohol units consumed on weekend and weekdays (dependent variables) of respondent classes (independent variable). Finally, univariate analyses of variance were performed with respondent class as independent variable and favourability and similarity as dependent variables. Post hoc Bonferroni comparisons examined evaluation differences between respondent classes.
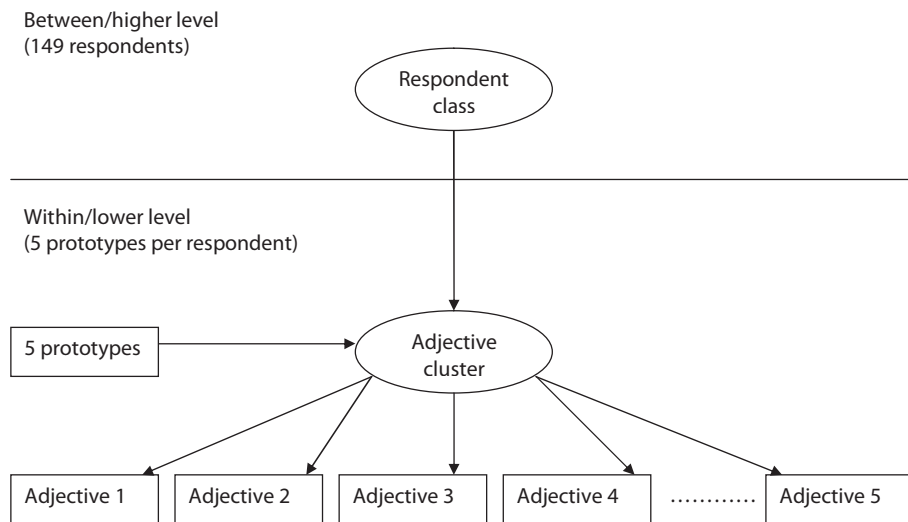

Figure 1. A three-level multilevel latent class model of drinker prototypes

RESULTS

Drinking behaviour

On average, respondents drank 1.1 glasses of alcohol on a weekday (Monday–Thursday, SD = 2.04, range: 0–14.25) and 2.3 on a weekend day (Friday–Sunday, SD = 3.38, range: 0–22.33). Binge drinking was reported by 21.5% of respondents; this is similar to the national average of 20%.[2] Among men, 18% reported norm violations, and 44% reported binge drinking. Men drank 2.1 glasses of alcohol per weekday (SD = 2.93) and 4.37 per weekend day (SD = 4.64). Conversely, only 3% of women reported excessive norm violations, and 8.5% engaged in binge drinking. Women drank 0.5 glasses per weekday (SD = .76) and 1.1 per weekend day (SD = 1.36). In comparison to women, men reported more binge drinking, $\chi^2(1) = 25.39$, excessive drinking norm violations, $\chi^2(1) = 9.79$, weekday quantity, $F(1, 148) = 28.31$, and weekend day quantity, $F(1, 148) = 39.64$.

Latent class cluster analyses: Clusters of adjectives

The first step in the LCA was to establish the number of classes and clusters by means of the multilevel LCA. In the LCA, a six-cluster (adjectives) model with four respondent classes had the lowest AIC3 value (10452), and, thus, was the preferred model. All other combinations gave higher AIC3 values (e.g. five adjective clusters and three respondent classes resulted in AIC3 = 10471, seven clusters and three classes revealed AIC3 = 10460, six clusters and three classes revealed AIC3 = 10458). In the second step, the LCA examined the probability for adjectives to be allocated to adjective clusters and the probability per prototype to be allocated to a cluster. In other words, the adjective clusters could be linked to drinker prototypes by assessing the probability of selecting a cluster given the prototypes. Accordingly, the clusters could be labelled according to which adjectives and prototypes were allocated to them. The upper part of Table 2 shows these probabilities and highlights the highest value(s) in each row by which adjectives are allocated to each cluster. The lower part of Table 2 shows how the adjectives are related to the clusters. The adjectives 'annoying' and 'amiable' were mentioned most (each 33.6% of the respondents) and 'dependent' the least (3.6% over all prototypes). 'Cheery,' 'determined,' and 'boring' had the largest explained variance (see Table 2). The adjectives and prototypes were allocated to clusters and were labelled as follows. The drunk and heavy drinker prototypes had the highest probability of being allocated to Cluster 1 (61% and 47% probability, respectively), which included the adjectives 'annoying,' 'amiable,' 'spontaneous,' 'volatile,' 'funny,' 'sad,' 'uncontrolled,' 'irresponsible,' 'dependent,' 'foolish,' and 'insecure'. Cluster 1 was labelled the *'negative, excessive drinker cluster'.* Cluster 2 was most likely associated with the abstainer prototype (84% probability) and contained the adjectives 'determined,' 'boring,' 'reserved,' 'responsible,' 'controlled,' 'self-confident,' 'healthy,' and 'unsociable'. We labelled this cluster the *'determined abstainer cluster'.* The tipsy prototype was related to both Clusters 3 and 5 (50% and 29% probability, respectively). Cluster 3 was mostly characterised by adjectives

Table 2. Probabilities (prob) of adjectives and prototypes being allocated to clusters, and corresponding R^2 and Wald statistics

	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6	R^2	Wald statistic
Prototype	prob	prob	prob	prob	prob	prob		
Abstainer	.00	**.84**	.01	.15	.00	0		
Moderate drinker	.00	.15	.07	**.65**	.03	.11		
Tipsy	.06	.00	**.50**	.06	**.29**	.09		
Heavy drinker	**.47**	.00	.17	.05	.06	**.26**		
Drunk	**.61**	.00	.19	.00	.16	.04		
Adjectives								
Cheery	.04	.06	.16	.09	**.55**	.11	.47	49.77***
Determined	.00	**.74**	.00	**.16**	.00	.10	.35	54.84***
Boring	.09	**.77**	.01	.05	.01	.06	.33	114.57***
Annoying	**.39**	.03	**.35**	.01	.14	.08	.29	95.18***
Reserved	.00	**.80**	.00	.10	.02	.09	.20	38.74***
Sociable	.23	.13	.00	.13	.12	**.39**	.20	38.40***
Responsible	.00	**.68**	.01	**.29**	.00	.02	.19	33.82***
Amiable	**.24**	.02	**.24**	**.27**	.07	**.17**	.14	46.48***
Loud	.04	.08	**.22**	.00	**.41**	**.25**	.13	36.09***
Uncontrolled	**.48**	.00	.18	.03	.18	.13	.14	31.94***
Self-confident	.00	**.67**	.00	.22	.00	.11	.14	16.33**
Unordered	.20	.05	.13	.00	.19	**.42**	.13	39.89***
Controlled	.00	**.41**	.01	**.48**	.05	.04	.13	29.65***
Healthy	.00	**.77**	.00	**.23**	.00	.00	.12	8.47
Volatile	**.44**	.00	.16	.03	**.22**	.15	.11	26.02***
Spontaneous	**.19**	.03	**.31**	.10	**.18**	**.18**	.10	47.94***
Funny	**.35**	.01	**.41**	.01	.09	.13	.10	30.15***
Irresponsible	**.67**	.00	.00	.02	.11	**.19**	.10	15.38**
Sad	**.31**	.14	.09	.02	.14	**.30**	.07	19.55***
Foolish	**.58**	.00	.04	.00	.14	.24	.07	7.41
Dependent	**.71**	.00	.00	.04	.00	**.25**	.07	7.03
Unsociable	.22	**.42**	.09	.05	.12	.09	.05	24.64***
Insecure	**.45**	.09	.00	**.15**	.03	**.28**	.05	15.41**

Note: Wald statistic is significant at the following levels: *p < .01, **p < .001. Probabilities are given, such that .73 means the adjective has a 73% probability of being allocated to the according cluster given the other clusters. Numbers in bold indicate which adjectives are allocated to the clusters. Cluster 1 is allocated to the drunk and heavy drinker prototype; Cluster 2 to the abstainer prototype; Cluster 3 to the tipsy prototype; Cluster 4 to the moderate drinker prototype; Cluster 5 to the tipsy prototype; Cluster 6 to the heavy drinker prototype.

such as 'annoying,' 'amiable,' 'funny,' 'loud,' and 'spontaneous'. This cluster was referred to as the *'funny tipsy cluster'.* The fourth cluster best described the moderate drinker prototype (65% probability) and was characterised by the adjectives 'determined,' 'responsible,' 'amiable,' 'controlled,' 'self-confident,' 'healthy,' and 'insecure'. This cluster was labelled the *'moderate, responsible drinker cluster'.* Cluster 5 included descriptions such as 'cheery,' 'spontaneous,' 'volatile,' 'unordered,' 'loud,' and 'foolish'. This cluster was labelled the *'elated tipsy cluster'.* Finally, Cluster 6 was mostly comprised of the heavy drinker prototype (26% probability) and was characterised as 'sociable,' 'amiable,' 'spontaneous,' 'unordered,' 'ir-responsible,' 'sad,' 'dependent' and 'insecure'. Cluster 6 was referred to as the *'uncontrolled excessive drinker cluster'.*

Classes of respondents

In the third step, the multilevel LCA determined the probability of (1) separate adjectives being allocated to each of the four respondent classes and (2) adjectives clusters being al-located to each of the four respondent classes (subgroups). Again, the highest probability determines the allocation to the class. These analyses revealed which separate adjectives and adjective clusters each respondent class focussed on. Table 3 shows the distribution of adjective clusters and of the separate adjectives among the four respondent classes. Among the respondents, 48% were allocated to respondent Class 1, 20% to Class 2, 16% to Class 3, and 16% to Class 4. Given the probabilities, the highest probability was that respondent Class 1 consisted of the '*negative, excessive drinker cluster*' (adjective Cluster 1, 43% probability) and the '*moderate, responsible drinker cluster*' (Cluster 4, 24% probability). Respondent Class 1 had most likely mentioned the adjectives 'amiable,' 'responsible,' 'controlled,' 'uncontrolled' and 'dependent'. Respondent Class 1 seemed to focus especially on controlled to uncon-trolled drinking and was further labelled the 'focus-on-control class'. Respondent Class 2 consisted of the *'funny tipsy cluster'* (Cluster 3, 65% probability) and *'moderate, responsible drinker cluster'* (26% probability). This class most likely mentioned the adjectives 'annoying,' 'amiable,' 'controlled,' 'spontaneous,' 'foolish,' and 'funny'. Respondent Class 2 thus focused mostly on adjectives relating to outgoingness and pleasantness or hedonism (meanwhile acknowledging some backsides), and was therefore labelled the *'focus-on-hedonism class'.* Respondent Class 3 consisted of the *'determined abstainer cluster'* (Cluster 2, 33% probability) and *'uncontrolled excessive drinker cluster'* (Cluster 6, 41% probability). These respondents mostly mentioned the adjectives 'determined,' 'boring,' 'reserved,' 'sociable,' 'responsible,' 'self-confident,' 'spontaneous,' 'healthy,' 'uncontrolled,' 'unordered,' 'sad,' 'irresponsible,' 'dependent,' 'unsociable,' 'foolish,' and 'insecure'. Class 3 seemed to contrast extreme prototypes, therefore labelled the *'contrasting-extremes-prototypes class'.* Finally, respondent Class 4 consisted of the '*elated tipsy cluster*' (Cluster 5, 48% probability), mostly consisting of the adjectives 'fool-ish,' 'loud,' 'uncontrolled,' 'unordered,' 'volatile,' 'spontaneous,' 'controlled,' 'cheery,' 'responsible,' and 'unsociable'. Respondent Class 4 was labelled the *'focus-on-elation class'.*

Table 3. Distribution of respondents over three classes based on probability (prob)

	Class 1 (N = 71)	Class 2 (N = 30)	Class 3 (N = 24)	Class 4 (N = 24)
Cluster	prob	prob	prob	prob
Negative, excessive drinker cluster	**.43**	.00	.16	.02
Determined abstainer cluster	.19	.09	**.33**	.20
Funny tipsy cluster	.13	**.65**	.01	.00
Moderate, responsible drinker cluster	**.23**	**.26**	.00	.13
Elated tipsy cluster	.02	.00	.09	**.48**
Uncontrolled excessive drinker cluster	.00	.00	**.41**	.17
Adjectives				
Cheery	.08	.13	.19	**.51**
Determined	.14	.09	**.24**	.15
Boring	.14	.06	**.22**	.13
Annoying	.35	**.41**	.27	.29
Reserved	.07	.04	**.14**	.09
Sociable	.12	.04	**.34**	.23
Responsible	**.10**	.07	**.11**	**.09**
Amiable	.33	**.41**	.32	.28
Loud	.03	.06	.12	**.19**
Uncontrolled	**.19**	.12	**.19**	**.20**
Self-confident	.07	.05	**.12**	.08
Unordered	.04	.04	**.17**	**.14**
Controlled	**.10**	**.09**	**.09**	**.11**
Healthy	.05	.04	**.07**	.05
Volatile	.15	.09	.16	**.19**
Spontaneous	.16	**.26**	**.24**	**.27**
Funny	.12	**.18**	.11	.09
Irresponsible	**.09**	.00	**.09**	.06
Sad	.07	.04	**.16**	.12
Foolish	**.06**	.01	**.08**	**.06**
Dependent	**.05**	.00	**.05**	.02
Unsociable	.10	.06	**.14**	**.13**
Insecure	.07	.02	**.10**	.05

Note: Probabilities are given, such that .39 means a 39% probability of being allocated to the according class. An adjective is allocated to a class when the probability exceeds the mean chance of being mentioned in general. The numbers in bold indicate which adjectives are allocated to the clusters.

Respondent class differences by demographic variables and drinking behaviour

In the fourth step, separate multinomial regression analyses were performed to assess differences in respondent classes (dependent variable) by gender and education (separate independent dichotomous variables). We alternated respondent classes as reference groups enabling understanding of differences between all classes. Class 2 (*focus-on-hedonism class*) differed from Class 4 (*focus-on-elation class*) and 1 (*focus-on-control class*) in terms of gender. Regarding education, all four classes differed from each other, except for Class 4 which only differed from Class 2. Next, multinomial regressions with classes as the independent variable and drinking as the dependent variable showed no differences between respondent classes for binge drinking and drinking norm violations. However, univariate analyses of variance did reveal significant differences between respondent classes in the total number of glasses on weekdays ($F(3, 148) = 3.10$, $p < .05$), but not on weekend days. Class 2 had the highest alcohol intake on weekdays. Refer to Table 4 for differences between the numbers and frequencies (%) allocated to each class.

Table 4. Number and frequency allocated to respondent classes based on demography and behaviour

	Class 1 (N = 71)	Class 2 (N = 30)	Class 3 (N = 24)	Class 4 (N = 24)
Females	48 (67.6%)$_a$	15 (50%)$_b$	13 (54.2%)$_{abc}$	18 (75%)$_c$
High education	48 (67.6%)$_a$	13 (43.3%)$_b$	22 (91.7%)$_c$	19 (79.2%)$_{bd}$
Binge drinkers	16 (22.5%)$_a$	8 (26.7%)$_a$	6 (25.0%)$_a$	2 (8.3%)$_a$
Norm violators	5 (7.0%)$_a$	5 (16.7%)$_a$	2 (8.3%)$_a$	1 (4.2%)$_a$
	M (SD)	M (SD)	M (SD)	M (SD)
Total nr of drinks on weekdays	3.8 (8.29)	5.8 (11.80)	5.3 (4.34)	2.5 (4.16)
Total nr of drinks on weekend days	6.5 (8.62)	9.4 (16.08)	6.8 (6.47)	5.6 (7.63)

Note: Allocation to respondent class is based on subgroup, for example 50% of Class 2 are women. Subscripts of education differ at $p < .05$, gender differences are significant at $p < .10$.

Similarity and favourability by respondent class

In the final step, evaluations of prototype favourability and perceived similarity for the five prototypes were compared between the classes of respondents by means of analyses of variance and post hoc analyses with Bonferroni corrections. Favourability and similarity were each assessed by two items. Table 5 depicts the mean scores for the evaluations per respondent class. Differences between respondent classes (between-group) were only marginally significant regarding perceived similarity and favourability to the drunk prototype, $F(3, 147) = 2.38$, $p = .07$; $F(3, 147) = 2.54$, $p = .07$. Post hoc Bonferroni analyses yielded no significant between-group differences with respect to differences between classes in favouring or feeling similar to prototypes. The mean scores suggest, regardless of class that all respondents favour the abstainer and moderate drinker prototype. Most respondents only felt similar to

the moderate drinker. Only Class 3 (*'contrasting-extremes-prototypes class'*) felt similar to the tipsy prototype. Both Classes 3 and 4 (*'focus-on-elation class'*) favoured the tipsy prototype. The drunk and heavy drinker prototypes were unfavourable and dissimilar to all respondents.

Table 5. Means and standard deviations of similarity and favourability per prototype by respondent class

Prototypes	Favourability				Similarity			
	Class 1 (N = 71)	Class 2 (N = 30)	Class 3 (N = 24)	Class 4 (N = 24)	Class 1 (N = 71)	Class 2 (N = 30)	Class 3 (N = 24)	Class 4 (N = 24)
Abstainer	3.54 (.97)	3.66 (.94)	3.27 (1.01)	3.54 (.93)	2.81 (1.28)	3.00 (1.28)	2.19 (1.14)	2.83 (1.36)
Moderate drinker	3.81 (.74)	3.44 (.82)	3.63 (.76)	3.65 (.65)	3.41 (1.21)	3.17 (1.23)	3.38 (1.21)	3.23 (.97)
Tipsy	2.94 (.75)	2.93 (.92)	3.33 (.90)	3.10 (.71)	2.71 (.95)	2.48 (1.14)	3.08 (1.06)	2.81 (1.11)
Heavy drinker	2.18 (.99)	2.29 (.92)	2.46 (.91)	2.31 (.84)	1.82 (1.06)	1.97 (1.15)	2.15 (.91)	1.77 (1.03)
Drunk	1.61 (.81)	1.81 (.93)	2.04 (.83)	2.00 (.72)	1.54 (.82)	1.76 (1.12)	2.02 (.97)	2.00 (1.00)

DISCUSSION

Previous studies have shown that studying prototypes can explain differences in health-related behaviour among young adults.[8-10] The present study examined whether it is important to distinguish between different typologies (i.e. characterisations) of prototypes among young adults (18–25 years old). The results do suggest that it may be important to distinguish between prototypes when aiming to understand health related behaviour, as well as ways to alter prototypes among young adults. A total of 23 unique drinker prototype adjectives were identified and were clustered into six adjective clusters characterising drinker prototypes: (1) the *'negative, excessive drinker cluster'* (including e.g. 'annoying' and 'volatile'), (2) the *'determined abstainer cluster'* (e.g. 'determined' and 'reserved'), (3) the *'funny tipsy drinker cluster'* (e.g. 'funny,' 'spontaneous'), (4) the *'moderate, responsible drinker cluster'* (e.g. 'amiable,' 'controlled'), (5) the *'elated tipsy cluster'* (e.g. 'loud,' 'cheery'), and (6) the *'uncontrolled excessive drinker cluster'* (e.g. 'unordered,' 'dependent'). The clusters generally reflected the prototypes presented: abstainer, heavy and moderate drinker, tipsy and drunk person. Both the tipsy person prototype and heavy drinker prototype were differentiated by adjectives of two clusters each. The two clusters related to the tipsy person seemed to reflect previous findings that suggest that differentiation in arousal level[41] or novelty-seeking[42] are important dimensions of alcohol use. Accordingly, the funny tipsy cluster might reflect adjectives of a novelty-seeking prototype, whereas the elated tipsy cluster might reflect prototype adjectives related to arousal. The differentiation between each of the two heavy drinker prototype clusters seemed to reflect differences in motives of excessive drinking such as coping or enhancement; this has been suggested elsewhere.[43] In other words, respondents seemed to evaluate the negative excessive drinker cluster as a person who uses alcohol to cope with problems, who is dependent, foolish, uncontrolled, and becomes volatile and annoying.

Conversely, the uncontrolled excessive drinker was described as somewhat more sociable, but is unordered and loud, which might relate to the motivation to enhance arousal. This combination of positive and negative adjectives being ascribed to drinker prototypes is in line with earlier research.[29] The combination suggests that people are aware that drinking has social consequences that may alter others' perceptions of them.[44] Moderate drinking has also been related to social motives.[43,45] This is in line with results from the moderate, responsible drinker cluster, which incorporated mostly positive and social-related adjectives.

The second study aim was to examine whether subgroups of respondents (respondent classes according to gender, level of education, and drinking behaviour) can be distinguished based on a differential focus on certain prototype adjectives. We additionally examined whether or not these groups differed in drinker prototype favourability and similarity. Four respondent classes were found, differing in their adjective focus. They were labelled as *'focus-on-control,'* *'focus-on-hedonism,* *'contrasting-extremes-prototypes,'* and *'focus-on elation'.* These results indicate that adjectives might be more important or salient for some groups of people, perhaps reflective of cultural group norms In other words, respondent classes differed as to their focus on prototypes and attributed adjectives, and this was dependent on education, gender and importantly on drinking behaviour during weekdays. For instance, the respondent class *'focus-on-hedonism'* favoured the tipsy prototype, and this class included relatively more men and respondents with lower educational attainment than other classes. This class had the highest alcohol consumption. This is in line with research suggesting that boys are especially likely to drink for enhancement motives.[46] The tendency for males to drink more[2] might reflect traditional gender role beliefs related to the acceptance of drinking.[47] Follow-up drinking behaviour during weekdays was explained by respondent class and thus by relevance of prototype adjectives. Respondent class was related to gender (marginally) and education.

The 23 adjectives observed in the present study is a substantially larger number than the 12 adjectives that are mainly examined in other prototype studies[3] as well as other adaptations resulting in a list of 16 adjectives for drinker prototypes.[11,48] Several recent studies have also elicited adjective lists.[9,10,28-30] Although our study observed adjectives reported elsewhere (e.g. self-confident, responsible), we did not find adjectives assumed to be important among adolescents and children that mainly seem to be reflections of externally oriented motives,[11,48] such as cool, looking though, immature, and popular. Three explanations might account for the differences regarding the number and type of adjectives observed. First, the inclusion of several prototypes might reflect a larger variety of drinker characterisations. Second, adjectives attributed to other people can differ as to their descriptive relevance for different age groups.[49] Therefore, the age group and/or behaviour being studied might yield different relevant adjectives. Lack of actual behavioural experience and exposure may preclude adolescents and children from making more subtle differentiations between risk prototypes, given that prototypes formation is partly based on behavioural experience.[5] Differences in experience might also explain the difference in relevance of externally oriented adjectives.

Older children have been found to be more likely than younger children to form stereotype images based on personal experience and guided by prototypes; younger children based their images on sources outside personal experience.[50] Finally, the larger differentiation between drinker prototypes among young adults, as compared to adjectives found to be relevant for adolescents in earlier studies, could be explained by the in-group/out-group effect.[51] According to this theory (social identity theory), people are more likely to perceive group diversity within their own group, whereas members from the out-group are seen as more similar to one another.[50] When drinking becomes part of the in-group identity, individuals are more likely to perceive heterogeneity in drinker prototypes/patterns. The difference in perception of the in-group/out-group has been found to be age dependent.[50] As drinking among young adults is likely to be more profound within the in-group, young adults may be more likely to differentiate between prototypes than younger children and adolescents.

With regard to implications, two main conclusions can be drawn. Firstly, our study results suggest that it may be important to examine alternative and more subtle prototypes. The prototypes presently included differed in attributed adjectives, and respondent classes differed in their focus on adjectives and prototypes, which in turn related to drinking behaviour on weekdays. We contribute to other studies showing that including healthy prototypes in addition to risk prototypes increases the understanding of health-related behaviour.[7,16,17] Our study adds to this body of research by including several prototypes within the range of drinkers. Secondly, young adults may focus on personally relevant prototype adjectives. This focus may differ from the focus of other people and may explain differences in behaviour. If relevance of prototypes and attributed adjectives indeed differs among respondents, and if alternative or subtle prototypes would have predictive value, then prototype alteration studies and interventions could be tailored accordingly. This suggests that these prototypes may need to be matched to relevant and salient adjectives to alter prototype perceptions. For instance, if someone feels similar to the tipsy person, then only negative adjectives relevant for this prototype could be highlighted in addition to positive adjectives relevant for the abstainer and/or moderate drinker. This is inline with earlier findings that prototype similarity is an important predictor of intention and behaviour [9] and the present finding that respondents felt most similar to the moderate drinker. This suggests that it might be important to assess relevant prototypes and attributed adjectives when aiming to explain behaviour, which may not necessarily be a general risk prototype. It may partly provide an explanation why earlier studies did not find a relationship between behaviour and the alternative prototypes of a social drinker[11] and binge drinker.[19]

Finally, our study has some limitations. The cross-sectional study design precludes us from making causal inferences. Further studies are required to understand the causal relationship between prototype development and behaviour (change). Our sample included relatively more women and higher educated respondents. Despite this limitation, we observed different respondent classes focusing on different prototypes and adjectives. Nevertheless, additional studies are needed to examine whether or not similar clusters and classes can

indeed be observed in other representative samples and among other behaviours. Longitudinal and experimental studies on the role of separate prototype adjectives on behaviour development and change are necessary to further analyse the patterns identified in the current study. To conclude, prototype alteration has been shown to be an effective means for behaviour change.[14] This study provides insights into prototype characterisation and differences between respondents in terms of behaviour, gender and education. The results can aid understanding ways to explain and potentially change behaviour via prototypes. Differentiation seems to make a difference.

3

ACKNOWLEDGEMENTS

NOTES

[i] According to the Statistics Netherlands, 'Western origin' includes all countries in Europe (except for Turkey), North America, Oceania, Japan, and Indonesia (including former Netherlands East Indies). 'Non-Western' includes Turkey and all countries of Africa, Latin America, and Asia, except Japan and Indonesia.[52]

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4

Associations between abstainer, moderate and heavy drinker prototypes and drinking behaviour in young adults

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ABSTRACT

Objective: Previous research has focused mostly on abstainer and/or general drinker prototypes. The present studies examined an abstainer, moderate drinker and heavy drinker prototype in relation to drinking behaviour.

Design: Two studies among young adults aged 18–25 (paper-and-pencil, cross-sectional, N = 140; online, prospective, N = 451) assessed prototype favourability and participants' perceived similarity to the prototypes. Participants were also categorised into abstainers, moderate, and heavy drinkers.

Results: Similarity and favourability had similar sequences in both studies: the moderate drinker and abstainer prototypes were evaluated most favourable and felt similar to; the heavy drinker prototype was rated the least favourable and felt similar to. Importantly, heavy drinking participants felt most similar to the moderate drinker prototype and rated the heavy drinker least desirable. The results suggest a need for research to include other prototypes, such as the moderate drinker, besides the abstainer and heavy drinker.

Conclusion: The studies provide insights into the contribution of alternative prototypes (i.e. moderate drinker) into the relationship between prototype perceptions and drinking behaviour. The results suggest tailoring prototype-based interventions according to drinking behaviour. Importantly, realistic perceived similarity to the more favourable moderate drinker prototype may therefore need to be encouraged only after appropriate reductions in heavy drinkers' alcohol consumption.

INTRODUCTION

Excessive drinking poses an important public health problem in many countries[1] and is generally most prevalent among young adults (18–25 years old) compared to all other age categories.[e.g. 2,3] In the Netherlands, one out of five young adults drinks excessively, defined as six or more glasses per occasion.[3] Excessive drinking (e.g. binge drinking) is associated with several long-term risks, such as cancer and cardiovascular disease, and short-term problems, such as criminality, aggression, public disturbance, and traffic safety.[4] Worldwide, 9% of deaths in the age group of 15–29 is due to an alcohol-related cause.[1] As a result, it is necessary to further investigate factors explaining why young adults, in particular, engage in excessive drinking. One such factor is the impact of drinker prototypes.

Prototypes (also referred to as social images) refer to perceptions or cognitions of an image of a typical person engaging in certain risky or healthy behaviours.[5,6] Several studies have shown that prototypes can explain various behaviours, including drinking behaviour[7-13] across various age groups, including young adults.[8,10,14,15] Alteration of prototype perceptions has shown to be an effective intervention strategy for changing behaviour.[16-18] Within the context of alcohol consumption, it has been shown that decreased prototype favourability resulted in decreased rates of alcohol consumption for up to two years.[17] This shows that prototypes can serve an inhibitory function.[19]

Prototypes have a prominent role in the Prototype Willingness Model (PWM), a dual-process model describing two pathways that influence behaviour.[5,6,20] The reasoned path (1) describes behaviour as intentional, whereas the social reaction path (2) assumes that many risky behaviours are not intended or planned, but instead, some situations facilitate risky behaviours such as excessive drinking.[21,22] According to this pathway, behaviour is influenced by one's willingness to engage in risky behaviour which, in turn, is influenced by perceptions of the prototype.[5,22] Thus, individuals who have more favourable prototype perceptions are more willing to engage in the health-risk behaviour, should such an opportunity arise. Subsequent research based on the PWM has explored the role of prototypes, differentiating between prototype similarity and favourability[e.g. 6,8,23,24] and have related prototypes not only to behavioural willingness, but also to intentions.[e.g. 5,7,13,14,16,24-27] As such, prototypes can serve as strong intrinsic motivators[21] guiding healthy and risky decision-making and behaviours.[9,18] The present study investigates the roles of favourability and similarity of alternative prototypes in explaining drinking behaviour.

Prototype *favourability* refers to the extent to which a prototype is positively or negatively evaluated and has been shown to explain drinking behaviour.[10,13,28] People conceivably favour risky prototypes of behaviours that they engage in.[7] Subsequently, prototype favourability increases the occurrence of behaviour.[6,28] For example, favourability of a heavy drinker prototype has been found to be related to observed drinking in young adults,[10] especially in men.[25]

Prototype *similarity* refers to the perception of a prototype being (dis)similar to one's self-image.[17,26] Prototypes are thought to influence behaviour through a process of social com-

parison.[6] This is in line with Bandura's social cognitive theory, which suggests that behaviour is especially influenced by the role models or prototypes that someone identifies with.[29] In other words, some prototypes can serve as certain role models. The role of prototype similarity may be especially important in young adulthood for two reasons. First, like adolescents, young adults are aware of the social images that they portray, and the social consequences of these images.[5,7,30] Second, recent research has shown that prototype similarity is more important in explaining drinking behaviour than favourability,[e.g. 8] although both prototype favourability and similarity have been found to be related to health-risk intentions and behaviour as outlined above.

Previous research examining the drinking behaviour of young adults has considered a range of different prototypes including a general drinker prototype (i.e. the typical peer that drinks alcohol),[7,13,14,26] or alternative prototypes, such as 'binge drinker,'[8,11,31] 'heavy drinker,' and 'social drinker'.[10] However, previous studies have tended to only focus on these alternative prototypes in isolation, or compared a general drinker and abstainer prototype.[e.g. 12,26] The study of Spijkerman et al.[10] is a notable exception. They investigated a social drinker besides an abstainer and heavy drinker, showing that only favourability of the heavy drinker prototype was related to observed drinking levels after controlling for group effects, measured as the drinking levels of their friend group members. As stated earlier, prototypes may play a significant role in modeling and social comparison processes.[29] It is therefore important to extend the exploration of meaningful prototypes as a social identity and, in addition, to examine them simultaneously rather than in isolation. Hence, the present studies will contribute to the preliminary knowledge, and aims at further exploring the existence and roles of alternative prototypes.

It is furthermore important to extend this body of research by examining the potential contribution of favourability and similarity of several (alternative) prototypes simultaneously in order to examine which prototypes young adults identify with and to understand their potential contributions in explaining drinking behaviour for two reasons. First, prototype favourability and similarity of extreme prototypes do not necessarily align. For example, Gerrard et al.[7] found that both drinkers and abstainers favoured the abstainer prototype over the drinker, which did not match with drinkers' perceived similarity.

Second, extreme prototypes, such as the abstainer and heavy drinker, may be less suitable or desired comparators to identify with. That is, young adults generally use negative adjectives to describe the heavy drinker prototype. Consequently, this prototype may therefore be less desirable to identify with. The abstainer prototype is rated somewhat more positively, but heavy drinkers may be less likely to identify with this prototype.[e.g. 32] In addition, young adults are likely to distinguish beyond an abstainer and heavy drinker prototype.[32] This is plausibly due to their own drinking behaviour or observations of drinking among their peers, which is likely to vary along an abstainer-excessive drinking continuum. Previous research has shown that the moderate drinker prototype is positively evaluated by young adults.[32] Examining the role of the moderate drinker prototype simultaneously with the extremes of

a heavy drinker and abstainer prototype is likely to increase our understanding of drinking behaviour among young adults.

Study aims

In two studies (cross-sectional and prospective), we investigated perceived similarity to, and favourability of, prototypes varying in alcohol consumption in their relation to drinking behaviour in young adults. We included three prototypes based on previous literature and reflecting Dutch normative rates[10,25,32-35]: abstainer, moderate drinker and heavy drinker prototype. The studies examined (1) whether young adults differentiate between the moderate drinker and the extremes of the abstainer and heavy drinker in terms of favourability and similarity, and (2) whether there is an association between young adults' favourability and similarity ratings for the three prototypes and their drinking behaviour. Study 1 was a cross-sectional study to explore whether young adults' favourability and similarity ratings for various drinker prototypes differed by drinking behaviour. Study 2 serves to replicate and extend findings of the Study 1 in a prospective setting with a larger sample so that drinking behaviour can be predicted prospectively, controlling for past behaviour.

STUDY 1

Methods

Sample and procedure

A total of 400 surveys were distributed in public areas in Rotterdam among young adults (18–25 years old).[i] Participants were asked their age, to read the study information and, if eligible, asked to sign an informed consent form. They then returned the survey by mail. If a signature was not issued on the street, participants could return their informed consent form together with their completed survey by means of a pre-stamped envelope. Twenty vouchers worth €50 were distributed among completed surveys by means of a raffle. The Ethical Committee of the Erasmus MC in Rotterdam approved the study (MEC-2010-112).

A total of 140 young adults completed the survey (35% response; 37% male; M_{age} = 20.7, SD = 2.4), of whom 92% were of Western origin[ii] according to the definition provided by Statistics Netherlands.[36] Educational level was dichotomised according to low level (no education after primary school, or vocational or pre-vocational level) (29%) and middle to high level (university, professional education or equivalent, further referred to as 'high') (71%).

Variables

Participant drinking behaviour

A standardised Dutch survey assessed drinking behaviour in the past six months.[33] Participants were asked to indicate the number of consumed standard glasses of alcohol for each day of the past week. One standard glass contains 10 g of alcohol. These items were used to

calculate the number of days on which participants drank alcohol and the total number of glasses consumed per week. Additionally, participants were asked their frequency of drinking four or more and six or more glasses of alcohol per occasion, ranging from (1) never to (8) every day. We categorised participants according to the NIPHE[33] guidelines, into three drinker groups: (1) abstainer, (2) moderate drinker or (3) excessive drinker. If participants abstained entirely from alcohol in the past 12 months, they were categorised as abstainers. Participants were categorised as heavy drinkers when exceeding the following norms: drinking on a maximum of 5 days per week, maximum 3 glasses per day and 14 per week for women, and maximum five glasses per day and 21 per week for men. Moderate drinkers were defined as those who drank alcohol during the past 12 months, but who did not exceed the norms for excessive drinking.

Prototype evaluations

A general explanation of prototypes was given.[e.g.37,38] 'When trying to describe someone, people generally use characteristics of that person. These characteristics can be positive, negative, or neutral. For instance, when you describe someone of your age who gets good marks characteristics could be smart, serious, or bookish. Also, a movie star can be described as rich, a striver, and handsome.' Participants were then instructed that they would be presented with different drinker prototypes and that they should 'Think about the average (typical) person of your age, not one particular person that you know personally.' It was explicitly stated that the abstainer refrained from alcohol during the past 12 months. No definition of other prototype drinking patterns was given in order to avoid enforcing standard drinking patterns onto drinker prototypes. Instead, to facilitate such responses, participants were asked to indicate the number of alcoholic glasses they expected the moderate drinker and heavy prototypes would drink per week and per occasion.[39] The expected drinking behaviour of the prototypes of participants resembled the Dutch norms for moderate and heavy drinking. Moderate drinkers were expected to drink 3.7 glasses of alcohol per occasion and 7.6 glasses per week on average. Heavy drinkers were expected to drink 8.6 glasses of alcohol per occasion and 20.7 glasses per week on average. The different drinker prototypes were presented in a random order.

All prototype items were assessed on five-point Likert scales. First, participants read the following: 'Think about the person of your own age who abstains/drinks moderately/heavily.' Next, *favourability* was assessed for each prototype by 'What do you think of [prototype, e.g. the typical person of your age who drinks moderately]?' ranging from (1) 'very negative' to (5) 'very positive'.[9] *Similarity* was assessed for each prototype by: 'Are you similar to [prototype]?'[e.g. 17] ranging from (1) 'certainly not' to (5) 'certainly' and 'What is the chance that you will be similar to the [prototype] in the future?' ranging from (1) 'very small' to (5) 'very large'.[18] Similarity comprised of the mean of both items (abstainer α = .88, moderate drinker α = .84, and heavy drinker α = .80).

Statistical analyses

A series of 3 (prototype similarity or favourability: abstainer vs. moderate drinker vs. heavy drinker) x 3 (participants' drinking: abstaining vs. moderate drinking vs. heavy drinking) mixed-measures ANCOVAs were performed (SPSS version 20.0), thereby correcting for the non-independency of the prototype measures, and with past behaviour as covariate. These analyses were conducted separately with prototype similarity and favourability as the dependent variables. First, main effects of prototypes on favourability and similarity ratings were assessed in order to examine whether the different drinker prototypes received different ratings. Second, the main effect of drinker subgroup on favourability and similarity was assessed. Third, the prototype type (i.e. abstainer, moderate drinker, heavy drinker prototype) by drinker subgroup (i.e. abstainer, moderate drinker, heavy drinker participant group) interaction effect was assessed in order to examine whether the different drinker prototypes received different ratings of similarity and favourability from the different drinker subgroups, controlling for past behaviour. Significant interaction effects were decomposed using both within- and between-participants comparisons in order to examine differences between prototypes evaluations (similarity or favourability) within drinker subgroups and differences between participant drinker subgroups within prototypes. Post hoc comparisons were performed with Bonferroni correction for multiple testing. In line with Field,[40] Mauchly's test of sphericity was computed for each interaction effect. When sphericity was violated, the Greenhouse-Geisser statistic is reported. In addition, the shape of the distributions for prototype favourability and similarity according to the participants' drinking behaviour was determined by examining whether the linear and quadratic functions were significant at $p < .05$.

Results and conclusions

Drinking behaviour among participants

Mean self-reported drinking was 10.6 glasses per week (SD = 14.8). The participant drinker groups differed significantly in total week consumption ($F(2, 138) = 40.10$, $p < .001$). Moderate drinking participants consumed a mean weekly total of 3.7 glasses (SD = 2.7), whereas heavy drinking participants consumed a mean weekly total of 20.3 glasses (SD = 17.3).

Prototype evaluations

Table 1 reports the means and standard deviations of the prototype evaluations for the total sample and per drinker subgroup.

Significant main effects of prototype types were found on favourability, $F(2, 137) = 114.42$, $p < .001$, partial eta squared = .63, and similarity, $F(2, 138) = 61.40$, $p < .001$, partial eta squared = .47, ratings. Post hoc comparison (with Bonferroni corrections) showed that the prototypes differed in the ratings they received with the moderate drinker (MD) prototype receiving the most positive favourability and similarity ratings, followed by the abstainer (AB) prototype

and the heavy drinker (HD) prototype. Thus, the results revealed a sequence of MD > AB > HD for both favourability and similarity (all p-values < .01).

The main effects of drinker subgroup on favourability, $F(2, 136) = 2.92$, $p = .06$, and similarity, $F(2, 137) = 1.17$, $p = .32$, ratings were non-significant. The prototype type by drinker subgroup interaction effects were significant for both favourability, $F(3.6, 242.1) = 14.34$, $p < .001$, partial eta squared = .17, and similarity, $F(3.9, 269.5) = 33.08$, $p < .001$, partial eta squared = .33. These significant interactions were examined in more detail using both within- and between-participants comparisons.

Within-participant post hoc comparisons revealed different prototype sequences for favourability and similarity according to drinker subgroup (Table 1). In particular, abstaining participants felt most similar to, and favoured most, the abstainer prototype over the moderate and heavy drinker prototypes (AB > MD > HD, all p-values < .05). Moderate drinking participants equally favoured the moderate drinker and abstainer prototypes, and gave these higher ratings than the heavy drinker prototype (MD = AB > HD). Moderate drinkers felt most similar to the moderate drinker prototype, followed by the abstainer prototype, and felt most dissimilar to the heavy drinker prototype (MD > AB > HD, all p-values < .05). Finally, heavy drinking participants favoured the moderate drinker prototype most, followed by the abstainer, and heavy drinker prototype least (MD > AB > HD, all p-values < .05). Importantly, heavy drinking participants felt most similar to the moderate drinker prototype, followed by the heavy drinker, and least similar to the abstainer prototype (MD > HD > AB, all p-values < .05). In general, significant inverted U-shaped distributions were observed regarding prototype favourability and similarity for the moderate and heavy drinking participants, whereas more linear declines in prototype favourability and similarity were observed for abstaining participants (see Figure 1).

Table 1. Study 1 – Means (M) and standard deviations (SD) on a five-point Likert scale of drinker prototype favourability and similarity among 140 young adults

Prototype evaluation	Drinking behaviour			
	All participants	Abstaining participants	Moderate drinking participants	Heavy drinking participants
N	140	26	50	64
	M(SD)	M(SD)	M(SD)	M(SD)
Prototype favourability				
Abstainer	3.56(1.11)	4.27(.96)	3.66(.94)	3.19(1.15)
Moderate drinker	3.90(.79)	3.35(.98)	4.00(.70)	4.05(.68)
Heavy drinker	2.36(.99)	1.62(.75)	2.26(.94)	2.75(.93)
Prototype similarity				
Abstainer	2.74(1.30)	4.21(.86)	2.89(1.11)	2.03(1.02)
Moderate drinker	3.32(1.15)	2.27(1.19)	3.52(1.14)	3.59(.89)
Heavy drinker	1.91(1.05)	1.13(.36)	1.63(.83)	2.44(1.13)

Between-participant Bonferroni post hoc comparisons of favourability and similarity revealed different drinker subgroup differences for the three prototypes (see Figure 1). The abstainer prototype received the highest favourability and similarity ratings from abstaining participants (ABs), followed by moderate (MDs) and finally heavy drinkers (HDs), resulting in the sequence ABs > MDs > HDs (all p-values < .05). The moderate drinker prototype was equally favoured and felt similar to by moderate and heavy drinkers but received lower favourability and similarity ratings from abstaining participants (HDs = MDs > ABs). Finally, the heavy drinker prototype received the highest favourability and similarity ratings from heavy drinkers, followed by moderate drinkers and abstaining participants (HDs > MDs > ABs).
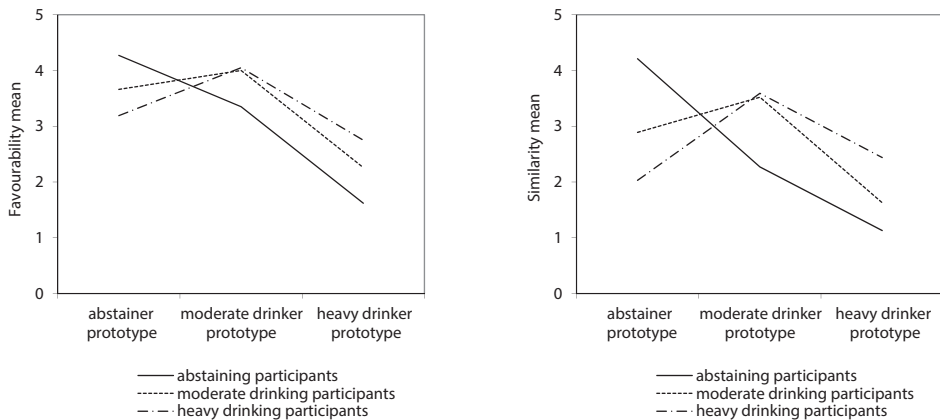
Figure 1. Study 1 – Within-group and between-group differences of prototype favourability (left) and similarity (right) by participants' drinking behaviour

STUDY 2

Study 1 revealed that the prototypes generally differed in favourability and similarity both for the total sample and among subgroups of participants' drinking. Distinct and comparable tendencies emerged of favourability and similarity ordering amongst the subgroups. However, the cross-sectional results and relatively small sample do not allow drawing strong conclusions. Examining participants' drinking by these various prototypes, controlling for past behaviour, would further add to the existing literature on prototype perceptions and drinking behaviour in young adults. Therefore, the purpose of the second study was to replicate and extend the results in a larger sample, and to assess drinking behaviour prospectively.

Methods

Design

Participants were recruited via several social network websites and forums such as Facebook and Hyves (a Dutch social network website), through advertisements and posts in the period of September to November 2010. Participants first received the study information and signed the informed consent form, which stated that anonymity was guaranteed. Email addresses were used to send an invitation linking to the second measurement at one-month follow-up (T2) and a reminder two weeks thereafter if necessary. Email addresses were also used to notify winners of one of the 20 vouchers worth €50. The Ethical Committee of the Erasmus Medical Centre in Rotterdam (MEC-2010-112) approved the study.

Participants

A total of 605 participants participated in the first measurement (T1, M_{age} = 21.0, SD = 2.2, 27.4% male). The majority of participants were of Western origin (89.8%; see note ii), and middle to high educated (88.9%). Of this sample 451 participants participated in the one-month follow-up (T2). Attrition analyses revealed significant differences between those who remained in the study at follow-up and those who dropped-out (all p-values < .05) in gender, educational level, ethnicity and baseline drinking behaviour. Instead of a conventional list-wise deletion, we used a multiple imputation method to deal with the missing follow-up data,[41] see Statistical analyses.

Variables

The study included the same questions as in Study 1 for drinking behaviour, prototype favourability and similarity, but was conducted online and used seven-point Likert scales. Self-reported *drinking behaviour* was measured at T2 with respect to the past month. In order to control for past behaviour, the total number of glasses of alcohol drank per week at T1 was used in the analyses. Cronbach's alphas for prototype similarity of the abstainer, moderate drinker and heavy drinker were .93, .90, and .79 respectively.

Statistical analyses

The statistical analysis (SPSS version 20.0) for Study 2 closely followed the approach taken in Study 1. SPSS uses chained equations for multiple imputations in which five completed data sets are generated to estimate missing data with estimated means based on the average of the multiple imputations. The resulting dataset that includes the imputed scores may be less biased than the data set including only participants that completed both measurements. There is currently no agreed way of computing the pooled estimates for the present analyses. Therefore, the ranges of F-values, degrees of freedom, p-values and effect sizes will be reported for Study 2. Reported pooled means are the average of the means over the five imputations.

Results and conclusions

Drinking behaviour among participants at follow-up

Mean self-reported drinking was 9.1 glasses per week at baseline and 8.0 glasses per week at follow-up. The participant drinker groups (at T2) differed significantly in weekly alcohol consumption, $F(2, 602) = 186.07–197.82$, all p-values $< .001$. Moderate drinking participants consumed a mean weekly total of 3.2 glasses. Heavy drinking participants consumed a mean weekly total of 14.1 glasses.

Prototype evaluations

Table 2 presents the pooled means of the prototype evaluations for the total sample and for each participant drinker subgroup.

First, significant main effects were found of prototype type on favourability, $F(2, 603) = 301.60$, $p < .001$, partial eta squared $= .50$, and similarity ratings, $F(2, 603) = 338.16$, $p < .001$, partial eta squared $= .53$. The pattern of means was similar to Study 1. Bonferroni post hoc comparisons showed that the abstainer prototype (AB) received the most favourable ratings, followed by the moderate drinker (MD), and the heavy drinker (HD) prototype was least favourable (AB > MD > HD, all p-values $< .05$). For similarity, the total sample felt equally similar to the abstainer and moderate drinker prototypes ($p = .07$) over the heavy drinker (MD = AB > HD).

The main effects of drinker subgroup on favourability, $F(2, 601) = .04–.37$, $p = .69–.97$, and similarity ratings, $F(2, 601) = .41–3.59$, $p = .03–.66$, controlling for past behaviour were non-significant. Significant interaction effects were found regarding prototype type by drinker subgroup corrected for past behaviour for both favourability, $F(3.6–3.7, 1095.6–1100.6) = 16.83–20.75$, all p-values $< .001$, partial eta squared $= .05–.07$, and similarity ratings, $F(3.2–3.3,$

Table 2. Study 2 – Pooled means (M) on a seven-point Likert scale of drinker prototype favourability and similarity (T1) among 451 young adults regarding participants' drinking (T2)

Prototype evaluation	Drinking behaviour at follow-up			
	All participants	Abstaining participants	Moderate drinking participants	Heavy drinking participants
N	605	135	156	314
	M	M	M	M
Prototype favourability				
Abstainer	4.85	5.81	5.01	4.35
Moderate drinker	4.63	4.39	4.73	4.68
Heavy drinker	3.13	2.50	2.92	3.50
Prototype similarity				
Abstainer	3.64	5.51	3.81	2.75
Moderate drinker	3.94	2.92	4.19	4.25
Heavy drinker	2.07	1.32	1.66	2.61

976.0–986.6) = 51.21–56.91, all p-values < .001, partial eta squared = .15–.16, and were further examined using within- and between-participant comparisons.

Within-participant post hoc comparisons revealed differences in favourability and similarity ratings between the three prototypes according to drinker subgroup, controlling for past behaviour (Table 2). Study 1 and 2 revealed identical differences. Like Study 1, Study 2 revealed similar significant inverted U-shaped distributions regarding prototype favourability and similarity for the moderate and heavy drinking participants, and more linear declines for abstaining participants (see Figure 2).

Finally, between-participant Bonferroni post hoc comparisons of favourability and similarity ratings revealed different subgroup differences for the three prototypes (Table 2). Differences between drinker subgroups in Study 2 were identical to Study 1 for both favourability and similarity ratings with the exception that abstainer and moderate drinkers felt equally dissimilar to the heavy drinker prototype. Thus, like Study 1, prototype favourability and similarity revealed a U-shaped distribution according to participants' drinking behaviour as shown in Figure 2, but a linear shaped distribution among abstaining participants.

In summary, the results support the findings from Study 1. Both studies showed that the various prototypes received different favourability and similarity ratings from the different drinker subgroups. Of particular interest was the finding that heavy drinking participants gave their highest favourability and similarity ratings to the moderate drinker prototype.
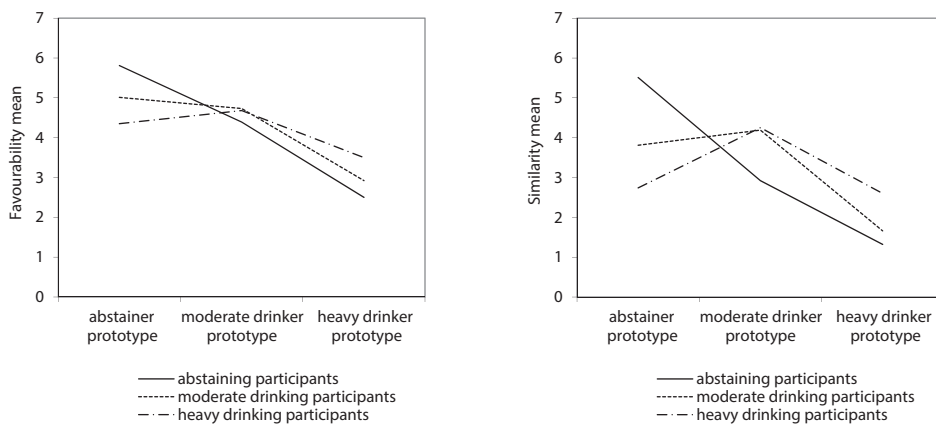
Figure 2. Study 2 – Within-group and between-group differences of prototype favourability (left) and similarity (right) by participants' drinking behaviour

GENERAL DISCUSSION

Previous research has described the roles of favourability and perceived similarity to one's self-image by which prototypes may influence behaviour adoption, maintenance or change.[5,7,14,16,24-26] Furthermore, previous research has mainly focused on general drinker prototypes or the influence of drinker and abstainer prototypes. However, recent research has highlighted the relevance of examining alternative prototypes.[8,10,11,23,37,42,43] Two studies, cross-sectional and prospective, were conducted to extend this body of research. We examined whether young adults differentiate between a range of drinker prototypes varying in levels of alcohol consumption – abstainer, moderate and heavy drinker – regarding prototype favourability and perceived similarity to the self. More specifically, we examined differences between prototypes per subgroup of participants' drinking behaviour (within-group differences) and differences between subgroups per prototype (between-group differences). To our knowledge, previous studies have not included a moderate drinker prototype along with the extreme prototypes of the abstainer and heavy drinker in explaining behaviour (although the social drinker prototype examined by Spijkerman et al.[10] may resemble the moderate drinker in some ways), and have not looked at differences between drinker prototype evaluations across drinking groups varying in their levels of drinking. The present studies therefore contribute to the existing literature in explaining drinking behaviour and examining alternative prototypes.

The results showed that the three prototypes differed from each other in terms of favourability and similarity ratings. Both studies found similar tendencies regarding favourability and similarity sequences, from least to most favourable and similar. Overall, young adults evaluated the moderate drinker and abstainer prototypes as most favourable and similar to the self, while evaluating the heavy drinker as least favourable and similar. The results therefore show that young adults distinguish beyond an abstainer and general drinker prototype[32] and support the suggestion that more than just risk (general drinker) prototypes are vivid.[18] Importantly, differences in ratings emerged between the subgroups of participants' drinking, which suggests a need to include a more diverse range of prototypes beyond the extremes of abstinence and heavy drinking, when explaining behaviour and tailoring interventions. Perhaps the most important finding of the studies was that heavy drinking participants most favoured and felt most similar to the moderate drinker prototype whilst drinking excessively, whereas abstaining and moderate drinking participants' favourability and similarity ratings of prototypes were in line with their drinking behaviour. This may provide a potential for future interventions for increasing awareness in heavy drinkers concerning their actual drinking status by providing feedback on desired versus actual state.

The present findings support the proposition that negative and positive prototypes have differential roles,[44] and that risk images are generally evaluated more negatively.[7,43] That is, negative prototypes may function as 'avoidance motivators,'[9] which is the motivation or need to avoid the resemblance of a negatively evaluated prototype or feared self, whereas positive

prototypes may be desired self-images and serve as goals.[16,17,26] More specifically, the extreme heavy drinker prototype – negatively evaluated by all participants – may be an important avoidance motivator for young adults. That is, nobody favoured or felt similar to the heavy drinker prototype, which may indicate the wish for all three drinker groups to avoid acquiring the negative characteristics that are generally attributed to this prototype.[32] At the same time, the moderate drinker prototype – positively evaluated by all participants – may be a goal for moderate and heavy drinking participants. For heavy drinking participants, the pattern of results suggests that they may be denying their excessive drinking as a means of dissonance reduction or self-defensive comparisons. They may desire a sense of control which the heavy drinker is generally thought not to have,[32] and therefore report to resemble a moderate drinker. Alternatively, it may be the case that heavy drinkers may perceive their behaviour as actual moderate drinking, thus favouring the image that they think they resemble. Future research is needed to further investigate these possibilities. Finally, the abstainer prototype is likely to be a goal for abstainers as it is favoured but, simultaneously, it may also be an avoidance motivator for heavy drinking participants who favour the abstainer prototype but feel quite dissimilar to it. Only abstaining participants felt similar to the abstainer prototype, although most young adults favoured the abstainer.

Although the results were largely consistent between the two studies, limitations of the study samples need to be acknowledged. Both studies included more females and highly educated participants. To examine the generalisability of the findings, future research is therefore necessary among a larger sample with more equal proportions of both genders and educational levels. Also, the studies differed in terms of method of data collection. Namely, one study recruited participants in public areas and one was online, although the samples were broadly similar. In addition, the studies used different response scales. Despite these differences, the two studies produced similar results, which increases confidence in the robustness of the findings. Finally, the response to Study 1 was low but similar to other studies that hand out questionnaires or mail paper-and-pencil surveys.[e.g. 45,46]

Future research is needed to extend the present findings, both experimentally and using longitudinal designs, and to include other variables from the PWM. In particular, there is a need to assess to what extent changes in similarity and favourability over time may influence or change behaviour, and how changes in similarity can best be established given that perceived similarity is a more important predictor of actual drinking behaviour than favourability.[e.g. 8] Future research is also needed to determine whether there are differences in favourability and similarity ratings among heavy drinking young adults that are related to maintenance or changes in high levels of alcohol intake. Together these insights can help understand how interventions could be targeted to specific subpopulations. Finally, future research could examine the effect of social comparison as a moderator.[6]

With regard to practical implications, two main conclusions can be drawn. First, the current studies suggest the need to focus on a broader range of prototypes. The acknowledgement of a larger range of prototypes may also be important for interventions, as the moderate

drinker prototype was the most desired prototypes and may help in explaining drinking behaviour. Second, as prototype evaluations differed across drinking behaviour, targeting interventions according to these subgroups may be a new way forward in addition to existing approaches in addressing excessive alcohol consumption. Upward or downward social comparison with the heavy drinker prototype may establish prototype distancing. Distancing (drinker) prototypes from one's self-image could result in behaviour change.[8,14,26,47] Specifically, from an intervention perspective, the results may suggest to reinforce the positive abstainer prototype among abstaining and moderate drinking participants, and to reinforce the positive moderate drinker prototype and the negative prototype of the heavy drinker prototype among heavy drinking and moderate drinking participants. However, in order to change behaviour among heavy drinkers, the results suggest that it may be important to first highlight that they do not resemble the mostly desired moderate drinker prototype, but rather a heavy drinker prototype that is evaluated unfavourably by peers. This undesirability of the heavy drinker prototype should be emphasised[14] along with the recommendation to drink less excessively.[17] Subsequently, only after appropriate reductions in drinking levels, realistic similarity to the moderate drinker can be encouraged and established. Further research is necessary to investigate how similarity can best be changed, but perhaps more importantly, whether this strategy has the desired effect. Furthermore, the distance between the moderate and heavy drinker prototypes could be made more salient. For example, as a sense of 'control' is desired by most drinkers,[see also 32] feedback could show how the heavy drinker is not in control, whereas the moderate drinker is. This strategy will likely help prevent moderate drinkers from becoming heavy drinkers and for heavy drinking participants to become moderate drinkers.

To conclude, the current study provides insights into associations between favourability and similarity ratings for different prototypes and drinking behaviour in different subgroups of drinkers. Based on the results, we conclude that young adults seem to avoid perceived similarity to the heavy drinker prototype, and that the moderate drinker prototype is the most desired prototype in terms of favourability and perceived similarity to a person's self-image. The findings may have important implications for interventions aiming to reduce alcohol intake through prototype alteration.

4

ACKNOWLEDGEMENTS

NOTES

[i] In the Netherlands, the legal drinking age is 16 years old for beer and wine, and 18 years old for hard liquor.

[ii] According to the Statistics Netherlands, 'Western origin' includes all countries in Europe (except for Turkey), North America, Oceania, Japan, and Indonesia (including former Netherlands East Indies). 'Non-Western' includes Turkey and all countries of Africa, Latin America, and Asia, except Japan and Indonesia.[36]

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5

Explaining drinking behaviour among young adults: Do alternative drinker prototypes contribute?

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ABSTRACT

Objective: Health-related behaviour has been explained by prototypes—the perception of a typical person engaging in certain behaviour or not. The present study examined the value of alternative prototypes (i.e. moderate drinker, tipsy, drunk) in addition to the commonly assessed abstainer and heavy drinker prototypes in relation to young adults' drinking behaviour, within the Prototype Willingness Model (PWM).

Method: In an online prospective study among Dutch young adults (N = 450), intentions, willingness, social norms, attitude, and per prototype its favourability and perceived similarity to the self were assessed at baseline. Drinking behaviour was assessed at baseline and one-month follow-up. Structural equation modeling was performed that tested the PWM including the abstainer and heavy drinker prototypes (Model 1) and the PWM including the above mentioned five prototypes (incorporating both the common and alternative prototypes, Model 2).

Results: Drinking behaviour (R^2 = .66) was explained by perceived dissimilarity to the abstainer prototype and similarity to the heavy drinker prototypes. Intentions (R^2 = .40) and willingness (R^2 = .26) associated with favourability of the abstainer and drunk prototypes and with similarity to the heavy drinker, abstainer, and drunk. The explained variance of intentions increased 6% by including alternative prototypes besides the common heavy drinker and abstainer prototypes.

Conclusions: Especially the similarity to the alternative drunk prototype may be of practical value due to its explanatory value. In addition, prototype similarity and favourability were both important determinants of intentions and willingness, whereas only similarity explained behaviour. Finally, the PWM might benefit from including a prototype-intention path.

INTRODUCTION

Drinking behaviour poses an important health problem in many countries.[1] In the Nether-lands, excessive drinking is most prevalent among young adults (18–25 years old). One out of five young adults drinks excessively (i.e. 6 or more standard glasses per occasion).[2] Excessive drinking has been related to various short-term and long-term consequences for health and social and behavioural problems.[e.g. 1,3,4]

The impact of drinker *prototypes* (i.e. social images) may help explain why many young people drink excessively and why others do not.[e.g. 5,6-8] Prototypes refer to the mental im-age of a typical person engaging in certain behaviour or not,[9,10] such as a drinker or smoker prototype (or its abstainer), usually described by personal characteristics (e.g. a heavy drinker prototype may be described as 'annoying').[11] Prototype perceptions can refer to prototype favourability and similarity, which have shown to differ in their impact on behaviour and thus should be regarded as separate constructs.[7,8,12] Favourability refers to the extent to which person evaluates a prototype positively or negatively. Similarity refers to perceived similar-ity of a prototype to someone's self-image.[10] Experimental research has shown that altering prototype perceptions can guide behavioural change.[13-17]

Prototypes can provide input for interventions, but further research is necessary to de-termine *which* drinker prototypes are relevant in explaining (determinants of) behaviour. The commonly assessed 'abstainer' and '(heavy) drinker' (further referred to as the 'common prototypes') may not necessarily function as role models that young adults desire to be similar to. In previous studies, we have shown that assessing various drinker prototypes may be important in order to increase our understanding of why many young adults drink excessively[7,11]: young adults were found to differentiate between prototypes other than an abstainer and heavy drinker. Specifically, young adults differentially attributed unique adjec-tives to five presented drinker prototypes: an abstainer, moderate drinker, heavy drinker, and tipsy and drunk person.[11] In addition, respondent drinker groups were found to differ in their ratings of favourability and similarity of the abstainer, moderate drinker and heavy drinker prototypes. Especially the moderate drinker was found to be desirable,[7,11] rather than the often assessed heavy drinker prototype.

In the present study, we tested the predictive value of alternative prototypes within the context of the Prototype Willingness Model (PWM). The PWM is a dual process model assum-ing that two pathways of information processing guide behaviour which can, and often do, operate simultaneously.[10,18] In the reasoned pathway (1), processing is more analytic or sys-tematic, and behaviour is the result of intentions. Intentions represent a person's motivation (i.e. plan or self-instruction) to perform certain behaviour and are the result of attitudes and social norms (i.e. the perception of what significant others do). The social reaction pathway (2) of the PWM involves more heuristic or experiential processing, and affect is influential.[9] This pathway suggests that behaviour is influenced by behavioural willingness (further referred to as 'willingness,' i.e. openness to opportunity). That is, many risky behaviours are

not intended per se, but are rather facilitated or prompted by external stimuli or (social) situations.[9] Prototypes, according to the PWM, guide behaviour through their effect on willingness. Moreover, prototype research has shown that prototypes also explain intentions and behaviour.[e.g. 12,19] The PWM has successfully been applied to explain several behaviours, such as drinking, smoking, (un)safe sex, exercise, and others.[e.g. 8,12,13]

The present study adds to previous research in the following ways. First, only some studies have examined alternative drinker prototypes, such as a 'binge drinker,' but most examined alternative drinker prototypes in isolation only.[e.g. 12,20,21] This prevents us from drawing conclusions regarding the potential contribution of alternative prototypes to the common prototypes. Therefore, the present study assessed the contribution of alternative prototypes by examining several prototypes simultaneously and comparing it to the PWM including the common prototypes only. Second, our previous studies did not determine the extent to which the distinguished alternative prototypes contribute to the explanation of determinants (i.e. intentions and willingness) of behaviour. The present study addressed this issue. Third, ours and other previous studies did not investigate alternative prototypes embedded in the PWM being applied to young adults' drinking behaviour. Only a binge drinker prototype in isolation[12] and an abstainer prototype and actor (i.e. engager) prototype of drinking have been assessed within the Theory of Planned Behaviour and PWM.[22] Hence, the present study provides insights into the contribution of alternative prototypes to the commonly assessed prototypes within the PWM.

Study purposes

In summary, previous studies showed that prototypes can explain behaviour, although most have focused on one or two common prototypes. Because young adults have been shown to differentiate between several prototypes, the present study aimed to determine the additional value of alternative drinker prototypes in explaining young adults' drinking behaviour, within the context of the PWM. Perceptions of favourability and similarity were assessed of five previously assessed prototypes[i]: abstainer, moderate drinker, heavy drinker, and tipsy and drunk person. The PWM was first tested with the common abstainer and heavy drinker and subsequently tested including all five prototypes, enabling comparison of the models. It was expected that alternative prototypes would add to the predictive value of behaviour, intentions, and willingness, but that the common heavy and abstainer prototypes would remain core factors.

METHOD

Sample and procedure

Young adults, aged 18–25 years old (both drinkers and abstainers, N = 450, M_{age} = 21.0, SD = 2.1, 22.4% male, 25.6% attrition), participated in the online study including a one-month

follow-up (T2). The majority were of Western origin[ii] (92.2%) as defined by Statistics Netherlands.[23] Education was assessed according to Dutch rankings, including low level (i.e. no degree attained after primary school, vocational level, or pre-vocational level) and middle to high level (i.e. professional education, or university or equivalent). The majority of respondents were middle to highly educated (92.4%). Women (OR = 0.40, p < .05) and highly educated respondents (OR = 0.29, p < .05) were less likely to drop out, and non-Western respondents were more likely to drop out (OR = 3.18, p < .05).[also see 7,24]

Respondents first received the study information and signed the informed consent form, which guaranteed their anonymity. Email was used to invite respondents to the second measurement at one-month follow-up and to send a reminder thereafter if necessary. Twenty vouchers worth €50 were offered (in a raffle) as an incentive for participation among the respondents. The study was approved by the ethical committee of the research institute of the lead author (MEC-2010-112).

Questionnaire variables at baseline (T1)

Correlations among the study variables[iii] are presented in Table 1 with means and SD at the bottom of the correlation table.

Intentions (T1) were measured by the mean of five items (α = .94) rated from (1) 'certainly not' to (7) 'very certain,' i.e. 'I intend to prevent myself from getting drunk during the next month,' 'I plan to prevent myself from getting drunk during the next month,' 'I intend to drink less than 6 glasses per occasion during the next month,' 'I plan to drink less than 6 glasses per occasion during the next month I plan to drink less than 6 glasses per occasion during the next month,' and 'I want to drink less than 6 glasses per occasion during the next month'.[see 25] A higher score represents higher intentions to drink sensibly.

Behavioural willingness (i.e. willingness, T1; α = .93) was assessed by describing a situation with two possible actions[adapted from 5,22]: 'Imagine that it is Saturday night. You're going out with friends and you already had several alcoholic drinks. You feel you've had enough. One of your friends offers you a drink.' This scenario was followed by the question 'How willing would you be to…' with the statements 'take it and drink it' and 'refuse it' rated from (1) 'certainly not' to (7) 'very certain'. Answers to the second statement were reversed and the mean score was used for analyses. A higher score represents a higher willingness to engage in drinking.

Attitude (T1) was measured using the statement: 'I find drinking a maximum of five alcoholic beverages per occasion…' with four semantic differentials of which the mean was used for analyses (α = .86, i.e. unhealthy-healthy; bad-good; boring-fun; unpleasant-pleasant), each rated from (1) 'certainly not' to (7) very certain'.[see 25] A higher score represents a more positive attitude of drinking sensibly.

Social norms (T1) were assessed by the item 'Most of my friends drink less than six glasses of alcohol per occasion'. A higher score (ranging from (1) 'certainly not' to (7) 'very certain') represents a social norm of drinking sensibly.[see 25 and see 24 for reasons for this operationalisation]

Table 1. Means, standard deviations, and correlations for the Prototype Willingness Model (N = 450)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 Drinking behaviour T1	-															
2 Drinking behaviour T2	.79	-														
3 Intentions	-.40	-.42	-													
4 Willingness	.36	.36	-.38	-												
5 Attitude	.28	.30	-.32	.31	-											
6 Social norms	-.41	-.41	.42	-.28	-.36	-										
7 Abstainer Fav.	-.34	-.32	.31	-.35	-.29	.28	-									
8 Moderate drinker Fav.	.02	.04	-.01	.00	.13	-.05	.25	-								
9 Heavy drinker Fav.	.39	.40	-.32	.28	.29	-.32	-.26	.30	-							
10 Tipsy Fav.	.29	.30	-.31	.25	.42	-.29	-.19	.26	.49	-						
11 Drunk Fav.	.29	.28	-.41	.31	.22	-.36	-.24	.09	.57	.53	-					
12 Abstainer Sim.	-.45	-.48	.49	-.41	-.42	.36	.52	-.11	-.38	-.40	-.35	-				
13 Moderate drinker Sim.	.17	.16	-.24	.19	.37	-.17	-.29	.35	.22	.23	.11	-.45	-			
14 Heavy drinker Sim.	.58	.58	-.35	.37	.25	-.31	-.36	.02	.42	.28	.29	-.44	.25	-		
15 Tipsy Sim.	.38	.36	-.46	.37	.44	-.33	-.37	.11	.33	.66	.35	-.61	.41	.47	-	
16 Drunk Sim.	.43	.43	-.47	.38	.24	-.35	-.34	-.02	.31	.32	.45	-.44	.18	.56	.56	-
M	7.60	6.84	4.66	3.00	4.10	3.92	4.91	4.65	3.88	4.24	3.31	3.76	4.02	1.94	3.31	1.81
SD	10.48	9.13	1.98	1.86	1.32	1.97	.74	.64	.72	.68	.74	2.02	1.76	1.17	1.60	1.08

Note: Drinking behaviour (week total) was assessed at baseline and one-month follow-up. All other variables were assessed at baseline. 'Fav.' relates to prototype favourability and 'Sim.' relates to prototype similarity.

Correlations of r ≥ .11 are significant at p ≤ .05 and those of r ≥ .15 are significant at p ≤.001.

For each *prototype* (i.e. abstainer, moderate drinker, tipsy person, heavy drinker, and drunk person), respondents' favourability and perceived similarity to their self-image were assessed. First, respondents were provided with a general description of prototypes[e.g. 26,27]: 'When trying to describe someone, people generally use characteristics of that person. These characteristics can be positive, negative, or neutral. For instance, when you describe someone of your age who gets good marks characteristics could be smart, serious, or bookish. Also, a movie star can be described as rich, a striver, and handsome. Five types of persons will follow. Think about the average (typical) person of your age, not one particular person that you know personally.' In addition, an explicit definition stated that the abstainer prototype refers to someone who has refrained from alcohol during the past twelve months. Deliberately, no other definitions of drinking patterns per prototype were given to avoid enforcing standard drinking patterns on the drinker prototypes. Instead, respondents were asked in a previous study to indicate how many glasses of alcohol they expect the moderate and heavy drinker prototypes to drink per week and occasion, and the tipsy and drunk prototypes per occasion. The expected drinking patterns have been shown to resemble the Dutch drinking[iv] guidelines.[11]

Prototype similarity (T1) was measured by two items per prototype: 'Are you similar to the typical person of your age who [abstains/drinks heavily/moderately/is tipsy/drunk]?'[14] rated from (1) 'certainly not' to (7) very certain,' and 'What is the chance that you will be similar to the typical person of your age who [prototype] in the future?', with the latter rated on a scale from (1) 'very small' to (7) 'very large'.[15] A higher mean of the two items represents a higher perception of similarity to the prototype. Correlations between the two similarity items ranged between .66–.87 (heavy drinker; abstainer).

To assess *prototype favourability* (T1) respondents rated the prototypes on 11 semantic pairs of characteristics derived from our previous study on drinker prototypes among young adults.[11] Favourability of each prototype was rated on 7-point scales as follows: 'Please indicate how much the following characteristics describe the typical person of your age who [prototype]: unsociable-sociable, insecure-self-confident, loud-quiet, volatile-nonvolatile, reserved-spontaneous, annoying-funny, boring-amiable, sad-cheery, uncontrolled-controlled, irresponsible-responsible, unordered-determined'. A higher average of the 11 items represents a higher favourability of the prototype. Cronbach's alphas ranged between .72–.85 (drunk; moderate drinker).

Questionnaire variables at baseline (T1) and one month follow-up (T2)

Drinking behaviour was assessed at baseline and follow-up using a standardised Dutch questionnaire.[28] Respondents indicated, by means of an open-ended question, how many glasses of alcohol they had consumed each day in the past week. These items were used to calculate the total of consumed glasses of alcohol during the past week.

Statistical analyses: SEM

Structural equation modeling (SEM) (AMOS 18.0) was used to assess the common and alternative prototypes within the PWM. Associations were considered statistically significant at p < .05. Three criteria were used to assess goodness of fit of the models. Because the χ^2-value (1) is likely to be large and significant when the sample size exceeds 400, two other indices of goodness of fit were used as well: the Comparative Fit Index (2; CFI), which should be at least .90, and the Root Mean Square Error of Approximation (3; RMSEA), for which values in the range of .05 to .08 indicate a fair fit, and values greater than .10 indicate a poor fit.[29] An upper limit of .8 was followed.

Two SEM models were specified examining prototypes within the PWM: one model including the common abstainer and heavy drinker prototypes only (Model 1), and one model including the five prototypes (Model 2). The two models were specified following the PWM[9,10] such that attitude and social norms related to intentions and willingness. In line with previous research we related prototypes not only to willingness but to intentions as well and prototype similarity to behaviour.[see 12,19,30] Finally, the explained variances of the two models per behavioural outcome were compared to determine the contribution of the alternative prototypes to the common prototypes. Figure 1 presents the specified model.
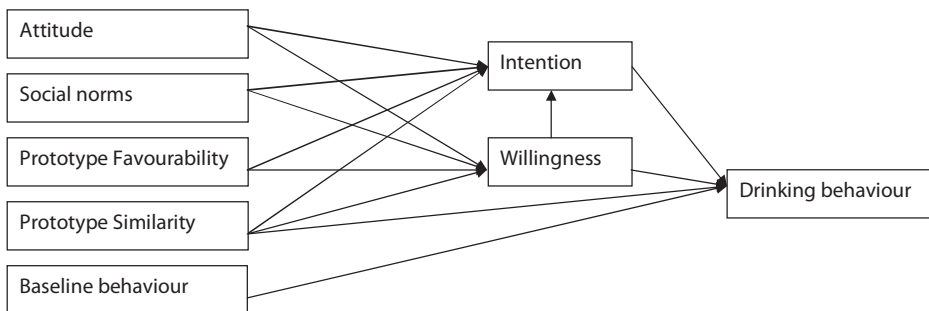

Figure 1. PWM as specified in the present study, including both prototype favourability and similarity, and with follow-up behaviour corrected for past behaviour. For Model 1, the common abstainer and heavy drinker prototypes were included; for Model 2, both the common and alternative (i.e. moderate drinker, tipsy, and drunk) prototypes were included.

RESULTS

Descriptive statistics

On average, respondents reported to have consumed at total of 7.6 (SD = 10.5) glasses during the past week at baseline and 6.8 (SD = 9.1) glasses at follow-up. Of the sample, 18% engaged in excessive drinking at baseline and 16% at follow-up. Most respondents reported reasonably high intentions to drink sensibly. Respondents reported a moderate willingness

to engage in (more) drinking. The moderate drinker prototype was evaluated most favourably and felt most similar to; the drunk prototype was evaluated as the least favourable and felt the least similar to (see bottom of Table 1 for the means).

Model tests

First, the PWM model (specified above) was tested including the abstainer and heavy drinker prototypes (Model 1), which resulted in a good fit, χ^2(6, N = 450) = 11.05, p = .09, CFI = .99, RMSEA = .04(.00–.08). To test whether alternative models would result in a better fit, we assessed whether prototype favourability should also be related to behaviour at follow-up. However, this model was not selected because this relationship was not significant for either of the two prototypes and the model did not produce a better fit, $\chi^2\Delta$(2) = 2.09, p = .35. Importantly, other models including, for instance, associations between attitude and behaviour, were not tested as this is not part of the PWM theory. Thus, the model as specified in Figure 1 was used for all analyses instead of an alternative model.

Outcomes of Model 1: Abstainer and heavy drinker prototypes

Table 2 presents the associations (standardised betas and model fit) of the PWM variables including the perceptions (i.e. similarity and favourability) of the abstainer and heavy drinker prototypes with intentions, willingness and behaviour (Model 1). The results showed that *drinking behaviour* at follow-up (R^2 = .66) was explained by baseline behaviour, similarity to the heavy drinker prototype, dissimilarity to the abstainer prototype, and lower intentions to drink sensibly. *Behavioural*

Table 2. PWM including an abstainer and heavy drinker prototype examined among 450 Dutch young adults

	Intentions T1	Willingness T1	Drinking Behaviour T2
	β	β	β
Baseline behaviour			.63***
Willingness	-.14***		.02
Intentions			-.07*
Attitude	-.05	.11*	
Social norms	.22***	-.07	
Abstainer favourability	-.00	-.14**	
Heavy drinker favourability	-.06	.06	
Abstainer similarity	.29***	-.16**	-.09*
Heavy drinker similarity	-.07	.17***	.14***
R^2	.34	.25	.66
CFI			.99
RMSEA			.04

Note: Paths are significant at the following levels: *p ≤ 0.05, **p ≤ 0.01, ***p ≤ .001. Standardised betas are presented for drinking behaviour at baseline and follow-up, and PWM variables including the abstainer and heavy drinker prototypes at baseline.

willingness (R^2 = .25) was explained by attitude, similarity to the heavy drinker prototype, and dissimilarity to and negative favourability of the abstainer prototype. *Intentions* to drink sensibly (R^2 = .34) were positively explained by social norms to drink sensibly and similarity to the abstainer prototype and by a reduced willingness to engage in drinking.

Outcomes of Model 2: Alternative and common prototypes

Subsequently, the PWM was examined including both the common and alternative prototypes[v] (Model 2; including all five prototypes), specified in the same way as for the common prototypes (Model 1, see Figure 1). This model resulted in a good fit as well, χ^2(9, N = 450) = 18.70, p < .05, CFI = .99, RMSEA = .05(.02–.08). Table 3 (Model 2) shows that *drinking behaviour*[vi] at follow-up T2 (R^2 = .66) was explained by similarity to the heavy drinker prototype, dissimilarity to the abstainer, and lower intentions to drink sensibly. *Behavioural willingness* (R^2 = .27) was positively explained by attitude, heavy drinker similarity, and negatively by abstainer favourability and similarity. *Intentions* to drink sensibly (R^2 = .40) were positively explained by social norms to drink sensibly, abstainer similarity, and negatively by willingness, and drunk prototype similarity and favourability.

Table 3. PWM including five drinker prototypes examined among 450 Dutch young adults

	Intentions T1	Willingness T1	Drinking behaviour T2
	β	β	β
Baseline behaviour			.63***
Willingness	-.10*		.03
Intentions			-.08*
Attitude	-.05	.12*	
Social norms	.17***	-.04	
Abstainer favourability	-.05	-.12*	
Moderate drinker favourability	.07	.00	
Heavy drinker favourability	-.02	.03	
Tipsy favourability	.06	-.05	
Drunk favourability	-.17***	.11	
Abstainer similarity	.22***	-.12*	-.13***
Moderate drinker similarity	-.03	-.03	-.04
Heavy drinker similarity	.01	.12*	.15***
Tipsy similarity	-.11	.07	-.07
Drunk similarity	-.15**	.10	.02
R^2	.40	.27	.66
CFI			.99
RMSEA			.05

Note: Paths are significant at the following levels: *p ≤ 0.05, **p ≤ 0.01, ***p ≤ .001. Standardised betas are presented for drinking behaviour at baseline and follow-up, and PWM variables including the five prototypes at baseline.

Assessing the contribution of alternative prototypes

The two models were compared to assess whether alternative prototypes contribute to the explanation of the behavioural outcomes compared to the commonly assessed prototypes. The results showed that, when including the alternative prototypes, the explained variance increased with 6% for intentions, 2% for willingness, and remained unchanged for drinking behaviour. The model including the five prototypes (Model 2) resulted in a marginally different fit compared to the model including the common abstainer and heavy drinker prototypes only (Model 1), $\chi^2\Delta(3) = 7.65$, p = .05.

DISCUSSION

The present study examined the contribution of alternative drinker prototypes in explaining drinking behaviour of young adults (18–25 years) within the PWM framework. Two main conclusions could be drawn.

First, alternative prototypes may increase our understanding of (intentional) drinking behaviour and may be of practical value for future research and possibly for interventions. Specifically, including the alternative prototypes (i.e. moderate drinker, and tipsy person and drunk person) in the PWM (Model 2) increased the explained variance of intentions by 6% compared to a PWM only including the – commonly assessed in previous studies – abstainer and heavy drinker prototypes (Model 1), and the two models produced a marginally different fit. The drunk prototype was the most relevant alternative prototype explaining intentions. Second, both common abstainer and heavy drinker prototypes remained important core factors in explaining drinking behaviour, intentions, and willingness.

An explanation that may account for the finding that only the 'extreme' drunk, heavy drinker, and abstainer prototypes were relevant in explaining the outcomes may be that these may exert their impact due to their saliency,[see 15,24] which, in turn, may be due to their characterisation.[11] Being tipsy or drinking moderately may not stand out as much and as such may have less impact than more 'extreme' salient prototypes such as the abstainer, heavy drinker, and drunk prototypes.[see 6,15]

Furthermore, intentions explained behaviour, whereas willingness did not. Other studies assessing the relationship between willingness and young adults' drinking behaviour are limited and the results are inconsistent.[21,22] Previous research suggests that behaviour becomes more intentional as individuals age and gain experience in the behaviour,[31] and as a result intentions may be a stronger predictor than willingness to explain (young) adults behaviour since they are more experienced in drinking.[2]

Limitations

Some study limitations should be acknowledged. First, the sample included a majority of respondents who were higher educated, female, and of Western origin; this distribution was

likely caused by the sampling method. Despite this limitation, we observed differences in the roles of alternative prototypes in explaining behaviour. Additional longitudinal and experimental studies are needed to further analyse the results found in the present study. Second, it should be noted that the PWM was designed to explain adolescent risk behaviour,[e.g. 18,32] although the model has been applied to risk behaviour among young adults.[e.g. 21,22] The presently found patterns may therefore be different for adolescents. This possibility should be taken into account in future studies.

Implications and future directions

With regard to future studies on prototype influences, the present study has three implications. First, especially prototype similarity is important in explaining behaviour, willingness, and intentions. This finding is in line with previous research.[e.g. 8,12,33] Both favourability and similarity explained willingness and only similarity explained intentions. Hence both may provide guidance in interventions aiming at changing these determinants.

Second, our and previous results suggest that the PWM might benefit from including a path from prototypes to intentions[8,12,22,34] (from prototype similarity in particular).

Third, alternative prototypes may provide useful targets in interventions: the drunk prototype (and heavy drinker) may provide a useful image to be portrayed as undesirable to target intentional drinking. Thus, individuals could be guided in distancing their self-image from the drunk and heavy drinker,[35] which may function as 'avoidance motivators'.[36] It may be important for future research to make these (un)desirable prototypes more salient in order to increase the impact,[15] which may be achieved by accentuating the negative characteristics and the consequences of similarity to this undesirable prototype.[13,16] The moderate drinker may not explain behaviour, but may be portrayed among excessive drinkers as a reachable and desirable prototype to become similar to.[7] This prototype is likely to be more feasible for excessive drinking young adults than the abstainer image. Non-risk prototypes, such as the moderate drinker, may have greater potential to become encouraged goal states than the unfavourable health-risk heavy drinker prototype.[e.g. 37] Further research is necessary to investigate whether the suggested strategies would result in the desired effects and how changed similarity can best be achieved and maintained.

To conclude, this study provides insights into the contribution of various prototypes in explaining drinking behaviour among young adults. The common abstainer and heavy drinker, and alternative drunk prototype were the most relevant prototypes in explaining drinking behaviour, willingness and intentions among young adults. The results can increase our understanding of risk behaviours and the role of (various) prototypes.

ACKNOWLEDGEMENTS

NOTES

[i] The choice of the five prototypes was based on (1) Dutch normative rates, (2) previous research[6,11,22,28,38,39] and (3) so that prototypes varying in alcohol consumption and intoxication level are included. A 'social drinker' prototype previously assessed along the abstainer and heavy drinker did not explain drinking behaviour[6] and was therefore not included.

[ii] According to Statistics Netherlands,[23] 'Western origin' includes all countries in Europe (except for Turkey), North America, Oceania, Japan, and Indonesia (including the former Dutch East Indies). Non-Western origin includes Turkey and all countries in Africa, Latin-America, and Asia.

[iii] As explained previously,[24] the questionnaire items were based on the Dutch drinking norm of a maximum of five glasses per occasion[28] and thus are phrased such that the number of glasses always matches a maximum of five. 'Glasses' are a standard measure used by several Dutch studies. Generally, a standard glass contains 10 grams of alcohol, but the amount of liquid (cl) differs per type of drink.

[iv] Excessive drinking is defined as exceeding either of the following guidelines: drinking on a maximum of 5 days per week, a maximum of 4 glasses per day and 14 per week for women, and 6 glasses per day and 21 per week for men.[28]

[v] Excluding past behaviour resulted in moderate drinker similarity to significantly explain behaviour at follow-up. A PWM model including only the abstainer, moderate drinker, and heavy drinker prototypes did not fit better or worse than the model including the common prototypes either.

[vi] The two models did not find indirect effects of prototypes on behaviour through intentions and willingness.

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6

Explaining young adults' drinking behaviour within an augmented Theory of Planned Behaviour: Temporal stability of drinker prototypes

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ABSTRACT

Objectives: Prototypes (i.e. social images) predict health-related behaviours and intentions within the context of the Theory of Planned Behaviour (TPB). The present study tested the moderating role of temporal stability of drinker prototype perceptions on prototype-intentions and prototype–behaviour relationships, within an augmented TPB. The study examined abstainer, moderate drinker, heavy drinker, tipsy, and drunk prototypes.

Design and methods: An online prospective study with one-month follow-up was conducted among 410 young adults (18–25 years old, M_{age} = 21.0, SD = 2.14, 21.7% male). Assessed were prototype perceptions (favourability and similarity, T1, T2), stability of prototype perceptions, TPB variables (T1), intentions (T2), and drinking behaviour (T2). Intention analyses were corrected for baseline behaviour; drinking behaviour analyses were corrected for intentions and baseline behaviour.

Results: Hierarchical regressions showed that prototype stability moderated the relationships of drunk and abstainer prototype similarity with intention. Similarity to the abstainer prototype explained intentions to drink sensibly more strongly among individuals with stable perceptions than among those with unstable perceptions. Conversely, intentions were explained stronger among individuals with stable perceptions of dissimilarity to the drunk prototype than among those with unstable perceptions. No moderation effects were found for stability of favourability or for relationships with behaviour.

Conclusions: Stable prototype similarity perceptions were more predictive of intentions than unstable perceptions. These perceptions were most relevant in enhancing the explanation of young adults' intended drinking behaviour. Specifically, young adults' health intentions seem to be guided by the dissociation from the drunk prototype and association with the abstainer prototype.

INTRODUCTION

Excessive drinking has been related to several negative health, social, and economic conse-quences.[1] Examples are social and behavioural problems such as trouble with police, friends, or parents, injuries, unsafe sex and physical fights.[2] Excessive drinking is especially prevalent among young adults.[3] Young adults can experience a number of problems due to their alco-hol use such as overweight, high blood pressure, and unsafe driving practices.[4] Alcohol is the world's third largest risk factor for disease burden; in Europe, it is the second largest. Each year 2.5 million deaths worldwide are related to the harmful use of alcohol.[1]

Many risk behaviours, such as excessive drinking, have been studied in the context of the Theory of Planned Behaviour (TPB).[5] The TPB proposes that behaviour results from deliberative reasoning. In other words, behaviour is regarded as intentional or goal-directed. Intentions are guided by attitudes, social norms (i.e. subjective and descriptive norms), and perceived behavioural control (PBC). Attitude is defined as the overall evaluation of performing a be-haviour (e.g. pleasant, healthy). Subjective norms refer to the social approval or disapproval to engage in behaviour and descriptive norms refer to the perception of what significant others do. PBC is defined as an individual's perception of control over or confidence in engag-ing in the behaviour. As Ajzen[5] stated: 'The relative importance of attitude, subjective norm, and perceived behavioural control in the prediction of intention, is expected to vary across behaviours and situations.'

A previous meta-analysis found that across studies, the TPB explained 27% and 39% of the variance in behaviours and intentions, respectively.[6] Thus, a significant proportion is left un-explained. Importantly, the type of health-related behaviour has been found to moderate the proportion of variance explained in both intentions and behaviour.[7] Furthermore, research has found intentions to not always be acted upon, even among individuals with strong inten-tions to engage in a behaviour.[8] For these reasons, research has focused on extending the TPB in order to explain additional variance in intentions and behaviour.

Prototypes and the TPB

Various extensions to the TPB have been studied.[9] Recent approaches extend the TPB by in-cluding the factor 'prototypes' to the model.[e.g. 10,11] The current study examined the moderat-ing role of stability of prototype perceptions. *Prototypes* (i.e. social images) refer to the mental image of a typical person engaging in (or abstaining from) a behaviour,[12,13] such as a typical drinker. The assumption is that prototypes exert their influence through social comparison processes.[12] In other words, individuals compare prototypes to their self-identity. Individuals are thought to be aware that engagement in (or abstinence from) a behaviour might make other people evaluate them as having the prototypical characteristics associated with that behaviour.[14] Characteristics found to describe heavy drinkers are, for instance, 'annoying,' 'volatile,' and 'uncontrolled'. Characteristics ascribed to a moderate drinker prototype are, for instance, 'spontaneous' and 'sociable'.[15]

Prototypes perceptions can refer to prototype favourability and similarity, both of which are relevant in their relation to behaviour and intentions. *Favourability* refers to the positive or negative characterisation or evaluation of the prototype; *similarity* refers to the perceived similarity of the self-image to the prototype.[e.g. 10,16] These prototype perceptions can guide behaviour through their impact on intentions. Indeed, these prototype perceptions have been related to intentions to engage in various behaviours, including drinking behaviour.[e.g. 10,17] A more positive perception of prototypes associated with a behaviour is related to increased intention or engagement in that behaviour.[18] In addition, engagement in (risk) behaviour can result in prototype perception change.[12,19] Several studies on drinking behaviour have found that prototype perceptions explain variance of intentions and behaviour over and above that explained by TPB variables and past behaviour.[10,11,20]

Temporal stability of prototypes

Other research has suggested that the TPB can be usefully extended by focussing on the stability of cognitions.[21-24] Temporal stability can be defined as the extent to which a construct remains unchanged over time, regardless of manipulations or challenges.[25,26] It can be regarded as an operative measure of strength.[26] For instance, temporal stability can help explain the consistency between intentions and behaviour.[21,22,26-28] Temporally stable prototype perceptions might be expected to have stronger impacts on intentions and behaviour and help explain unique additional variance in intentions and behaviour compared with TPB variables and past behaviour.

The aim of this study was to further our understanding of the determinants of a health-risk behaviour, namely alcohol consumption in young adults. This was achieved by applying an augmented TPB to this behaviour in a sample of young Dutch adults. The particular focus was on the importance of drinker prototype perceptions and the potential moderating effects of temporal stability of such perceptions. Two reasons support this focus on prototypes. First, for some, acquiring the characteristics attributed to certain prototypes is thought to represent a goal or a core self-value.[18,29] As a result, stability of prototype perceptions could be a reflection of variability of prototype perceptions that represent core self-values. Second, prototype perceptions are subject to natural change over time, due to accumulation of experience in the particular behaviour and observation of peers. This natural change in prototypes over time has been related to intentions and behaviour[17,30] and stability may tap on important aspects of this change.

Study aims

In sum, the present study examined whether temporal stability of prototype perceptions moderates the relation of prototype perceptions with behaviour and intentions among young adults, in the context of an augmented TPB. In line with previous research, favourability of and perceived similarity to five prototypes are assessed[e.g. 15]: abstainer, moderate drinker, heavy drinker, tipsy and drunk person. These prototypes were chosen for two reasons. First, previous studies found that young adults distinguish between not only 'drinkers' and

'abstainers,' but also a number of intermediate prototype as relevant to them.[15] Second, these five prototypes have been found to differ in characterisation and evaluations of favourability and similarity, and to contribute to the explanation of young adults' drinking behaviour and intentions in other studies.[15,31] It is because stability of prototypes has not been assessed before that we examined the moderating impact of temporal stability on the relationship of prototype favourability and similarity with intentions and behaviour.

METHODS

Design

Young adults (18–25 years of age, drinkers and abstainers) were recruited online through several Dutch forums and social networking websites by means of advertisements or forum posts, between September and November 2010. Participants first received the study information and signed the online informed consent form, guaranteeing their anonymity. The online prospective study included a one-month follow-up (T2). Participants were emailed a link to the second questionnaire and a reminder 2 weeks thereafter if needed. Twenty vouchers worth €50 were distributed among the 410 participants as incentive. The Ethical Committee of the research institution of the lead author approved the study (MEC-2010-112).

Participants

A total of 605 participants participated in the first measurement (T1, M_{age} = 21.0, SD = 2.2, 27.4% male). Of these 410 participants (attrition: 32.2%, M_{age} = 21.0, SD = 2.14, 21.7% male) also completed the measurements at one-month follow-up (T2). These 410 participants were included in all analyses. The majority were of Western origin[i] (92.7%), as defined by Statistics Netherlands.[32] The majority of participants were either pursuing or had completed middle or high educational level (professional education and university or equivalent, respectively) according to Dutch rankings (92.9%). Men (OR = 2.33, p < .05), low educated participants (OR = 3.29, p < .05), and non-Western participants (OR = 3.08, p < .05) were more likely to drop out. Additionally, the total number of drinks consumed in the week at baseline was significantly higher among those that dropped out (M = 13.04, SD = 16.84; M = 7.27, SD = 9.79; F(1, 603) = 28.16, p < .01).

Measures

Questions were rated on 7-point scales (1: *certainly not*; 7: *very certain*) and variables consisted of the mean of items, unless otherwise specified. Table 1 presents the correlations between the variables (plus means and standard deviations at bottom of Table 1). The questionnaire items were based on the Dutch drinking norm of a maximum of five glasses per occasion.[33] Therefore, items are phrased such that the number of glasses always matches a maximum of five. 'Glasses' are a standard measure used by several Dutch studies. A standard glass contains 10 grams of alcohol, but the amount of liquid (cl) differs per type of drink.

Table 1. Means, standard deviations, and correlations for the augmented Theory of Planned Behaviour (N = 410)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 Drinking behaviour T1	-															
2 Drinking behaviour T2	.78	-														
3 Intention T2	-.41	-.43	-													
4 Attitude T1	.26	.28	-.34	-												
5 Descriptive norms T1	-.41	-.40	.42	-.38	-											
6 PBC T1	-.43	-.46	.40	-.30	.33	-										
7 Abstainer Fav. T1	-.35	-.32	.34	-.29	.31	.35	-									
8 Moderate drinker Fav. T1	.02	.03	-.05	.16	-.02	-.03	.29	-								
9 Heavy drinker Fav. T1	.38	.37	-.35	.29	-.30	-.31	-.26	.25	-							
10 Tipsy Fav. T1	.27	.26	-.32	.42	-.27	-.26	-.18	.22	.45	-						
11 Drunk Fav. T1	.31	.27	-.42	.24	-.33	-.23	-.28	.01	.56	.52	-					
12 Abstainer Sim. T1	-.45	-.47	.51	-.41	.36	.48	.52	-.09	-.38	-.39	-.36	-				
13 Moderate drinker Sim. T1	.17	.15	-.23	.39	-.18	-.25	-.26	.37	.24	.25	.14	-.44	-			
14 Heavy drinker Sim. T1	.56	.56	-.38	.24	-.31	-.45	-.35	.04	.42	.27	.29	-.43	.25	-		
15 Tipsy Sim. T1	.37	.33	-.49	.42	-.33	-.43	-.36	.11	.32	.55	.36	-.61	.41	.45	-	
16 Drunk Sim. T1	.42	.42	-.49	.23	-.35	-.36	-.36	-.05	.29	.29	.45	-.45	.20	.56	.56	-
M	7.27	6.55	4.84	4.12	3.99	6.10	4.89	4.65	3.87	4.23	3.29	3.73	4.05	1.91	3.35	1.81
SD	9.79	8.79	1.84	1.31	1.96	.93	.73	.61	.69	.67	.71	2.00	1.77	1.14	1.59	1.09

Note: Drinking behaviour was assessed at one-month follow-up. All other variables were assessed at baseline. 'Fav.' relates to prototype favourability and 'Sim.' relates to prototype similarity. Correlations of r ≥ .11 are significant at p ≤ 0.05 and those of r ≥ .15 are significant at p ≤.001.

Independent variables

Attitude (T1) was measured using the statement: 'I find drinking a maximum of five alcoholic beverages per occasion…' with four semantic differentials (α = .86; unhealthy–healthy, bad–good, boring–fun, unpleasant–pleasant), each rated on a 7-point scale.[34] A higher mean represented a more positive attitude to drinking a maximum of five glasses of alcohol.

One item assessed *descriptive norms[ii]* (T1): 'Most of my friends drink less than six glasses of alcohol per occasion.'[34] A higher score thus represented a perception of descriptive norms of sensible drinking.

Perceived behavioural control (PBC, T1) included nine items. The first four items were similar to self-efficacy. For example, 'I feel capable of drinking <6 glasses of alcohol per occasion.'[34] The last five items were similar to PBC,[6] using the statement: 'Image you wanted to limit the number of glasses of alcohol per occasion to 6. Would it be (1) *very hard to* (7) *very easy* to…' followed by, for example, 'succeed if you were offered another drink?' The mean of the nine items formed our measure of PBC (α = .88). A higher mean thus represented more perceived control over drinking behaviour.

Five drinker prototypes were assessed at baseline (T1) and at follow-up (T2): abstainer, moderate drinker, tipsy person, heavy drinker, and drunk person. First, participants were provided with a general description of prototypes[35,36]: 'When trying to describe someone, people generally use characteristics of that person. These characteristics can be positive, negative or neutral. For instance, a movie star could be described as rich, a striver, or handsome; a person that gets good grades could be smart, serious, or bookish. Five types of persons will follow. Think about the average (typical) person of your age, not one particular person that you know personally.' Additionally, an explicit definition stated that the abstainer prototype refers to someone who has refrained from alcohol during the past 12 months. Purposefully, no other definitions of drinking patterns per prototype were given, so as to avoid enforcing standard drinking patterns on the drinker prototypes. Instead, in a previous study, participants were asked to indicate the number of glasses of alcohol they expect the moderate and heavy drinker prototypes to drink per week and occasion, and the tipsy and drunk prototypes per occasion. The expected drinking patterns resembled the Dutch drinking norms.[15]

Prototype favourability (T1, T2) is typically measured by rating prototypes on a list of (semantic) characteristics.[e.g. 11,16] This study used a list of 11 semantic pairs (7-point scales) of characteristics derived from a previous study on the five drinker prototypes.[15] Participants were asked: 'Please indicate how much the following characteristics describe the typical person of your age who [abstains/drinks heavily/moderately/is tipsy/drunk]: unsociable-sociable, insecure-self-confident, loud-quiet, volatile-non-volatile, reserved-spontaneous, sad-cheery, irresponsible-responsible, annoying-funny, boring-amiable, uncontrolled-controlled, unordered-determined.' A higher mean over the 11 items (i.e. adjective pairs) indicated a higher favourability of the prototype. Cronbach's alphas ranged from .71 (drunk prototype) to .85 (moderate drinker) at baseline and from .74 (drunk prototype) to .91 (moderate drinker) at follow-up.

Prototype similarity (T1, T2) was measured using two items per prototype—'How much are you like the typical person of your age who [prototype]?'[37], and 'What is the chance that you

will be similar to the typical person of your age who [prototype] in the future?', with the latter rated on a scale from (1) *very small* to (7) *very large*.[38] Higher mean scores of the two items indicated a higher perceived similarity to the prototype. Correlations between the two similarity items ranged from .65 (heavy drinker) to .86 (abstainer prototype) at baseline and from .72 (drunk prototype) to .83 (moderate drinker) at follow-up.

Stability of prototype perceptions was operationalised by three measures of stability forming the stability index for favourability and similarity separately. These measures were based on previous studies[21,24]: (1) the sum of the absolute differences between prototype items (11 items for favourability, 2 for similarity) measured at T1 and T2; (2) the sum of the absolute differences between the sum of items at these time points; (3) the number of items that have changed. The stability index was composed of the mean of the three standardised measures.[21,26] The scores were reversed in the analyses by subtracting the mean stability score for an individual from zero to ensure that high scores on the stability index represented higher levels of stability.[21] Reliability of the stability indexes was generally high, with Cronbach's alphas ranging from .60 (moderate drinker) to .96 (drunk person) for favourability stability and from .77 (drunk person) to .89 (moderate drinker) for similarity stability. Importantly, the stability of similarity to the drunk was based on a median split, to minimise skewness[iii] (i.e. participants generally felt dissimilar to the drunk prototype).

Drinking behaviour at baseline was assessed using a standardised Dutch questionnaire.[33] Participants indicated by means of an open-ended question regarding the number of glasses of alcohol they had consumed each day in the past week. These items were used to calculate the total of consumed glasses of alcohol during the past week, further referred to as 'week total'.

Dependent variables

Intentions (T2) were measured by means of five items (α = .94), that is, 'I intend to prevent myself from getting drunk during the next month,' 'I plan to prevent myself from getting drunk during the next month,' 'I intend to drink <6 glasses per occasion during the next month,' 'I plan to drink <6 glasses per occasion during the next month I plan to drink less than 6 glasses per occasion during the next month,' and 'I want to drink <6 glasses per occasion during the next month'.[e.g. 34] A higher score represents a higher intention to drink sensibly.

Drinking behaviour at follow-up (T2) was assessed with the same items as at baseline.[33]

Statistical analyses

All analyses were performed in SPSS (IBM SPSS Statistics for Windows, Version 20.0; IBM Corp, Armonk, NY). Statistics are considered to be significant at p < .05. To minimise potential problems of multicollinearity in estimating regression coefficients, variables were mean-centred.[39,40] First, hierarchical regressions were performed with intention to drink sensibly at follow-up (T2) as dependent variable. One model was tested including prototype favourability and another including prototype similarity (for five prototypes simultaneously). In both models, baseline drinking behaviour (week total T1) was entered in step 1 and all

TPB variables (T1) in step 2. At step 3, either the prototypes' favourability or similarity (T1) was entered. At step 4, the corresponding stability of either the prototypes' favourability or similarity was entered. Finally, to test moderation by stability of prototype perceptions, step 5 added the interaction between prototypes at baseline and their stability value. The same procedure was followed to explain drinking behaviour (total of glasses of alcohol consumed in the past week) at follow-up, including intentions (T2) as an extra step between baseline behaviour and the TPB variables (T1). Thus, two models are presented in Table 2 for intentions (2a for favourability and 2b for similarity, 5 steps) and two models for drinking behaviour in Table 3 (3a for favourability and 3b for similarity, 6 steps). Simple slope analyses were performed to examine the direction of significant interactions.[39] Additionally, the Hayes and Matthes macro for SPSS was used for examination of plots.[41]

RESULTS

Descriptive statistics

Participants reported having consumed a total of 7.27 glasses of alcohol per week at baseline (SD = 9.79) and 6.55 at follow-up (SD = 8.79). Table 1 presents the correlations and the means and deviations (bottom of table). Most participants reported high perceived control (PBC) and reasonably high intentions to drink sensibly. Participants generally felt most similar to the moderate drinker prototype and favoured it the most. The drunk prototype was generally evaluated least favourably and participants felt the least similar to it.

Explaining intention

TPB and prototypes

First, regression analyses were performed regarding the explanation of intentions to drink sensibly (T2). Intentions were found to be significantly explained by baseline drinking behaviour, attitude, descriptive norms, PBC, favourability of or similarity to the abstainer and drunk prototypes and similarity to the tipsy prototype (step 3, Table 2). The explained variance was 36% for the prototype favourability model (Table 2a) and 41% for the similarity model (Table 2b).

Temporal stability

Second, moderation of the relation between prototypes perceptions and intentions by prototype perception stability was tested. Stability did not moderate the relationship between prototype favourability and intentions. However, a main effect was found for the stable perception of similarity to the drunk prototype (step 5, β = .11, p < .05). This effect was qualified by a significant interaction effect (step 6) between similarity to the drunk prototype and its stability value (β = -.13, p < .05). Additionally, a significant interaction effect was found for similarity to the abstainer prototype and its stability value (β = .12, p < .01). The interactions

significantly increased the explained variance by 2% (Table 2b). Table 2 presents the stan-
dardised betas for the model (2a for favourability, 2b for similarity). Post hoc power analyses
produced a power of 1.00 for the favourability and similarity models.

Third, simple slope analyses were performed to examine the direction of the significant in-
teractions.[39] The results showed that the more individuals felt similar to the drunk prototype,
the lower the intention to drink sensibly. However, the effect was only marginally significant
among those with a low stability of similarity to the drunk prototype (B = -.20, p = .05). This
effect was stronger and significant for individuals with more stable similarity perceptions for
the drunk prototype (B = -.64, p < .001, Figure 1a). Conversely, the more similar individuals
felt to the abstainer prototype, the higher their intentions to drink sensibly. This relationship
was stronger among those individuals with more stable perceptions (B = .29, p < .001) than
among those with unstable perceptions for whom the relation was not significant (B = .09,
p = .14, Figure 1b). In conclusion, stable perceptions of prototype similarity (for drunk or ab-
stainer prototypes) had stronger effects in explaining intentions than unstable perceptions.[iv]

Table 2. Explaining intention at follow-up, including interactions by stability of prototype favourability (2a)
and similarity (2b) (N = 410)

	Intention T2	Step 1	Step 2	Step 3	Step 4	Step 5
		β	β	β	β	β
2a	Drinking behaviour T1	-.41***	-.19***	-.13**	-.14***	-.14**
	Attitude		-.14**	-.10*	-.10	-.09
	PBC		.20***	.17***	.16***	.16***
	Descriptive norms		.22***	.17***	.17***	.16***
	Favourability T1					
	Abstainer			.10*	.07	.09
	Moderate drinker			-.04	-.04	-.04
	Heavy drinker			-.01	-.03	-.03
	Tipsy			-.01	-.00	-.03
	Drunk			-.22***	-.20***	-.19***
	Favourability stability					
	Abstainer				.03	.01
	Moderate drinker				-.09	-.07
	Heavy drinker				-.00	-.01
	Tipsy				-.03	.27
	Drunk				-.01	-.01
	Favourability by stability					
	Abstainer					.06
	Moderate drinker					.01
	Heavy drinker					-.00
	Tipsy					-.31
	Drunk					.02
	R²	.17	.30	.36	.37	.37
	R² change	-	.14***	.06***	.01	.01
	Model F	81.27	43.66	24.64	16.19	12.08

Table 2. Explaining intention at follow-up, including interactions by stability of prototype favourability (2a) and similarity (2b) (N = 410) (continued)

	Intention T2	Step 1	Step 2	Step 3	Step 4	Step 5
		β	β	β	β	β
2b	Drinking behaviour T1	-.41***	-.19***	-.08	-.08	-.05
	Attitude		-.14**	-.07	-.07	-.04
	PBC		.20***	.09	.07	.06
	Descriptive norms		.22***	.16***	.16***	.15***
Similarity T1						
	Abstainer			.20***	.19***	.21***
	Moderate drinker			.04	.00	.01
	Heavy drinker			.02	.02	-.00
	Tipsy			-.13*	-.10	-.05
	Drunk			-.21***	-.17**	-.12
Similarity stability						
	Abstainer				-.02	.00
	Moderate drinker				-.08	-.08
	Heavy drinker				-.00	-.02
	Tipsy				.01	.00
	Drunk				.11*	.08
Similarity by stability						
	Abstainer					.12**
	Moderate drinker					-.04
	Heavy drinker					-.03
	Tipsy					.04
	Drunk					-.13*
	R^2	.17	.30	.41	.42	.45
	R^2 change	-	.14***	.11***	.01	.02**
	Model F	81.27	43.66	30.83	20.61	16.50

Note: Paths are significant at the following levels: *$p \leq 0.05$, **$p \leq 0.01$, ***$p \leq .001$. Presented are standardised betas. F-values were significant at $p < .001$.
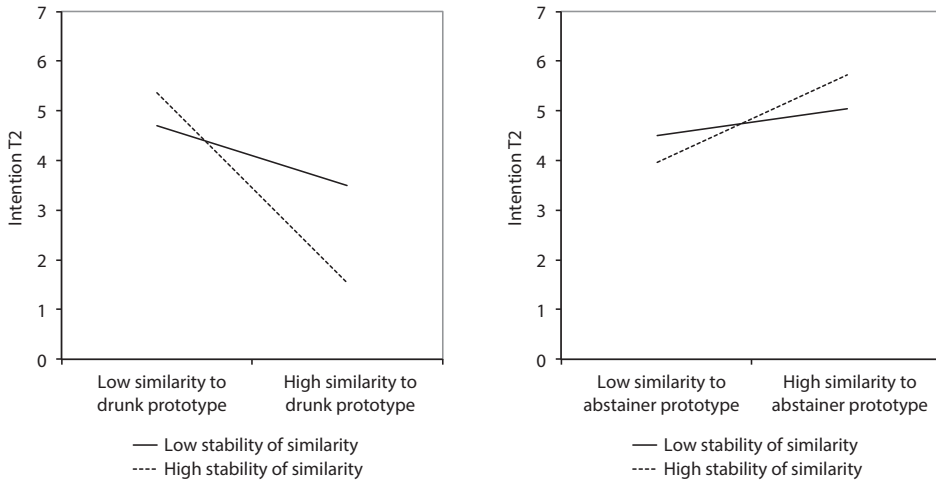
Figure 1. Intention (T2) explained by moderation of similarity to the drunk prototype (1a) and abstainer prototype (1b) by similarity stability

Explaining drinking behaviour
TPB and prototypes
Next we performed regression analyses for drinking behaviour (T2). Main effects were found for baseline drinking behaviour, intentions, PBC, and similarity to the abstainer (β = -.11, p < .01), tipsy (β = -.13, p < .01), and heavy drinker prototypes (β = .14, p < .001; step 4). Table 3 shows an explained variance of 64% regarding the favourability model (Table 3a) and 66% for the prototype similarity model (Table 3b). Again, post hoc power analyses produced a power of 1.00 for the favourability and similarity models.

Temporal stability
Finally, the moderation effect of temporal stability was tested regarding the relationship between prototype perceptions and behaviour. No main effects were found for either stability of favourability or similarity (step 5). Additionally, no interaction effects were found (step 6) between prototype perceptions and their stability values. The interactions did not result in significant additional explained variance. Table 3 presents the models for prototype favourability (3a) and similarity (3b).

Table 3. Explaining drinking behaviour (week total) at follow-up, including interactions by stability of prototype favourability (3a) and similarity (3b) (N = 410)

	Drinking behaviour T2	Step 1 β	Step 2 β	Step 3 β	Step 4 β	Step 5 β	Step 6 β
3a	Drinking behaviour T1	.78***	.72***	.67***	.66***	.66***	.66***
	Intention T2		-.14***	-.09*	-.09*	-.09*	-.09*
	Attitude			.02	.02	.03	.03
	PBC			-.12***	-.12***	-.11**	-.11**
	Descriptive norms			-.04	-.04	-.05	-.05
	Favourability T1						
	Abstainer				.02	.01	.01
	Moderate drinker				-.02	-.02	-.02
	Heavy drinker				.06	.08	.07
	Tipsy				.02	.02	.02
	Drunk				-.05	-.08	-.08
	Favourability stability						
	Abstainer					-.04	-.04
	Moderate drinker					-.05	-.05
	Heavy drinker					.07	.08
	Tipsy					.03	.00
	Drunk					-.04	-.05
	Favourability by stability						
	Abstainer						-.02
	Moderate drinker						-.01
	Heavy drinker						-.00
	Tipsy						.03
	Drunk						.01
	R^2	.61	.62	.63	.64	.64	.64
	R^2 change	-	.02***	.01***	.00	.01	.00
	Model F	624.01	332.39	140.26	69.93	47.14	35.00
3b	Drinking behaviour T1	.78***	.72***	.67***	.60***	.60***	.60***
	Intention T2		-.14***	-.09*	-.07	-.07	-.07
	Attitude			.02	.04	.04	.03
	PBC			-.12***	-.09*	-.09*	-.09*
	Descriptive norms			-.04	-.04	-.04	-.04
	Similarity T1						
	Abstainer				-.11**	-.13**	-.13**
	Moderate drinker				-.05	-.06	-.06
	Heavy drinker				.14***	.13**	.10*
	Tipsy				-.13**	-.11**	-.09
	Drunk				.03	.03	.04

Table 3. Explaining drinking behaviour (week total) at follow-up, including interactions by stability of prototype favourability (3a) and similarity (3b) (N = 410) (continued)

Drinking behaviour T2	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6
	β	β	β	β	β	β
Similarity stability						
Abstainer					.06	.05
Moderate drinker					-.05	-.04
Heavy drinker					-.03	-.03
Tipsy					.02	.03
Drunk					.01	.01
Similarity by stability						
Abstainer						-.05
Moderate drinker						-.01
Heavy drinker						-.03
Tipsy						.04
Drunk						-.03
R^2	.61	.62	.63	.66	.66	.67
R^2 change	-	.02***	.01***	.02***	.01	.00
Model F	624.01	332.39	140.26	76.67	51.67	38.94

Note: Paths are significant at the following levels: *$p \leq 0.05$, **$p \leq 0.01$, ***$p \leq .001$. Presented are standardised betas. F-values were significant at $p < .001$. 'Fav.' relates to prototype favourability and 'Sim.' relates to prototype similarity.

DISCUSSION

The present study examined whether prototype stability moderated the relationships between prototypes and young adults' intentions and drinking behaviour within an augmented TPB. The results indicated that the prototype perception-intention relationship was moderated by stability. Prototype stability enhanced the prediction of intentions. No moderation effect was found for stability on the prototype-behaviour relationship.

Consistent with previous studies, the results suggest that temporal stability can improve the consistency of the relationship between cognition (i.e. prototype perceptions) and intention.[22] Stable prototype perceptions permit more accurate prediction of intentions than when they are unstable.[see also 5,42] A possible explanation for these relationships is the suggestion that more stable cognitions are more resistant to persuasion and can have larger impact on information procession than unstable cognitions.[22,27] Furthermore, important cognitions regarding the prototypes may be shielded from competing cognitions.[22]

Importantly, prototype stability only moderated the relationship with intentions but not with behaviour. This finding is in contrast to the suggestion that stability may moderate cognition-behaviour relations because it predicts changes in cognition prior to action.[22] An explanation is that drinking behaviour is complex and not always fully intentional.[16]

Previous studies have found that when behaviour is performed frequently, which is presently the case, stable intentions were not capable of breaking the link between previous and future behaviour.[21] Plausibly, the predictive value of prototype perceptions' stability was not strong enough to break this habitual behaviour. Competing goals that influence behaviour irrespective of intentions could be at play and reduce the impact of even stable prototype perceptions. For example, an individual may intend to drink moderately or abstain because of an upcoming examination but simultaneously wanting to be sociable and liked by others. This competing goal might make it more difficult to refuse drinks.

Furthermore, only stable abstainer and drunk prototype perceptions were predictive of intentions. We suggest the following as potential explanations as to why these and not other (i.e. moderate drinker, heavy drinker, tipsy) prototypes were relevant. First, the abstainer and drunk prototypes were likely to be especially relevant due to their saliency.[38] Their characterisation has been shown to be more profound than for the other prototypes while both the heavy drinker and tipsy prototype were each characterised by two types of characterisations instead of one.[15] Second, stable perceptions are thought to be less liable to contextual factors that could deviate from intentions[27]; however these other prototypes may be more liable to contextual factors. For instance, contextual factors may exert less impact on the drunk and abstainer prototypes because the drunk prototype is described with a more stable characterisation as an 'addicted' person and the abstainer as a 'determined' person, irrespective of the situation.[15]

Importantly, only prototype similarity and not favourability perceptions were moderated by stability. This finding is consistent with previous research that established that similarity was a stronger predictor of drinking behaviour than favourability.[10,20,43] Additionally, prototype similarity has particularly been found to enhance the predictive validity of the TPB.[20] A possible explanation from possible selves theory is that similarity can present core-values of the self-image. Adults, and perhaps young adults, tend to have a consistent and stable sense of the self.[44] Individuals not only hold a view of the present self, but also conceptions of how they could be in the future.[45] Negatively evaluated possible selves are likely to be 'feared' and thus will be avoided, whereas positive evaluated selves will be 'desired' which will activate an approach system.[46,47]

Limitations

Some limitations of the present research should be acknowledged. First, the sample mainly consisted of higher educated, female participants of Western origin. Importantly, national data show that individuals from Western and non-Western origin consume relatively similar amounts of alcohol.[48] Given this finding, it is expected that ethnic origin would not have changed the influenced of prototype perceptions. Similarly, the study was performed within the Dutch drinking culture. Thus, conclusions as to whether other North American or EU countries would produce different result cannot be drawn. Furthermore, females and males generally differ in their alcohol consumption.[48] An additional analysis showed that for females

only, stability of abstainer prototype similarity moderated the prototype-behaviour relationship. This may be explained by the more feminine description of the abstainer prototype and the fact that females and males differ in their focus of characterisation.[15] As a result, it may be more acceptable for females to identify with the abstainer prototype by their (non-) drinking behaviour than for males. Future research could attempt to unravel such patterns and examine how stable such perceptions are. Second, the prototypes presently assessed were relevant among young adult populations.[15] It may be that certain prototypes, such as drunk and tipsy prototypes, are less relevant for adolescents and children as they are likely to lack drinking experience. Third, the present study is based on a prospective correlational design. This design may prevent us from drawing causal conclusions. Future longitudinal and experimental studies are necessary to replicate the presented patterns.

Implications and further directions

The following implications can be drawn from this study. First, the finding that both the abstainer and drunk prototypes explained intentions confirms the suggestion that both healthy and risky prototypes constitute useful cognitive targets for interventions[20] and can help explain behaviours. The results also suggest that the undesirable drunk prototype (generally a low favourability and similarity) can be an avoidance goal, whereas the abstainer prototype may be an approach goal for abstaining or moderate drinking individuals.[31] It seems plausible that the abstainer and drunk prototypes can be contrasted with the self-image. More specifically, abstaining or moderately drinking individuals may aim to avoid negative characteristics of the drunk prototype and to achieve positive characterisation of the abstainer prototype. The reverse may be true for heavy drinking individuals.

Furthermore, prototype similarity especially enhanced the predictive validity when perceptions were stable. Therefore, the second implication is that in order to target intentions focusing on stability of similarity to prototypes is likely to be important. Similarity to the abstainer and more reachable moderate drinker could be enhanced, whereas distancing could be encouraged from the drunk, especially among individuals with unstable prototype perceptions. Two strategies are suggested by previous research. First, distancing from a prototype may help in changing behaviour or maintaining behavioural change.[49-51] This can be achieved by guiding drinkers in contemplating on characteristics and emphasising negative consequences of resembling the drunk prototype.[19] Additionally, providing normative feedback can show heavy drinking individuals that they are usually described with negative characteristics by their peers, whereas they would be valued with more positive characteristics when they would resemble a moderate drinker.[15] A second strategy is guiding individuals in forming implementation intentions. The results of Godin et al.[23] found that for a health behaviour, implementation intentions were only effective in explaining behaviour 6 months later among those with unstable intentions. Rivis and Sheeran[52] found that implementation intentions can overcome the effect of binge drinker prototypes on behaviour because it fosters self-regulation by heightening people's self-focused attention. Thus, this strategy

can overcome the influence of prototypes and unstable intentions.[23,52] The formulation of plans is thought to facilitate the stabilisation of intentions[53] and is likely to help overcome the prototypes' influence. Finally, future research could investigate the potentially moderating role of stability of prototypes corresponding with other behaviours.

To conclude, the present study provides insights into the moderating role of stability of prototype perceptions in the relation of prototype perceptions to intentions and behaviour. In sum, stability regarding the abstainer and drunk prototypes' perceptions moderated the prototype-intentions relationship. Greater stability is associated with greater consistency of prototype-intentions relationships, but had no effect on direct relationships with behaviour. Although research needs to investigate what factors influence the stability of prototype perceptions, the results suggest targeting stable perceptions of prototypes' similarity that explain intentions in order to change intentional (drinking) behaviour.

6

ACKNOWLEDGEMENTS

NOTES

[i] According to Statistics Netherlands, 'Western origin' includes all countries in Europe (except for Turkey), North America, Oceania, Japan, and Indonesia (including the former Dutch East Indies). Non-Western origin includes Turkey and all countries in Africa, Latin-America, and Asia.[32]

[ii] The original TPB was adapted by combining a subjective and descriptive norm (also referred to social modelling by some scholars)[e.g. 54] to better capture social norms.[55] However, the constructs are found to be distinct.[54,56,57] At present, only descriptive norms were assessed for three reasons. First, young people are especially susceptible to descriptive norms[57] as they tend to select peer groups based on the group members' drinking behaviour and are likely to conform to peers' behaviour.[56,58] Second, Dutch studies[54,56] and a meta-analysis[57] found that descriptive norms have a larger effect in explaining intention than subjective norms, especially in the case of health-risk behaviour. Interventions targeting descriptive norms by normative feedback have effectively changed alcohol consumption among young adults.[e.g. 59]

[iii] Additional analyses were performed based on the split median of stability of each prototype. Similar results were found: only the stability of similarity to the abstainer and drunk prototypes moderated the prototype-intention relationship.

[iv] The only minor difference found in additional analyses including all variables that significantly explained intentions was that the main effect of abstainer favourability was no longer significant at step 3. As a result, prototype similarity seems to be a stronger predictor than favourability when the constructs are assessed simultaneously. For all other significant variables similar standardised betas were found as for the presented models (Table 2 and 3).

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7

Drinker prototype alteration and cue reminders as strategies in a tailored web-based intervention reducing adults' alcohol consumption: An RCT

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ABSTRACT

Objective: A web-based randomised controlled trial tested two strategies (i.e. prototype alteration and cue reminders) within an existing online personalised feedback intervention ('Drinktest') aiming at reducing adults' excessive drinking. It was expected that both strategies would add to the Drinktest and would result in reductions in alcohol consumption by intrinsic motivation and the seizure of opportunities to act.

Method: Participants were recruited online and through printed materials. Excessive drinking adults (N = 2634) were randomly assigned to four conditions: original Drinktest, Drinktest plus prototype alteration, Drinktest plus cue reminder, and Drinktest plus prototype alteration and cue reminder. Evaluation took place after one and six months follow-up. Differences in drinking behaviour, intentions, and behavioural willingness (i.e. primary outcomes) were assessed by means of longitudinal multilevel analyses using a 'last observation carried forward' method. Measures were based on self-reports.

Results: All conditions showed reductions in drinking behaviour and willingness to drink, and increased intentions to reduce drinking. Prototype alteration (B = -.15, p < .05) and cue reminder usage (B = -.15, p < .05) were both more effective in reducing alcohol consumption than when these strategies were not provided. Combining the strategies did enhance the effect of either prototype alteration or cue reminder usage. In addition, no differences across conditions were found regarding intentions or willingness.

Conclusion: Although individuals were reasonably aware of their cue, they reported reduced alcohol consumption. As expected, individuals appeared to distance their self-image from heavier drinking prototypes. Thus, prototype alteration and cue reminder usage may be feasible and simple intervention strategies to promote reductions in alcohol consumption among adults, with an effect up to 6 months.

Trial registration ID: NTR 4169 (www.trialregister.nl).

Ethical approval by an independent ethics committee (ref. no. MEC-2010-112)

INTRODUCTION

Excessive alcohol use is a prevalent and worldwide problem.[1] In the Netherlands, 12.9% of the general population engages in weekly binge drinking, defined by 4 and 6 or more glasses of alcohol (10 grams each) per occasion for women and men, respectively. Also, 8.3% drinks excessively, defined as drinking 14 or 21 glasses per week for women and men, respectively.[2] The percentage of drinkers and alcohol consumed is generally higher among men than women.[2] Excessive drinking causes a significant burden of disease.[3] It is associated with both morbidity and excess mortality.[4] Also, it is an underlying cause, in part or entirely, of more than 30 health conditions and a contributing factor to many more problems such as social harm, costs, etc.[5]

It is important to further our understanding of how to reduce excessive drinking. A majority of interventions have targeted drinking behaviour assuming that behaviour is intentional. However, medium-to-large changes in intentions only lead to small-to-medium changes in behaviour.[6] And, effect sizes are found to vary for different behaviour types and specific populations (e.g. age specific) with lower effect sizes for risk behaviour than for health behaviour.[7] A meta-analysis showed that, among the interventions that were based on the goal-striving Theory of Planned Behaviour (TPB) components,[8] only half were found to guide changes in intentions and two-third guided changes behaviour, and only small effect sizes were produced.[9] In addition, a meta-analysis based on 7 studies found a medium effect size (g = 0.39) regarding the effect of online self-help interventions in reducing adults' drinking behaviour in the general population with an effect up to 6 or 9 months.[10] These type of interventions have several advantages, such as reach and cost-effectiveness.[e.g. 11,12-14] However, single-session interventions, such as Drinktest.nl (described below), have been found to produce small effect sizes only.[10] Drinktest has been shown to be more effective at reducing alcohol consumption among adult males in the experimental group than in the control group up to one-month follow-up, but not up to six-months follow-up.[15] In sum, the results of previous research and interventions often focused on (changing) intentional behaviour suggest that a significant proportion of intentions and behaviour remains unexplained and that the effectiveness of interventions can be improved.

Two main reasons may account for the small-to-medium (or lack of long-term) effects. First, individuals may not be fully aware of the opportunities of how to act upon their intentions. For example, in the case of drinking behavior, the individual may intent to limit his alcohol consumption. Then, the person needs to be aware of, for example, opportunities and means to accomplish this limitation, such as responses to others of how to resist drinks when offered. As a result, many studies and interventions have focused on helping people act on their intentions,[e.g. 16] acknowledging the well-known intentions-behaviour gap. Their applied strategies are thus based on rational decision-making. However, the second reason is that behaviours may occur without intentions or even when having intentions *not* to do so.[17,18] Risk behaviours may also be guided by factors such as impulsivity, sensation seeking, heat of the moment,[19] more implicit and social-reactive processes.[20] Importantly, because people do not always comply with their

intentions and since intensions are less likely to predict impulsive behaviours (such as excessive drinking could be) some have suggested that targeting this implicit social-reactive process or route may be more fruitful than the explicit goal-directed route to overcome these issues.[21-23]

Additional strategies

The present study addresses these issues by examining the effect of two intervention strategies that could potentially help enhancing the effect of an existing online (i.e. web-based) tailored intervention, Drinktest.nl: prototype alteration and cue reminders. Drinktest.nl is based on the TPB,[8] I-Change[24] and Stages of Change Model[25] which provides normative and personalised feedback regarding self-help guidelines to reduce alcohol consumption. As previous research described[15]: 'Drinktest was developed by the Netherlands Institute for Health Promotion and Disease Prevention (NIGZ). Drinktest offers brief personalised feedback regarding an individual's personal alcohol consumption patterns. The intervention consists of various components: overview of mean weekly alcohol intake, associated health risks, self-help guidelines to reduce alcohol intake, normative feedback to compare one's own alcohol consumption to the level of one's own cohort.'

The first strategy that could potentially enhance the effect of Drinktest is prototype alteration. *Prototypes* refer to the mental image of a typical person engaging in a certain behaviour,[17,18] such as a typical drinker or smoker (or who abstains from those behaviours). Prototypes are described in the Prototype Willingness Model (PWM), a dual-process model[17,20,23] assuming that behaviour is guided by (1) reasoned intentions and (2) unintentional implicit social reactions. These 'routes' may coexist in guiding behaviour. Unintentional implicit social reactions incorporate that behaviour is the result of 'behavioural willingness' (further referred to as 'willingness'), defined as an 'openness' to risk situations,[18,20] such as the willingness to drink more than was planned. Specifically, many risky behaviours are facilitated or prompted by external stimuli or (social) situations.[18] Thus, the PWM recognises factors such as impulsivity.

Prototypes have been shown to explain behaviour through their effect on willingness, and intentions, and have been shown to directly explain drinking behaviour as well.[26-31] The assumption is that the more similar to the self and the more favourable the prototype is perceived, the more the individual will be willing or intending to engage in certain behaviour.[17,20] Prototypes can incorporate core values (i.e. goal states) that individuals desire (or avoid).[e.g. 18,32] *Altering* the perception of *prototypes* can be used as strategy to cultivate behaviour change by, for instance, contemplation of or accentuating the (negative/positive) characteristics attributed to the prototypes[33,34] and by encouraging social comparison and distancing from health-risk prototypes.[35,36] Experiments and intervention studies revealed that prototype alteration was effective in (1) postponing the onset of drinking among children aged 10–12 years old with an effect up to two years,[37] (2) quitting successes for an adult smoking cessation group,[36,38] and (3) changing (health-risk and health-protective) behaviour among adolescents and undergraduates.[28,33,34,37,39] Although prototype alteration has been applied to alcohol use, only few interventions aimed at reducing excessive drinking that are

based on dual-process models (PWM) have been applied to young adults (usually incorporating only university students), and results have been mixed.[40-42] To our knowledge there are no such interventions for the general adult population.

A second strategy is the use of *cue reminders*. The limited number of studies focusing on cue reminders has shown that cue reminders can help in changing (and maintaining) behaviour,[43-45] because cue reminders can help people remember the content of interventions or their personal goals. Cue reminders can support enactment of intentions as they can unconsciously prompt self-enhancing or self-protecting opportunities. That is, experimental research suggests that cue reminders could function through their salience and through an inhibiting mechanism. This would result in the inhibition of other cues (i.e. to engage in health-risk behaviour) that are present in a situation and as a result impulsive behaviours can be hampered.[43,44] Cue reminders are found to be effective even when people lack the cognitive capacity to reason, such as when being under time pressure or when already having consumed alcohol. This suggests an effect through the implicit route.[43,44] Finally, a cue reminder strategy has the advantage that it be a simply means, such as a bracelet, that can remind people of an intervention or their intentions.

The present study

This study examined whether prototype alteration and provision of a cue reminder can be useful strategies to enhance the effectiveness of an existing online (i.e. web-based) tailored intervention, i.e. Drinktest.nl. Drinking behaviour, intentions to reduce drinking, and willingness to drink were targeted as primary outcomes. Expected was that (1) prototype alteration may intrinsically motivate people to drink less, (2) cue reminders may strengthen the salience of alcohol reduction goals, and (3) the combination of prototype alteration and a cue reminder may increase the salience and intrinsic motivation of alcohol reduction goals. As such, it was hypothesized that the strategies of prototype alteration and/or a cue reminder in addition to the original Drinktest would be more effective in addressing the primary outcomes than the original Drinktest without those extensions. Other outcomes are also addressed, as will be described below.

METHODS

Design and participants

A randomised controlled trial was conducted in the Netherlands in which participants were randomly assigned (computerised) to one of four conditions: (1) original Drinktest, (2 Drinktest extended by prototype alteration, (3) Drinktest extended by cue reminder, (4) Drinktest extended by prototype alteration and cue reminder (further called 'combined condition'). The online tailored intervention consisted of baseline measures and tailored feedback. A one- and six-months follow-up measurement was conducted (post-intervention: T2, T3). Eligible participants were individuals aged 18 or over engaging in excessive drinking: exceeding 14

and 21 or more glasses of alcohol per week or drinking 4 and 6 glasses or more per occasion for women and for men, respectively.[46] This norm was set by the original Drinktest and thus was left unchanged.

Recruitment and procedure

Participants were recruited online and by printed materials (posters and newspaper advertisements) from September 2012 till June 2013. The website of www.drinktest.nl was also easily accessible by online search engines. At start (T1), participants read the study information and were told that the existing Drinktest was being evaluated. Importantly, it was explicitly stated that participants did not have to commit themselves to reducing their alcohol consumption. Participants were then asked to sign the online informed consent form. In case participants declined to participate, they could close the browser or receive the old Drinktest without taking part in the study. After the informed consent form had been signed, participants were randomized to the conditions. Non-excessive drinkers (of which the status was only known after drinking behavior was measured) were then routed to the original Drinktest and thus were not part of the study sample.

All questions were self-administered and data was collected online. Participants were invited by email to participate in the two follow-up measurements and received reminders if necessary (max. 3). Participants were invited for T3 irrespective of their participation in T2. A total of 50 vouchers worth €50 were distributed (by means of a raffle) as incentive.

Intervention

Figure 1 represents the flow of the intervention. All tailored feedback was based on participant's responses and gender and was delivered online. All participants, irrespective of condition, received questions and feedback according to the original Drinktest. Feedback was derived from a computer program linking each possible combination of responses with an appropriate message. Feedback was not provided during the second and third measurement.

Original Drinktest condition

Participants in the original Drinktest condition only received the standard version, in which they received feedback tailored to demographic background (gender), alcohol consumption, and intentions to reduce drinking. These messages reflected on personal drinking levels in comparison to the Dutch norm and peers' drinking behaviour, the correctness of their absolute and relative perceived susceptibility for health risks due to their alcohol consumption, intentions, temptations (e.g. coping with fights), correctness of positive effects of alcohol (e.g. whether alcohol helps to sleep better), and correctness of negative effects of alcohol (e.g. consequences for the liver and heart). Self-efficacy was reflected on by encouraging participants to make a plan (without guidance) or to balance the advantages and disadvantages of reducing alcohol consumption. This part took about 10 minutes.[15] Multimedia appendix A provides examples.
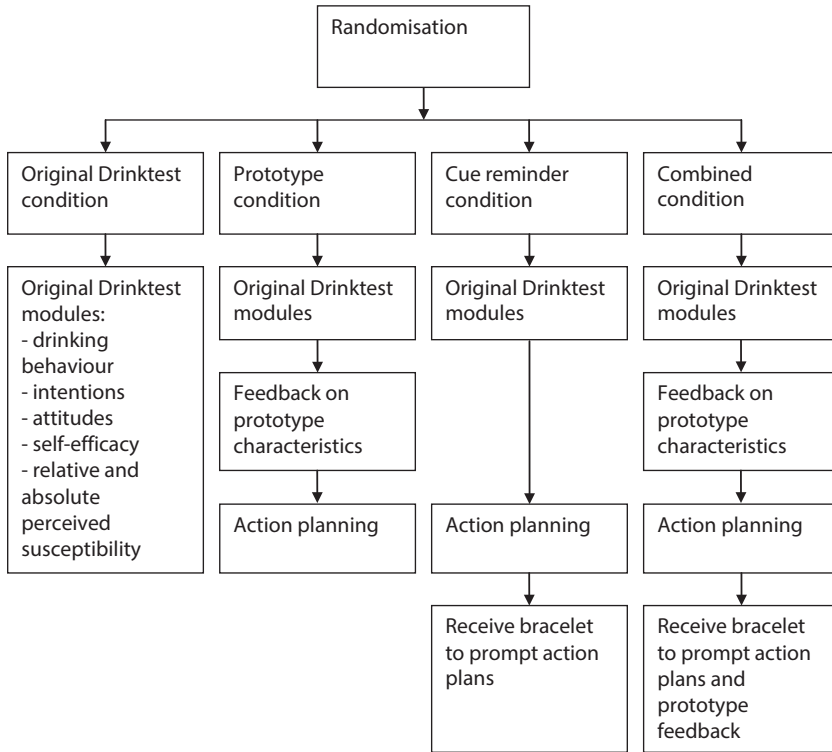
Figure 1. Flow chart illustrating the flow of the intervention

Prototype condition

After the completion of the original Drinktest, participants in the prototype condition received feedback regarding prototype alteration (see measures and Figure 1, and see multimedia appendix A for examples) tailored to gender, drinking behaviour (also including normative feedback), intentions, and prototypical self-characterisation. This extension took about 5 minutes. The prototype message reflected on characteristics that the participants evaluated as personally (un)desirable by evaluating oneself on 11 characteristics (see measures). Negative characteristics were accentuated as being negatively valued by peers and were linked to excessive drinking (i.e. implicitly referring to heavier drinking prototypes) and positive characteristics were linked to moderate drinking and being positive valued by peers (i.e. moderate drinker prototype). Participants were encouraged to reduce their drinking in order to achieve their desired characteristics and so that they would be positively valued by peers. Thus, this feedback implicitly aims to distance participants from the heavier drinking prototypes, such as the drunk and heavy drinker, and to encourage similarity to and favourability of the moderate drinker prototype.[see 35,36,38]

Then, participants were guided in their goal setting by selecting action plans[adapted from 47,48] in order to achieve the desired characteristics. First, they selected how they felt about reducing their alcohol consumption after having received tailored feedback ranging from (1) 'I do not wish to reduce my alcohol consumption' to (4) 'I want to quit drinking'. If they were in doubt or were certain about reducing or quitting, participants were guided in their action plans by selecting a date to quit or start reducing. If they chose to reduce their consumption, they could set a limit of number of glasses per day and week and a number of days on which the participant will not drink alcohol. Participants could also refuse to make plans (i.e. 'I do not wish to make a plan') or could set their own goals. (Participants in the original Drinktest condition did not form action plans.)

It should be noted that participants selected action plans rather than forming their own because (1) forming plans of good quality is proven to be difficult for participants[49] and (2) plans formed by individuals are subject to additional variables compared to plans provided by the researcher.[50]

Cue reminder condition

After finishing the original Drinktest modules, cue condition participants followed the same procedure in forming action plans as in the prototype condition.[adapted from 47,48] Feedback was provided that reflected on their action plans explaining that a cue reminder may help remember those (if set) and were offered to receive a free silicone bracelet,[see 43] sent to them by mail. If participants did not want to receive the bracelet, they were encouraged to select a piece of their own jewellery or another object of frequent use. After the cue selection participants were instructed to think of their plans when they were aware of their cue so that the cue was linked to the action plans. If no plans were formed, participants were requested to use a cue for the duration of one month for the sake of the study, and were told to think of the content of Drinktest when they were aware of the cue. All participants were asked to wear their cue at least one month (i.e. until T2). See Appendix A for examples. This extension took less than 5 minutes.

Combined condition

Participants in the combined condition completed the original Drinktest modules, the prototype alteration module, and the cue module (see Figure 1). These participants were offered a cue reminder and were instructed to remember their goals (if set) and the desired characteristics they can achieve by reducing their alcohol consumption when they are aware of the cue reminder. See Appendix A for examples.

Measures

All measurements included the same questions and followed the same guidelines for drinking norms unless otherwise specified. Measures from the original Drinktest were left

unchanged and were extended by items regarding demography, willingness, prototypes, cue reminder, and process evaluation.

Process evaluation

Participants reported on their appreciation of the intervention at T2 answering to the statement 'the information and advice of Drinktest.nl were…' ranging from (1) 'I disagree' to (7) 'I agree' regarding reliability, novelty, being informative, ease of understanding, personal relevance, persuasiveness, enjoyability, and usefulness ($\alpha = .86$).

At T2 and T3, all participants were asked, regarding the past four weeks, (1) how aware they had been of their alcohol use, (2) how often they had contemplated on the intervention's feedback, and (3) their perception of having tried to reduce their alcohol consumption. Finally, we checked whether participants had correctly remembered their choice of cue, how aware they were of their cue and how often they had worn or used the cue reminder. Answers to the Likert scales ranged from (1) 'not at all' to (7) 'a lot'.

Primary outcome measures

Drinking behaviour

Drinking behaviour was assessed by the Dutch version of the Quantity-Frequency Variability index of alcohol intake (QFV),[51] asking participants to report the number of glasses they had consumed for each day of the past week. The mean number of drinks per day was calculated and used for analyses. A standard unit of alcohol contains 10 grams of ethanol, generally irrespective of the type of drink.

Intentions

To assess intentions, the item was framed by Drinktest in behavioural stages where participants chose from the following options: (1) 'I do not plan to reduce my alcohol consumption,' 'I plan to reduce my alcohol consumption within half a year,' 'I plan to reduce my alcohol consumption within a month,' 'I already started reducing my alcohol consumption,' and (5) 'I have reduced my alcohol consumption more than half a year ago'. This single item was treated as a continuous variable.

Behavioural willingness

Willingness was assessed by describing a scenario with two possible actions[adapted from 22,42]: 'Imagine that it is Saturday night. You're going out with friends and you already had several alcoholic drinks. You feel you've had enough. One of your friends offers you a drink.' This scenario was followed by the question 'How willing would you be to…' with the statements 'I take it and drink it' and 'I refuse,' rated from (1) 'certainly not' to (7) 'very certain' (T1–T3 $r =$ .76–.85). Answers to the second statement were reversed.

Secondary outcome measures

Absolute and relative perceived susceptibility
The item 'With regard to my health, I consume too much alcohol' followed by (1) 'I disagree' to (3) 'I agree' assessed absolute perceived susceptibility. The item 'Compared to [women/men] of my age, I drink' followed by (1) 'a little' to (3) 'a lot' assessed relative perceived susceptibility.

Attitude
Attitude was examined by the original Drinktest using 12 items measuring advantages and disadvantages of drinking alcohol regarding health, sociability, and coping. For instance, 'My alcohol use is healthy for my heart and veins' followed by (1) 'yes, healthy' to (3) 'no, unhealthy' and 'My alcohol use is a bad example to others' and 'My alcohol use is bad for my liver,' both followed by (1) 'yes, bad' to (3) 'no, good'. If needed, items were reversed so that a higher score represented a more positive attitude towards drinking. Because reliability over the 12 items was low, principle component analysis was performed revealing two factors. Only the first factor (5 items regarding relaxation, sleep, group conformation, sociability, coping) was used in analyses (T1–T3 α = .73–.78), because the second factor still had a low reliability (T1–T3 α = .35–.43).

Self-efficacy
A single item assessed self-efficacy: 'I find reducing my alcohol use' (1) 'very hard' to (5) 'very easy'.

Temptations
Twelve items examined temptations, which regarded emotions, coping, habit, and social situations, e.g. 'How tempting do you find it to drink alcohol when you are at a party or in a restaurant?' with answers ranging from (1) 'not tempting at all' to (5) 'very tempting' (T1–T3 α = .86–.87).

Self-characterisation
Participants were asked to characterise themselves by prototypical characteristics. That is, prototypes are usually assessed by a list of characteristics describing them.[e.g. 18,52] In this case, participants were instructed to rate themselves (i.e. self-image) on 11 semantic pairs of prototype adjectives so that they reflected which adjectives they generally desired to be described with (7-point scale). The adjectives (i.e. characteristics) were derived from a previous study on drinker prototypes[53]: unsociable-sociable, insecure-self-confident, loud-quiet, volatile-non-volatile, reserved-spontaneous, annoying-funny, boring-amiable, sad-cheery, uncontrolled-controlled, irresponsible-responsible, unordered-determined. A higher mean indicated a more positive desired self-image (T1–T3 α = .79–.86). These items were assessed only at baseline among the prototype and combined conditions because it was part of their manipulation and feedback and was assessed among all participants at T2 and T3.

Statistical analyses

All analyses were performed in SPSS 21.0. First, we determined whether drop-out between baseline and follow-up measurements was different for condition, gender, age, ethnicity, level of education, intentions, willingness, and drinking behaviour. Second, potential differences between conditions at baseline were assessed regarding these measures. Third, the process evaluations were assessed. Fourth, longitudinal multilevel analyses ('mixed models,' Table 3) were performed using the 'last observation carried forward' (LOCF) method (1) to account for drop-out and (2) because of the nested design (measurements, i.e. time, were nested in individuals). LOFC implies that, in case data of a follow-up measurement is missing, the data of the previous known data is used for analyses. For example, if data is available of the first and third measurement and the second is missing, the data of the first measurement is also used as second measurement instead of treating this measurement as missing.

The following independent variables were included in the analyses: having received prototype alteration feedback or not, having received a bracelet or not, and the interaction of prototype alteration and cue reminder to assess the added value of their combination, and including 'time' (measurements). The analyses were also corrected for potential significant differences between conditions at baseline (see Table 1). It should be noted that reported descriptives are based on LOCF (Table 2). Finally, for sensitivity purposes the analyses were repeated for complete cases only. Importantly, we used the median absolute deviation (MAD) to detect outliers. MAD was applied because it is more robust to outliers than the standard deviation.[54] After applying MAD, the variables were normally distributed.

Table 1. Participant characteristics and primary outcome measures at baseline

	Original Drinktest condition (N = 860)	Prototype condition (N = 660)	Cue reminder condition (N = 597)	Combined condition (N = 517)	Overall (N = 2634)	Test result
Mean age (SD)	35.24(15.30)	37.43(15.03)	37.43(15.03)	39.03(15.18)	37.03(15.19)	$F(3, 2633) = 7.33***$
Gender						
Males	54%	50%	50%	50%	51%	$\chi^2(3) = 4.65$
Females	46%	50%	50%	50%	49%	
Higher educational level						$\chi^2(3) = 15.39**$
Low	40%	34%	33%	31%	35%	
Middle to high	60%	69%	67%	69%	65%	
Origin (%)						$\chi^2(3) = 0.40$
Non-Western	6%	5%	5%	5%	5%	
Western	94%	95%	95%	95%	95%	
Drinking behaviour, M(SD)	3.51(1.82)	3.65(1.79)	3.64(1.83)	3.64(1.83)	3.60(1.82)	$F(3, 2633) = 1.08$
Intentions, M(SD)	2.58(1.40)	2.71(1.34)	2.69(1.36)	2.71(1.33)	2.66(1.36)	$F(3, 2633) = 1.58$
Willingness, M(SD)	4.60(1.98)	4.65(1.95)	4.57(2.04)	4.41(2.08)	4.57(2.01)	$F(3, 2633) = 1.57$

Note: Analyses are significant at the following levels: *$p \leq 0.05$, **$p \leq 0.01$, ***$p \leq .001$.

RESULTS

Participants' characteristics

Figure 2 presents the flow chart of participants showing that a total of 6378 persons started the program. Nine same email addresses seemed to be used by different persons and were therefore removed (N = 19). Then, duplicates (N = 99), non-excessive drinkers (N = 2506), incomplete (N = 892), and outliers (N = 228) at baseline were removed. The resulting final sample consisted of 2634 eligible participants (51% males, M_{age} = 37.03, SD = 15.19). Last observation carried forward was applied. The majority (95%) of the sample was of Western origin, as defined by Statistics Netherlands,[55] most originating from the Netherlands, followed by Belgium and Germany. 'Western origin' includes all countries in Europe (except for Turkey), North America, Oceania, Japan and Indonesia (including former Netherlands East Indies). 'Non-Western' includes Turkey and all countries of Africa, Latin America and Asia, except Japan and Indonesia.[55] Also, the majority were either pursuing or had completed a middle or higher educational level (65%).

Intervention analyses were corrected for age and educational level because these were significantly different between conditions at baseline. Table 1 presents the baseline characteristics of participants overall and per condition.
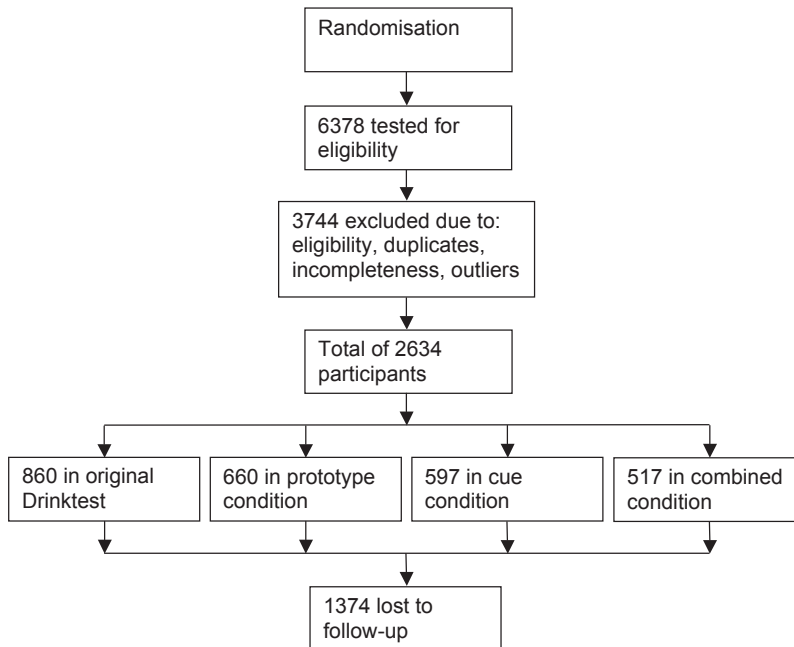
Figure 2. Flow chart illustrating the flow of participants

Drop out

A total of 1260 participants completed one or both of the follow-up measurements (attrition 48%). A total of 599 participants participated in all three measurements (attrition 77%). Drop-out analyses were performed regarding those who did not participate in either of the two follow-up measurements. Drop-out was highest among the original Drinktest condition (57.4%) and was significantly higher than the prototype condition (OR = 1.48(95%CI 1.20–1.81), p < .001), cue condition (OR = 1.26(95%CI 1.02–1.55), p < .05), and combined condition (OR = 1.38(95%CI 1.10–1.71), p < .01); the three extended conditions did not differ from each other. Drop-out was also higher among men (OR = 1.34(95%CI 1.15–1.57), p < .05), lower educated participants (OR = 2.21(95%CI 1.87–2.60), p < .001), and non-Western participants (OR = 1.46(95%CI 1.03–2.07), p < .05). Additionally, those who dropped-out were also slightly younger (F(1, 2633) = 48.83, p < .001) and reported a slightly higher alcohol consumption (F(1, 2633) = 17.66, p < .05). We used LOCF in the longitudinal multilevel analyses to account for drop-out and corrected the analyses for age and ethnicity.

Process evaluation

Second, the appreciation of the intervention was assessed. The original (M = 4.85, SD = .96) and extended Drinktest (combining the three extended conditions; M = 4.88, SD = 1.12) did not differ in their intervention evaluations (F(1, 802) = 0.06, p = .81). Both Drinktest versions were rated as equally interesting, new, informative, understandable, personally relevant, persuasive, enjoyable, and useful. The results were similar across all four conditions.

Furthermore, amongst the participants in the cue and combination conditions, 34.2% received a bracelet and 45.1% chose to use their own cue, whereas only 22.7% did not wish to be reminded. At follow-up, the vast majority was found to remember their chosen cue reminder correctly (94.1%) and reported to use or wear their cue reminder frequently (61.4%). The awareness of the cue was reasonable (M = 3.27, SD = 2.11).

Finally, participants in the conditions did not differ in their awareness of their alcohol consumption. However, unlike expected, the use of a cue reminder in addition to the original Drinktest significantly resulted in lower contemplation of the intervention (B = -.45, p < .001) and a lower perception of having reduced alcohol consumption (B = -.33, p < .001, Table 3).

Primary outcomes

Table 2 shows that the reported mean number of drinks per day was 3.6 glasses at baseline (SD = 1.82), 3.2 glasses at T2 (SD = 1.82) and 3.06 at T3 (SD = 1.81). Table 3 shows that alcohol consumption was reduced overall and that those participants receiving the prototypes alteration (B = -.15, p < .05) and a cue reminder (B = -.15, p < .05) strategies had larger reductions than those who did not receive these strategies in addition to the original Drinktest. On average, intentions to reduce alcohol consumption was increased and behavioural willingness to drink more was decreased over time (Table 2), but no differences were found across conditions (Table 3). The interaction of prototype alteration x cue reminder was not significant regarding any of the primary outcomes.

Table 2. Means and standard deviation of baseline and follow-up measurements, overall and per condition

	Original Drinktest condition (N = 860)	Prototype condition (N = 660)	Cue reminder condition (N = 597)	Combined condition (N = 517)	Overall (N = 2634)
	M(SD)	M(SD)	M(SD)	M(SD)	M(SD)
Primary outcomes					
Drinking behaviour					
Baseline	3.51(1.82)	3.65(1.79)	3.64(1.83)	3.64(1.83)	3.60(1.82)
T2 post-test	3.20(1.79)	3.17(1.83)	3.23(1.82)	3.18(1.88)	3.20(1.82)
T3 post-test	3.10(1.81)	3.03(1.78)	3.05(1.80)	3.03(1.88)	3.06(1.81)
Intentions					
Baseline	2.58(1.40)	2.71(1.34)	2.69(1.36)	2.71(1.33)	2.66(1.36)
T2 post-test	2.67(1.42)	2.86(1.35)	2.82(1.36)	2.86(1.35)	2.79(1.38)
T3 post-test	2.74(1.45)	2.87(1.40)	2.89(1.43)	2.88(1.43)	2.84(1.43)
Behavioural willingness					
Baseline	4.60(1.98)	4.65(1.95)	4.57(2.04)	4.41(2.08)	4.57(2.01)
T2 post-test	4.45(2.02)	4.36(2.03)	4.34(2.07)	4.11(2.15)	4.34(2.06
T3 post-test	4.39(2.04)	4.27(2.03)	4.19(2.12)	4.02(2.10)	4.24(2.07)
Secondary outcomes					
Attitude					
Baseline	1.48(1.48)	1.47(.34)	1.47(.33)	1.46(.31)	1.47(.33)
T2 post-test	1.47(.34)	1.45(.32)	1.46(.34)	1.45(.31)	1.46(.33)
T3 post-test	1.46(.34)	1.46(.34)	1.47(.36)	1.47(.32)	1.47(.34)
Self-efficacy					
Baseline	2.38(.96)	2.27(.92)	2.23(.90)	2.35.94)	2.31(.93)
T2 post-test	2.48(.94)	2.45(1.00)	2.38(.93)	2.50(.96)	2.45(.96)
T3 post-test	2.58(1.00)	2.55(1.02)	2.44(.99)	2.53(.97)	2.53(1.00)
Temptations					
Baseline	2.27(.43)	2.30(.42)	2.31(.42)	2.25(.42)	2.29(.42)
T2 post-test	2.22(.43)	2.23(.42)	2.27(.41)	2.20(.43)	2.23(.42)
T3 post-test	2.48(.66)	2.45(.67)	2.45(.66)	2.42(.65)	2.45(.66)
Absolute perceived susceptibility					
Baseline	2.38(.75)	2.45(.73)	2.50(.71)	2.48(.72)	2.45(.73)
T2 post-test	2.37(.76)	2.44(.76)	3.26(1.51)	3.27(1.57)	2.77(1.23)
T3 post-test	2.34(.77)	2.40(.78)	2.77(1.25)	2.71(1.30)	2.53(1.03)
Relative perceived susceptibility					
Baseline	4.80(1.25)	5.05(1.15)	5.05(1.20)	5.00(1.16)	4.96(1.20)
T2 post-test	3.55(1.53)	3.50(1.61)	3.76(1.69)	3.54(1.62)	3.59(1.61)
T3 post-test	3.21(1.49)	3.10(1.53)	3.30(1.64)	3.16(1.57)	3.19(1.55)
Self-characterisation					
Baseline	N/A	5.42(.92)	N/A	5.46(.87)	5.44(.90)
T2 post-test	5.81(.60)	5.57(.86)	5.82(.63)	5.66(.83)	5.67(.80)
T3 post-test	5.88(.61)	5.63(.84)	5.88(.61)	5.73(.82)	5.75(.77)

Note: T2 post-test includes a one-month and T3 a six-month follow-up. Reported means and deviations are based on 'last-observation carried forward'.

Table 3. Longitudinal multilevel analyses (mixed models). Regression coefficient (B) and 95% confidence intervals (CI: LL, HL) for the strategy group versus no strategy (in addition to the original Drinktest)

	Prototype versus no prototype		Cue reminder versus no cue		Combination cue and prototype versus no strategy		Overall effect	
	B	CI	B	CI	B	CI	B	CI
Process evaluation								
Awareness of drinking	-.17	-.41,.07	-.14	-.38, .11	-.03	-.22, .16	-.10	-.20, .01
Contemplation of intervention	-.25	-.53, .04	-.45**	-.75, -.16	.04	-.19, .27	-.22***	-.34, -.10
Tried to reduce drinking	-.29	-.59, .01	-.33*	-.64, -.02	-.08	-.34, .17	-.21***	-.34, -.09
Primary outcomes								
Drinking behaviour	-.15*	-.28, -.01	-.15*	-.29, -.01	.08	-.11, .27	-.07**	-.11, -.02
Intentions	-.01	-.10, .09	.09	-.01, .20	-.08	-.22, .06	.01	-.02, .05
Willingness	-.05	-.18, .08	-.10	-.24, .05	.01	-.19, .21	-.05	-.09, .00
Secondary outcomes								
Attitude	.00	-.03, .03	.01	-.02, .04	.00	-.03, .04	.00	-.00, .01
Self- efficacy	.01	-.06, .09	-.02	-.10, .06	.01	-.10, .11	-.00	-.03, .03
Temptations	-.00	-.06, 05	-.01	-.07, .04	-.00	-.07, .07	-.01	-.03, .01
Absolute perceived susceptibility	-.01	-.10, .09	.27***	.17, .37	-.05	-.17, .08	.09***	.06, .13
Relative perceived susceptibility	-.11*	-.22, -.01	-.13*	-.24, -.02	.04	-.09, .18	-.07**	-.10, -.02
Self-characterisation	.21***	.12, .31	-.00	-.08, .08	.01	-.08, .10	.02	-.01, .05

Note: Regression analyses are corrected for differences at baseline (i.e. age and educational level) and include all three measurements (T1-2). Analyses are significant at the following levels: *p ≤ 0.05, **p ≤ 0.01, ***p ≤ .001.

Secondary outcomes

Next, the effects on secondary outcomes were tested. The conditions did not differ in changing attitude, temptation, or self-efficacy. Significant higher ratings on the prototypical self-characterisation were found for participants who received the prototype alteration (B = .21, p < .001) than for those who did not receive this feedback in addition to the original Drinktest. Additionally, absolute perceived susceptibility was higher for those who used a cue reminder in addition to the original Drinktest (B = .27, p < .001) than for those who did not. However, both the cue reminder (B = -.13, p < .05) and prototype feedback (B = -.11, p < .05) resulted in a lower relative perceived susceptibility than when these extensions would not have been provided. When testing the prototype alteration x cue reminder interaction, no significant effects were found regarding any of the secondary outcomes.

Analyses with complete cases only

Finally, the analyses were repeated including full cases only (thus without LOCF). Similar patterns of results were found as when the LOCF method was applied, albeit that the effect of the cue reminder on relative susceptibility and perceived attempts to reduce alcohol became marginally significant (p < .10). The effect of prototype alteration (in addition to Drinktest) on drinking behaviour became non-significant and the effect on having tried to reduce alcohol became significant (instead of marginally).

DISCUSSION

An online randomised controlled trial showed that prototype alteration and a cue reminder usage can be useful strategies to complement an existing tailored intervention ('Drinktest') in reducing alcohol consumption. Specifically, although all conditions showed reductions in alcohol consumptions and willingness and increased intentions to reduce drinking over a period of 6 months, reductions in alcohol consumption were higher among people who had received the prototype alteration or a cue reminder in addition to the original Drinktest compared to those who did not. The combination of the cue reminder and prototype alteration did not enhance the effect of either of the independent strategies. Importantly, participants in all conditions equally appreciated the intervention, but drop-out was lower for participants who received the prototype alteration and/or cue reminder in addition to Drinktest than for participants who received the original Drinktest only.

Regarding the effect of the prototype alteration strategy, the found reduced drinking levels were expected, whereas the found reduced susceptibility perception was not. It may be that, as expected, distancing from heavier drinking prototypes (e.g. drunk and heavy drinker prototypes)[52,53] was at play, so that corresponding negative characteristics to excessive drinking were avoided[see also 33] which may have led individuals to feel that their susceptibility is lower than for others. This explanation seems to be supported by the finding that participants' positive self-characterisation increased over time (based on prototypical characteristics). It may also be that individuals changed their unhealthy behaviour to feel good and positive about themselves[e.g. 56] and hence may be motivated to engage in self-consistent behaviour.

The results showed that cue reminders may be an effective strategy in addition to an existing intervention such as Drinktest, but moreover, the type of cue that we provided is feasible (i.e. silicone bracelet). Our study adds to the knowledge of testing the effect of cue reminders on drinking behaviour[43-45] by applying it in a real-life setting (i.e. participants used the cue in their own environment and aimed at self-regulation). The cue was directly linked to reducing drinking behaviour and may have inhibited the urge to drink. However, although participants generally wore or used their cue frequently, they were only reasonably aware of it, reported less perceived attempts to reduce their drinking, and contemplated less on the intervention. This may imply that, rather than functioning through their salience as previously proposed,

the cue reminder may have functioned through its presence in the context instead.[44] Finally, usage of the cue in addition to Drinktest was associated with changes in drinking behaviour and absolute perceived susceptibility rather than intentions. It could be that, as would be expected, the cue has reminded the participant to seize opportunities to act rather than that it changed intentions or willingness.

It is unclear why the combination of prototype alteration and cue reminders did not enhance the effect of either of the two strategies. It suggests no additional benefit of their combination over the independent strategies. Perhaps the link between the characteristics to be achieved and the cue reminder should have been stronger. It could be that the characteristics were already salient in the prototype alteration and hence no additional benefit of cue reminders arised.

Limitations

The following study limitations must be addressed before discussing the implications. First, drop-out was large and the sample mainly consisted of Western participants. However, it is unlikely that selection based on ethnicity would have changed the results, because non-Western and Western samples have been found to show similar drinking behaviour in the Netherlands,[2] and analyses were corrected for ethnicity. In addition, the drop-out was accounted for by applying LOCF and by additionally analysing the full cases sample. Although the same pattern of results was found, two effects became marginally significant which may indicate a selection bias. Therefore, the results should be interpreted with caution and generalisability may be decreased due to the larger drop-out among specific groups. Second, the results were based on self-report. However, we do not think that under-reporting was presently the case, due to the removal of outliers based on the MAD method. Third, the found prototype alteration and cue effects in addition to Drinktest can be partly explained by the addition of action plans, although they both had unique contributions to the outcomes. The effects are meaningful and are generally consistent with our expectations. Finally, tailored feedback was provided at baseline only. Although the results cover a period of six months, future studies could determine whether feedback at several measurements will improve the present findings.

Implications and future research

The findings suggest the following implications and future directions. First, our findings support earlier suggestions that future interventions may benefit from providing relevant prototypes to be achieved and avoided[29] and to tailor prototypical characteristics according to the individuals' relevance.[53] Heavier drinking prototypes (e.g. heavy drinker, drunk)[52] could be relevant prototypes to be distanced from by accentuating the attributed negative characteristics,[33] and the moderate drinker prototype to be encouraged to assimilate with[29] by accentuating the achievability of its positive characteristics if alcohol consumption were reduced. Thus, in the case of experienced drinkers, modifying the valence of prototypes could

prove worthwhile and the effect of prototypes on drinking behaviour could be overcome by implementation intentions or action plans.[see also 41]

Second, the bracelet had the advantage of being self-regulated by participants and that it can be effective even when alcohol is already consumed.[43,44] However, only limited knowledge is available regarding the effectiveness of different types of cue reminders. Future research should determine which type of cue reminder is most effective and how to make individuals more aware of the cue. Future research also needs to be aware of the different mechanisms influencing the effect of cue reminders.

Third, it may be important for future interventions to complement the strategies with messages that make people aware of their drinking behaviour and that informs especially excessive drinkers about the consequences of their behaviour, as was done by the original Drinktest.[15] However, future research is necessary to further our understanding of how to optimise prototype alteration and cue reminders as strategies.

ACKNOWLEDGEMENTS

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APPENDIX A. EXAMPLES OF TAILORED FEEDBACK

Condition	Example
Original Drinktest	Perceived susceptibility: 'With regard to your health, you do drink too much, although you reported not to think so…'
	Intentions: 'You intend to reduce your alcohol consumption within half a year. That's a good idea, because your current behaviour can cause you permanent health damage. To avoid damage, you will have to reduce your drinking. But why not in the short-term?'
	Attitude – advantages: 'You said alcohol makes you feel more relaxed. … But note that only small amounts of alcohol can work relaxing. After that, alcohol will make you feel more tense and anxious. By reducing your alcohol consumption you will probably feel more relaxed, actually.'
	Attitude – disadvantages: '… Your alcohol use is not good, but actually unhealthy (bad) for your liver. If you'd reduce your alcohol use, your liver can recover. This can reduce potential health complaints and avoids permanent damage.'
	Temptations: 'It is tempting for you to drink alcohol when you are having a fight. You may know that alcohol can worsen fights. … It will be better to be sober to solve the fight. Take the time and find out what it really is about …'
Prototype alteration	Example of reflection on some negative and positive characteristics: 'Your answers show you'd like to be [social, irresponsible, uncontrolled, and spontaneous]. The characteristics of [social and spontaneous] correspond best with drinking moderately. Your peers generally value these characteristics the most and find those important. The norm of drinking moderately is …'
	Example of reflection on drinking behaviour: 'You have consumed a total of [n] glasses of alcohol. As you can see, this exceeds the norm of drinking moderately. … Your peers generally will regard excessive drinking as annoying, uncontrolled, volatile, and insecure. They generally value these characteristics as negative and undesirable.'
	Example of reflection on intention: 'You intend to reduce your alcohol use within a month. That's great, because, if you drink less, you will be more likely to appear more positively and be positively valued!'
Cue reminder	Example of reflection on goal setting and encouragement to use a cue reminder: '… You reported to doubt whether you'd like to reduce your alcohol use. … Yet, you have set the goal to quit drinking. A cue reminder can help you remember your goal and the information provides by Drinktest …'
	Example of instruction to remember one's goal: 'Every time that you are aware of the bracelet think of your goal to quit.'
Combination	'Every time that you are aware of your [bracelet] think of your goal to [quit drinking] and the positive characteristics you can achieve.'

8

General discussion

INTRODUCTION

This thesis presents a series of studies focusing on the role of prototypes in explaining drinking behaviour among (young) adults. Prototypes are perceptions of typical persons engaging in certain behaviour or not. For our purpose, we focussed on the Prototype Willingness Model (PWM),[1,2] which proposes that behaviour is guided by intentions (i.e. plans or goals to engage in certain behaviour) and willingness (i.e. openness to risk taking) and that prototypes exert their influence on behaviour through willingness. The first aim of this thesis was to increase the understanding of the role that prototypes play in explaining (drinking) behaviour. Secondly, previous studies have suggested that changing the perception of prototypes (from here on referred to as prototype alteration) might be a useful strategy to change (health-risk) behaviour.[e.g. 3,4] Another suggested strategy that can aid in behavioural change[e.g. 5,6] is cue reminder usage. Cue reminders can help individuals remember their personal plans or the content of interventions. In addition, it is possible that cue reminders can support prototype alteration by reminding individuals of the prototype feedback. Experimental research that focused on the effectiveness of prototype alteration and cue reminders is limited and inconsistent. As a result, the second aim was to determine whether prototype alteration and cue reminders can enhance the effectiveness of an existing intervention (Drinktest) in reducing alcohol use.

    The current chapter first summarises the main findings and implications of the studies addressing the first aim, and then follows with the main findings and implications of the studies addressing the second aim. Subsequently, limitations of the studies will be discussed, followed by recommendations for future research and practice.

AIM 1. UNDERSTANDING THE ROLE OF PROTOTYPES IN EXPLAINING (DRINKING) BEHAVIOUR: MAIN FINDINGS AND IMPLICATIONS

Prototype perceptions regard prototype favourability (i.e. the degree of positiveness or characterisation) and similarity (i.e. the perception of being similar to the prototype). Conclusions are not straightforward regarding their roles in explaining behaviour, willingness, and intentions. Although the PWM proposes that prototype favourability influences behaviour, some have suggested that similarity might be a stronger predictor than favourability.[7,8] Inconsistent results are found regarding the effect of their interaction.[8-10] It is important for research to focus on the effect of both health-risk (e.g. drinker) and health-protective (e.g. exerciser) prototypes.[e.g. 10,11,12] However, it is unclear whether their predictive strengths differ. To address these inconsistencies and unclarities, a meta-analysis and two studies among young adults (cross-sectional and prospective) were performed. These studies addressed three research questions: (1) How do prototype perceptions relate to health-related behaviour and motivation (i.e. intentions and willingness)? (2) Do young adults distinguish between several

drinker prototypes in terms of characterisation, their favourability, and perceived similarity to the self? and (3) Do alternative prototypes provide additional predictive value over the commonly assessed prototypes?

1. The relation between prototype perceptions and health-related behaviour and motivation

Regarding the first question, our meta-analysis (Chapter 2), that included 80 independent studies (69 articles), showed that prototype favourability and similarity were important factors in explaining behaviour, intentions, and willingness. Small-to-medium effect sizes ($r_+ = 0.12–0.43$) were produced. Importantly, similarity ($r_+ = 0.26–0.43$) generally produced stronger effect sizes than favourability ($r_+ = 0.12–0.28$). When comparing similarity to the interaction of favourability and similarity (i.e. multiplicative function; $r_+ = .22–.54$), the results were mixed. In addition, associations were generally stronger for health-risk than health-protective prototypes. Moreover, direct prototype measures (e.g. thermometer) generally produced larger effects than the often used indirect measures (e.g. adjective lists).

Furthermore, some studies suggest that similarity and favourability might tap on the same construct and that individuals will favour those prototypes that they feel similar to.[e.g. 1,13] However, the findings of the meta-analysis confirmed the findings of the studies described in Chapter 3-6 (described below) showing that prototype favourability and similarity were distinct constructs that differentially explained young adults' drinking behaviour. The findings also confirmed that the constructs did not necessarily align: individuals could favour prototypes that they did *not* feel similar to at all.

2. Distinguishing between several drinker prototypes

It is important to recognise those prototypes that young adults identify with and which prototypes are regarded as desirable and undesirable because these will have the potential to function as role models[14] and thus might be important for interventions focusing on prototypes. Although some studies have examined alternative prototypes, such as a 'binge drinker'[e.g. 15,16] or 'social drinker,'[17] most studies examined these prototypes in isolation. Therefore, young adults' prototype perceptions were assessed by asking participants to characterise (Chapter 3) and report on the favourability and similarity (Chapter 3-4) of five drinker prototypes: an abstainer, moderate drinker, heavy drinker, tipsy and drunk person. Strengths of these studies were that the five prototypes were studied and analysed simultaneously instead of in isolation and that young adults from the general population were studied rather than adolescents or students from one university.

Regarding the second question, our findings (Chapter 3-4) showed that young adults indeed distinguished between and identified with other prototypes than a 'drinker prototype' or 'abstainer' that are commonly studied among adolescents.[e.g. 13,18] This might be due to young adults being more experienced in drinking than children and adolescents.[19] Specifically, each prototype was characterised by its own unique adjectives. The moderate

drinker and abstainer prototypes were generally perceived as most favourable and were felt most similar to (Chapter 3-4), probably due to their most positive characterisations (Chapter 3). Similarly, the heavy drinker and drunk prototypes were perceived as the least favourable and felt the least similar to (Chapter 3-4), probably because of their negative characterisation (Chapter 4). In addition, participants differed in their focus on relevant aspects of the prototypes such as adjectives related to 'control,' 'hedonism,' 'elation,' or 'contrasting extremes' (i.e. very positive vs. very negative adjectives), based on their gender, educational level, and drinking behaviour (Chapter 3). Finally, drinker groups differed in which prototypes they favoured or felt similar to (Chapter 3-4). Of interest was the finding that heavy drinking young adults did not feel similar to heavy drinker prototypes and, instead, favoured the abstainer and moderate drinker prototypes.

3. Examining the additional value of alternative prototypes

Next, to answer question 3, we assessed whether the alternative prototypes (i.e. moderate drinker, tipsy, and drunk person) provide additional predictive value over the prototypes commonly assessed in the PWM (i.e. abstainer and heavy drinker) in explaining young adults' drinking behaviour (Chapter 5) and whether the stability of the prototypes can offer explanations as well (Chapter 6). The outcomes first provided additional information on the need for acknowledging a broader scale of prototypes and, secondly, might be relevant for further tailoring feedback focusing on prototypes. The main conclusion was that the alternative drinker prototypes might be of practical value, based on the following findings.

Firstly, alternative prototypes and the common prototypes were tested in the PWM, so that the additional predictive values could be determined (Chapter 5). The common abstainer and heavy drinker prototypes were found to explain intentions, willingness and behaviour, and the alternative drunk prototype explained intentions as well. The addition of the alternative prototypes to the common prototypes embedded in the PWM increased the explained variance of intentions with 6%, but not of behaviour. The model including the alternative prototypes had a marginally better fit than the model with the common prototypes. Contrary to assumption of the original PWM willingness did not explain behaviour and thus prototypes could not explain behaviour through willingness. Instead, behaviour was explained by prototype similarity and intentions only.

Secondly, the alternative drunk prototype was also relevant regarding prototype stability. Specifically, we augmented the Theory of Planned Behaviour (TPB) with the five prototypes. Intentions to drink sensibly were more strongly explained among individuals with stable perceptions of dissimilarity to the drunk prototype compared to individuals holding unstable perceptions ($B = -.64$ vs. $B = -.20$). In addition, intentions to drink sensibly were more strongly explained among individuals with stable perceptions of similarity to the abstainer prototype than among individuals with unstable perceptions ($B = .29$ vs. $B = .09$). Stability of prototype favourability did not moderate the relationship between prototypes and intentions and behaviour.

In summary, the drunk (Chapter 5-6) and moderate drinker (Chapter 3-4) prototypes were the most relevant 'alternative' prototypes that might be targets to dissociate from or associate with, respectively.

Implications regarding the role of prototypes in explaining (drinking) behaviour

The following three implications can be deducted from the above findings. Firstly, prototypes explained (drinking) behaviour and might be important targets when explaining and changing behaviour. Their contribution to commonly applied social-cognitive constructs has been shown in Chapter 4-6 and previous research.[8,10,20] Both health-risk and health-protective prototypes might be important targets for research and interventions. Health-risk prototypes are suggested to exert a stronger influence due to their saliency.[21] Risk behaviour might be decreased by targeting willingness by modifying health-risk prototype favourability and similarity. In order to increase health behaviours, intentions and behaviour could be targeted by increasing similarity to health-protective prototypes. The results might suggest the need to make health-protective prototypes more salient, as will be described below.

Secondly, prototype favourability and similarity should be considered as distinct constructs that do not necessarily align. Importantly, interventions should intervene on similarity perceptions in particular in order to change behaviour, because similarity produced stronger effects in explaining behaviour and motivations (Chapter 2-6) than favourability. Importantly, perceived similarity did not per se reflect actual similarity, since heavy drinking participants did not feel similar to a heavy drinker prototype. An explanation might be that individuals are aware of the social consequences of their behaviour.[22] It is thus likely that people engage in heavy drinking to avoid social rejection and for self-presentation strivings.[23] People are generally motivated to maintain a positive self image[24] and therefore might perceive their self-image to resemble the positive characterisation of the moderate drinking prototype instead of the negative characterisation of the heavy drinker or drunk prototype (Chapter 3). Another explanation might be that individuals overestimate actual drinking behaviour of peers.[25] As a result, heavy drinking as a group norm might be enforced[26] and might be misinterpreted as moderate drinking.

Third, it is important to study prototypes that are relevant for the target group and therefore studying alternative prototypes might prove fruitful. Specifically, alternative prototypes could help increase our understanding of (intentional) drinking behaviour, although it should be kept in mind that the explanatory value of alternative prototypes was only moderate. The results suggest to encourage distancing from health-risk prototypes (i.e. drunk prototype) and assimilation with health-protective prototypes (i.e. moderate drinker prototype).[e.g. 27,28] Since health-risk prototypes generally produce stronger effects (Chapter 2), the heavy drinker and alternative drunk prototypes might be useful targets to distance from (Chapter 4-6).

Strategies

Distancing can be achieved by making the discrepancy between individuals' desired and undesired image salient and showing that they can reduce this discrepancy by changing their behaviour. Accentuating the negative characterisation[29] of excessive drinking could portray this behaviour as undesirable. Characteristics found in the cross-sectional study (Chapter 3) are especially relevant for young adults and might prove valuable for this feedback. In addition, our results suggest that it is important to help people maintain their positive self-image[24] and thus the alternative health-protective moderate drinker prototype might be an important target whose desirable positive characteristics (e.g. 'sociable') can be achieved should alcohol consumption be reduced. The moderate drinker prototype might be more reachable and desirable for heavy drinking individuals than the commonly assessed abstainer prototype might be and, from a social learning perspective, might be more likely to function as a role model. The message could show that moderate drinking will lead to being positively valued by peers rather than cause social rejection. Enhancing the expectancy of similarity to the moderate drinker might help increasing healthy behaviour.[30] In sum, prototype alteration could be achieved by letting people contemplate on desired and undesired characteristics and by providing feedback on and accentuating negative characteristics and social consequences.[3,21,29] Helping individuals form implementation intentions[31] and providing them with normative feedback can support prototype alteration and overcome the prototypes' influence.[32,33]

Implications regarding the PWM and other social cognition models

The presented findings have implications for the PWM and other social cognition models. The PWM originally assumed that prototypes only explain behaviour through their effect on willingness. Several studies support this proposition among adolescents.[e.g. 13,34] However, evidence showing that prototypes explain young adults' drinking behaviour through their effect on willingness is limited. To our knowledge, only two previous studies (prospective[20] and experimental[16]) tested the willingness-behaviour association among young adults, of which only one found a significant relationship (moderated by gender). Our results did not find a significant relationship among young adults. Furthermore, our studies supported earlier findings showing that prototype perceptions can directly relate to behaviour[e.g. 17,18] and intentions,[e.g. 8,35] as well. A first explanation of these findings might be that the PWM was developed to explain young people's risk behaviour, first most often applied to adolescents and later also more to young adults (including the present studies). Secondly, individuals are found to be more aware of their behaviour as their experience with it increases. As a result, behaviour becomes more intentional, rather than based on willingness, when people turn older and gain more experience.[36]

Our results suggested that a prototype-intention and a prototype-behaviour path might be more explanatory of young adults' drinking behaviour than a prototype-willingness path. Likewise, the present results suggested that the TPB, and perhaps other social cognition

models, could benefit from being extended by prototypes that are relevant for the target group. The TPB alone has been shown to explain 27% and 39% of the variance of various behaviours and intentions, respectively.[37] The presented studies and previous research have shown that prototypes can effectively augment the TPB in explaining (drinking) intentions and (drinking) behaviour over and above the TPB variables, with 4-7% and 9-14% additional explained variance, respectively.[e.g. 8,10,20]

AIM 2. DETERMINING THE ENHANCING EFFECTS OF PROTOTYPE ALTERATION AND CUE REMINDERS IN REDUCING ALCOHOL USE: MAIN FINDINGS AND IMPLICATIONS

Chapter 7 described whether prototype alteration and cue reminders can be useful strategies to enhance the effectiveness of an existing intervention called 'Drinktest.nl'. This intervention was based on the TPB, I-Change model,[38,39] and Stages of Change Model, and has been found to effectively reduce drinking behaviour up to one month but not six months.[40] Insights gained from the presented studies (Chapter 2-6) and literature research[e.g. 29,41,42] were used to develop the two strategies aimed at improving the effect of Drinktest. We considered this a strength.

An online randomised controlled trial (RCT) was performed among 2634 excessively drinking participants (18+) who were randomly assigned to four conditions: original Drinktest, Drinktest extended by prototype alteration, Drinktest extended by a cue reminder, and Drinktest extended by both strategies (i.e. combined condition). The online intervention provided tailored feedback according to participants' drinking behaviour, gender, and intentions. All conditions were extended by the assessment of behavioural willingness, although no feedback explicitly addressed it. The prototype alteration feedback aimed at implicitly distancing participants from the heavy drinker and drunk person prototypes by accentuating their negative characteristics. The feedback showed that, should alcohol consumption be reduced, positive characteristics associated with the moderate drinker prototype could be achieved. The prototype alteration was thus made salient by showing that the participant's behaviour caused a discrepancy between their desired and actual self, as described earlier. Participants were additionally guided in goal-setting and action planning. Participants in the cue reminder condition received a silicone bracelet (or other cue reminder if preferred) that reminded them of their action plans. Finally, participants in the combined condition received all modules. It was expected that the cue could support the prototype alteration.

Multilevel longitudinal analyses were performed using the 'last observation carried forward' method. The effects were examined at one and six months after the baseline Drinktest regarding drinking behaviour, behavioural willingness, intentions, and additional variables. Participants generally appreciated the intervention and the extended Drinktest conditions

were not evaluated as better or worse than the original Drinktest condition. Importantly, participants in the original Drinktest condition were more likely to drop-out.

Participants in all conditions showed reductions in alcohol consumption (M = 3.60 vs. M = 3.06) and willingness to drink (M = 4.57 vs. M = 4.24) and increased their intentions to reduce drinking (M = 2.66 vs. M = 2.84). Participants that received the prototype alteration in addition to Drinktest showed a larger reduction in alcohol consumption than those who did not receive this feedback (B = -.15). The same was found for participants who used a cue reminder in addition to Drinktest compared to those who did not (B = -.15). The cue reminder was generally used frequently, but participants were reasonably aware of the cue. Unlike expected, participants reported a decreased awareness of their alcohol use and decreased attempts to reduce their drinking regarding the past month. The combination of cue reminders and prototypes, in addition to Drinktest, did not further enhance the effect of the two strategies in addition to Drinktest in changing drinking behaviour. Thus, the cue reminder did not support the effect of the prototype alteration.

Implications regarding the effect of prototype alteration and cue reminders

The most important implication based on the RCT was that prototype alteration and cue reminders proved to be effective strategies that can enhance the effectiveness of existing interventions, such as Drinktest, that are based on social cognition models.

Prototype alteration

Regarding prototype alteration, a possible explanations of the findings is that participants were acting on individuals' intrinsic motivations, being motivated to maintain a positive self-image[24] and thus that self-presentation strivings[23] were playing a role. In addition, it is plausible that prototype distancing was at play, as suggested to be effective by earlier research[e.g. 27,28,43] and previous findings (Chapter 3-6), indicating that accentuating negative characteristics of the heavier drinking prototypes and portraying the moderate drinker as a reachable and positive alternative might have been effective strategies. Thus, the moderate drinker prototype might indeed be useful as a target to become similar to and thus might be important to include in interventions and research. In addition, participants might have applied downward comparison with others who are worse off because these participants (that received the prototype alteration) felt they had better or at least healthier drinking levels than others[e.g. 43,44] and because they reported increased self-evaluations over time. Furthermore, the RCT (and presented studies) showed that those who received the prototypes alteration feedback reported more behavioural change, which was not found for intentions or willingness, awareness of drinking behaviour, contemplation of the intervention, or perceived attempts to reduce drinking. The results might support earlier research showing that feedback on prototypes can have a direct effect on changes in young adults' behaviour.[e.g. 3]

Cue reminders

Individuals that received the cue reminder also reported more reduced alcohol consumption compared to those who did not. This result might suggest that, as would be expected, the cue served an inhibiting function.[5,6] However, participants were only reasonably aware of the cue and thus the cue cannot have been effective due to its salience, as earlier research suggested. A possible explanation is that the cue reminder could have functioned through its presence in the context instead.[45] This would support the alcohol myopia theory in showing that prominent powerful cues of protective safe behaviour could actually lead to more cautious behaviour among people that already consumed some alcohol.[e.g. 46,47] Furthermore, it is possible that the cue supported the seizure of opportunities to act rather than changing intentions or willingness.

Providing a cue reminder as a strategy is feasible. It has the advantage that the cue does not need to be associated in any way with the behaviour in itself – a silicone bracelet by itself does not relate to drinking behaviour or condom use[6] before a link is made. The results suggest that might be important to provide participants a cue reminder that is used frequently so that it is present in the context should an opportunities to act on one's intentions arise. Therefore, we concluded that it might be important for interventions to increase individuals' awareness (i.e. salience) of the cue reminder,[45] because this could increase the salience and effect of the intervention.[6]

Finally, the cue did not support the effect of the prototype alteration. It is unclear why this was the case. It might be due to the operationalisation. That is, perhaps a combined effect could be have been achieved by instructing individuals to think of the characteristics to be achieved rather than characteristics *and* one's action plans (i.e. intentions). Or perhaps a cue that relates to self-images more directly might be more effective. This option could not be tested.

METHODOLOGICAL ISSUES

Some limitations of the presented studies should be discussed. Firstly, the meta-analysis (Chapter 2) included only the commonly assessed prototypes and could not assess the effect of alternative prototypes, such as our introduced moderate drinker, tipsy, and drunk prototypes. At time of inclusion, there were only two studies, including our own, which examined these prototypes. Secondly, it was beyond the scope to meta-analytically test the effects of prototypes within social cognitive models, such as the PWM. Thus, conclusions on the additive value of prototypes on social cognitive models can only be based on our own studies and previous studies supporting their impact.[e.g. 8,20,48] Third, the majority of studies included in this thesis (Chapter 2-6) were correlational and cross-sectional rather than experimental. The ability to draw causal conclusions is therefore reduced and the above described conclusions should be interpreted with caution.

Issues regarding key concepts

Three main issues should be discussed regarding measurements of the key concepts. Firstly, it might be that either the operationalisation of willingness is not optimal or that willingness might not be a suitable measure to assess (young) adults' implicit behavioural processes. Regarding its operationalisation, willingness might be less predictive of (young) adults' than adolescents' behaviour. It is usually measured by proposing a hypothetical situation in which someone reports the willingness to engage in risk behaviour or not. However, several studies did not strictly follow the definition[49] (Chapter 3), which might explain inconsistent findings. This suggests the need for a clear definition. Regarding implicit processes, perhaps alternative implicit measures will provide other insights, such as assessing implicit measures by the Implicit Association Test (IAT)[50] or by experimental studies in a bar lab setting.[see 3,17,33]

The second issue was the lack of definition of (alternative) prototypes, which avoided that participants' perceptions of prototypes were influenced by pre-set definitions. This enabled us to assume that the characteristics (i.e. adjectives) really reflected those adjectives that were relevant for young adults' drinking behaviour. However, it might have caused some prototypes to be interpretable as being state or trait and might explain why two adjective clusters were found to explain the tipsy and heavy drinker prototypes (Chapter 3). Participants had a stable negative perception of the drunk prototype, which thus might not have formed a problem for interpretation. It might also explain why the alternative prototypes only moderately enhanced the PWM compared to the PWM including only the common prototypes. The results imply that clearer instructions should be provided regarding the prototype definitions.

Finally, prototype perceptions can be assessed in several ways. Most studies, including our own, directly asked participants how similar they feel to the prototype and how favourable they find it.[e.g. 8,10] The effect of indirect measures, or implicit measures, could not be tested against direct measures (e.g. deducted from prototype adjective lists). Some researchers suggested that the Drinking Identity Implicit Associations Test, thought to implicitly test prototype similarity, could be used to predict alcohol use and problems.[51,52] Such measures could provide different insights. However, it remains unclear whether direct measures will produce stronger effects compared to implicit measures such as the Drinking Identity IAT (rather than indirect measures).

Issues regarding the RCT

The presented RCT is the first to determine the effect of prototype alteration among a general adult population. Although the results are promising, more research is needed to verify the presented patterns. An issue regarding the RCT might be its uptake. It is unclear whether the effects would have been larger should the feedback have been provided at several moments. On the other hand, attrition has been found to be higher with multiple sessions.[53,54] The long-term effects (6 months) might mean that cue alteration and prototype alteration can be strategies that can work for several months outside of the context of the online

intervention. Furthermore, motivation, commitment and motives for drinking or reducing alcohol consumption were not measured. It is also not clear whether discontinuation was due to satisfaction with personal behavioural change.[55] Furthermore, the RCT did not include a control condition and feedback was provided at baseline (although after the assessment of behaviour). As a result, conclusions on the effects of prototype alteration and cue reminders without the original Drinktest feedback or compared to, for example, a waiting list, could not be drawn.

RECOMMENDATIONS FOR FUTURE RESEARCH

- Future meta-analyses should quantify the strength of prototypes relative to other concepts from social cognitive models such as the PWM and TPB. This could provide insights into the additional value of prototypes.
- Research that unravels the mechanisms by which prototypes can explain adults' behaviour is limited and could be expanded.
- Studies focusing on various alternative health-risk and especially health-protective prototypes are very limited. Therefore, other research is necessary to understand their influence on young adults' health-related behaviour and the robustness of the findings. For instance, exercise can be performed in various extents and young adults might be likely to distinguish between several exerciser prototypes. As a result, a professional (more extreme) sports person might not be a plausible prototype to identify with.
- Future research and interventions need to take into account the different roles of favourability and similarity and the different effects of health-risk and health-protective prototypes. It is important to be aware that actual and perceived similarity do not always align.
- Experimental studies have mostly intervened on prototype favourability. However, similarity to prototypes was the most important predictor of drinking behaviour. Knowledge on how to change similarity and maintain that (stable) change is limited (although our studies provide some insights). Especially the knowledge of the effect of similarity to health-protective prototypes is still limited. Future research needs to assess whether expected similarity to alternative prototypes in the future will result in different outcomes than current similarity.
- The results of our studies suggest that prototypes are best assessed with direct (e.g. thermometer) measures in order to increase their explanatory power. But, indirect measures, such as adjective lists, might provide different insights. Adjective lists, as used in the RCT, might provide a valuable means to let participants contemplate on prototype adjectives in order to change prototype similarity and favourability. Thus, the choice for indirect or direct measures should depend on the study purpose. In addition, research is necessary

that assesses whether directs and indirect measures really assess the same construct or not.

- The results suggest that the PWM might not be suitable in its current form to explain young adults' (risk) behaviour. Prototype similarity should not be omitted and the inclusion of a prototype-intention path is important.

- In addition, more research is necessary regarding pathways of behavioural change in integrated theoretical models. The suggestion that the implicit route might be a better predictor of behaviour,[56] or might add to the prediction,[57] was not supported by our studies. More longitudinal and experimental research is necessary to determine the best way to operationalise behavioural willingness and to assess implicit processes among young adults and adults.

- Future research could take motives to avoid social rejection into account. Namely, it is likely that heavy drinking participants engage in this behaviour to avoid social rejection, as they will be aware of the social consequences of their behaviour[22] and thus the social image that they portray.

- Our RCT was one of the few available experimental studies determining the effect of prototype alteration on behavioural change. There is a need for future research to experimentally test the effect of prototypes alteration, which might vary across age groups. In addition, some efforts have been taken to alter prototype perceptions with mixed results and the present results regard the effect of prototypes in addition to Drinktest. However, prototype alteration only slightly enhanced the effect of Drinktest in changing alcohol consumption. Still, more research is necessary to determine the best method to alter prototype perceptions in order to achieve and maintain behavioural change.

- Knowledge regarding the type of cue that was presently used (thus other than cues like text messages) is lacking.[6] Future research should determine which type of cue reminder is most effective and how to make individuals more aware of their cue.

- Thus far, the present type of cue reminder has only been applied to risk behaviour. Future research could determine whether cue reminders are effective in helping people remember their health-protective goals as well, such as exercise.

RECOMMENDATIONS FOR POLICY AND PRACTICE

- Health benefits are likely to be gained by decreasing the popular image of drinking. The first step in reducing excessive drinking is motivating (young) adults to do so. The Drinktest was shown to be an effective tool.[40] Prototype alteration provides an extra strategy to motivate people to change behaviour. As such, interventions need to (1) encourage dissociation from heavier drinking prototypes such as the drunk prototype and to maintain this as a stable perception, (2) portray the moderate drinker prototype as a positively valued prototype that is reachable by reducing drinking behaviour, such

that a positive self-image is maintained, and (3) provide feedback based on personally relevant characteristics.

- The intention-behaviour gap is a well-know problem. The use of cue reminders can be a useful strategy to help individuals seize opportunities to enact their intentions. Thus, interventions could benefit from providing a cue reminder that is salient and frequently used or that is frequently present in the context.
- Prototype perceptions are formed through experience and media messages.[58-60] Given the influence of drinker prototypes on drinking behaviour, it is important to stop the portrayal of drinking as being sociable, spontaneous, and all other positive characteristics described in Chapter 3. As a result, it is recommended to prohibit alcohol advertisements from television and cinemas.
- When developing interventions, the target group should be involved. Otherwise, important motivations for change and personal relevance of prototypes (and attributed characteristics) could be overlooked and as a result feedback cannot be well-tailored.

GENERAL CONCLUSION

This thesis presented a series of studies aimed at examining the roles that prototypes play in explaining (drinking) behaviour, whether alternative prototypes can provide added explanatory value, and whether prototype alteration and cue reminders strategies can aid existing interventions in reducing alcohol consumption. By using valid research designs – a meta-analysis, elicitation (cross-sectional) study, prospective study, and RCT – we were able to assess these roles thoroughly. It demonstrated the relevance of studying and including drinker prototypes and cue reminders in research and interventions. Using a cue reminder and receiving prototype alteration feedback was more effective in reducing alcohol consumption than when this feedback was not provided. Both can be effective and feasible strategies to implement. The insights gained from the presented studies can be used in future research and interventions.

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Summary
Samenvatting

SUMMARY

Excessive drinking is a major problem for burden of disease. Consequences of alcohol (ab) use include, for instance, dependence, overweight, obesity, and high blood pressure. It can affect quality of life and cause other social and behavioural problems, such as unsafe driving practices, trouble with police, friends, or parents, injuries, unsafe sex, and physical fights. The costs related to employment (productivity loss, sick leave), crimes and offense (justice costs, court cases, traffic injuries), and addiction treatment and healthcare, are high.

Worldwide, excessive drinking is especially prevalent among young adults. Several efforts have been taken to explain and reduce excessive drinking among adolescents and young adults, but results have been mixed. These efforts were generally based on the assumption that behaviour is goal-directed, rational, and intentional (i.e. explicit information processing). However, recent insights suggest that risk behaviour can also be non-intentional, guided by social reactive processes (i.e. implicit information processing), and that both routes of information processing might be important targets for interventions aiming at reducing young adults' drinking behaviour. Yet, knowledge is limited regarding the impact of the implicit route of processing on excessive drinking among young adults.

This thesis focused on the role of 'prototypes' in understanding alcohol consumption, which are defined as the perceptions of typical persons engaging in certain behaviour (or not). Prototypes were originally thought to guide risk behaviour through their effect on behavioural willingness (i.e. implicit route). Though, they have been shown to explain behaviour through intentions in addition (i.e. explicit route). **Chapter 1** describes the rationale of this thesis and the corresponding aims. The two main study aims addressed in this thesis are:

1. To increase the understanding of the role that prototypes play in explaining (drinking) behaviour
2. To determine the effects of prototype alteration and cue reminders as behavioural change strategies in addition to an existing intervention on alcohol use

Four studies are presented that address these aims (Chapters 2-7). Data was collected by means of meta-analysis (Chapter 2), a cross-sectional (Chapter 3) and prospective study with one month follow-up (Chapters 3-6), and a randomised controlled trial (RCT, described in Chapter 7).

Understanding the role of prototypes in explaining (drinking) behaviour

Chapter 2 presents a meta-analysis examining the relation between prototype perceptions (i.e. positive evaluation and similarity between the self-image and the prototype, referred to as 'favourability' and 'similarity') and health-related behaviour, behavioural willingness, and intentions. A total of 69 articles were included. Small-to-medium effect sizes were found (r+

= 0.12–0.43). Prototype similarity (r+ = 0.26–0.43) generally produced stronger effect sizes than favourability (r+ = 0.12–0.28). Their interaction resulted in small-to-large effect sizes (r+ = .22–.54), which was larger than the effect of favourability but was only larger than the effect of similarity for explaining intentions. In addition, prototype perceptions generally had stronger associations with health-risk than health-protective outcomes. Interestingly, although prototype perceptions are most often assessed by indirect measures (e.g. adjective lists), the effect of direct measures (e.g. thermometer type) was generally larger. The findings were in line with the cross-sectional and prospective studies presented in chapters 3–6.

Chapter 3 describes the cross-sectional (elicitation) study including 149 participants. The study examined whether young adults distinguish between alternative prototypes other than the commonly assessed abstainer and heavy drinker prototypes in terms of their characterisation, prototype favourability and perceived similarity of the prototypes to the self. The results showed that young adults indeed distinguished between five prototypes that were presented to them: an abstainer, a moderate drinker, a heavy drinker, a tipsy person, and a drunk person. The prototypes were characterised by 23 characteristics that were distributed among six characteristic clusters so that each prototype was described by its unique (cluster of) characteristics. Participants differed in their focus on certain characteristics that they attributed to the prototypes. For instance, one of the four classes of participants that were found, focused especially on adjectives related to hedonism. The focus of participants differed across gender, educational level, and drinking behaviour. The results underscore that it might be important to differentiate between various prototypes and to provide young adults relevant prototype adjectives in research and interventions.

The results of the cross-sectional study and the online prospective study are presented in **chapter 4**. The prospective study included 450 participants. Analyses showed that, on the one hand, the moderate drinker and abstainer prototypes were evaluated most favourable and felt similar to. On the other hand, the heavy drinker and drunk prototypes were rated the least favourable and felt similar to. Of special interest was the finding that excessive drinking participants favoured the moderate drinker prototype and felt most similar to it, while they dissociated with the heavy drinker prototype. The dissociation with the heavy drinker prototype is likely due to its negative characterisation as described in chapter 3. This implies that prototype favourability and similarity do not necessarily align and thus should be regarded as distinct mechanisms. It might additionally imply that the moderate drinker prototype can be an important target for excessive drinking individuals to encourage to become similar to if their alcohol consumption were decreased. The studies suggest that studying alternative prototypes can increase our understanding of (excessive) alcohol consumption among young adults.

In **chapter 5** (prospective study) the additional value of alternative prototypes over the commonly assessed abstainer and heavy drinker prototypes was determined, tested within the framework of the Prototype Willingness Model (PWM). The common abstainer and heavy drinker prototypes explained intentions and drinking behaviour. In addition, the alterna-

tive drunk prototype explained intentions as well. The addition of the alternative drinker prototypes increased the explained variance of intentions with 6% and willingness with 3%. Importantly, willingness did not explain drinking behaviour, implying that drinking was rather intentional. This result confirms earlier findings that behaviour becomes more intentional when people age. This chapter also showed that alternative prototypes can enhance the explanation of intentional drinking within the PWM and could provide practical input for research and interventions.

In **chapter 6,** the Theory of Planned Behaviour (TPB) was extended with prototype perceptions. The results showed that stable perceptions of prototype similarity were more predictive of intentions than unstable perceptions. Specifically, intentions to drink sensibly were more strongly explained among individuals with stable perceptions of similarity to the abstainer prototype than among individuals with unstable perceptions of this prototype. In addition, intentions to drink sensibly were more strongly explained among individuals with stable perceptions of dissimilarity to the drunk prototype compared to individuals with unstable perceptions. Stability of prototype favourability did not moderate the association between favourability of any of the prototypes with either intentions or behaviour. Finally, stability of prototype similarity did not moderate the relationship of prototype similarity with behaviour either.

Effects of prototype alteration and cue reminders on changing alcohol use

Chapter 7 addresses the second aim of this thesis by means of an online RCT among excessive drinking adults (aged 18+). The existing Drinktest (www.drinktest.nl, an online tailored intervention aimed at reducing excessive drinking) was extended by two strategies: prototype alteration and cue reminders. Drinktest is based on the TPB and Stages of Change Model. Feedback was tailored based on gender, drinking behaviour, and intentions. The extended version of the Drinktest was based on the PWM as the tailored feedback was meant to implicitly distance excessive drinking participants' self-image from heavier drinking prototypes by encouraging to reduce their alcohol consumption and, as a result, achieve more positive characteristics. This feedback was tailored according to gender, intentions, drinking behaviour, and characteristics that can be achieved (desirable) or avoided (undesirable). The cue reminder, a silicone bracelet, aimed at helping participants to act on their intentions by reminding them of their action plans. The RCT included four conditions: original Drinktest condition, original Drinktest extended by prototype alteration condition, original Drinktest extended by cue reminder condition, and a combination condition receiving the original Drinktest plus the cue reminder and prototype alteration. The cue in the combination condition reminded participants of their action plans *and* positive characteristics to be achieved.

The effects of the intervention on drinking behaviour, intentions, and willingness were measured over three waves: a baseline (including the feedback) and a one- and six-months follow-up measurement. 'Last observation carried forward' was applied to account for the

large drop-out. As a result, longitudinal multilevel analyses were performed including 2634 excessive drinkers. Overall, the intervention was similarly evaluated across the four conditions in terms of the reliability, novelty, being informative, ease of understanding, personal relevance, persuasiveness, enjoyability, and usefulness. Participants in all conditions reported reduced alcohol consumption, decreased willingness to drink, and increased intentions to reduce drinking. Additionally, the results confirmed the hypothesis that the two added strategies would add to the effect of the Drinktest. More specifically, prototype alteration (B = -.15, p < .05) and cue reminder usage (B = -.15, p < .05) were both, but independently, more effective in reducing alcohol consumption than when these strategies were not provided in addition to the original Drinktest. The results showed that participants indeed seemed to distance themselves from undesirable characteristics of the heavier drinking prototypes. In addition, although participants were only moderately aware of their cue, they did reduce their alcohol consumption more than participants who did not receive a cue reminder in addition to the original Drinktest. It was additionally expected that the cue reminder could help people act on the prototype alteration by remembering which prototype characteristics they could achieve by reducing their alcohol consumption. This hypothesis was not confirmed, because the combination did not enhance the effect of either of the strategies. The results suggest that prototype alteration and cue reminder usage are most likely independent strategies that can increase the effect of tailored feedback based on variables from social cognitive theory, even up to six months post-intervention.

The results of the studies are integrated in the discussion in **chapter 8**. Main conclusions, study limitations, and recommendations for practice and research are discussed. Regarding the first aim, the main conclusions were that (1) prototypes can explain health-related behaviours across different age groups, (2) prototype similarity generally is a stronger predictor of health-related behaviour, willingness, and intentions than favourability, and might therefore be more important to target in order to change health-related behaviour, (3) willingness did not explain drinking behaviour and, consequently, the results did not support the original PWM applied to young adults' drinking behaviour, (4) young adults can and do distinguish between several prototypes other than the commonly assessed drinker prototypes, (5) alternative drinker prototypes could enhance our understanding of (intentional) behaviour, and (6) stability of drinker prototypes' similarity moderates the prototype-intention relationship. The results provided insights into the importance of relevant drinker prototypes in research and interventions aiming at reducing alcohol consumption. However, it remains important to replicate the current findings in longitudinal and experimental studies. The main conclusion regarding the second study aim, based on the RCT, was that prototype alteration and cue reminders can be useful strategies to complement online tailored interventions based on variables of social cognition models. It might be important for interventions aiming at reducing alcohol consumption to ensure and to increase the awareness of the cue reminder. Whether cue reminders can be used to support prototype alteration remains to be seen as

we could not demonstrate the enhancing effect of this combination on the independent strategies.

SAMENVATTING

Excessief drankgebruik levert een groot bijdrage aan ziektelast op bevolkingsniveau. Consequenties van alcoholgebruik en -misbruik omvatten bijvoorbeeld afhankelijkheid, overgewicht, obesitas en hoge bloeddruk. Het kan de kwaliteit van leven beïnvloeden en andere sociale -en gedragsproblemen veroorzaken zoals onveilig rijgedrag, problemen met politie, vrienden of ouders, ongelukken, onveilig vrijen, of betrokken raken in gevechten. De kosten, gerelateerd aan werk (productieverlies, ziekmelden), criminaliteit en overtredingen (justitiële kosten, rechtszaken, verkeersongelukken), verslavingsbehandelingen en gezondheidszorg, zijn hoog.

Wereldwijd drinken vooral jongvolwassenen excessief. Verscheidene inspanningen zijn verricht om excessief drankgebruik van adolescenten en jongvolwassenen te verklaren en te reduceren, maar met gemengde resultaten. Deze inspanningen waren in het algemeen gebaseerd op de aanname dat gedrag doelgericht is, rationeel en intentioneel (expliciete informatieverwerking). Recente inzichten suggereren echter dat vooral risicogedrag een reactie kan zijn op sociale situaties (impliciete informatieverwerking) en dat beide routes van informatieverwerking belangrijke doelen kunnen zijn voor interventies die gericht zijn op het reduceren van drankgebruik onder jongvolwassenen. Toch is er maar beperkte kennis op basis van de impliciete route van informatieverwerking betreffende de relatie met drankgebruik van jongvolwassenen.

Dit proefschrift richtte zich op 'prototypes,' de perceptie van typische personen die een bepaald gedrag uitvoeren (of juist niet). Oorspronkelijk werd gedacht dat prototypes gedrag beïnvloeden door hun effect op bereidheid tot drinken ('behavioural willingness,' impliciete route). Maar prototypes blijken ook gedrag te verklaren door hun effect op intenties (expliciete route). **Hoofdstuk 1** beschrijft de rationale van dit proefschrift en de bijbehorende doelstellingen. De twee doelstellingen die in dit proefschrift werden besproken, zijn:

1. Het vergroten van de kennis van de rol die prototypes spelen in het verklaren van (drink) gedrag
2. Het vaststellen van de effecten van prototypeverandering en een geheugensteuntje als gedragsveranderingsstrategieën als toevoeging aan een bestaande interventie gericht op alcoholgebruik

Vier studies zijn gepresenteerd welke ingaan op deze doelstellingen (hoofdstuk 2-7). De dataverzameling werd gedaan door middel van een meta-analyse (hoofdstuk 2), een cross-sectionele (hoofdstuk 3) en prospectieve studie met één maand tussen de eerste en de vervolgmeting (hoofdstuk 3-6) en een gerandomiseerd gecontroleerd onderzoek (RCT; hoofdstuk 7).

Kennis van de rol van prototypes in de verklaring van (drink)gedrag

Hoofdstuk 2 presenteert een meta-analyse welke de relatie bestudeert tussen prototype percepties (positief beeld en gelijkenis tussen iemands zelfbeeld en het prototype, oftewel 'favourability' en 'similarity') en gezondheidsgerelateerd gedrag, bereidheid tot gedrag en intenties. In totaal werden er 69 artikelen geïncludeerd. Kleine-tot-medium effectgrootes werden gevonden (r+ = 0.12–0.43). Gelijkenis met prototypes (r+ = 0.26–0.43) produceerde in het algemeen sterkere effecten dan het hebben van een positief beeld van prototypes (r+ = 0.12–0.28). Hun interactie resulteerde in kleine-tot-grote effectgrootes (r+ = .22–.54) welke groter waren dan het effect van een positief beeld, maar alleen groter dan het effect van gelijkenis op het verklaren van intenties. Daarnaast hadden prototype percepties over het algemeen sterkere associaties met gezondheidsrisicovolle dan gezondheidsbevorderende uitkomsten. Interessant is dat, hoewel prototype percepties meestal worden gemeten met indirecte maten (bijv. eigenschappenlijst), het effect van directe maten (bijv. type thermometer) over het algemeen sterker bleek. De resultaten kwamen overeen met de cross-sectionele en prospectieve studies gepresenteerd in hoofdstuk 3-6.

Hoofdstuk 3 beschrijft de cross-sectionele (elicitatie) studie welke 149 proefpersonen bevat. De studie onderzocht of jongvolwassenen onderscheid maken tussen alternatieve prototypes anders dan de gewoonlijk onderzochte niet-drinker en veel-drinker prototypes in termen van eigenschappen, het positieve beeld van een prototype (favourability) en waargenomen gelijkenis met het zelfbeeld (similarity). De resultaten toonden aan dat jongvolwassenen dit onderscheid inderdaad maken betreffende de vijf aan hen gepresenteerde prototypes: een niet-drinker, matige drinker, veel-drinker, aangeschoten persoon en dronken persoon. De prototypes werden gekenmerkt door 23 eigenschappen die verdeeld waren over zes clusters van eigenschappen zodat elk prototype werd beschreven door zijn unieke (cluster van) eigenschappen. Proefpersonen verschilden in hun focus op bepaalde eigenschappen die zij toekennen aan de prototypes. Een van de vier proefpersoonklassen die werd gevonden, focuste zich bijvoorbeeld vooral op eigenschappen gerelateerd aan hedonisme. De focus van de proefpersonen verschilde op basis van hun geslacht, opleidingsniveau en drankgebruik. De resultaten onderstrepen dat het belangrijk kan zijn om te differentiëren tussen verscheidene prototypes en om jongvolwassenen relevante prototype-eigenschappen voor te leggen bij onderzoek en interventies.

De resultaten van de cross-sectionele en de online prospectieve studie worden gepresenteerd in **hoofdstuk 4**. De prospectieve studie bevatte 450 proefpersonen. De analyses toonden aan dat enerzijds de matige drinker en niet-drinker prototypes het positiefst werden gevonden en men zich er het meest op vond lijken. Anderzijds werden de veel-drinker en dronken prototypes het minst positief gevonden en vond men zich er het minst op lijken. Vooral interessant was de bevinding dat veel drinkende proefpersonen juist de matige drinker het positiefst vonden en zich daarop vonden lijken, terwijl ze zich dissocieerden met het veel-drinker prototype. De dissociatie met de veel-drinker komt waarschijnlijk door zijn negatieve karakterisering, zoals beschreven in hoofdstuk 3. Dit impliceert dat het positieve

beeld van prototypes en het gevoel hierop te lijken niet per se gelijklopen aan elkaar en dus als aparte mechanismes moeten worden beschouwd. Daarnaast impliceert het dat het matige drinker prototype een belangrijk doel kan zijn voor veel-drinkende mensen om aangemoedigd te worden om hierop te gaan lijken als zij hun alcoholgebruik zouden reduceren. De studies suggereren dat het bestuderen van alternatieve prototypes ons begrip van (excessief) drankgebruik onder jongvolwassenen kan verbeteren.

In **hoofdstuk 5** (prospectieve studie) werd de toegevoegde waarde van alternatieve prototypes ten opzichte van de gewoonlijk onderzochte niet-drinker en veel-drinker prototypes vastgesteld, getest binnen het Prototype Willingness Model (PWM). De gewone niet-drinker en veel-drinker prototype verklaarden intentie en drankgebruik. Daarnaast verklaarde ook het dronken prototype intenties. De toevoeging van de alternatieve prototypes verhoogde de verklaarde variantie van intentie met 6% en bereidheid tot gedrag met 3%. Van belang is dat bereidheid tot gedrag het gedrag zelf niet verklaarde, hetgeen impliceert dat drankgebruik voornamelijk intentioneel was. Dit hoofdstuk liet ook zien dat alternatieve prototypes de verklaring van intentioneel drinken kunnen verbeteren binnen het PWM en deze een praktische invulling kunnen geven voor onderzoek en interventies.

In **hoofdstuk 6** werd de Theory of Planned Behaviour (TPB) uitgebreid met prototype percepties. De resultaten liet zien dat stabiele percepties van prototype gelijkenis meer voorspellend waren voor intenties dan onstabiele percepties. Intenties om verantwoord te drinken werden beter verklaard onder mensen met stabiele percepties van gelijkenis met het niet-drinker prototype dan onder mensen met een onstabiele perceptie hiervan. Daarnaast werd de intentie om verantwoord te drinken beter verklaard onder mensen waarvan het beeld dat ze niet op het dronken prototype leken stabiel was, dan onder mensen waarbij dit beeld niet stabiel was. De relatie tussen een positieve prototype beeld en intentie of gedrag werd niet gemodereerd door de stabiliteit van dit beeld. Tenslotte modereerde de stabiliteit van gelijkenis ook niet de relatie tussen prototype gelijkenis en gedrag.

Effect van prototypeverandering en een geheugensteuntje op verandering van alcoholgebruik
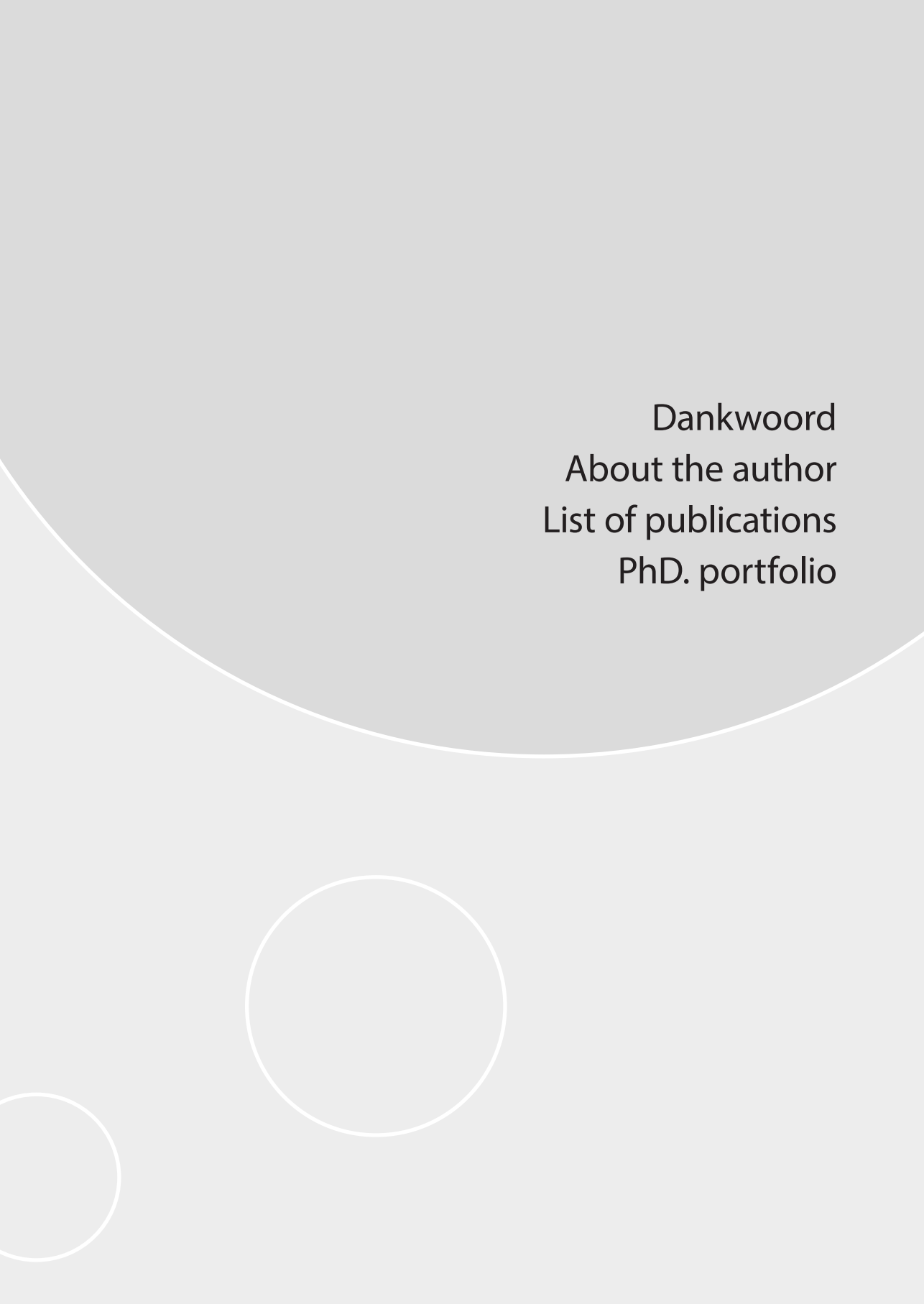
Hoofdstuk 7 behandelt de tweede doelstelling van dit proefschrift door middel van een online RCT onder excessief drinkende volwassenen (18+). De bestaande Drinktest (www. drinktest.nl, een online getailorde interventie gericht op het verminderen van excessief alcoholgebruik) werd uitgebreid met twee strategieën: prototypeverandering en een geheugensteuntje. Drinktest is gebaseerd op de TPB en Stages of Change Model. Feedback werd getailored op basis van geslacht, drankgebruik en intenties. De uitgebreide versie van de Drinktest was gebaseerd op het PWM aangezien de getailorde feedback gedoeld was om het zelfbeeld van excessief drinkende proefpersonen te distantiëren van zwaarder drinkende prototypes door ze aan te moedigen om hun alcoholgebruik te verminderen en daardoor positiever gekarakteriseerd te worden. Deze feedback werd getailored op basis van geslacht, intenties, drankgebruik en eigenschappen die behaald (gewenst) of voorkomen (ongewenst)

kunnen worden. Het geheugensteuntje, een siliconen polsbandje, was bedoeld om proefpersonen te helpen om hun intenties uit te voeren door ze aan hun actieplannen te herinneren. De RCT bevatte vier condities: originele Drinktest conditie, originele Drinktest uitgebreid met prototypeverandering, originele Drinktest uitgebreid met geheugensteun en een combinatieconditie welke de originele Drinktest ontving met zowel de prototypeverandering als geheugensteun ontving. Het geheugensteuntje in de combinatieconditie herinnerde proefpersonen aan hun actieplannen én de te behalen positieve eigenschappen.

De effecten van de interventie op drankgebruik, intenties en bereidheid tot gedrag werden op drie momenten gemeten: een basismeting (die de feedback bevatte) en een vervolg op één en zes maanden daarna. 'Last observation carried forward' werd toegepast om de grote uitval van proefpersonen op te vangen. Longitudinale multilevel analyses werden uitgevoerd met 2634 excessieve drinkers. Over het algemeen werd de interventie hetzelfde geëvalueerd onder de vier condities in termen van de betrouwbaarheid, vernieuwing, informatief zijn, makkelijk te begrijpen, persoonlijke relevantie, overtuigend zijn, plezierig zijn en persoonlijk nut. Proefpersonen in alle condities rapporteerden verminderd alcoholgebruik, verminderde bereidheid om te drinken en verhoogde intenties om te minderen. Daarnaast bevestigden de resultaten de hypothese dat de twee toegevoegde strategieën zouden bijdragen aan het effect van de Drinktest. Specifiek bleek dat de prototypeverandering (B = -.15, p < .05) en gebruik van geheugensteuntje (B = -.15, p < .05) beide, maar los van elkaar, effectiever waren in het verminderen van alcoholgebruik dan wanneer deze strategieën niet werden aangeboden als toevoeging aan de originele Drinktest. De resultaten lieten zien dat proefpersonen zich inderdaad leken te distantiëren van ongewenste eigenschappen van de zwaarder drinkende prototypes. En, hoewel proefpersonen maar matig bewust waren van hun geheugensteuntje, verminderden zij toch hun alcoholgebruik meer dan proefpersonen die geen geheugensteuntje kregen naast de orginele Drinktest. Daarnaast werd verwacht dat het geheugensteuntje mensen kon helpen handelen naar de prototypeverandering door hen te herinneren aan de te behalen eigenschappen wanneer ze hun alcoholgebruik zouden verminderen. Deze hypothese werd niet bevestigd, omdat de combinatie niet effectief was in het verhogen van het effect van een van beide strategieën. De resultaten suggereren dat prototypeverandering en een geheugensteuntje waarschijnlijk onafhankelijke strategieën zijn welke het effect kunnen vergroten van getailorde feedback op basis van variabelen van sociaal cognitieve theorie, zelf tot zes maanden na de interventie.

De studieresultaten zijn geïntegreerd in de discussie in **hoofdstuk 8**. Hoofdconclusies, studielimitaties en aanbevelingen voor praktijk en onderzoek worden bediscussieerd. De hoofdconclusies betreffende de eerste doelstelling waren dat (1) prototypes gezondheidsgerelateerde gedragingen kunnen verklaren onder verschillende leeftijdsgroepen, (2) gelijkenis aan prototypes over het algemeen een sterkere voorspeller is dan favourability en daarom een belangrijkere target kan zijn om gedrag te veranderen, (3) bereidheid niet gedrag verklaarde en ondersteunde daarom niet het PWM in zijn huidige vorm onder (jong)volwas-

senen, (4) jongvolwassenen onderscheid kunnen maken tussen verschillende prototypes, anders dan de gewoonlijk bestudeerde prototypes, (5) alternatieve prototypes ons begrip van (intentioneel) gedrag kunnen vergroten en (6) de stabiliteit van gelijkenis aan prototypes de intentie-gedrag relatie modereert. De resultaten geven inzicht in het belang van relevante prototypes van drinkers in onderzoek en interventies die gericht zijn op vermindering van alcoholgebruik. Het blijft echter belangrijk om de huidige resultaten te repliceren in longitudinale en experimentele studies. De hoofdconclusie betreffende de tweede doelstelling is gebaseerd op de RCT en luidde dat prototypeverandering en geheugensteuntjes bruikbare strategieën kunnen zijn om online getailorde interventies aan te vullen die gebaseerd zijn op variabelen van sociaal cognitieve modellen. Het is belangrijk dat interventies, die zich richten op vermindering van alcoholgebruik, het bewustzijn van het geheugensteuntje verzekeren en verhogen. Of geheugensteuntjes ook prototypeverandering kunnen ondersteunen zal nog moeten blijken, omdat we het vergrotende effect van deze combinatie op de onafhankelijke strategieën nog niet hebben kunnen aantonen.

Dankwoord
About the author
List of publications
PhD. portfolio

DANKWOORD

Mooi hoe tegelijk met de Erasmus MC nieuwbouw tegelijk mijn proefschrift ontstond. Zo'n zes jaar geleden had ik nog niet verwacht dat ik zou gaan promoveren. En inmiddels is mijn proefschrift gedrukt. Er zijn een aantal mensen zonder wie dit proefschrift niet mogelijk was geweest en zonder wie het niet zo'n goede en leuke tijd was geweest. Tijd voor een bedankje!

Als eerste wil ik Pepijn bedanken voor alle steun, goede feedback, gezellige momenten en leuke congressen. Jouw kennis is niet alleen zeer belangrijk geweest voor de totstandkoming van het project, maar ook voor mij om van te leren! Mede door jouw kennis en kunnen is dit project een succes geworden. Lex, jij was degene die goed een oogje in het zeil hield of alles wel voorspoedig bleef verlopen. Je reageerde altijd snel en kritisch op manuscripten. Dank voor alle leermomenten! Lex en Pepijn, beiden wil ik jullie bedanken voor het mogelijk maken van de tijd die ik in Amerika kon doorbrengen als 'visiting scholar.' Ik heb een geweldige en leerzame tijd gehad, zowel professioneel als persoonlijk, die ik niet had willen missen! Hein, ook jij bedankt voor de feedback, kritische opmerkingen en gezelligheid tijdens congressen. Zoals verwacht, was vooral jouw input voor de ontwikkeling van de interventie zeer welkom en belangrijk. Het is een mooi resultaat geworden. Veel dank dus! Pepijn, Hein en Lex, ik vond het een fijne samenwerking en hoop deze in de toekomst wellicht te kunnen voorzetten.

De leden van de kleine commissie – Dike van de Mheen, Gerjo Kok en Ingmar Franken – en de grote commissie wil ik hartelijk danken voor de tijd en aandacht die ze aan dit proefschrift hebben geschonken.

Daarnaast wil ik natuurlijk de onderzoeksmedewerkers danken: Elaine, Lennard, Dyanti, Annemarijn. Met jullie hulp hebben we de data van de interventie kunnen verzamelen en verwerken. Bij het ontwikkelen van de vragenlijsten en de interventie heb ik vaak beroep gedaan op collega's, familie en vrienden om te kijken of vragen en adviezen duidelijk waren. Deze personen wil ik heel hartelijk danken voor alle hulp en interesse! Alle (andere) proefpersonen wil ik hartelijk danken voor hun deelname aan de onderzoeken.

Mentalshare Direct en het Trimbos Instituut dank ik voor de samenwerking en voor het mogelijk maken van het gebruik van de 'oude' drinktest. Ik dank E-Vision voor de technische zaken van de interventie.

Dankbaar ben ik ook voor de adviezen van mede-auteurs van de artikelen: Paul Norman, Brigitte Boon, Gera Noordzij, Mark Conner. I would like to sincerely thank you, Meg Gerrard and Rick Gibbons (UConn), for your advice on the meta-analysis and giving me the opportunity to work at your department. I really enjoyed our collaboration and conversations. Mia and Steph, thank you so much for your kindness, letting a 'stranger' stay over at your house so often. I am happy to have met you and to have become friends! And of course, I've met several other great people during my time at UConn. Vera and Arnold, thank you for your kindness and having us stay at your apartment until we found a place of our own!

Dank ook aan de heren van onze helpdesk voor de technische ondersteuning en de dames van het secretariaat op MGZ en TNO.

Mijn eerste maanden op MGZ werd ik hartelijk ontvangen door Lenneke en mijn kamergenoot Rianne. Dat was super. Lifang and James, you were my roomies for most of my time at MGZ. I enjoyed all our moments… Jorinde en Lenneke, ook bij jullie is het gezellig op de kamer op TNO. Fijn om met jullie deze tijd te hebben kunnen delen. David, Carlijn, Kerstin, Fenna, Nanda, we kwamen met ons zessen op de kamer. Ik vond het gezellig met jullie! Dank voor de gezellige en soms relativerende gesprekken. Veel gezelligheid kwam ook van andere collega's tijdens bijvoorbeeld theemomenten, lunch, etc.: Ineke, Anne, Karen, Marcel, Astrid en vele anderen. Jullie maken het werk er nog leuker op!

Daarnaast ben ik ook ontzettend blij met mijn vriendinnen en vrienden buiten MGZ. Merel, wie kon er anders mijn paranimf zijn dan jij? Ik vond het een enorme eer om jouw getuige te mogen zijn tijdens je bruiloft en dat je mijn paranimf was. Carlijn, andere paranimf, wat een luxe dat een collega tegelijk een goede vriendin is. Dank voor alle momenten op de fiets, op MGZ, congressen, thuis… Met jou (en Merel tijdens de middelbare school) werd fietsen een stuk leuker! Marle, Annelies, Mariska, Nelise, Maartje, Elaine, Marlies, Froukje, Ewout, Frans, Marjolein, Collin, Karen, Claudia en Lennard, dank je wel voor alle gezellige en ontspannende momenten! Ik ben heel blij met jullie!

Dank, lieve oma's, opa en andere (schoon)familie voor alle interesse in mijn werk. Lieve Paska en Maska, jullie wil ik daarnaast ook bedanken voor de steun en het aanmoedigen van 'jullie kindertjes.' Anna, Damir, Olga, Tonio, we zaten allen zo'n beetje tegelijk in hetzelfde schuitje, dat was leuk, fijn en motiverend.

Lieve pap, mam, Boris, Jolien, dank voor jullie steun, het meeleven als ik weer eens zat te wachten op reactie van een tijdschrift, baalde van een afwijzing, of blij was met een acceptatie van een artikel. Bor, ik ben heel blij met jou als mijn broer en ben trots op je. Lieve papa en mama, heel erg bedankt voor jullie steun en bemoedigingen. Jullie hebben altijd in me geloofd, me gemotiveerd, me de mogelijkheid gegeven om goed te studeren, me te ontwikkelen.

Lieve Zjenja, jij bent mijn steun en toeverlaat al vanaf dat ik 16 was. We hebben al zoveel meegemaakt in onze jaren samen. Dank je wel voor de steun tijdens mijn promotie, je hielp me relativeren. Ik kan altijd bij jou terecht. Dat vind ik super. We hebben elkaar gemotiveerd om te studeren, te promoveren, onszelf te ontwikkelen, hebben samen al zoveel gezien van de wereld. En we gaan nog veel meer ontdekken van de wereld! Ik ben ook trots op jou. Ja tebja loebloe.

ABOUT THE AUTHOR

Britt van Lettow was born in Rotterdam, the Netherlands, on 11th of May, 1985. She grew up in Rhoon, near Rotterdam. In 2003, she finished her secondary education (TVWO) and International Baccalaureate (IB, A2 higher level) at the bilingual department of the Wolfert van Borselen in Rotterdam. From 2003 until 2008, Britt studied Psychology at Leiden University. In 2007 she studied at the University of Melbourne, Australia, where she lived for one semester. In 2008 she graduated in Health Psychology at Leiden University. The Master thesis described the impact of quality of implementation intentions on condom use and preparatory behaviours. Until end of 2009 Britt worked as a practicing psychologist treating individuals and groups with several explained and unexplained complaints. She started her trajectory as PhD. candidate from January 2010 at the Department of Public Health of the Erasmus MC. The studies are described in this thesis. During this time, she obtained her second Master, the Master of Public Health, at the Netherlands Institute of Health Sciences (Nihes). She additionally worked as visiting scholar at the University of Connecticut, USA, at the department of Social Psychology, Center for Health, Intervention and Prevention. She worked on the meta-analysis presented in this thesis. Britt is currently working as e-Health advisor at Zorgaanbieders Online.

Britt van Lettow werd op 11 mei 1985 geboren te Rotterdam, Nederland. Ze groeide op in Rhoon, vlakbij Rotterdam. In 2003 rondde ze haar middelbare school (TVWO) en International Baccalaureate (IB, A2 higher level) af aan de tweetalige afdeling van de Wolfert van Borselen te Rotterdam. Van 2003 tot 2007 studeerde Britt Psychologie aan de Universiteit Leiden. In 2007 studeerde zij aan de University of Melbourne in Australië waar ze gedurende een semester woonde. In 2008 studeerde ze af in Gezondheidspsychologie aan de Universiteit Leiden. De Masterscriptie beschreef de invloed van de kwaliteit van implementatie intenties op condoomgebruik en voorbereidende gedragingen. Tot eind 2009 werkte Britt als praktiserend psycholoog waarbij ze individuen en groepen behandelde met verklaarde en onverklaarde klachten. In januari 2010 startte ze haar traject als PhD. student aan de afdeling Maatschappelijke Gezondheidszorg van het Erasmus MC. De studies zijn beschreven in dit proefschrift. Tijdens deze tijd behaalde ze haar tweede Master, de Master Volksgezondheid, aan het Netherlands Institute of Health Sciences (Nihes). Daarnaast werkte ze als 'visiting scholar' aan de University of Connecticut, VS, aan de afdeling Sociale Psychologie, Center for Health, Intervention and Prevention. Daar werkte ze aan de meta-analyse welke is beschreven in dit proefschrift. Op dit moment is Britt werkzaam als e-Health adviseur bij Zorgaanbieders Online.

LIST OF PUBLICATIONS

Publications in this thesis

van Lettow B, Vermunt JK, de Vries H, Burdorf A, Conner M, van Empelen P. Explaining young adults' drinking behaviour within an augmented Theory of Planned Behaviour: Temporal stability of drinker prototypes. *British Journal of Health Psychology* 2014.

van Lettow B, de Vries H, Burdorf A, Norman P, van Empelen P. Associations between abstainer, moderate and heavy drinker prototypes and drinking behavior in young adults. *Psychology & Health* 2013;28(12):1407-1423.

van Lettow B, Vermunt JK, de Vries H, Burdorf A, van Empelen P. Clustering of drinker prototype characteristics: What characterizes the typical drinker? *British Journal of Psychology* 2013;104(3):382–399.

van Lettow B, de Vries H, Burdorf A, van Empelen P. Quantifying the strength of the associations of prototype perceptions with behaviour, behavioural willingness, and intentions: A meta-analysis. *Health Psychology Review* 2014

van Lettow B, de Vries H, Burdorf A, Noordzij G, van Empelen P. Explaining drinking behaviour among young adults: Do alternative drinker prototypes contribute? *Submitted*

van Lettow B, de Vries H, Burdorf A, Boon B, van Empelen P. Drinker prototype alteration and cue reminders as strategies in a tailored web-based intervention reducing adults' alcohol consumption: An RCT. *Submitted*

Other publications

de Vet E, Gebhardt WA, Sinnige J, van Puffelen A, van Lettow B, de Wit JB. Implementation intentions for buying, carrying, discussing and using condoms: the role of the quality of plans. *Health Education Research* 2011;26(3):443-455.

PHD PORTFOLIO

Summary of PhD training and teaching

Name: Britt van Lettow

Erasmus MC Department of Public Health

Research School: Nihes

PhD period: 2010-2014

Promotor(s): Lex Burdorf, Hein de Vries

Supervisor: Pepijn van Empelen

	Year	Workload (Hours/ECTS)
1. PhD training: 57.4		
General courses: 2 ects		
- Writing course	2010	1 ects
- Scientific writing, English course	2012	1 ects
Statistics: 10 ects		
- Classical methods for data-analysis	2010	5.7 ects
- Modern statistical methods	2011	4.3 ects
Methodology: 5.7 ects		
- Methods of health services research	2010	0.7 ects
- Methods of public health research	2010	0.7 ects
- Study design	2012	4.3 ects
Specific courses (e.g. Research school, Medical Training): 15 ects		
- Alcohol, drugs and addiction	2010	1.4 ects
- Epidemiology of infectious diseases	2010	1.4 ects
- Ethnicity, health and health care	2010	1.1 ects
- International comparison of health care systems	2010	1.4 ects
- Primary and secondary prevention research	2010	0.7 ects
- Quality of life measurement	2010	0.9 ects
- Social epidemiology	2010	0.7 ects
- Case-control studies	2011	0.7 ects
- Clinical decision analysis	2011	0.7 ects
- Clinical trials	2011	0.7 ects
- Cohort studies	2011	0.7 ects
- Conceptual foundation of epidemiology: Study design	2011	0.7 ects
- From problem to solution	2011	1.1 ects
- Health economics	2011	0.7 ects
- Practice of epidemiological analysis	2011	0.7 ects
- Public health research: from epidemiology to health promotion	2012	0.7 ects
- Deelcertificaat Basis Kwalificatie Onderwijs (Desiderius school, cursus feedback geven; cursus teach the teacher I)	2014	0.7 ects

Seminars and workshops: 6.3 ects

- Mixed models seminar	2011	0.1 ects
- Preconference workshop CREATE by EHPS: meta-analysis	2011	0.1 ects
- Methodologie van patiëntgebonden onderzoek en voorbereiding van subsidie aanvragen	2011	0.1 ects
- Masterclass Addiction – IVO	2012	0.9 ects
- Attending seminars at the Department of Public Health (MGZ)	2010-2014	3.6 ects
- Masterclass How to write a competitive proposal	2013	0.5 ects
- Attending seminars at University of Connecticut	2013	0.7 etcs
- PhD day with workshops	2011 and 2013	0.3 ects

Presentations: 10.8 ects

- Presentation at research meeting about project	2010	0.5 ects
- Presentation at research meeting about odds ratios	2010	0.4 ects
- Presentation at section meeting about online questionnaires and interventions	2011	0.4 ects
- Presentation during conference of NCVGZ	2011	1 ects
- Two poster presentations each 4 minutes during conference of EHPS and session chair	2011	1 ects
- Presentation at Maastricht University of study results	2011	0.5 ects
- Presentation at research seminar Erasmus MC, MGZ, of study results	2011	0.5 ects
- Presentation during IVO Masterclass	2012	0.3 ects
- Oral presentation at the European Health Psychology Society (EHPS) Conference, symposium	2012	1 ects
- Two oral presentations at the International Conference of Psychology	2012	1 ects
- Presentation at the Alcohol Research Center, University of Connecticut	2013	0.8 ects
- Presentation at the Center of Health, Interventions and Prevention, Department of Social Psychology, University of Connecticut	2013	0.8 ects
- Presentation at the conference of E-Health, Ottawa	2013	1 ects
- Presentation at Maastricht University, GVO, of study results	2013	0.8 ects
- Presentation at TNO, Lifestyle Research Group, of study results	2013	0.8 ects

(Inter)national conferences: 7.6 ects

- Cephir, Rotterdam, the Netherlands	2010	0.1 ects
- 25th Conference of EHPS, European Health Psychology Society, Hersonissos, Crete	2011	1.4 ects
- NCVGZ, Dutch Conference of Public Health, Amsterdam, the Netherlands	2011	1 ects
- Successes of prevention, Erasmus MC, Rotterdam, the Netherlands	2011	0.2 ects
- Symposium 'Sweet Sixteen: rethink the way you drink. Aanknopingspunten voor alcohol preventie bij 16+ jongeren in Nederland' Utrecht, the Netherlands	2011	0.1 ects
- 26th Conference of EHPS, European Health Psychology Society, Prague, Czech Republic	2012	1.4 ects
- International Conference of Psychology, Cape Town, South-Africa	2012	1.4 ects
- Masterclass/Conference Addiction, by IVO, the Hague, the Netherlands	2012	0.5 ects
- Conference of E-Health, Ottawa, Canada	2013	1 ects
- Conference of Association of Researchers in Psychology, Groningen, the Netherlands	2014	0.5 ects

2. Teaching: 10.8 ects

Lecturing: 1.2 ects

- VO lifestyle	2010	0.3 ects
- VO lifestyle	2011	0.3 ects
- VO lifestyle	2012	0.3 ects
- VO lifestyle	2013	0.3 ects

Supervising practicals and excursions, Tutoring: 5.6 ects

- Alcohol: 2 workgroups writing about primary prevention and presenting results	2010	0.8 ects
- Community projects (topic: alcohol use among adolescents)	2012	0.8 ects

Supervising Master theses: 4 ects

- Supervision of Master student 'Health Psychology' of Leiden University. Thesis title: 'Do individual differences moderate the effects of intention and behavioural willingness on binge drinking?'	2011-12	2 ects
- Supervision of Master student 'Health Psychology' of Leiden University. Thesis title: 'Investigating the influence of possible selves on health-risk and health-protective intentions and behaviours in young adults?'	2012	2 ects

3. Other: 0.4 ects		
- Organize celebration of 40 years of existence of the Department of Public Health	2011	0.1 ects
- Organize presentation course for department	2012	0.1 ects
- Organize symposium 'impact of prototypes' at 26th conference of EHPS	2012	0.2 ects
		Total 68.6 ects