CURBING YOUNG ADOLESCENTS' ALCOHOL ABUSE

TIME TO REVISIT THE PREVENTION PARADOX?

Jeroen Lammers

Curbing young adolescents' alcohol abuse: Time to revisit the prevention paradox?

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Het verminderen van alcoholmisbruik bij jonge adolescenten:
Tijd om de preventieparadox te heroverwegen?

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Voor Luc

Contents

Running in circles, coming up tails
Heads on a science apart
The Scientist, Coldplay

CHAPTER 1

General introduction

General introduction

The central theme of this thesis is alcohol prevention in adolescence. During the teenage years, young people discover and acquire new behaviours through experimentation and experience, including having their first alcoholic beverage. In the past decades, various prevention programmes have been developed to prevent young adolescents from initiating alcohol use at an early age and to prevent them from developing unhealthy drinking patterns once they have initiated drinking. Until today, efforts to control adolescents drinking behaviour mainly fall under universal prevention, which means prevention for the group of adolescents in general. Fewer efforts have been made towards adolescents who are at higher risk for initiating alcohol (mis)use at an early age and developing alcohol related problems at a later age; so-called selective and indicated prevention (targeted prevention).

This introductory chapter provides background information on the main issues of this thesis. First, the prevalence of alcohol use among youth and alcohol related health consequences are addressed. Second, the importance of offering selective prevention programmes in addition to universal prevention programmes is discussed. Third, the role of personality traits in alcohol misuse and alcohol related harm is described. This is followed by an explanation of the theoretical methods and mechanisms of the Preventure programme; a selective prevention programme that we tested for effectiveness in the Netherlands. Finally, the methodological issues from the various studies presented in this thesis are addressed and a general overview of the thesis is provided.

Alcohol use of youth in The Netherlands

Although the prevalence of alcohol use has decreased in the past decade (Van Dorsselaer et al., 2016), drinking among adolescents is a persistent problem in the Netherlands. Of the Dutch 12- to 16-year-olds, 45% ever drank alcohol, and 26% drank alcohol in the past month [1]. In addition, youngsters in The Netherlands start drinking at an early age: 18% of 10- to 12-year-old boys report having consumed alcohol; this is 8% for 10- tot 12 year-old girls. The average age of onset of alcohol use is 13.2 years (boys: 13 years, girls: 13,5 years) and the average age of weekly alcohol consumption is 14.4 years (boys: 14,3 years, girls: 14,6 years) [1].

Binge drinking
Binge drinking is defined as consuming five or more alcoholic drinks on one occasion. Of the 12- to 16-year old boys and girls in The Netherlands who drink alcohol, 70% is engaged in binge drinking in the previous month. With age, binge drinking among adolescents sharply increases. Of the 12-year old boys and girls who drink, 52% is engaged in binge drinking in

the previous month, compared with 75% of the 16-year olds who drink alcohol [1]. Until the age of 16, there are no differences between boys and girls in the percentage of binge drinkers. At the age of 16, however, the difference between boys and girls tends to increases. At the age of 16, 81% of the boys and 68% of the girls is engaged in binge drinking in the previous month.

In comparison to other European countries, The Netherlands are among the highest scoring countries when it comes to excessive alcohol use [2]. Generally speaking: Dutch adolescents are at an older age when they start drinking than their European peers, but when they drink, they drink a lot and often. Heavy episodic drinking (binge drinking) among adolescents in The Netherlands was above the overall average of European youngsters (39 % versus 35 %; [2]).
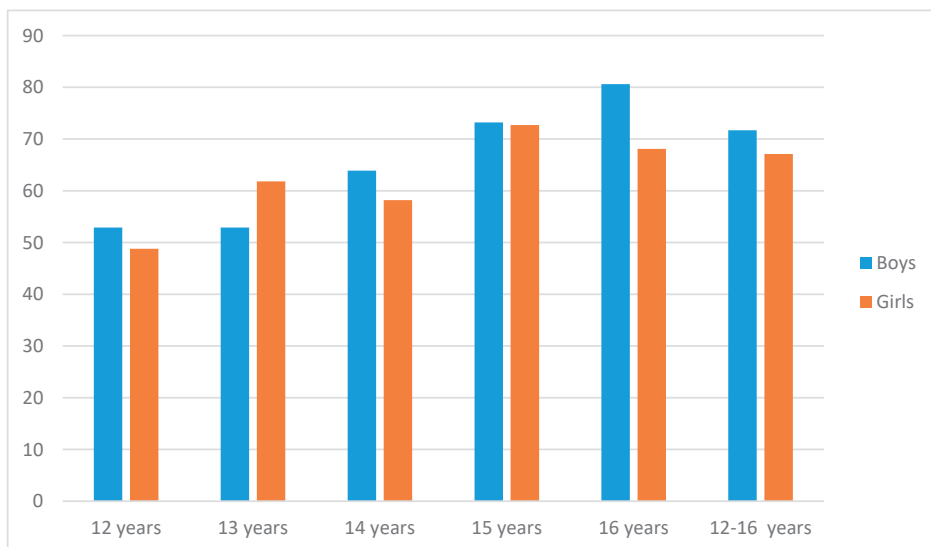
Figure 1. Prevalence of binge drinking in the previous month among Dutch 12- tot 16-years old boys and girls who drink alcohol (%) [1]

Alcohol-related harm

Early and heavy drinking is assumed to have severe negative health consequences [e.g., 3] Alcohol use before the age of 15 years leads to double the prospective risk of adult alcohol dependence [4, 5] and increases the risk of abusive or hazardous drinking during adolescence [e.g., 6]. Frequent and heavy adolescent drinking is predictive of alcohol dependence in young adulthood and leads to several severe physical and mental harms. This includes violent and delinquent behaviours [7], addiction problems [8], risky sexual behaviours [9], suicide attempts [10], co-morbid substance use [7] and premature and violent deaths, for example through traffic accidents [11]. Besides, early heavy alcohol consumption seems

to be related to poor academic performance, learning difficulties and school dropout [12, 13]. In addition, heavy alcohol use during puberty appears to be related to damage to the development of cognitive and emotional abilities [14]. Alcohol-related risks to cognitive functions seem to be higher in adolescents than in adults [3]. From the point of view of public health, prevention of heavy alcohol use among young adolescents is therefore essential.

Prevention: what works?

Several classifications of prevention are used. In a 1994 report on prevention research, the Institute of Medicine (IOM; [15]) proposed an operational framework for classifying disease prevention. The IOM model divides the continuum of services to prevent diseases into three parts: prevention, treatment, and maintenance. The prevention category is further divided into three classifications: universal, selective and indicated prevention. Prevention is a complementary approach in which services are offered to the general population or to people who are identified as being at risk for a disorder, and they receive services with the expectation that the likelihood of a future disorder will be reduced [16]. This prevention classification is still commonly used in the field of substance use prevention.

Universal prevention strategies are designed to reach the entire population, without regard to individual risk factors and are intended to reach a very large and wide audience. The programme is provided to everyone in the population, such as a school or community. For example, universal preventive interventions for substance abuse, which include substance abuse education using school-based curricula for all children within a school.

Selective prevention strategies target subgroups of the general population that are statistically at enhanced risk for substance abuse. Recipients of selective prevention strategies are known to have specific risks for substance abuse and are recruited to participate in the prevention effort because of that group's profile. Examples of selective prevention programmes for substance abuse include special groups for children of substance abusing parents or families who live in high crime or impoverished neighbourhoods and mentoring programmes at school aimed at children with behavioural or mental problems.

Indicated prevention interventions identify individuals who are experiencing early signs of substance abuse and other related problem behaviours associated with substance abuse and target them with special programmes. The individuals identified at this stage, though experimenting, have not reached the point where clinical diagnosis of substance abuse can be made. Indicated prevention approaches are used for individuals who may or may not be abusing substances but who exhibit risk factors such as school failure, interpersonal social problems, antisocial behaviours, and psychological problems such as depression and suicidal behaviour, which increases their chances of developing a drug abuse problem. An example of an indicated prevention intervention is an assessment based substance abuse

programme for high school students who are experiencing a number of problem behaviours because of their substance abuse or multiple gaming.

Universal prevention versus selective and indicated prevention

In the field of substance use prevention, universal based prevention programmes are the most common and the most applied, especially within the school setting. Although widely used, scientific evidence that universal prevention programmes aimed at youngsters effectively affect drinking behaviour and drinking related problems, is mixed, and not consistent. Several meta-analyses have shown that universal programmes have effects on alcohol use and binge drinking, but small to modest and most often the effects are short term only [17, 18, 19, 20, 21, 22]. There are some exceptions, however, of universal prevention approaches that proved effective, namely the Life Skills Training Programme [23], and the Good Behaviour Game [18], which are generic psychosocial and developmental prevention programmes. Also, universal interventions aimed at both adolescents and their parents seem to be effective in reducing alcohol use [e.g. 24, 25]. Hence, there are universal prevention programmes that can have an impact on delaying initiation of substance use among low-risk individuals, but these universal programmes are very likely to be less effective for adolescents who have already initiated use and are at an increased risk for developing harmful drinking patterns. For those adolescents, a targeted approach that is tailored to their specific needs and focusses on reducing or eliminating personal risk factors could sort a bigger effect.

Evaluations on mental health and substance use prevention programmes suggest that, although universal programmes can be effective in reducing and preventing substance use, selective and indicated programmes are both more effective and have greater cost-benefit ratios. Meta-analyses of the effects of programmes for prevention of depression [26, 27, 28], anxiety [29], aggression/anti-social behaviour [30] and alcohol use [21] reported that selective or indicated programmes have larger effects than universal programmes. A meta-analyses by Shamblen and Derzon [20] showed that the observed average impact of selective and indicated programmes on alcohol use (d = .22) is larger than that of universal programmes (d = .12), though the effect sizes are marginal. In addition, selective and indicated prevention programmes seem to be more cost-effective than universal programmes in reducing alcohol use [e.g., 20; 31]. To the extent that selected and indicated programmes target young adolescents who are more likely to engage in the outcome, the effectiveness estimates obtained from these samples will be larger, and more likely significant, because of the large number of non-users in universal programmes [20, 32].

Considering that selective and indicated programmes are more tailored to the specific risk or protective factors of adolescents, are targeted only to those who are likely to need prevention and can therefore lead to a more efficient use of already limited resources, it is surprising that still so little research has been done with regard to the development and testing of

these types of programmes for reducing alcohol use in adolescents. The present thesis aims to fill this gap. Before some concrete examples of selective and indicated prevention programmes will be described, the pros and cons of these types of prevention approaches will be summarized.

Advantages and disadvantages of selective and indicated prevention

To be effective, selective and indicated prevention programmes (targeted prevention) should include activities that are directly targeted at reducing identified risk factors and increasing protective factors found in the risk group. Targeted prevention programmes do not necessarily have to be longer and more intensive than universal programmes [31]. In order to maintain effectiveness over time, it is recommended that booster sessions are applied to review prior learnings and skills and to introduce developmentally appropriate new material [33]. Selective and indicated prevention programmes are targeted only to those who are likely to need prevention; therefore, these programmes can lead to more efficient use of limited resources for prevention. The content is more tailored to the specific risk or protective factors, and to the special needs of the group, thus potentially increasing effectiveness [34]. Selective prevention can be more meaningful for the individual, because it recognizes itself in the intervention, and he or she has more the idea that it relates to him or her, compared to universal prevention aimed at everyone. Additionally, it is easier to measure improvements from a prevention programme if the participants have more serious risk factors at intake. The effectiveness of universal prevention programmes is smaller than that for selective programmes for high-risk participants because fewer participants have room for improvements (e.g., a ceiling effect; [34]).

However, identifying, recruiting, and attracting high-risk young adolescents can be more difficult than providing universal programmes to all students in schools. The identification of individuals who have already started to exhibit early signs of substance abuse (i.e., indicated populations) may be easier, as initiation of substance use can be an indicator of risks for later problem behaviour. Yet, it is much more challenging to systematically and operationally define criteria for the selection of individuals who are at risk (i.e., selective populations) [20]. Another issue is the potential for negative labelling and stigmatization. Identifying at-risk adolescents and youngsters exhibiting problem behaviour may stigmatize the individuals involved [20, 28]. Informing the pupil's environment about his or her high-risk and/or problem behaviour can unintentionally create the side effect that this environment is worried or that it will treat the pupil differently. Therefore, the screening of high-risk adolescents and sharing information about the results of the screening must be carefully handled.

Selective and indicated alcohol prevention programmes

The range of selective and indicated prevention programmes for preventing alcohol abuse among young adolescents is diverse. Selective and indicated prevention programmes focus on a wide-range of target groups: from children who have never drank alcohol, to adolescents who are already experiencing problems due to excessive alcohol consumption, and from adolescents of parents with mental health problems to young adolescents living in poverty. Depending on the target group, the objectives and methods of the prevention programmes, as well as the settings within them, differ. These differences make it difficult to make statements on the entire spectrum of targeted prevention. Target groups known to be at increased risk of alcohol misuse and alcohol related problems, include [19, 35]:

• Adolescents with mental health problems and/or behavioural problems;
• Substance abusing parents and/or parents with severe mental health problems;
• Families who live in high crime or impoverished neighbourhoods;
• Adolescents in early stages of substance abuse and who are experiencing negative consequences;
• Adolescents with elevated scores on certain personality traits.

Although not as extensive as for universal prevention, there have been several studies on the development and evaluation of selective and indicated prevention programmes. Chapter 2 describes the results of a meta-analyses on selective and indicated alcohol prevention in the school setting. We refer to Chapter 2 for an overview of selective and indicated prevention programmes that have been developed and tested (and published) within the school setting. Below, a few examples of selective and indicated programmes are highlighted in more detail. Young adolescents with behavioural or psychiatric problems form a risk group. In The Netherlands these children receive special education (Cluster 4 education). A Dutch study among young adolescents from twelve to seventeen years showed that young pupils in Cluster 4 education are getting drunk more often and have more drinking problems, and have also experimented more often with hard drugs than pupils from regular secondary schools [36]. To prevent and reduce substance abuse among this target group, various school-based prevention programmes have been developed, including 'Project Towards No Drug Abuse'. This prevention programme consists of nine sessions, in which students are motivated for the programme, gain information about physical dependence and alternative coping strategies, and are trained in social skills. Long-term effects of this programme were found for drug use, no effects were found for alcohol use [37]. Also 'Project Success', a school based selective prevention programme for young students from 'alternative high schools' (special education) in the United States, did not have long-term effects on alcohol use or the use of other substances either [38]; and 'Leren Drinken', a selective prevention programme to moderate alcohol use and alcohol-related problems in adolescents at risk for alcoholism, did not reveal effects on alcohol (mis)use [39].

Indicated prevention programmes are often aimed at creating motivation for change. Either indirectly, by giving young adolescents more insight into their own drinking behaviour (personal and normative feedback), or directly, through motivational conversations (motivational interviewing). Both types of interventions are aimed at the youngsters themselves, rather than the whole family. An example of a personal feedback programme is the e-health intervention www.watdrinkjij.nl, a website where late adolescents map their alcohol consumption and, based on their answers, receive personal feedback on their alcohol consumption, their drinking motives and their risk of developing alcohol problems. This web-based brief intervention was tested through a RCT among different age groups. It was not effective among young adolescents from preparatory and secondary vocational education (aged 15-20 years). A small beneficial effect was shown on self-efficacy and drinking patterns over time among the group of heavy drinking college students (18-25 years of age) [40, 41]. An example of an intervention focusing on using motivational interviewing techniques to alter drinking behaviour is the Dutch programme Moti-4. This intervention focuses on adolescents and young adults aged 14-24 who have mild problems with alcohol use, drug use or gaming, or already show the first symptoms of addiction. In four individual one-hour interviews with an addiction prevention professional, efforts are made to reduce problematic behaviour. A Dutch RCT-study showed that Moti-4 has some positive effects on the expenditure on cannabis [42]. Effects of the intervention on alcohol (mis)use and gaming have not yet been tested.

Although selective and indicated prevention programmes seem to have an added value to universal prevention methods, insufficient and inconclusive research has been done to provide a clear view of the overall effectiveness of the full domain of targeted prevention interventions. Many intervention programmes have not been tested properly, appear to have no or limited effects on alcohol use, or have not been tested with regard to long-term effects. Some indicated prevention programmes, which have been tested in the Netherlands, are promising, though, especially concerning selective prevention programmes, strong evidence is still lacking.

A relatively new and promising selective prevention approach is the targeting of risk personalities. In this approach, young adolescents are identified as high-risk according to individual characteristics related to an elevated risk for alcohol misuse and alcohol related problems.

Selective prevention based on personality traits

In the past decade, addiction research has been working towards an integrative theory of substance abuse vulnerability. This theory focuses on how alcohol and drug abuse interact with brain reinforcement systems to influence expectancies and motivation with regard to substance use. These 'motivational theories' of addiction are supported by research sug-

gesting that individual differences in susceptibility toward addictive behaviour are mediated by certain neurobiological (e.g., prefrontal cortical or dopamine-mediated abnormalities), psychological (e.g. personality traits), or environmental (e.g., trauma, poverty) factors that all, to some extent, affect the functioning of brain reinforcement systems and their susceptibility to the effects of substance abuse [43, 44, 45, 46]. One of the areas that has shown much promise with respect to explaining the motivational factors underlying alcohol addiction is the focus on personality. Personality dimensions are assumed to be an expression of biologically based systems that regulate the different sensitivities of individuals to negative and positive affective stimuli [47]. Personality is a construct that is important for understanding alcohol use among adolescents, as several studies have convincingly shown that substance use is associated with personality. Two personality dimensions were found to be especially predictive of heavy alcohol use and alcohol use disorders in young adolescents [48, 49]:

(1) A neurotic personality dimension;
(2) A behavioural inhibition dimension.

The first category reflects a neurotic personality involving more anxious and negative thinking, the second involves sensation seekers and people with low impulse control. These two personality dimensions are robust predictors of heavy alcohol use and alcohol use disorders. Both personality dimensions are associated with different aspects of drinking motives, and sensitivity to different types of reinforcement (positive and negative reinforcement) from alcohol and other drug abuse [50, 51, 52, 48, 49]. Neurotic personality traits have been shown to predict progression from adolescent drinking to alcohol problems in young adulthood, by way of their association with negative affect coping motives (drinking to forget about worries). Disinhibited personality traits have been shown to be associated with positive affect related drinking, which was indirectly related to its association with heavier drinking [53, 54]. Within the two dimensions of personality, four personality profiles at higher risk of developing alcohol problems can be distinguished, according to Conrod and colleagues [48]:

(1) *Anxiety sensitivity* (AS) involves a specific fear of anxiety-related bodily sensations due to beliefs that such sensations will lead to catastrophic outcomes;
(2) *Negative thinking* (NT) or hopelessness, is a childhood inhibited and internalizing personality trait with an elevated risk for depression;
(3) *Impulsivity* (IMP) or reward dependency, is characterized by a rapid response to cues for potential reward and a minimal tolerance for negative emotion;
(4) *Sensation seeking* (SS) or high thrill-seeking, involves the regularly desire for arousal and intense and novel experiences.

These four personality profiles were subsequently found to be strongly related to adolescents' quantity and frequency of drinking, frequency of binge drinking, and severity of alcohol problems [50, 49, 55]. Each personality profile is associated with specific substance

misuse patterns, maladaptive drinking motives and vulnerability to specific forms of co-morbid psychopathology in adolescents [56, 57]. The personality trait anxiety sensitivity has been shown to be associated with increased drinking levels, a higher incidence of problem drinking symptoms, and negative reinforcement drinking motives [48]. The trait negative thinking or hopelessness appears to be especially associated with substance dependence comorbid with recurrent depression. Studies examining motives for drinking in young adolescents prone to depression in response to a significant life stressor are more likely to drink to cope with their negative affect, which in turn predicts greater substance use and related problems [56, 57, 49]. The personality trait sensation seeking is associated with risk-taking and reckless behaviour among adolescents and related to the predisposition of substance use, and binge drinking more specifically [48, 58]. In addition, sensation seeking has been associated with elevated enhancement-motivated drinking (e.g., drinking to get high) among young adolescents [52, 54]. Studies among Dutch populations from Malmberg et al. [55, 59] showed that young adolescents with higher levels of hopelessness and sensation seeking are at higher risk for an early onset of substance use and poly substance use. Impulsivity is influenced by first substance use experiences after which it becomes a risk factor for subsequent substance use.

Conclusively, the personality traits impulsivity, sensation seeking, negative thinking and anxiety sensitivity are related to alcohol misuse and are strong predictors for future heavy drinking and alcohol related problems among young adolescents. There are several scales used for personality assessment, based on various theoretical models. The scale that is best researched on relationships with alcohol use is the SURPS-scale.

The SURPS-scale
One instrument that measures personality dimensions specific to substance use is the Substance Use Risk Profile Scale (SURPS) [49]. This instrument distinguishes four distinct and independent personality traits (i.e. negative thinking, anxiety sensitivity, impulsivity, and sensation seeking), that found to be strongly related to adolescents' quantity and frequency of drinking, binge drinking, and severity of alcohol-related problems [48, 49]. The SURPS is a brief instrument suitable for large epidemiological and longitudinal designs to facilitate research on the role of multiple personality traits in addictive behaviours and co-morbid psychopathology [49]. Following the need for a brief instrument that measured the four risk personality traits in a distinct and independent manner, the SURPS was developed. The SURPS is constructed from data of a community sample of substance users, who completed personality and symptom inventories [49]. Among them were: NEO-Five Factor Inventory (NEO-FFI: [60]), the SS scale (SSS: [61]), the trait subscale from the State-Trait Anxiety Inventory (STAI-T: [62], the Anxiety Sensitivity Index (ASI: [63], the Cognitions Checklist (CCL: [64]), Posttraumatic Stress Symptom Scale Self-report (PSS-SR: [65]), the

Beck Hopelessness scale (BHS: [66]), and the Impulsiveness and Venturesomeness Scale (I-7: [47]). Factor analyses resulted in a scale with 23 non-overlapping items that assist in discriminating personality dimensions independent of substance use behaviour [49]. Factor structure, internal consistency and test-retest reliability, as well as construct, convergent, and discriminant validity of this instrument were shown to be adequate in studies among college students and adult samples [67] and among young adolescents [59]. See Table 1 for an overview of the items of the SURPS scale.

Table 1. The Substance Use Risk Profile Scale

Personality trait	SURPS scale items
Negative thinking	I am content. I am happy I have faith that my future holds great promise. I feel proud of my accomplishments. I feel that I'm a failure. I feel pleasant. I am very enthusiastic about my future.
Anxiety sensitivity	It's frightening to feel dizzy or faint. It frightens me when I feel my heart beat change. I get scared when I'm too nervous. I get scared when I experience unusual body sensations. It scares me when I'm unable to focus on a task.
Impulsivity	I often don't think things through before I speak. I often involve myself in situations that I later regret being involved in. I usually act without stopping to think. Generally, I am an impulsive person. I feel I have to be manipulative to get what I want.
Sensation seeking	I would like to skydive. I enjoy new and exciting experiences even if they are unconventional. I like doing things that frighten me a little. I would like to learn how to drive a motorcycle. I am interested in experience for its own sake even if it is illegal. I would enjoy hiking long distances in wild and uninhabited territory.

The personality-based selective prevention programme Preventure

In an attempt to provide an effective selective prevention programme, Conrod and colleagues developed Preventure. This school-based prevention programme targets young adolescents who demonstrate two classes of known prospective risk factors: (1) early-onset alcohol use, and (2) personality risk for alcohol abuse [48, 57, 50]. The main purpose of this personality-based approach is to prevent the early onset of alcohol misuse by targeting known prospective risk factors for early onset alcohol misuse in adolescents. The Preventure programme consists of three main components [48]:

(1) psycho-education;

(2) behavioural coping skills;

(3) cognitive coping skills.

Within the psycho-educational component, participants are educated about the personality variable in question and the problematic coping behaviours associated with that personality style. Students are encouraged to discuss the short-term reinforcing properties of a variety of problematic coping strategies (including alcohol use), as an attempt to help them understand their specific motivations for engaging in problematic and risky behaviours. This is followed by a motivational intervention, weighing the short- and long-term positive and negative consequences of a particular behaviour, around the use of problematic behavioural strategies for coping with that particular personality dimension [48]. In the coping skills sections, students are engaged in activities to induce automatic thoughts. They are trained to use cognitive restructuring techniques to counter these thoughts, based on cognitive behavioural therapy principles. Cognitive restructuring training has been shown to have a positive impact on the reduction of alcohol and drug abuse and symptoms of psychological disorders [68].

The Preventure intervention is brief, as the literature suggests that brief interventions can be effective in changing drinking patterns and related problems [33]. An effective component of successful brief interventions for alcohol abuse is the persuasiveness of individualized feedback. Individual, face-to-face interventions using motivational interviewing and personalized normative feedback predict greater reductions in alcohol-related problems [21]. Preventure provides pupils with personalized feedback on their results from a personality and motivational assessment.

The Preventure programme is adapted to the four personality profiles for substance abuse: anxiety sensitivity, negative thinking, impulsivity and sensation seeking. The group sessions are adapted to one of the four personality profiles. This means that the program consists of four versions, depending on the dominant personality profile of the students. The intervention involves two group sessions, carried out at the participants' schools. Both group sessions last for 90 minutes and are provided by a qualified counsellor and a co-facilitator:

Session 1: psycho-educational strategies are used to educate students about the target personality variable and the associated problematic coping behaviours, such as interpersonal dependence, aggression, risky behaviours, and substance misuse. Students are motivated to explore their personality and ways of coping with their personality through a goal-setting exercise. Thereafter, they are introduced to the cognitive behavioural model by analysing a personal experience according to the physical, cognitive, and behavioural responses. Students receive a between-session homework exercise.

Session 2: participants are encouraged to identify and challenge personality-specific cognitive thoughts that lead to problematic behaviours. For example, the impulsivity intervention focuses on not thinking things through and aggressive thinking, and the sensation-seeking intervention focuses on challenging cognitive thoughts associated with reward seeking and boredom susceptibility.

Effectiveness of the Preventure programme

Several studies show that the Preventure programme has proven to be effective on alcohol misuse among young adolescents. Trials in England and Canada have found that this method of intervention has significant effects on alcohol use, binge drinking, and severity of drinking problems, after four months and after two years [48, 69, 58]. A recent Australian trial revealed the same results on alcohol use, binge drinking and alcohol related problems, for a three-year period [70]. In these trials, the Preventure programme was delivered by trained counsellors. In another trial, the intervention was delivered by trained school staff (Adventure trial). The effects of this trial were less robust, but revealed results on alcohol use, binge drinking and drinking related problems, after six months and two years [71, 72].

Table 2. Overview RCT trials Preventure and Adventure programme

RCT trial	Target group	Results
Preventure trial Canada (*Conrod, Stewart, Comeau, Maclean, 2006; [48]*)	- 14-17 year - drinkers only - NT, AS and SS - 4 months results	- binge drinking: whole group and SS - no effects NT and AS - quantity: whole group
Preventure trial Engeland	- 13-16 year - drinkers and non-drinkers - NT, AS, IMP and SS - 2 waves: 1 alcohol use 2 drugs use	
Wave 1 (*Conrod, Castellanos, Mackie, 2008; [73]*)	- 12 months results alcohol	- alcohol use: SS-group, no effects NT, AS and IMP - binge drinking: SS-group, no effects NT, AS and IMP - latent growth: 6 months effects whole group and SS for alcohol use
Wave 2 (*Conrod, Castellanos, Mackie, 2011; [58]*)	- 24 months results alcohol	- alcohol frequency: 6 months whole group - binge frequency: 6 months effect whole group, no effects 12 and 24 months - no effects binge drinking - problem drinking: effect 24 months whole group
Wave 2 (*Conrod, Castellanos, Strang, 2010; [69]*).	- 24 months results drug use	- 24 months effects on cannabis, cocaine and other drugs use
Adventure trial England	- Teacher delivered - Mean age 13.7 year - NT, AS, IMP and SS	
Wave 1 (*O'Leary-Barret, Mackie, Castellanos, Conrod, 2010; [71]*)	- 6 months results	- alcohol use: effects for the whole group - binge drinking and drinking related problems: effects for the whole group
Wave 2 (*Conrod, O'Leary-Barrett, Newton, Topper, Castellanos, Mackie, Girard, 2013; [72]*)	- \24 months results	- alcohol use: effects for the whole group - binge drinking and growth in binge drinking: effects whole group - binge drinking quantity and frequency: whole group

With the Preventure trial in The Netherlands, it was the first time the prevention programme has been studied outside the setting where it was developed, England and Canada. For the first time the Preventure approach could prove its effectiveness in a different culture and a different educational setting. Besides, in our trial there was less involvement from the developers of the Preventure programme, and therefore more independent. The Australian trial was the second trial outside the development setting. It was carried out with the involvement of the developers of the programme (Conrod and her colleagues) and therefore less independent. In addition, in the Dutch trial we had the opportunity to study differences between educational levels, whether higher-educated students benefit more or less from the intervention than lower-educated students. In contrast to the English and Australian trials, where this was not studied because of different education systems.

Objectives and outline of this thesis

This thesis provides insight into the field of targeted alcohol prevention among young adolescents. The main objective is to provide insight in the effective components of targeted school based alcohol prevention, selective alcohol prevention programmes in particular. A meta-analysis has been conducted to elaborate the effective components of targeted prevention programmes in comparison with universal prevention programmes. As mentioned before, it is assumed that selective and indicated prevention are more effective approaches than universal prevention. At the same time the availability of these selective and indicated programmes in The Netherlands is scarce. There is a need for effective targeted prevention approaches to effectively target young adolescents with elevated risk for alcohol misuse. A promising approach is Preventure, a selective school-based prevention programme on alcohol misuse, that targets high-risk young adolescents with specific personality characteristics. A randomized controlled trial was carried out to test whether Preventure would be an effective prevention programme to use in the Dutch school setting.

The key questions of the thesis are:

(1) Are targeted school based prevention programmes (selective and indicated) more effective than universal prevention programmes to affect alcohol misuse among young adolescents? (**Chapter 2**)

(2) Which (intervention) characteristics are the effective components in selective and indicated school based alcohol prevention programmes compared to universal prevention programmes? (**Chapter 2**)

(3) What role do drinking motives have in the relationship between personality traits and alcohol misuse outcomes among young adolescents? (**Chapter 3**)

(4) Is the selective school based prevention programme Preventure effective in de Dutch culture and school setting? (**Chapters 4, 5**)

(5) Are there specific subgroups that benefit more from the selective school based prevention programme Preventure (personality traits, sex and educational level)? (**Chapter 6**)

Chapter 1

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Well the comedown here was easy
Like the arrival of a new day
Under the pressure, The War on drugs

CHAPTER 2

Universal and targeted school-based prevention programmes for alcohol misuse in young adolescents: a meta-analytic comparison

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Abstract

Aim: This study examines the differences in effectiveness between universal and targeted (selective and indicated) school-based alcohol prevention programmes. Five target groups at risk for harmful drinking patterns were distinguished, and it was examined which of these high-risk groups benefitted more from targeted prevention.

Methods: Three databases *(PsycINFO, Pubmed, and COCHRANE)* were searched for controlled studies of school-based programmes, which were evaluated on their effect on alcohol use. Multivariate meta-regression analysis was used to analyse the differences in effects between universal and targeted prevention, and between at-risk target groups.

Results: Our meta-analysis evaluated 134 publications of 161 distinct school-based prevention programmes, involving 205,521 adolescents, aged 11-18 years old (mean age of 13.4 years). Findings supported our hypothesis that targeted prevention (ES = -.13; 95% CI [-.18,-.09]) is more effective than universal prevention (ES = -.08; 95% CI [-.10,-.05]) in the prevention or reduction of alcohol misuse among adolescents (*p* < .04). The high-risk group of adolescents initiating alcohol use at an early age, was found to benefit most from targeted prevention strategies (ES = -.23; 95% CI [-.32,-,13]; *p* < .001).

Conclusions: The findings of the present study indicate that targeted alcohol prevention seems more effective than universal prevention among adolescents. When selective and indicated intervention strategies are applied, targeting the group of young adolescents who already have experiences with the use of alcohol at an early age, appears most effective.

Introduction

In adolescents, heavy alcohol consumption is associated with a range of negative health outcomes, such as traffic accidents, having risky sexual intercourse [1,2] learning difficulties and school dropout [3,4]. In addition, heavy alcohol use during puberty appears to be related to damage to the development of cognitive and emotional abilities [e.g., 5] and an elevated risk of later dependence and misuse [6,7]. Hence, prevention of heavy alcohol use among adolescents is essential.

Until today, efforts to control adolescents drinking behaviour mainly fall under universal prevention, which means prevention for the group of adolescents in general. Far fewer efforts have been done for adolescents who are at higher risk for initiating alcohol misuse at an early age and developing alcohol related problems at a later age; so-called selective and indicated prevention (targeted prevention). Several meta-analyses have indicated that universal programmes have effects on alcohol use and binge drinking [8-13], but these effects are small to modest and most often short term. Universal prevention programmes have a small impact on preventing or decreasing substance use and its consequences, because these programmes also tend to target a part of children and adolescents who will not initiate substance use during adolescence [11,16]. Besides, universal programmes are likely to be less effective for adolescents who have already initiated use and are at an increased risk for developing harmful drinking patterns [17]. For those adolescents, a targeted approach that is tailored to their specific needs and focuses on reducing or eliminating personal risk factors, could be more effective. Selective prevention strategies target subgroups of the general population, at risk for substance misuse. Recipients of selective prevention strategies are recruited to participate in the prevention effort because of that group's profile. Indicated prevention strategies identify individuals who are experiencing early signs of substance misuse and related problem behaviours associated with substance misuse and target them with special programs [e.g., 18]. The rationale is that selected and indicated programmes target young adolescents who are more likely to engage in risky behaviour, the effectiveness estimates obtained from these samples will be larger, and more likely significant, because of the large number of non-users in universal programmes [11,19]. In addition, selective and indicated programmes are more tailored to the target group, then universal programmes [11,19], as a result of which more health gain probably will be achieved.

In recent years several meta-analytic studies have been conducted on the effectiveness of (school based) preventive interventions on adolescent alcohol use, both universal and targeted interventions [20,21,22,23,8]. Though, none of these meta analyses explored the differences between the effectiveness of universal and targeted approaches. An exception is the meta-analysis by Shamblen and Derzon [11]. This study revealed that the observed

average impact of selective and indicated programmes on alcohol use is larger (d = .22) than that the impact of universal programmes (d = .12). Furthermore, only evaluations on mental health prevention programmes give indications of preferring targeted prevention above universal strategies. Meta-analyses of the effects of programmes for depression [24,25,26], anxiety [27], and aggression/anti-social behaviour [28], suggest that, programmes targeting adolescents at risk are more effective and have better cost-benefit ratios than universal prevention efforts. To further explore the differences between universal and targeted alcohol prevention, more research is needed.

Besides, more insight is needed for which high-risk groups for alcohol misuse targeted prevention is most effective. Although there are several reviews and meta-analyses on universal and targeted alcohol prevention programmes [20,21,22,23], it is not clear which specific high-risk groups benefit most from targeted prevention. The range of targeted prevention programmes for preventing alcohol misuse among young adolescents is diverse. Dependent on the target group, the objectives, methods and settings, the targeted prevention programmes differ. Risk factors for alcohol abuse can arise from the environment in which the young person grows up, such as young people who live in high crime or impoverished neighbourhoods, or are related to the behaviour or character of the young adolescent, such as young people with behaviour problems or certain personality traits. Although there is evidence for many risk factors, they are not all equally suitable for selecting participants for an intervention, e.g. genetic and physiological factors. In this study, we focused on groups that have been shown to be at increased risk of alcohol abuse and that emerged in research as a target group for interventions. Five target groups have been identified that are at increased risk of alcohol misuse and alcohol related problems [10,29], namely (1) adolescents with behavioural problems and/or mental health problems, (2) families who live in high crime or impoverished neighbourhoods, (3) adolescents from (ethnic) minority families, (4) adolescents in early stages of substance misuse and/or are experiencing negative consequences thereof, and (5) adolescents with elevated scores on certain (innate) personality traits, e.g. impulsivity. These target groups show overlap, some young adolescents have several risk factors. Because it makes sense to know which risk factor is the best selection criterion, studies were also included that focus on a combination of risk factors.

The current study is a follow-up of the meta-analysis of Onrust et al. [8] on the effects of various prevention strategies on substance use of children and adolescents in different developmental stages [8], We used a selection of the studies on alcohol use that were included in the meta-analysis of Onrust and her colleagues, and supplemented it with recently published studies. Included are studies examining school-based programmes, targeting adolescents (mean age between 11-18 years old across the studies) and evaluating alcohol use. In addition to the study by Onrust and colleagues, our meta-analysis explored the differ-

ences between universal and targeted preventive interventions, and the differences between several high-risk target groups.

Two questions are addressed in this meta-analysis: 1) Is universal prevention more or less effective than targeted prevention (selective and indicated prevention) in preventing or reducing alcohol misuse among adolescents, 2) Which of the five distinguished high-risk groups of adolescents benefits most from targeted alcohol prevention.

Methods

Selection of studies

Inclusion and exclusion criteria

Studies were eligible for review when (a) examining programmes delivered in the school setting, (b) targeting adolescents (mean age between 11-18 years old across the studies), (c) evaluating alcohol use (d) comparing the intervention with a control condition, and (e) reporting sufficient data to calculate effect sizes. Hence, only primary studies were included. There is an overlap in meta-analyses and review studies, and to prevent duplicate studies, only primary studies have been included. However, overview studies have been used to find additional primary studies.

Search strategy

This study utilizes a selection of the studies that were included in a recent meta-analysis on the effects of various prevention strategies on substance use of children and adolescents in different developmental stages [8], supplemented with recently published studies on the effects of school-based programmes on the alcohol use of adolescents. Three databases *(PsycINFO, Pubmed, and COCHRANE)* were searched for controlled studies of school-based programmes, which were evaluated on their effect on alcohol use. The computer search was restricted to studies published between January 2012 and February 2017, as older studies were already retrieved by Onrust and colleagues [8].

Studies were retrieved by a combination of key words and text words referring to alcohol use (*Substance-related disorders/prevention and control, Binge drinking/prevention and control, Alcohol Drinking/prevention and control, Risk-Taking)* in combination with a title and abstract search for school-based *(school, schools, schoolbased, school-based, schoolchild, school-children, classroom, classes, classical, student, students, course, courses)* programmes *(program, programmes, programmes, intervention, interventions, prevention, preventive)*. Filters were used for methodology *(controlled, random*, rct, controlled clinical trial, evaluation studies, meta-analysis, randomized controlled trial, review, program evaluation)* and language (*English, German and Dutch*).

In total, 1,415 titles were screened on relevance, resulting in the exclusion of 689 records. After removal of duplications, 522 abstracts were screened, resulting in the exclusion of 426 papers not meeting the inclusion criteria. The remaining publications were retrieved (12 publications were not available) and studied full-text. After studying the remaining publications full text, 60 publications were excluded. Most of them were excluded because the reported outcome measures did not include alcohol use. The remaining 24 publications were included in the analyses, combined with 110 publications that were selected from the study of Onrust and colleagues [8]. These publications reported on 134 studies, evaluating the effects of 161 distinct programmes. The coding procedure of programme characteristics has been carried out by two independent researchers with outstanding inter-rater reliability. Kappa coefficients corrected for chance agreement ranged from 0.81 to 1.00. Figure 1 depicts the retrieval and selection process.

Data extraction

Dependent variables: alcohol use

The dependent variable used in this study is alcohol use. We included several measures, ranging from the number (or percentage) of participants using alcohol to the number of alcoholic beverages consumed. If a single study reported multiple outcome measures per outcome category, these results were combined into a single effect size.

Independent variables: type of programme and target population

The type of programme (universal programme targeting all students or programme targeting high-risk students) and the target population of all included programmes were coded into dichotomous variables, '1' if a feature was present, and '0' if this was not the case. Coding is based on the description of the target population in the primary study and the participants. An '1' was given if the study focused on a specific population and the majority of the participants actually fulfilled this criterion. The target population of the interventions included in the study was coded as: (a) students that are not specifically at risk (no risk), (b) students with Low Socio Economic Status (SES), (c) students from (ethnic) minority families, (d) students with problem behaviour, (e) students who were already experimenting with alcohol , and (f) students with an elevated at risk personality trait.

Methodological covariates

In order to adjust for the impact of methodological features of the study, six methodological variables were constructed. Two variables were continuous variables, including (a) the year of publication and (b) the time in months between the delivery of the programme and the post-test. The other four dichotomous variables, referring to study quality based on the Cochrane Risk of Bias Tool [30], were: (c) randomization, (d) adequate handling of missing data, (e) free of selective reporting, and (f) free of other bias.

Computer search of electronic databases

1415 records identified through database searching:
- PsychINFO + Pubmed: 596
- COCHRANE Trials: 819

1415 records screened based on title

689 records excluded
- PsychINFO + Pubmed: 207
- COCHRANE Trials: 482

522 remaining records after duplicates removed

522 records screened based on abstract

426 records excluded

12 publications not available

84 records screened full-text

60 publications excluded:
- No primary study: 10
- Manuscript does not report results of the intervention: 7
- No control group: 2
- No relevant outcome measures: 19
- Not possible to calculate effect size: 4
- Reports same results as other included study: 11
- Included in Onrust et al. (2016): 7

24 new publications included

110 publications selected from Onrust et al. (2016)

134 publications included in the study reporting on 161 separate programs

Figure 1. Flow chart of retrieval and selection of studies.

Calculation of effect sizes

For each comparison between a school-based programme and a control condition, we calculated one effect size. Cohen's *d* was preferably calculated using the means and standard deviations of both the programme group and the control group (at post-test). If means and standard deviations were not reported, we used statistics that were reported for the test between the conditions (for instance *p* or *t*-value). In case of dichotomous outcomes, odds ratios were calculated, and these were converted to standardised effect sizes fol-

lowing Chinn [31]. In our study, effect sizes of zero indicated that there was no difference between the included programme and the control condition. Negative effect sizes indicated that students in the programme condition were less engaged in alcohol use than students in the control condition. According to Lipsey [32], a standardized effect size of less than -.32 corresponds to a small effect, effect sizes between -.32 and -.55 correspond to medium effect sizes and effect sizes larger than -.55 correspond to large effects.

Analysis

Unit of analysis

In this meta-analysis we included several studies that evaluated more than one school-based programme. The unit of analysis is the effect size per evaluated programme. Therefore, multiple programmes described in the same publication were coded and analysed separately.

Pooling effect sizes and heterogeneity

Pooled effect sizes across studies were calculated using the Stata command "metan", using the calculated effect size per programme and its standard error. As we included a wide variety of programmes, we expected considerable heterogeneity. Therefore, pooled effect sizes were calculated using the random-effects model, assuming that the included studies are drawn from populations of studies that may differ from each other not only due to sample error but also systematically. The extent of heterogeneity was expressed in the I^2 statistic: a value of 0% indicated no heterogeneity, and larger values show increasing heterogeneity, with 25% classified as low, 50% classified as moderate and 75% classified as high [33].

Meta-regression analyses and publication bias

The research question was addressed by means of multivariate meta-regression analysis. Subsequently, we performed sensitivity analyses adjusting the analyses for the influence of the studies' methodological features. All analyses were performed in Stata (version 12; StataCorp, Texas) using the downloadable procedure "metareg". Meta-analysis may be subject to publication bias, as studies with non-significant or negative findings are less likely to be published in peer-reviewed journals [34]. We first created a funnel plot, a graphical display of the study size against the programme effect. Publication bias will lead to an asymmetrical appearance of the funnel plot. Egger's regression test was performed as a proxy for publication bias captured by the funnel plot [35]. We used the PRISMA checklist when writing our report.

Results

Descriptive characteristics of reviewed studies

The meta-analytical dataset was based on 134 studies evaluating 161 programmes involving 205,521 adolescents. The mean age of these students ranged from 11 to 18 years of

age (mean age 13.4 years). In the majority of the evaluations, alcohol use was measured within 3 months after the implementation of the programme (58.4%). In the majority of the evaluations, a randomized design was used (81.4%). Almost all of the evaluations appeared free of selective reporting (91.9%), and the majority of the evaluations appeared free of other biases (62.7%). Adequate handling of missing data was present in the minority of evaluations (30.4%). The majority of programmes were universal programmes (70.8%). Programmes targeting a high-risk population, were mostly directed towards students already using alcohol (10.6%) and students with Low Socio Economic Status (6.2%) (see Table 1).

Universal versus targeted prevention

Meta-analysis of the studies on universal prevention programmes included in this study, resulted in a mean effect size of d = -.08 (95% Confidence Interval [CI] -.10,-.05). The overall mean effect size of the studies on prevention programmes targeting at risk groups was -.13 (95% CI [-.18,-.09]). The negative effect sizes indicate that adolescents in the programme condition were less engaged in alcohol use than students in the control condition. After using sensitivity analyses, i.e. adjusting the analyses for the influence of the studies' methodological features, the difference between the effect sizes of universal prevention programmes and targeted prevention programmes was significant (p = .04). This implies that targeted alcohol prevention programmes are more effective than universal alcohol prevention programmes. The effect sizes of both universal prevention programmes and targeted prevention programmes are small. The extent of heterogeneity was between moderate and high (universal prevention programmes I^2 = 70%; targeted prevention programmes I^2 = 67%).

The possible impact of publication bias on the effects was examined using Eggers' regression analyses. Both for the studies on universal prevention (t = -3.87, p < .001) and the studies on targeted prevention (t = -4.55, p < .001), the Eggers' tests were significant, which implies publication bias. However, the Failsafe test revealed that for universal programmes 1920 studies were needed to nullify the effects. For targeted prevention programmes 791 studies are needed. This indicates that the effects of publication bias are minimal. The results of the meta-analyses are shown in Table 2.

At-risk groups

Several target groups known to be at-risk of alcohol misuse and alcohol related problems, can be distinguished. In order to examine which of these different groups at risk benefit most from targeted prevention, five subgroups at risk for alcohol misuse were determined. These groups were not completely distinctive, some prevention programmes were aimed at multiple high-risk groups, e.g. young adolescents with elevated personality traits that had already consumed alcohol.

Multivariate meta-regression analyses of the studies on the different at-risk subgroups, resulted in mean effect sizes ranging from -.10 to -.23 (see Table 2). The subgroup with

Table 1. Descriptive characteristics of 161 school based programmes

General publication features	n	%
Date of report		
1970 - 1979	2	1.2
1980 - 1989	12	7.5
1990 - 1999	24	14.9
2000 - 2009	74	46.0
2010 - 2017	49	30.4
Time between programme delivery and post-test		
< 3 months	94	58.4
3 – 6 months	42	26.1
7 – 12 months	14	8.7
13 – 24 months	5	3.1
> 24 months	6	3.7
Methodological characteristics		
Randomization	131	81.4
Adequate handling of missing data	49	30.4
Free of selective reporting	148	91.9
Free of other bias	101	62.7
Age groups		
Grade 6 and 7 students (mean age 12.1 years)	93	57.8
Grade 8 and 9 students (mean age 14.1 years)	39	24.2
Grade 10 – 12 students (mean age 16.4 years)	29	18.0
Type of programme		
Universal programme	114	70.8
Programme for high-risk students	47	29.2
Risk group targeted		
No risk	114	70.8
Low Socio Economic Status	10	6.2
Ethnic minority	9	5.6
Problem behaviour	9	5.6
Substance use	17	10.6
At risk personality	6	3.7

an effect size that differed significantly from the effect sizes of the other four subgroups is the group of adolescents who already have experiences with consumption of alcohol use (n = 17; ES = -.23; 95% CI [-.32, -,13]; p < .001). The extent of heterogeneity ranged from moderate (group of ethnic minorities I^2 = 45%) to high (group with experience of alcohol use I^2 = 77%), except for the group of low SES, which showed no heterogeneity (I^2 = 1%).

Table 2. Results of meta-analyses between universal prevention and targeted prevention and multivariate meta-regression analyses of at risk groups

	ES	SE	N	95% CI Lower limit	95% CI Upper limit	p	I²	t
Universal	-.08	.02	114	-.10	-.05	<.001	70%	-3.87
Targeted	-.13	.03	47	-.18	-.09	<.001	67%	-4.55
At risk groups								
Low SES	-.11	.02	10	-.16	-.07	<.001	10%	1.04
Ethnic minority	-.10	.03	9	-.17	-.02	<.001	46%	-0.80
Problem behav	-.16	.07	9	-.29	-.04	.021	70%	-2.25
Alcohol use	-.23	.06	17	-.32	-.13	<.001	77%	-3.48
Personality	-.17	.05	6	-.31	-.03	.020	68%	-1.87

ES = Effect Size; SE = Standard Error; N = Number of studies included; CI = Confidence Interval; P = p-value; I = measure of consistency between studies; t = t-test of Egger Regression analysis.

Again, the impact of publication bias on the effects was examined using Eggers' regression analyses. For the studies on prevention programmes targeting adolescents who already have used alcohol, the Eggers' test was significant (t = -3.48, p < .001), which implies publication bias. However, the Failsafe test revealed that 155 studies were needed to nullify the effects found for this group, which minimized the effect of publication bias.

Discussion

In this meta-analysis we included 134 studies, evaluating the effects of 161 distinct universal and targeted school-based alcohol prevention programmes in adolescents. The aim of the present study was to examine whether universal prevention is as effective as targeted prevention (selective and targeted prevention) on preventing alcohol misuse in young adolescents. Our findings suggest that the impact of targeted prevention programmes on preventing or reducing alcohol misuse among adolescents may be larger than the impact of universal prevention programmes on alcohol misuse, although the effect is small on average.

The effect sizes of our analyses are similar to the small to moderate effect sizes reported in three previous meta-analyses. Carey and colleagues [12,13] found small effect sizes on alcohol use among college students. Shamblen and Derzon [11] found a significant difference between universal prevention programmes (d = .07) and selective and indicated prevention programmes (d = .22). The effect size of universal prevention is similar to our findings, whereas the effect size of selective and indicated prevention differs from our findings. An explanation of this difference may lie in differential characteristics of the interventions studied. The smaller effect size in our meta-analyses may have derived from the inclusion of younger populations. In the other three meta-analyses both adult and college populations

are included too. Within these older populations, the group of alcohol drinkers is more manifest and, therefore, selective and indicated prevention programmes may be more effective. This corresponds with the findings of a recent meta-analyses of Onrust et al. [8]. In this study a small effect size on alcohol was found for programmes for grade 6 and 7 high-risk students (d = -.10) and a medium effect size for high-risk students in an older age group (grade 10 to 12 students) (d = -.32).

A few side-notes can be made. It is not clear whether the intervention or the selection of adolescents determines the difference in effect sizes. In a group of at-risk adolescents an effect size of -.13 can be found with a targeted intervention, while an universal intervention including the whole sample would show an effect size of -.08. Theoretically it could be that the effect size of this universal intervention is also -.13 in the same subgroup of high-risk adolescents, and 0 in the non-risk group. In addition, with universal prevention greater societal gain could be obtained by achieving a small reduction in alcohol misuse within a larger group of 'risky' drinkers with less serious problems, than by trying to reduce problems among a smaller number of heavy drinkers with more serious problems (the so called prevention paradox).

The range of targeted prevention programmes for preventing alcohol misuse among young adolescents is diverse, as was also reflected in the I^2 statistics. We distinguished different groups of adolescents at risk for alcohol misuse in order to examine which of these different groups at risk benefit most from targeted prevention. Within the group of the targeted prevention programmes, five subgroups were distinguished. The group of adolescents who already used alcohol differed significantly from the other subgroups. Although there was some overlap between the at-risk groups, this suggests that selective and indicated alcohol prevention may be most effective when it is targeted at young adolescents in an early stage of alcohol use. Previous studies on alcohol use among adolescents [e.g., 36,37,38] showed that an early onset of alcohol use was identified as a risk trajectory for adverse behaviour, e.g., escalation of alcohol use and the use of other substances, later during adolescence. And early alcohol misuse, e.g. drunkenness had shown to be a risk factor for problem behaviours among adolescents [39]. Several meta-analyses concluded that larger effects of prevention programmes were associated with higher levels of initial problems, among which alcohol use, before and during the trajectory of prevention efforts aimed at young adolescents [10,13,40].

Strengths and limitations

Although there are several reviews and meta-analyses available on the effectiveness of alcohol use prevention and interventions, only a few examined the difference between universal and targeted prevention. Besides, none of these studies considered the effectiveness of these programmes while taking into account the different target groups at risk. Our study not only examined the differences between universal and selective/indicated prevention, but also

distinguished different target groups at risk within the group of selective and indicated prevention programmes. This results in concrete recommendations to improve the effectiveness of preventive alcohol interventions. Other strengths of our study are the systematic search strategies, the coding of programme characteristics by two independent researchers with outstanding inter-rater reliability, and sensitivity analyses in order to adjust for methodological features of the reviewed studies.

This study has also some limitations. In our study, we based our conclusion on the results of multivariate meta-regression analyses. Meta-regression analysis is the meta-analytical equivalent of regression analysis in primary studies. Because our conclusions are based on regression coefficients expressing the strength of an alcohol use prevention strategy on behavioural outcomes, some caution is warranted regarding conclusions on causality. Still, our study only included controlled studies with longitudinal data, in which the utilization of the alcohol use prevention strategies was antecedent to the measurement of behavioural outcomes, strengthening etiological inference.

Another limitation is that the conclusions were only based on the variables that were included in the analyses. It is always possible that the variability in programme effects is related to unmeasured variables. For example, intervention components, e.g. duration, group versus individual meetings, practitioner experience, were not incorporated in the models. This limitation, however, is not unique for meta-analyses. Finally, we excluded a number of studies due to the fact that we were not able to calculate effect sizes. Considering the size of our study, we were not able to contact all authors of studies with missing data. Exclusion of these studies, however, could have influenced our findings to some extent.

Conclusion

Although the effect sizes found in this study are relatively small, the use of targeted preventive interventions, especially among the group of adolescents who already have experimented with alcohol use, may have a considerable public health impact due to both the short and long-term negative (health) effects of alcohol. Besides universal prevention, future alcohol prevention efforts among young adolescents should be focused on selective and indicated intervention strategies, especially targeting the group of young adolescents who already have experiences with the use of alcohol at an early age.

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Appendix 1. Studies included in the meta-analyses

Study	Intervention	N Experimental condition	N Control condition	Allocation Randomized	Addressing incomplete data	No signs of selective reporting	Free of other Bias	Target population	Effect size (d)
Amundsen, 2010	Ölweus Bullying Program	573	573	0	0	1	0	Universal intervention	0,006
Asseltine, 2000	Across Ages Curriculum	135	138	1	0	1	1	Universal intervention	-0,235
	Across Ages Combined	85	138	1	0	1	1	Universal intervention	-0,299
Bagnall, 1990	Alcohol Education	1040	520	0	0	1	0	Universal intervention	-0,167
Bodin, 2011	Örebro Prevention Program	893	859	1	1	1	1	Universal intervention	-0,178
Bond, 2004	Gatehouse Project	1282	1208	1	1	1	1	Universal intervention	0,007
Botvin, 1984a	Life Skills Training	948	237	1	0	1	0	Universal intervention	-0,159
Botvin, 1984b	Life Skills Training	94	73	1	0	1	1	Universal intervention	0,225
Botvin, 2001	Life Skills Training	2144	1477	1	0	0	1	Ethnic minority	-0,127
Buhler, 2008	Life Skills Approach	256	192	1	1	1	0	Universal intervention	0,017
Caplan, 1992	Positive Youth	109	173	1	0	1	1	Universal intervention	-0,214
Cho, 2005	Reconnecting Youth	532	615	1	1	0	0	Problem behaviour	0,005
Clark, 2010	Project SUCCESS	752	978	1	1	1	1	Problem behaviour	-0,04
Cohen, 1995	Combined intervention	359	359	1	0	0	0	Universal intervention	-0,399
	Combined intervention	428	428	1	0	0	0	Universal intervention	0
Conrod, 2006	Preventure	151	115	1	1	1	0	At risk personality Substance use	-0,342
Conrod, 2008	Preventure	199	169	1	1	1	0	At risk personality Substance use	-0,182

Chapter 2

Appendix 1. Studies included in the meta-analyses (continued)

Study	Intervention	N Experimental condition	N Control condition	Allocation Randomized	Addressing incomplete data	No signs of selective reporting	Free of other Bias	Target population	Effect size (d)
Conrod, 2011	Preventure	196	168	1	1	1	1	At risk personality Substance use	-0,259
Cook, 1984	Positive Alternatives for Youth	77	57	1	0	1	0	Universal intervention	-0,274
Cuijpers, 2002	Healthy School and Drugs	783	622	0	0	1	1	Universal intervention	-0,246
Dent, 2001	Project Towards No Drug Abuse	340	340	1	0	0	0	Universal intervention	-0,149
DeWit, 2000	Opening Doors	87	80	1	0	0	0	Problem behaviour Substance use	-0,313
Dielman, 1986	Alcohol Misuse Prevention Study	947	458	1	0	1	1	Universal intervention	-0,08
Dishion, 2002	Adolescent Transition Program	272	292	1	0	1	0	Universal intervention	-0,336
Donnelly, 2001	CARE project	426	413	0	0	1	0	Low SES	0,083
Dukes, 1996	DARE	248	176	0	0	1	0	Universal intervention	0,052
Eisen, 2002	Lions-Quest Skills for Adolescence	3119	3119	1	0	1	1	Universal intervention	-0,027
Elder, 2002	Community-based prevention program	280	257	1	0	1	1	Ethnic minority	0,215
Ellickson, 1990	Project ALERT	1926	1926	1	0	1	1	Universal intervention	-0,007
Espada, 2012	Social Skill training	98	87	1	1	1	1	Universal intervention	0,206
	Problem Solving Skill training	86	87	1	1	1	1	Universal intervention	0,175
	Combined program	86	87	1	1	1	1	Universal intervention	-0,0154
Evers, 2012	Intervention based on transtheoretical model of change	565	554	1	0	0	1	Substance use	-0,101

Appendix 1. Studies included in the meta-analyses (continued)

Study	Intervention	N Experimental condition	N Control condition	Allocation Randomized	Addressing incomplete data	No signs of selective reporting	Free of other Bias	Target population	Effect size (d)
Faggiano, 2008	Unplugged	3196	3174	1	0	1	1	Universal intervention	-0,193
Fearnow-Kenney, 2003	All Stars Sr.	339	206	1	0	1	0	Universal intervention	-0,31
Fraguela, 2003	Life Skills Approach	392	332	0	0	1	1	Universal intervention	-0,198
Gabrhelik, 2002	Unplugged	914	893	1	0	1	1	Universal intervention	0,107
Gersick, 1988	Social Cognitive Skill development	581	528	1	0	1	0	Universal intervention	0,073
Gmel, 2012	Brief Alcohol Intervention	338	330	1	1	1	1	Substance use	-0,012
Goodstadt, 1982	Alcohol Education	676	677	0	0	1	0	Universal intervention	-0,077
	Alcohol Education	342	342	0	0	1	0	Universal intervention	-0,017
Griffin, 2009	Brave	92	86	1	0	1	1	Ethnic minority	-0,19
Grunstein, 2007	Rock Eisteddfod Challenge (dance/ drama competetion)	216	375	0	0	1	0	Universal intervention	-0,132
Hallgren, 2011	PRIME for Life	400	334	1	0	1	1	Universal intervention	0,004
Hanssen, 1991	Resistance training	534	534	1	0	1	0	Universal intervention	0
	Normative Education	534	534	1	0	1	0	Universal intervention	-0,44
Hawthorne, 1995	Life Education	1721	1298	0	0	1	1	Universal intervention	0,172
Hecht, 2003	Keepin'it REAL	4254	2044	1	0	1	0	Low SES Ethnic minority	-0,148
Horan, 1982	Assertiveness training	24	24	1	0	1	0	Other risk population	-0,725
	Discussion Group	24	24	1	0	1	0	Other risk population	0,015

Appendix 1. Studies included in the meta-analyses (continued)

Study	Intervention	N Experimental condition	N Control condition	Allocation Randomized	Addressing incomplete data	No signs of selective reporting	Free of other Bias	Target population	Effect size (d)
Hurry, 2000	Project Charlie	41	268	0	0	1	0	Universal intervention	-0,349
Johnson, 1990	Multi-component intervention	552	552	1	0	1	0	Universal intervention	0,025
Kim, 1993	hlay 2000	170	58	0	0	1	0	Universal intervention	-0,068
Kimber, 2008	Social and Emotional Training Program	89	41	0	0	1	0	Universal intervention	0,17
Komro, 2004	Project Northland	2501	3079	1	1	1	1	Ethnic minority	0
Koning, 2009	Örebro Prevention Program	689	779	1	0	1	1	Universal intervention	-0,175
	Social Influence approach	771	779	1	0	1	1	Universal intervention	-0,019
	Combined program	698	779	1	0	1	1	Universal intervention	-0,22
Koutakis, 2008	Örebro Prevention Program	339	366	0	1	1	0	Universal intervention	-0,55
Kulis, 2005	Keepin'it REAL	2397	1005	1	0	1	0	Ethnic minority	-0,109
Kulis, 2007	Keepin'it REAL	1050	314	1	0	1	0	Universal intervention	-0,291
Lerner, 2003	Best Friends	1365	1365	0	0	1	0	Universal intervention	-0,357
Lochman, 2002	Coping Power Program	55	55	1	0	1	1	Universal intervention	-1,271
	Coping Power Program	52	55	1	0	1	1	Problem behaviour	-0,878
	Combined program	54	55	1	0	1	1	Problem behaviour	-0,472
LoSciuto, 1988	Project PRIDE	495	248	1	0	1	0	Universal intervention	-0,152
LoSciuto, 1999	Woodrock Youth Development Project	244	474	1	0	1	1	Low SES / Ethnic minority	-0,193

Appendix 1. Studies included in the meta-analyses (continued)

Study	Intervention	N Experimental condition	N Control condition	Allocation Randomized	Addressing incomplete data	No signs of selective reporting	Free of other Bias	Target population	Effect size (d)
McCambridge, 2005	Motivational Interviewing	84	78	1	0	1	1	Substance use	-0,981
McNeal, 2004	All Stars	607	607	1	0	1	0	Universal intervention	-0,227
	All Stars	607	607	1	0	1	0	Universal intervention	-0,787
Menrath, 2012	Life Skills Approach	528	528	1	0	1	0	Universal intervention	-0,172
Morgenstern, 2009	Alcohol Education	839	847	1	1	1	1	Universal intervention	-0,211
Moskowitz, 1983	Multi-component intervention	335	217	0	0	1	0	Universal intervention	-0,145
Newman, 1992	Resisting Pressures to drink and drive	1642	1158	1	0	1	0	Universal intervention	-0,065
Newton, 2009	Climate	247	283	1	0	1	0	Universal intervention	-0,085
O'Leary-Barret, 2010	Adventure	624	384	1	1	1	1	At risk personality	-0,169
Padget, 2005	Protecting You / Protecting Me	188	141	0	1	1	1	Universal intervention	-0,572
Park, 2000	Preparing for the Drug Free Years	184	176	1	0	1	1	Low SES	0,022
Peleg, 2001	Alcohol Abuse Prevention program	385	375	0	0	1	0	Universal intervention	-0,661
Perry, 1996	Project Northland	1030	1030	1	1	1	1	Universal intervention	-0,091
Perry, 2003	DARE	2518	2108	1	1	1	1	Universal intervention	-0,02
	DARE Plus	2635	2108	1	1	1	1	Universal intervention	-0,054
Pierre, 2005	Project ALERT	550	550	1	1	1	1	Universal intervention	-0,076
Piper, 2000	Healthy for Life	758	898	1	1	1	1	Universal intervention	0,13
	Healthy for Life	827	898	1	1	1	1	Universal intervention	0,13

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Appendix 1. Studies included in the meta-analyses (continued)

Study	Intervention	N Experimental condition	N Control condition	Allocation Randomized	Addressing incomplete data	No signs of selective reporting	Free of other Bias	Target population	Effect size (d)
Pierre, 2005	Project ALERT	550	550	1	1	1	1	Universal intervention	-0,076
Resnicow, 2008	Life Skills Approach	1529	1404	1	1	1	1	Universal intervention	0,145
Ringwalt, 2009	Keep left	1751	1404	1	1	1	1	Universal intervention	0,082
	Project ALERT	2765	2805	1	0	1	1	Universal intervention	-0,041
Rohrbach, 2010	Project Towards No Drug Abuse	1857	681	1	0	1	1	Universal intervention	0,005
Rosenbaum, 1994	DARE	859	709	1	0	1	1	Universal intervention	0,053
Scholz, 2000	Smoking prevention	878	720	1	0	1	0	Universal intervention	0,016
Schulte, 2010	Project Options	327	1728	0	0	1	0	Universal intervention	0,008
Severson, 1991	Project PATH	610	483	1	0	1	0	Universal intervention	0,165
	Project PATH	172	503	1	0	1	0	Universal intervention	0,165
Shetgiri, 2011	Intervention to reduce violence and substance abuse	40	46	1	0	1	0	Ethnic minority Problem behaviour	-0,184
Shope, 1994	Enhanced Alcohol Misuse Prevention Study	840	885	1	0	1	1	Universal intervention	0,004
Shope, 1996	Michigan Model for Comprehensive School Health Education	308	134	1	0	1	0	Universal intervention	0,032
Simons-Morton, 2005	Going Places	692	628	1	0	1	0	Universal intervention	-0,121
Slater, 2006	All Stars	1054	1054	0	1	1	0	Universal intervention	-0,33
Sloboda, 2009	Take Charge of your Life	10028	7292	0	0	1	1	Universal intervention	0,044

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Appendix 1. Studies included in the meta-analyses (continued)

Study	Intervention	N Experimental condition	N Control condition	Allocation Randomized	Addressing incomplete data	No signs of selective reporting	Free of other Bias	Target population	Effect size (d)
Smart, 1976	Peer oriented drug education program	262	133	0	0	1	0	Universal intervention	-0,155
Smith, 2004	Life Skills Training	244	244	1	1	1	1	Low SES	-0,056
	Infused Life Skill Training	244	244	1	1	1	1	Low SES	-0,028
Spoth, 2002	Life Skills Training	618	491	1	1	1	1	Universal intervention	-0,036
	Combined program	541	491	1	1	1	1	Universal intervention	-0,285
Stuart, 1974	Drugs Education	515	253	1	0	1	0	Universal intervention	0,299
Sun, 2006	Project Towards No Drug Abuse	756	318	1	0	1	1	Problem behaviour	0,034
Sun, 2008	Project Towards No Drug Abuse	688	609	1	0	1	1	Universal intervention	0
Sussman, 2003	Project Towards No Drug Abuse	192	192	1	0	1	1	Other risk population	-0,077
Sussman, 2003	Project Towards No Drug Abuse	192	192	1	0	1	1	Other risk population	-0,09
Sussman, 2012	Project Towards No Drug Abuse	1135	569	1	0	1	1	Problem behaviour	-0,217
Tebes, 2007	Positive Youth Development Program	149	155	0	0	1	1	Universal intervention	-0,556
Telch, 1990	Social Influence approach	116	200	1	0	1	0	Universal intervention	-0,042
	Social Influence approach	121	200	1	0	1	0	Universal intervention	-0,066
Vogl, 2009	Climate	611	855	1	0	0	0	Universal intervention	-0,061
Webster, 2002	Peer support program	169	157	0	0	1	0	Universal intervention	-0,133
Werch, 1996	Stars	60	64	1	0	1	0	Low SES Ethnic minority	-0,721

Appendix 1. Studies included in the meta-analyses (continued)

Study	Intervention	N Experimental condition	N Control condition	Allocation Randomized	Addressing incomplete data	No signs of selective reporting	Free of other Bias	Target population	Effect size (d)
Werch, 1998	Stars	88	99	1	0	1	1	Low SES	0,046
Werch, 2000	Stars	71	71	1	0	0	1	Universal intervention	-1,242
Werch, 2001	Stars	281	284	1	0	1	1	Universal intervention	-0,446
Werch, 2005	Alcohol Education	100	101	1	0	0	0	Substance use	-0,119
Werch, 2010	Planned Succes Intervention	179	181	1	0	1	1	Universal intervention	-0,021
Werch, 2011	Project Active	227	224	1	0	1	1	Universal intervention	-0,216
West, 2008	Project Northland	362	462	1	1	1	1	Universal intervention	-0,006
Wilhelmsen, 1994	Social Cognitive Skill development	278	260	1	0	1	0	Universal intervention	-0,175
Winters, 2007	Motivational Interviewing	26	26	1	0	1	1	Substance use	-0,844
	Motivational Interviewing	26	26	1	0	1	1	Other risk population	-1,335
Winters, 2012	Motivational Interviewing	134	55	1	0	1	1	Substance use	-0,631
	Motivational Interviewing	122	55	1	0	1	1	Substance use	-0,733
Wolfe, 2009	Fourth R: Skills for your relationship	968	754	1	1	1	1	Universal intervention	0,058
Wragg, 1986	Drugs Education	24	27	0	0	1	0	Universal intervention	-0,287
Bannink, 2014	E-health4Uth	392	434	1	0	0	1	Universal intervention	-0,058
	E-Health4Uth and Consultation Intervention	430	434	1	0	0	1	Other risk population	0,107
Champion, 2016	Climate Schools: Alcohol and Cannabis	576	527	1	0	1	1	Universal intervention	-0,069

Appendix 1. Studies included in the meta-analyses (continued)

Study	Intervention	N Experimental condition	N Control condition	Allocation Randomized	Addressing incomplete data	No signs of selective reporting	Free of other Bias	Target population	Effect size (d)
Doumas, 2014	eCHECKUP TO GO	205	205	1	0	1	0	Universal intervention	-0,0159
DuPont, 2013	Random student drug testing	2483	1427	0	1	1	1	Universal intervention	-0,029
Fekkes, 2016	Skills for Life	663	332	0	0	1	1	Universal intervention	-0,137
Guo, 2015	Intervention based on TPB and life skills training	1153	904	1	1	1	1	Universal intervention	-0,101
Harris, 2017	Urge Surfing	25	29	1	0	1	1	Substance use	-0,459
Haug, 2017	Web- and Text Messaging-Based Intervention	547	494	1	1	1	1	Universal intervention	-0,141
Isensee, 2015	Klasse2000	272	229	0	0	1	1	Universal intervention	-0,243
Jander, 2016	Alcohol Alert	1622	1027	1	0	1	1	Universal intervention	-0,455
Lammers, 2015	Preventure	343	356	1	1	1	1	Substance use At risk personality	0,013
Malmberg, 2015	Healthy School and Drugs - Elearning Condition	563	521	1	1	1	1	Universal intervention	0,092
	Healthy School and Drugs - Integral Condition	543	521	1	1	1	1	Universal intervention	-0,04
Mares, 2012	In control: No alcohol!	540	601	1	0	0	1	Universal intervention	-0,006
Marsiglia, 2014	Keepin' it REAL	226	206	1	1	1	1	Universal intervention	-0,152
McKay, 2014	SHAHRP teacher-led	600	847	0	1	1	1	Universal intervention	0,114

Appendix 1. Studies included in the meta-analyses (continued)

Study	Intervention	N Experimental condition	N Control condition	Allocation Randomized	Addressing incomplete data	No signs of selective reporting	Free of other Bias	Target population	Effect size (d)
	SHAHRP external facilitator	902	847	0	1	1	1	Universal intervention	-0,045
Melnyk, 2013	COPE Healthy Lifestyles TEEN	320	377	1	0	1	1	Universal intervention	-0,428
Midford, 2013	Drug Education in Victorian Schools (DEVS)	1161	585	1	1	1	1	Universal intervention	-0,201
Newton, 2016	Preventure	202	291	1	1	1	1	Substance use At risk personality	-0,282
Stewart, 2016	Enhanced Motivational Interviewing	152	92	1	0	1	1	Substance use	0
Sanchez, 2016	Unplugged	534	673	1	1	1	1	Universal intervention	-0,144
Rohde, 2012	CBT depression prevention	89	84	1	1	1	1	Other risk population	-0,294
Williams, 2017	Keepin' it REAL	136	139	1	0	1	1	Ethnic minority	-0,101
	Keepin' it REAL + FPNG (parent program)	118	139	1	0	1	1	Ethnic minority	0,132
Voogt, 2013	What do you drink?	318	291	1	1	1	1	Substance use	-0,034
Toumbourou, 2013	Resilient Families	1106	1179	1	1	1	1	Universal intervention	-0,167
Wagner, 2014	Guided Self Change (MI and CBT)	279	235	1	1	1	1	Problem behaviour Substance use	-0,45

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I used to dance alone of my own volition
I used to wait all night for the rock transmissions
I used to, LCD Soundsystem

CHAPTER 3

Mediational relations of substance use risk profiles, alcohol-related outcomes, and drinking motives among young adolescents in The Netherlands

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Abstract

Aim: To examine the mediation by drinking motives of the association between personality traits (negative thinking, anxiety sensitivity, impulsivity, and sensation seeking) and alcohol frequency, binge drinking, and alcohol-related problems using a sample of students (n=3053) aged between 13 and 15, who reported lifetime use of alcohol.

Method: Structural equation modeling was used to examine the relationship between personality traits and alcohol-related outcomes. The Model Indirect approach was used to examine the hypothesized mediation by drinking motives of the association between personality traits and alcohol-related outcomes.

Results: In this study among young adolescents, coping motives, social motives and enhancement motives played a prominent mediating role between personality and the alcohol outcomes. Multi-group analyses revealed that the role of drinking motives in the relation between personality and alcohol outcomes were largely similar between the sexes, though there were some differences found for binge drinking. More specifically, for young males, enhancement motives seems to play a more prominent mediation role between personality and binge drinking, while for young females, coping motives play a more mediating role between personality and binge drinking. Few mediation associations were found for conformity motives, and no relationships were found between anxiety sensitivity and drinking motives.

Conclusions: Already in early adolescence, personality traits are found to be associated with drinking motives, which in turn are related to alcohol use. This study provides indications that it is important to intervene in early adolescence with interventions focusing on personality traits in combination with drinking motives.

Introduction

Alcohol use among adolescents is a persistent problem in the Netherlands, especially binge drinking. Of the Dutch 12- to 16-year-olds who drink alcohol, 67% also engage in binge drinking [1], defined as consuming five or more alcoholic drinks on one occasion in the previous month. In addition, youngsters in The Netherlands start drinking at an early age: 46% of 12-year-old males report having consumed alcohol; for females, this is 36% [1]. Since early and heavy drinking has severe negative health consequences [e.g., 2, 3], it is important to get more insight into the correlates and underlying mechanism of the development of alcohol use in underage drinkers.

Previous studies have convincingly shown that substance use is associated with personality. Personality dimensions are an expression of biologically based systems that regulate the different sensitivities of individuals to negative and positive affective stimuli [4]. Personality dispositions involving neurotic tendencies or deficits in behavioural inhibition have been found to predict alcohol use and misuse [5, 6, 7, 8]. One instrument that measures personality dimensions specific to substance use is the Substance Use Risk Profile Scale (SURPS) [8]. This newly developed instrument distinguishes four distinct and independent personality traits (i.e. negative thinking, anxiety sensitivity, impulsivity, and sensation seeking) that have subsequently been found to be strongly related to adolescents' quantity and frequency of drinking, binge drinking, and severity of alcohol-related problems [7, 9, 8].

To provide more insight into the underlying mechanism of the development of alcohol use and alcohol-related problems, it is important to consider not only distant predictors such as personality traits, but also more proximal predictors, like drinking motives [10, 11]. Several studies have suggested that drinking motives play a pivotal role in young people's drinking and the development of alcohol-related problems [6, 12, 13, 14, 11]. Various studies have demonstrated that social motives (drinking to celebrate with others) are related to frequent but moderate drinking, enhancement motives (drinking to have fun and to get drunk) and coping (drinking to alleviate problems and worries) are related to heavy drinking, and conformity motives (drinking to be liked and to fit in with a peer group) are related to low levels of drinking, but together with coping motives they are associated with a higher level of alcohol-related problems [12, 10, 14].

A few studies have examined the mediating role of drinking motives with respect to the relationship between personality and patterns of alcohol use [15, 16, 17, 18, 11]. However, these studies focus mainly on young adults (i.e. college students; 18-24 years) rather than adolescents. Early adolescents in particular have been found to be vulnerable to risky personality predispositions [19, 20]. Risk behaviour, besides having genetic and environmental factors, is thought to be due to a combination of lack of logical reasoning and psychosocial factors. Whereas logical-reasoning abilities seem relatively developed around age 15 years,

psychosocial abilities relating to decision making and moderate risk taking are thought to continue to develop into young adulthood [21].

The SURPS captures specific personality dimensions concerning emotion regulation tendencies (anxiety sensitivity and negative thinking) and deficits in behavioural inhibition (impulsiveness and sensation seeking) and may therefore help to explain individual receptivity to substance use during the period of adolescence. Moreover, elucidating the interplay within young adolescent drinking behaviour between relevant and distinct risky personality traits and the different possible motives to drink, may provide for the construction of more developmentally appropriate interventions targeting juvenile drinking.

Almost all research on the mediating role of drinking motives in the association between personality and alcohol use has come from North America, with the two exceptions of Kuntsche et al. [17] and Urbán et al. [22]. It is imperative to study these relations in The Netherlands as alcohol prevalence is higher in Europe in general and in The Netherlands in particular [1]. Hence, in The Netherlands, the age of onset is low compared to other European countries [1], and the legal age for drinking is much lower than that in, for example, North America (16 vs. 21, respectively). Therefore, the aim of this study was to examine more closely the drinking behaviour in underage drinkers with relatively easy access, and few barriers, to alcohol use. On the basis of a review of young people's drinking motives, Kuntsche et al. [10] distinguished two patterns of use. Adolescents who were characterized as extravert, impulsive, aggressive, and sensation seekers with low inhibitory control drank for enhancement motives, used alcohol excessively, including binge drinking, and were more likely to be male. Adolescents who were neurotic and fearful of anxiety-related sensations drank for coping motives, experienced more alcohol-related problems, and tended to be female. Consistent with these findings, Magid et al. [11] found that these two pathways differed between male and female adolescents: the path from enhancement motives to alcohol use was stronger for males and the path from coping to alcohol-related problems was stronger for females.

Using a sample of 13- to 15-year-olds in The Netherlands, the primary aim of this study was to determine whether previous findings of relations between personality traits and drinking motives extend from young adults to young adolescents. It is not self-evident that drinking motives, and their associations with alcohol use and personality, in early adolescents are the same as in late adolescents or young adults. On the basis of previous studies on personality and drinking motives [6, 15, 16, 17, 18, 11], we expected (1) two patterns: the effect of extraversion and the novelty seeking traits *sensation seeking* and *impulsivity* on alcohol use was expected to be mediated by enhancement and social motives, and the effect of the neuroticism-related traits *anxiety sensitivity* and *negative thinking* on alcohol use and alcohol-related problems was expected to be mediated by coping motives; (2) that these patterns would be sex specific: we expected the pathway from extraversion traits to enhancement and social motives to alcohol outcomes to be more pronounced in male

young adolescents, and the pathway from neuroticism-related traits to coping motives to alcohol-related outcomes to be more specific for female adolescents. Research has shown that there are differences between males and females [e.g., 10, 11, 9].

Method

Participants and procedure

Cross-sectional data for this study were obtained from a larger effectiveness study, called Preventure. Preventure is a selective prevention program for binge drinking among young adolescents [7]. A total of 100 schools were selected randomly from a list of all public secondary schools in the Netherlands (N = 405). These schools fulfilled the following inclusion criteria: 1. at least 600 students, 2. < 25% of students from migrant populations, and 3. not offering special education. A total of 15 schools were willing to participate. Those schools were representative in terms of level of education and geographical spread. A screening survey (at baseline) among all students attending grades 8 and 9 was carried out at the participating schools. The data were collected in September–October 2010. The study design was approved by the Medical Ethical Commission for Mental Health. The Preventure study method is described in a study protocol [23].

A total of 5,057 students participated in the first baseline wave of the Preventure study. Because drinking motives were not relevant for non-drinkers (39.6%), the sample was restricted to those students who reported lifetime use of alcohol. This resulted in a final analytical sample of 3,053 students aged between 13 and 15 (M = 14.0, SD = 0.95), of which 1,615 were males (52.9%) and 2,627 (86.0%) were of Dutch ethnic origin. Of all participants, 47.6% pursued a combination of pre-university education and senior general secondary education, 27.7% junior general secondary education, and 24.6% preparatory vocational training.

Measures

Personality traits. The Substance Use Risk Profile Scale (SURPS) (Conrod and Woicik, 2002; Woicik et al., 2009) distinguishes four personality profiles. Negative Thinking (NT: 7 items) refers to hopelessness, which might lead to depressive symptoms. The Anxiety Sensitivity dimension (AS: 5 items) measures fear of bodily sensations. The Sensation Seeking subscale (SS: 6 items) measures the tendency to seek out thrilling experiences. The tendency to act without thinking is measured by the Impulsivity subscale (IMP: 5 items). Each profile is assessed using five to seven items that could be answered on a 4-point scale, with 1=*strongly disagree*, 2=*disagree*, 3=*agree*, 4=*strongly agree*. Sum scores of the personality profiles were used in the analyses, which is usual in this type of studies [20, 8].

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Studies in both adolescent and adult samples in several countries, including The Netherlands, have shown that this scale has good internal reliability, good convergent and discriminant validity, and adequate test–retest reliability [24, 20, 25, 8]. Two of the 23 items were removed because of low factor loadings. All four subscales demonstrated a reasonably good internal consistency in the current sample (Cronbach's α = 0.82 for NT, 0.68 for AS, 0.76 for IMP, and 0.63 for SS). These reliability estimates are satisfactory for short scales [26].

Drinking motives. The Drinking Motives Questionnaire Revised (DMQ-R) [12] is a 20-item self-report measure to assess drinking motives among adolescents. The DMQ-R distinguishes four drinking motives: enhancement motives (drinking to have fun and to get high), coping motives (drinking to forget about worries), conformity motives (drinking because friends pressure to drink) and social motives (drinking to better enjoy a party). Participants indicate how often they drink for a specified reason on a 5-point scale ranging from 1 (never/almost never) to 5 (always, almost always). The DMQ-R has been well validated in several international [14] and national studies [27, 28]. Cronbach's alphas in the present sample were excellent: .85 for enhancement motives, .84 for coping motives, .81 for conformity motives, and .89 for social motives. These reliability estimates are consistent with those from previous research [14; 11].

Alcohol frequency. Frequency of alcohol use was assessed with the question "In the past four weeks, how often did you drink one or more alcoholic beverage(s)?", ranging from 0 to 40 or more times. The variable was log-transformed to approximate a normal distribution.
Binge drinking. Additionally, binge drinking was assessed with the question "How many times have you had five or more drinks on one occasion, during the past four weeks?", with the answer categories: none, 1, 2, 3–4, 5–6, 7–8 and 9 or more. Because the variable was extremely skewed to the low end, the item was recoded into a binominal variable (0 = none; 1= 1 or more).

Drinking problems. To assess alcohol-related problems among adolescents, the Rutgers Alcohol Problems Index (RAPI) [29] was used. The RAPI version used consisted of 18 items. Participants could indicate on a scale ranging from 0 (never) to 5 (more than 6 times) how often they experienced each alcohol-related problem during their life. Item scores were summed to create a total score. The variable was log-transformed to approximate a normal distribution. The RAPI has been well validated for use with both clinical and community adolescent samples [29, 27]. The Cronbach's alpha in the present sample was .92, which is excellent.

Analyses

Descriptive statistics were compiled and Pearson correlations were computed for all variables included in this study. To examine the relations between the SURPS personality

profiles, drinking motives, and the outcome measures of frequency of alcohol use in the previous month, binge drinking, and alcohol problems, we applied structural equation modeling using the software package MPLUS 5.1 [30]. Models were tested separately for males and females. Within the models, we took into account the correlation between the four different SURPS profiles, as well as the correlation between the drinking motives. The comparative fit index (CFI, preferably .95 or higher) and the standardized root mean square residual (SRMR, preferably .09 or lower) served as model fit indices [31].

To examine the hypothesized mediation of drinking motives in the association between the SURPS personality profiles and drinking behaviour, we used the Model Indirect approach using MPLUS 5.1 with a bootstrap procedure. The SURPS personality traits were entered as summary scores. Binge drinking was specified as categorical and therefore we conducted logistic regression. In our sample, the intraclass correlation coefficient (ICC) for the outcome variable alcohol use was .003, indicating that 0.3% of the variance could be explained by a school effect. The ICC's for the outcome variables binge drinking and drinking problems were higher, respectively .06 and .12. According to Muthén [32], the size of the effect should preferably not exceed 5%. To assess the possible impact of nestedness within schools, we conducted additional analyses in MPLUS with a sampling design adjusted model with schools as clusters, using the Type is Complex option in Mplus. These analyses were run separately because in Mplus, the type is Complex option cannot be runned together with the model Indirect option using bootstraps. The sampling design adjusted model corrected for cluster sampling provided highly consistent results. On the basis of these findings, we concluded that the impact of nestedness within schools on our models was minimal.

To assess the possible moderating effect of sex, multi-group analyses were conducted within MPLUS 5.1. This was done by testing whether the model fit ($\Delta\chi^2$) was significantly better for the model in which the paths of interest were allowed to differ between males and females compared to the model in which the paths of interest were constrained to be equal between males and females [33, 34]. After that, differences between males and females in relations between model variables were tested per direct path, also by using the chi-square difference test. This was done by constraining each path of interest separately while all other paths are unconstrained and comparing this model to the model in which the path of interest, as well as all other paths, are unconstrained. For the log-transformed outcome variables of alcohol frequency and drinking problems, model parameters were estimated with maximum likelihood estimation with robust standard errors (MLR). The MLR estimator is often used to deal with skewed variables. Using the MLR estimator for the model with the dichotomized outcome variable binge drinking resulted in non-convergence of the model; therefore, for this model the WLSMV estimator was used. The categorical nature of the binge drinking variable was handled with the CATEGORICAL ARE option. To test possible significant sex differences, the WLSMV estimator allows for chi-square difference testing

with the DIFFTEST option. For the models for alcohol frequency and drinking problems we used the Satorra-Bentler scaled chi-squared difference test [35] for testing sex differences, as the DIFFTEST option and the chi-square values cannot be used for standard chi-square difference testing when using the MLR estimator. To test the differences in the indirect effects between males and females the MODEL TEST command is used. This command allows to test linear restrictions on the parameters using the Wald chi-square test [36].

Results

Descriptive analyses

The descriptive statistics indicated that 46.9% of the female students and 53.1% of the male students had drunk alcohol once or more during the previous month: the sample average was 2.57 occasions (SD = 7.85). Five hundred and thirty-three female students (47.8%) and 582 male students (52.2%) indicated that they had consumed five or more drinks in a row on at least one occasion in the previous 30 days: the sample average was 0.96 occasions (SD = 1.84). Drinking-related problems, such as social, academic, or violence problems were experienced by 1,120 students (37.7%). The sample average was low, with 1.13 drinking-related problems (SD = 0.33).

Correlations

The Pearson and Spearman correlations, means, and standard deviations for all model variables are reported in Table 1, for males and females separately. For males, negative thinking and anxiety sensitivity were not correlated to alcohol frequency, binge drinking, and drinking problems, whereas impulsivity was correlated to alcohol frequency and binge drinking, and sensation seeking to alcohol frequency, binge drinking, and drinking problems. For females, there was more diversity: negative thinking was not related to alcohol frequency, anxiety sensitivity was not related to binge drinking, and sensation seeking was not related to drinking problems, whereas impulsivity was related to all three alcohol measures. For both males and females, all the drinking motives were related to alcohol frequency, binge drinking, and drinking problems; and all the drinking motives were mutually correlated.

Structural equation modeling

All model fits ranged from satisfactory to excellent (see Figs. 1–3). Multi-group analysis was used to test sex differences. The (Satorra-Bentler) Chi-squared difference test indicated that the model differed for males and females for the three alcohol outcome measures, χ^2 (38) = 150.00, p < .001 (alcohol frequency), χ^2 (38) = 239.22, p < .001 (binge drinking) and χ^2 (38) = 117.69, p < .001 (drinking problems). The results of the models for the three outcome variables are described for males and females separately (see Figs. 1–3 for the models and Table 2 for the indirect effects), after which patterns of similarities and differences between the sexes are described.

Table 1. Pearson and Spearman correlations between personality profiles, drinking motives, (binge) drinking and drinking problems for males and females

	1	2	3	4	5	6	7	8	9	10	11	Mean	SD
1. NT	–	.22***	.26***	.04	.31***	.15***	.11***	.12***	.08**	.04	.08**	1.65	.52
2. AS	.27***	–	.16***	-.03	.14***	.13***	.07*	.07**	.04	.08**	.06*	2.05	.59
3. IMP	.27***	.22***	–	.33***	.28***	.12***	.24***	.26***	.15***	.05*	.07**	2.16	.61
4. SS	-.09*	-.03	.23***	–	.19***	.10***	.20***	.25***	.13***	.06*	.04	2.54	.60
5. Coping	.25***	.12***	.20***	.02	–	.39***	.54***	.58***	.35***	.13***	.38***	1.35	.67
6. Conformity	.21***	.16***	.15***	.04	.65***	–	.37***	.36***	.12***	.12***	.25***	1.14	.36
7. Social	.10***	.01	.24***	.18***	.53***	.42***	–	.78***	.46***	.24***	.37***	1.96	1.02
8. Enhancement	.11***	.02	.25***	.19***	.55***	.41***	.73***	–	.42***	.19***	.42***	1.69	.89
9. Binge drinking	.09***	.00	.17***	.14***	.30***	.20***	.45***	.45***	–	.19***	.15***	.38	.49
10. Alcohol frequency	.04	.21	.10***	.08**	.14***	.09***	.22***	.20***	.25***	–	-.01	1.31	1.14
11. Drinking problems	.04	-.017	.04	.06*	.28***	.25***	.23*	.25***	.19***	.02	–	.20	.69
Mean	1.48	1.71	2.15	2.87	1.22	1.15	1.94	1.71	.37	1.33	0.24		
SD	.47	.57	.62	.57	.52	.43	1.07	.92	.48	1.15	.80		

Notes: * $p < .05$, ** $p < .01$, *** $p < .001$; n = 3053; NT = negative thinking, AS = anxiety sensitivity, IMP = impulsivity, SS = sensation seeking; under diagonal: males, above diagonal: females
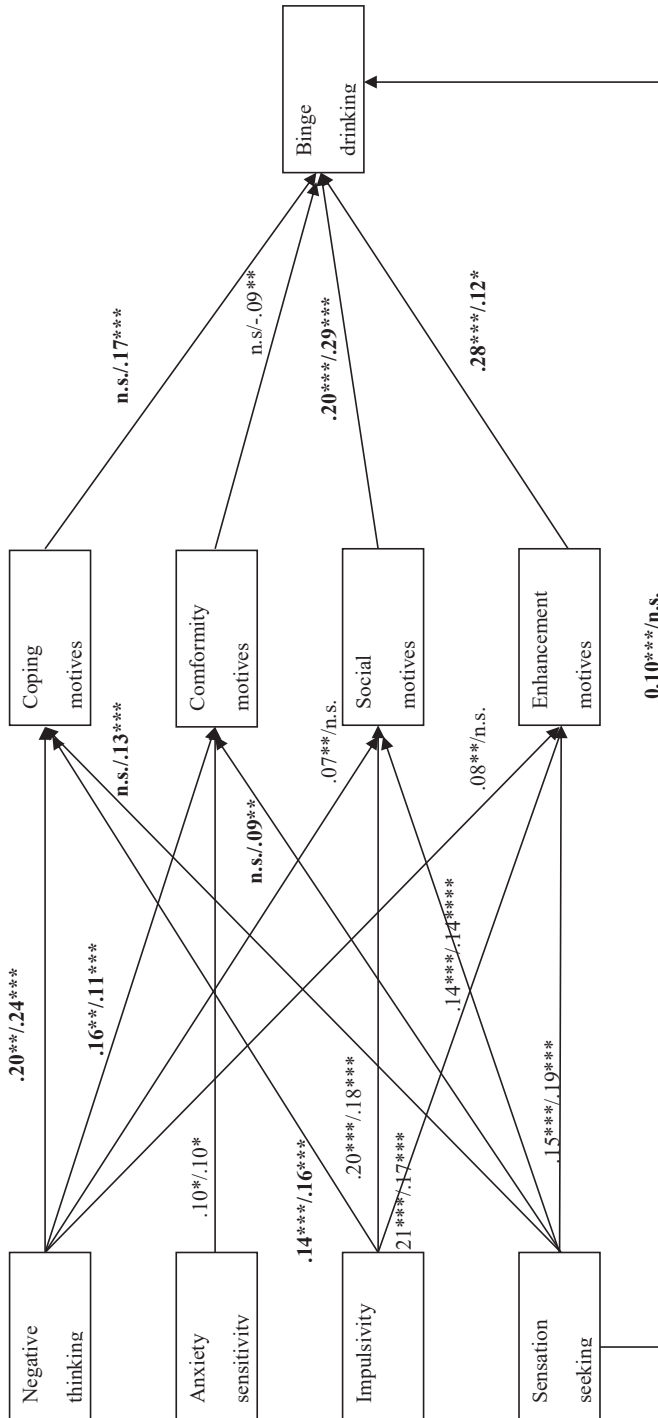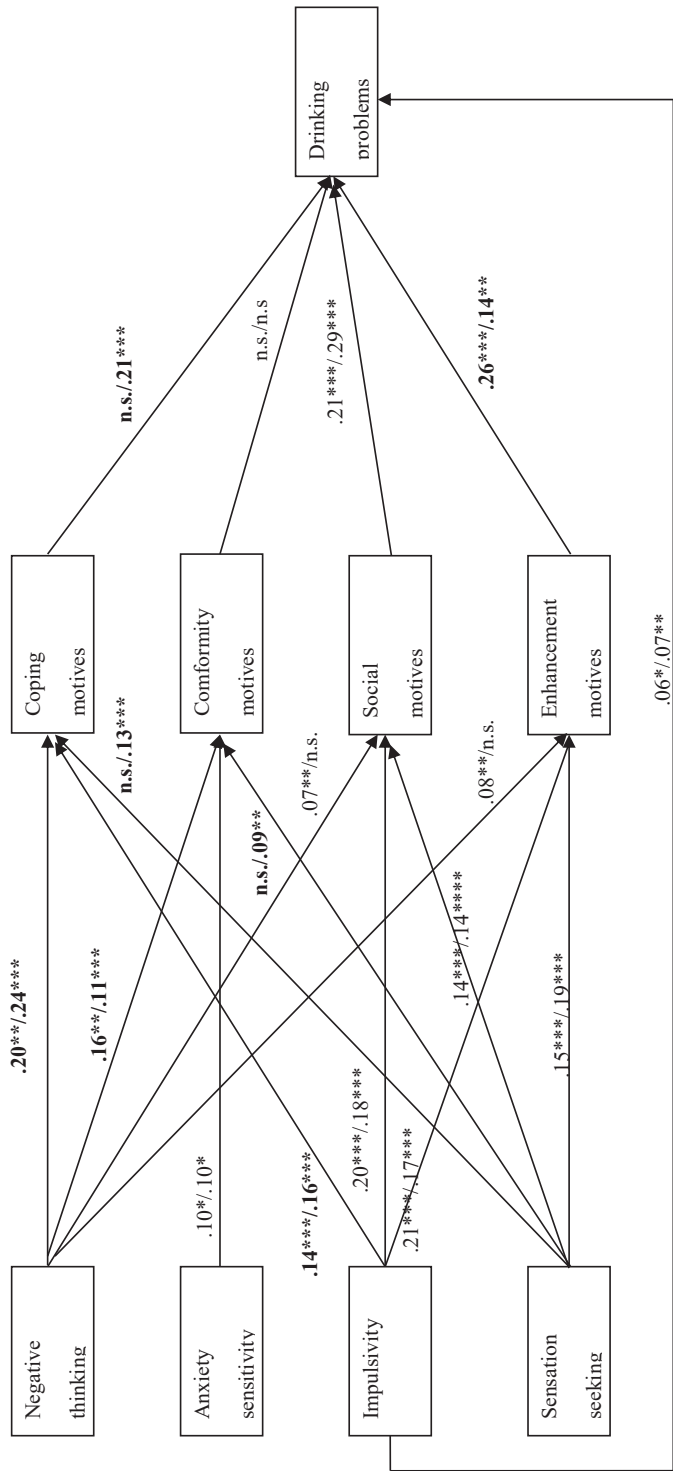
Chapter 3
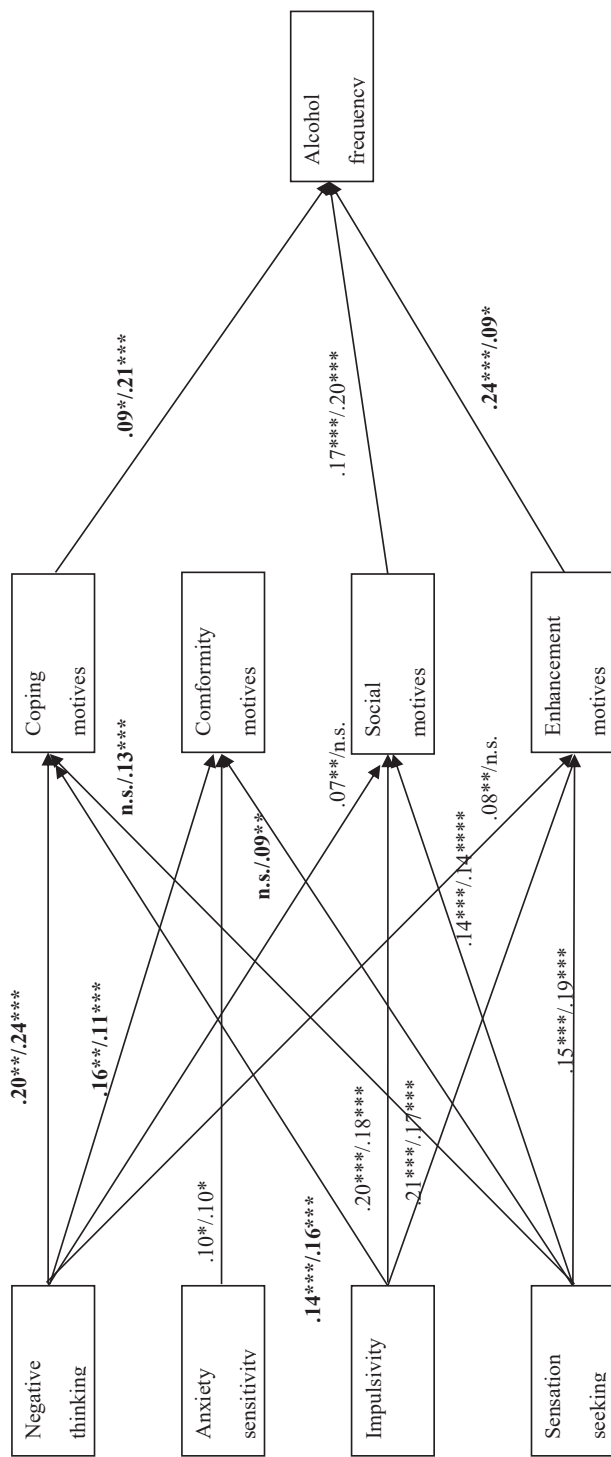
Figure 1. Standardized estimates of the multi-group model on alcohol frequency (n=3053). Only significant effects are shown (* $p < .05$, ** $p < .01$, *** $p < .001$). Model fit (χ^2 [112, N = 3044] = 143.689, $p < .00$; RMSEA = .048, CFI = .97; TLI = 0.93, SRMR = 0.048)

Notes: Estimates before the slash apply to boys; estimates after the slash apply to girls. The model is controlled for education level and age. Covariances between the personality traits and the drinking motives are excluded from the figure for clarity of presentation. Boldfaced estimates represent the estimates of the direct paths which significantly differed for males and females. The estimates of the indirect paths are shown in Table 2a and 2b.

Figure 2. Standardized estimates of the multi-group model on binge drinking (n=3053). Only significant effects are shown (* p < .05, ** p < .01, *** p < .001). Model fit (χ^2 [110, N = 3044] = 146.130, p < .00; RMSEA = .048, CFI = .97; TLI = 0.93, SRMR = 0.048)

Notes: Estimates before the slash apply to boys; estimates after the slash apply to girls. The model is controlled for education level and age. Covariances between the personality traits and the drinking motives are excluded from the figure for clarity of presentation. Boldfaced estimates represent the estimates of the direct paths which significantly differed for males and females.

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Figure 3. Standardized estimates of the multi-group model on drinking problems (n=3053). Only significant effects are shown (* p < .05, ** p < .01, *** p < .001). Model fit (χ^2 [112, N = 3044] = 146.165, p < .00; RMSEA = .048, CFI = .97; TLI = 0.93, SRMR = 0.048)

Notes: Estimates before the slash apply to boys; estimates after the slash apply to girls. The model is controlled for education level and age. Covariances between the personality traits and the drinking motives are excluded from the figure for clarity of presentation. Boldfaced estimates represent the estimates of the direct paths which significantly differed for males and females.

Direct associations between personality traits and drinking motives

Negative thinking had an association with coping and conformity motives, and for males also an association with social motives and enhancement motives (see Figs. 1–3). Impulsivity showed a significant association with coping, social, and enhancement motives. Sensation seeking was related to social and enhancement motives, and for females also an association with coping motives and conformity motives was found. There were no significant direct significant associations between anxiety sensitivity and any of the four drinking motives, except for conformity motives.

Separate path analyses were conducted to investigate the differences between males and females more in detail. The association between negative thinking and coping motives was more prominent for females (χ^2 (1) = 9.99, p < .01), and the association between negative thinking and conformity motives was more prominent for males (χ^2 (1) = 10.53, p < .01). Sex differences were also found in the associations between impulsivity and coping motives (χ^2 (1) = 4.60, p < .05), sensation seeking and coping motives (χ^2 (1) = 19.09, p < .001), and sensation seeking and conformity motives (χ^2 (1) = 4.07, p < .05). All these associations were more prominent for females, although the magnitude of the difference between impulsivity and coping motives is very small (0.14 vs 0.16).

Direct associations between drinking motives and alcohol measures

The multi-group analyses showed that only social motives had a significant association with all the alcohol outcome measures for both sexes. Regarding the other drinking motives, the patterns were more diverse (see Figures 1-3). For males, enhancement motives played a more prominent role, while for females, there were stronger associations with coping motives. The (Satorra-Bentler) Chi-squared difference test showed that the association between binge drinking and coping motives (χ^2 (1) = 4.01, p < .05) had a significant higher magnitude for females. While the associations between alcohol frequency and enhancement motives (χ^2 (1) = 4.43, p < .05), and binge drinking and enhancement motives (χ^2 (1) = 6.25, p < .05), had a significant higher magnitude for males.

Indirect associations

Alcohol frequency. For both males and females, there were significant indirect paths from impulsivity and sensation seeking to alcohol frequency, via social motives (see Tables 2a and 2b). This suggests that high levels of impulsivity or sensation seeking are associated with high levels of social motives, which in turn are associated with higher frequency of alcohol use. Also for both males and females, there were significant indirect paths from sensation seeking to alcohol frequency via enhancement motives, and from impulsivity to alcohol frequency via coping motives. Only for males there were significant paths between impulsivity and alcohol frequency, via enhancement motives, and between negative thinking and alcohol frequency, via both social motives and enhancement motives. However, the

Table 2a. Indirect effects of personality traits on alcohol frequency, binge drinking, and drinking problems via drinking motives; and explained variance; for males

	Alcohol frequency		Binge drinking		Drinking problems	
	Indirect	CI	Indirect	CI	Indirect	CI
Negative thinking via						
Coping	.02	-.01, .05	.01	-.02, .03	.02	-.02, .04
Conformity	-.01	-.02, .01	-.01	-.03, .01	-.01	-.03, .01
Social	.01**	.00, .02	.01*	.00, .03	.01**	.00, .02
Enhancement	.02*	-.00, .04	.02	.00, .04	.02*	-.00, .04
Anxiety sensitivity via						
Coping	.01	-.01, .02	.00	-.00, .01	.00	-.01, .01
Conformity	-.00	-.01, .01	-.00	-.01, .00	-.00	-.01, .00
Social	-.01	-.02, .01	-.01	-.03, .01	-.00	-.03, .00
Enhancement	-.01	-.04, .02	.01	-.04, .02	-.01	-.05, .01
Impulsivity via						
Coping	.01*	-.00, .03	.00	-.01, .02	.01	-.01, .03
Conformity	-.00	-.01, .00	-.00	-.01, .00	-.01	-.01, .00
Social	.03***	.01, .05	.03***	.02, .06	.04***	.02, ,06
Enhancement	.05***	.03, .07	.04***	.04, .07	.05***	.03, .07
Sensation seeking via						
Coping	.00	-.01, .01	.00	-.00, .00	.00	-.00, .00
Conformity	-.00	-.00, .00	-.00	-.01, .00	-.00	-.01, .00
Social	.02**	.00, .04	.02***	.02, .04	.03**	.01, .05
Enhancement	.04***	.02, .05	.03***	.02, .06	.04***	.02, .05
Explained variance (R^2)	30.6%		26.9%		45.9%	

Wald test of parameter constraints showed no significant differences between males and females for these indirect paths (respectively Wald test (1) = 2.37, p = .12, Wald test (1) = 0.042, p = .84, and Wald test (1) = 2.15, p = .14). For females, there were also significant indirect paths from negative thinking and sensation seeking to alcohol frequency, via coping motives. However, the Wald test of parameter constraints showed no significant differences between males and females for these indirect paths (respectively Wald test (1) = 0.41, p = .52, and Wald test (1) = 0.34, p = .56).

Binge drinking. The relationship between impulsivity and sensation seeking and binge drinking was significantly mediated by social motives, for both males and females. Also for both males and females, there were significant indirect paths from sensation seeking to binge drinking, via enhancement motives. For males, there was an indirect path from impulsivity to

Table 2b. Indirect effects of personality traits on alcohol frequency, binge drinking, and drinking problems via drinking motives; and explained variance; for females

	Alcohol frequency		Binge drinking		Drinking problems	
	Indirect	CI	Indirect	CI	Indirect	CI
Negative thinking via						
Coping	.05***	.02, .09	.03***	.01, .05	.05***	.02, .09
Conformity	-.01	-.02, .01	-.01*	-.02, .00	-.01	-.02, .01
Social	.01	-.01, .03	.01	-.01, .04	.01	-.01, .04
Enhancement	.01	-.01, .03	.01	-.01, .02	.01	-.01, .02
Anxiety sensitivity via						
Coping	.01	-.01, .04	.01	-.01, .02	.01	-.01, .04
Conformity	-.01	-.01, .00	-.01	-.02, .00	-.01	-.01, .00
Social	.01	-.01, .02	.01	-.02, .04	.01	-.02, .03
Enhancement	.01	-.01, .03	.00	-.01, .02	.01	-.01, .02
Impulsivity via						
Coping	.03**	.01, .06	.02***	.01, .03	.03***	.01, .06
Conformity	-.00	-.01, .01	-.00	-.02, .01	-.00	-.01, .01
Social	.04**	.00, .07	.04***	.02, .09	.05**	.01, .09
Enhancement	.01	.00, .07	.02	-.01, .05	.03**	.00, .05
Sensation seeking via						
Coping	.03**	.01, .05	.01*	-.00, .03	.03**	.01, .05
Conformity	-.01	-.01, .00	-.01	-.02, .00	-.00	-.01, .01
Social	.03**	.01, .05	.03***	.01, .07	.04***	.01, .07
Enhancement	.02*	.00, .07	.02*	-.00, .05	.03**	.00, .05
Expl variance (R^2)	34.3%		25.2%		41.3%	

Notes: Standardized path coefficients were used in computing the indirect effects; CI = Confidence interval 95%; * $p < .05$, ** $p < .01$, *** $p < .001$

binge drinking via enhancement motives. The Wald test of parameter constraints showed no significant difference between males and females for this indirect path (Wald test (1) = 0.09, $p = .77$), but the indirect path from negative thinking to binge drinking via social motives that was found for males did differ significantly from that of females (Wald test (1) = 7.06, $p < .01$). For females, there were indirect paths from negative thinking, impulsivity and sensation seeking to binge drinking via coping motives. All these indirect paths differed significantly from those of males (respectively Wald test (1) = 5.64, $p < .05$, Wald test (1) = 4.86, $p < .05$, and Wald test (1) = 11.85, $p < .001$). Also, an indirect path was found for females between negative thinking and binge drinking via conformity motives, which didn't differ from that of males (Wald test (1) = 0.49, $p = .48$). Finally, in males, there was also an additional direct association between sensation seeking and binge drinking. The Chi-squared difference test

showed that this direct path differed significantly between males and females (χ^2 (1) = 3.89, $p < .05$).

Drinking problems. The associations between impulsivity and sensation seeking and drinking problems were mediated by social motives and enhancement motives, for both sexes. In males, there were significant paths between negative thinking and drinking problems, via both social motives and enhancement motives. However, the Wald test of parameter constraints showed no significant differences between males and females for these indirect paths (Wald test (1) = 0.14, $p = .71$, and Wald test (1) = 0.42, $p = .52$) In females, the relationship between negative thinking, impulsivity, sensation seeking and drinking problems was also mediated by coping motives. The Wald test showed no significant differences between males and females for these indirect paths (respectively Wald test (1) = 0.02, $p = .90$, Wald test (1) = 0.01, $p = .92$, and Wald test (1) = 2.56, $p = .11$). For both sexes an additional direct association with drinking problems was found for impulsivity, such that high levels of impulsivity were associated with higher levels of alcohol-related problems.

Discussion

The goal of the present study was to provide evidence of the mediating role of drinking motives in the association between personality traits and alcohol-related outcomes among young adolescents (13 to 15 years of age). The study provides partial complementary evidence in addition to previous studies using older populations [6, 15, 16, 17, 18, 11]. The results indicate that drinking motives partly mediate the relationship between personality profiles and alcohol use patterns even in early adolescence.

In this study, the effects of impulsivity and sensation seeking on alcohol frequency were mediated by social drinking motives. This finding stands in contrast to previous research [6, 16, 13, 17; 11], where no mediation effect of social drinking motives was found for the relation between personality and alcohol frequency. It appears that young adolescents, who have little alcohol experience, often drink for social reasons [37]. Also, indications for sex differences in the indirect effects were found. For males, a more significant mediation effect were found for enhancement motives, and for females, coping motives seemed to play a more prominent role in the association between alcohol frequency and personality. However, multigroup analyses did not provide evidence that the differences in these indirect paths were significant. If alcohol is consumed more excessively (binge drinking), this same pattern occurs and more sex differences in indirect paths are significant. The relationship between personality and binge drinking is mediated by social motives (both males and females), enhancement motives (more for males) and coping motives (only for females). The mediation of enhancement motives in the association between sensation seeking and binge drinking is in line with previous findings [12, 17, 11, 38]. It appears that individuals high on sensation

seeking experience low base levels of arousal and may therefore be motivated to consume alcohol to achieve an optimal level of stimulation, whereas alcohol (and moreover binge drinking) is known to increase positive arousal [11]. The mediating effect of social drinking motives on binge drinking was not found in previous research. According to Kuntsche et al. [39, 10], drinking patterns such as binge drinking, related to particular drinking motives, establish gradually during adolescence. The present study found that, in females, the relation between negative thinking, impulsivity, sensation seeking and binge drinking is mediated by coping motives. This is partially in line with previous findings. Kuntsche et al. [17] found an indirect link between neuroticism and risky drinking via coping motives, although there was no distinction between males and females. It appears that females who drink to forget their problems and to alleviate negative affect have higher levels of risky alcohol use than females who do not drink for such motives.

When it comes to drinking problems, the relation between impulsivity, sensation seeking, and drinking problems is mediated by enhancement motives for both sexes. Enhancement motives have previously been found to mediate the relation between the extraversion traits *sensation seeking* and *impulsivity* and alcohol-related problems [15, 17, 11], although Magid et al. [11] found this meditational effect only for females. It appears that extraverted adolescents seek arousal stimuli and therefore are more likely to experience enhancement-motivated drinking problems [38]. In females, the relation between negative thinking, impulsivity, sensation seeking and drinking problems is also significantly mediated by coping motives. However, the difference between females and males in these meditational relationships remains speculative since the indirect effects were not tested as significantly different. This pattern is thus mostly consistent with previous studies [17, 11] reporting mediating effect for both males and females. As stated by Kuntsche et al. [10], individuals high on neurotic trait drink for coping motives (especially in early and mid-adolescence) and tend to experience drinking problems additionally to their heavy drinking. The significant mediation of coping motives in the relation between impulsivity and binge drinking and drinking problems, is mostly consistent with the literature [18, 11]. Impulsivity may be a particularly impairing trait because when faced with a problem, a person high on the trait of impulsivity may be likely to rely on coping methods that can be quickly implemented and provide short-term gains, despite potentially negative long-term consequences [40]. With regard to alcohol use, this suggest that individuals high on impulsivity may be inclined to use alcohol to cope with distress, which is not necessarily expected for individuals high on the other extraversion trait sensation seeking [11].

The results indicate that there are only few mediation associations for conformity drinking motives. Although this is in line with previous research by Magid et al. [11], it was expected that conformity motives would play a role within a young age group (cf. also [37]), particularly

for elevated extraversion traits, when peer socialization is thought to be particularly strong. Apparently, young adolescents who are at the beginning of their drinking career drink for social and enhancement reasons; this is consistent with the empirical findings of Kuntsche and Müller [37]. When they are older and have more alcohol experience, conformity motives may become an important predictor of drinking behaviour. Future longitudinal research is needed to further explore this.

Personality traits and drinking motives

Our results have shown that the relationships between personality traits and drinking motives are quite similar for males and females. This is in line with the theory that sex differences in relation to drinking motives appear to develop during adolescence [10]. We found no relation between anxiety sensitivity and any of the four drinking motives, when corrected for the interrelations with the other personality traits. This might be a result of the age of the sample, i.e. anxiety sensitivity is associated with later onset on alcohol misuse when adolescents start drinking to cope with negative emotions [8]. The relationship between anxiety sensitivity and drinking motives was found in previous findings in older populations [17, 41, 38]. Maybe the early adolescents in the present study scoring high on anxiety sensitivity experience a barrier to drink because of the possible negative effects, such as unusual body sensations and the feeling of losing control (see also [6, 20]). Comeau et al. [6] postulated that anxiety sensitivity is progressively more important in predicting anxiety-related outcomes over the course of development. In other words, anxiety sensitivity might have a greater role in predicting substance use to cope with negative emotions over the course of the transition from adolescence to young adulthood. Future research is needed to further test this hypothesis.

Limitations and directions for future research

First, because the current analyses are based on cross-sectional data, we cannot draw causal inferences. For example, drinking motives and alcohol outcomes are likely to be mutually related [42], in that consuming alcohol also shapes drinking motives, rather than being only unidirectional as is often assumed in drinking motives research. Future research is needed to replicate the current findings by testing the mediational model in a longitudinal design. Second, the use of self-reports might have led to measurement errors, such as socially desirable answers and over- or underestimation of alcohol use in a certain period [e.g., [43]]. To avoid social desirability, we guaranteed full anonymity to the participants. Because we asked the participants how much they had used in a certain period, some over- or underestimation may have occurred. However, on the basis of previous research among schools, where self-reports were used (e.g. the HBSC study, [1]), we expect this cognitive bias to be small.

Thirdly, in our study the neuroticism type traits did not show higher magnitude effects with drinking problems than with measures of heavy drinking, e.g. for females the association

between negative thinking and alcohol-related problems was similar to the association between negative thinking and binge drinking. These results are not completely consistent with previous studies using older populations [e.g., 17, 11]. A possible explanation for the differences in the findings, is the fact that drinking behaviour among the population of young adolescents in our study is still in its early stages, especially concerning drinking problems. More research is needed to get better insight into this hypothesis.

Conclusions and intervention implications

The current study provides indications that it is important to intervene in early adolescence, because already in this phase personality traits are associated with drinking motives, which in turn determine drinking patterns. There was remarkable similarity in the mediational roles of social and enhancement motives on the relation between personality and alcohol use and problem drinking, given that, of the 24 possible indirect paths involving the four personality traits, two motives, and three alcohol outcomes, only the indirect paths to binge drinking were found to be significantly different between males and females. The role of the drinking motives of enhancement and social motives to mediate the relation between personality and alcohol outcomes do not meaningfully differ by sex in this sample, except for binge drinking. The role of drinking motives in the relation between personality and binge drinking is likely to differ between the sexes. For young males, enhancement motives seems to play a more prominent mediation role, while for young females, coping motives play a more mediating role between personality and binge drinking.

Overall, the results suggest insights for future tailored interventions focused on personality dimensions [44, 45, 46]. These interventions should not only distinguish between the different personality traits, but also consider the various drinking motives of young adolescents.

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It holds us like a phantom
The touch is like a breeze
It shines its understanding
See the moon smiling
The Numbers, Radiohead

CHAPTER 4

Evaluating a selective prevention programme for binge drinking among young adolescents: Study protocol of a randomized controlled trial

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Abstract

Background: In comparison to other Europe countries, Dutch adolescents are at the top in drinking frequency and binge drinking. A total of 75% of the Dutch 12 to 16 year olds who drink alcohol also engage in binge drinking. A prevention programme called Preventure was developed in Canada to prevent adolescents from binge drinking. This article describes a study that aims to assess the effects of this selective school-based prevention programme in the Netherlands.

Method: A randomized controlled trial is being conducted among 13 to 15-year-old adolescents in secondary schools. Schools were randomly assigned to the intervention and control conditions. The intervention condition consisted of two 90 minute group sessions, carried out at the participants' schools and provided by a qualified counsellor and a co-facilitator. The intervention targeted young adolescents who demonstrated personality risk for alcohol abuse. The group sessions were adapted to four personality profiles. The control condition received no further intervention above the standard substance use education sessions provided in the Dutch national curriculum. The primary outcomes will be the percentage reduction in binge drinking, weekly drinking and drinking-related problems after three specified time periods. A screening survey collected data by means of an Internet questionnaire. Students have completed, or will complete, a post-treatment survey after 2, 6, and 12 months, also by means of an online questionnaire.

Discussion: This study protocol presents the design and current implementation of a randomized controlled trial to evaluate the effectiveness of a selective alcohol prevention programme. We expect that a significantly lower number of adolescents will binge drink, drink weekly, and have drinking-related problems in the intervention condition compared to the control condition, as a result of this intervention.

Background

Binge drinking is an increasing problem among young adolescents in the Netherlands. The recent use of alcohol among pupils in secondary education (12 to 16 years of age) in the Netherlands is declining, while binge drinking among these pupils is increasing. Nowadays, 75% of the Dutch 12 to 16 year olds who drink alcohol also engage in binge drinking [1]; this implies consuming five or more alcoholic drinks on one occasion in the past month. The largest proportion of binge drinkers are found in the age category of 15 and 16 years old. In comparison to other European countries, Dutch adolescents are among the leaders in drinking frequency and binge drinking [2, 3].

In adolescents, heavy alcohol consumption is associated with premature and violent deaths, e.g. traffic accidents, having risky sexual intercourse [4, 5] and poor academic performance, learning difficulties and school dropout [6-8]. In addition, heavy alcohol use during puberty appears to be related to damage to the development of cognitive and emotional abilities [9, 10] and an elevated risk of later dependence and misuse [11, 12]. Alcohol-related risks to cognitive functions seem to be higher in adolescents than in adults [11]. From the point of view of public health, prevention of heavy alcohol use among adolescents is essential.

There is little scientific evidence that universal prevention programmes aimed at young-sters affect drinking behaviour. Recent meta-analyses show that such programmes have small or no effects on alcohol use and binge drinking [3, 13, 14]. Exceptions to this are interventions aimed at both adolescents and their parents [15] and integrated programmes with multiple years of intervention and professional support [13, 16, 17]. Meta-analyses of school-based substance use prevention programmes have concluded that selective prevention programmes, targeting populations at increased risk, generally yield higher effects than universal programmes (e.g. [13, 18]). According to Cuijpers and colleagues [13], selective prevention programmes have proved effective, but the availability of these programmes is limited. Therefore there is a recognized need in the field of substance use prevention for selective prevention programmes.

Preventure

Preventure is a selective prevention programme and is one of the few school-based pro-grammes with long-term effects on adolescents' drinking behaviour and binge drinking [16, 19, 20]. In research conducted in Canadian and English samples of adolescents, effects of the programme were found on abstinence, quantity and frequency of drinking, binge drinking, and problem drinking symptoms at four months and one year after the programme [16, 19]. In addition to the effects on alcohol use, positive effects were found on emotional and behavioural problems, i.e. depression, panic attacks, truancy, and shoplifting [21].

The Preventure programme specifically targets young adolescents who have two well-known risk factors for heavy alcohol consumption: early-onset alcohol use [22, 23] and personality

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risk for alcohol abuse (e.g. [24]). The programme is based on the theory that personality is an important construct for understanding adolescents' alcohol use and abuse. Two personality dimensions were previously found to be predictive of heavy alcohol use and alcohol use disorders, namely (1) an impulsive sensation seeking dimension, and (2) a behavioural inhibition dimension [16]. The first category involves young sensation seekers and young people with low impulse control, the second reflects a neurotic personality involving more anxious and negative thinking young people. Within these two dimensions, Conrod and colleagues [16] distinguished four personality profiles at higher risk of developing alcohol problems: Sensation Seeking (SS), Impulsivity (IMP), Anxiety Sensitivity (AS) and Negative Thinking (NT).

The four personality profiles were subsequently found to be strongly related to adolescents' quantity and frequency of drinking, frequency of binge drinking, and severity of alcohol problems [25, 26]. Each personality profile is associated with specific substance misuse patterns, maladaptive motives for use, and vulnerability to specific forms of co-morbid psychopathology in adolescents [27, 28]. Impulsivity is related to an increased risk of the early onset of alcohol and drug problems [29]. Sensation seekers drink more [30], tend to drink in order to enhance euphoric (intoxicating) effects [28], and are more at risk of adverse drinking outcomes (e.g. [30]). Highly anxiety sensitive persons show increased levels of drinking [31], are more responsive to the anxiety-reducing effect of alcohol, and are more likely to use alcohol to cope with negative feelings [28]. Persons with high levels of hopelessness often have depression-specific motives for alcohol use [32] and usually drink to cope with negative feelings [16, 28, 33, 34].

The Preventure programme screens a school population for pupils who already drink alcohol and, additionally, belong to one of the four high-risk personality profiles. The programme identifies and treats high-risk adolescents, with the aim of preventing or intervening early before the high-risk adolescents engage in risky behaviours and/or these behaviours become problematic. The selected pupils are offered a tailored intervention based on cognitive behaviour therapy (CBT) and motivational interviewing. Cognitive behavioural techniques are used to target maladaptive thinking and coping skill deficits, and motivational interviewing techniques are used to address motivation to take responsibility for one's problematic behaviours. Motivational interviewing has proven to be effective for alcohol- and drug-related behaviour, and CBT can lead to reduction in anxiety sensitivity, depressive cognitions, and impulsivity (e.g. [35, 36]). The manualized intervention, developed by Conrod and colleagues [35], provides personalized feedback and personality-specific cognitive-behavioural exercises designed to facilitate more adaptive coping. The focus is not on drinking (or drug use) per se but on risky ways of coping with personality, such as avoidance, distraction, and aggressive thinking, that may lead to substance misuse or other risky behaviour.

Aims and hypotheses

In 2009, a project was started to develop and test Preventure in the Netherlands, where currently there is no selective school-based alcohol prevention available [37]. The main objective of this project is to study the effectiveness of Preventure on drinking behaviour of young adolescents in secondary education in the Netherlands. The effectiveness of the Dutch Preventure is being assessed by conducting a clustered randomized controlled trial (RCT), with two conditions (treatment and control arms). This is the first time that Preventure has been studied outside the setting where it was developed, England and Canada, to prove its effectiveness outside this setting.

The most relevant outcomes are percentage reductions in binge drinking ($\geq$ five drinks on one occasion in the past four weeks), weekly drinking, and drinking-related problems after 2, 6, and 12 months. The main hypothesis is that high-risk students who receive the personality targeted intervention will score lower on these outcomes relative to those in the no-treatment control group. In addition, our secondary aim is to test the effects of the programme on emotional and behavioural problems (e.g. aggression, truancy, and shoplifting). Our hypothesis is that Preventure facilitates lower depression rates, lower anxiety rates, lower delinquent behaviour rates, less problem behaviour, and lower truancy.

Methods/Design

Study design and time frame

The Preventure study is a 1-year RCT with two arms, an intervention and a control condition, testing the prevention programme effects, at 2, 6, and 12 months after the intervention (see Figure 1). Randomization is carried out at school level. The intervention condition consists of two group sessions based on cognitive behaviour therapy and motivational interviewing. The control condition receives no further intervention (business as usual).

The recruitment, inclusion, and randomization of the participants (schools and students) started in Spring 2009. The data collection started in 2010. The final follow-up measurement is planned for the end of 2011.

Participants

Recruitment

A total of 100 schools were selected randomly from a list of all public secondary schools (N=405) in four regions in the Netherlands (Zuid-Holland, Utrecht, Gelderland, Overijssel). Schools were invited to participate in the study, if the following inclusion criteria were met: 1. school had at least 600 students, 2. < 25% of students were from migrant populations, 3. school did not offer special education. A total of 15 schools were willing to participate and
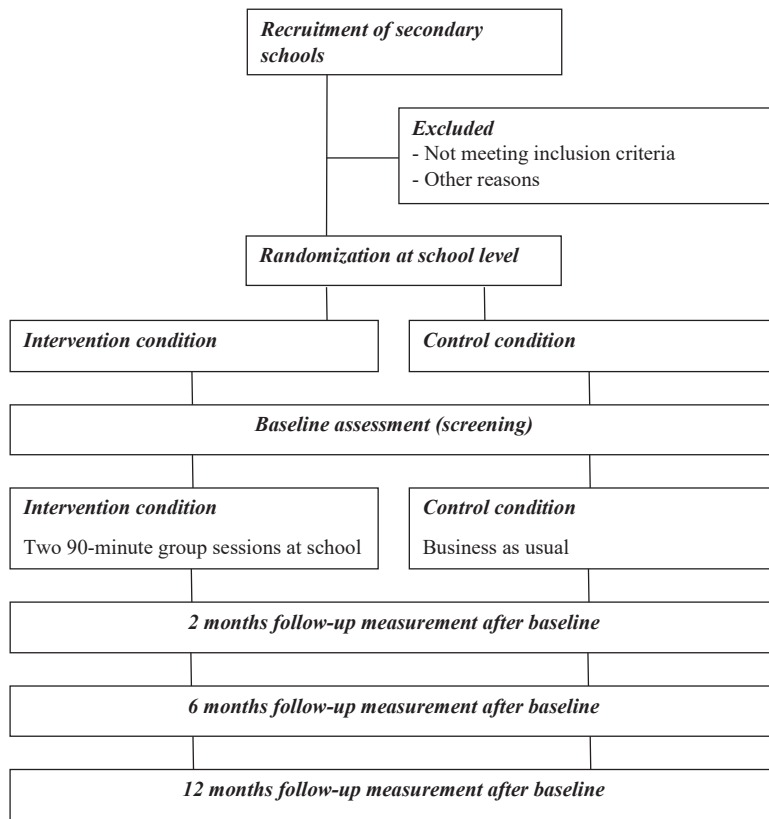
Figure 1. Study design

fulfilled the inclusion criteria. The main reasons for schools not participating were lack of time and no interest in participating in research in general.

Eligibility

Students were eligible to enter the trial if they fulfilled the following inclusion criteria: 1. life time prevalence of alcohol use (i.e. having drunk at least one glass of alcohol once in their life), 2. belonging to one of the four personality high-risk groups for (future) heavy drinking (AS, SS, NT or IMP) and 3. informed consent of the student and his or her parents. The study is aimed at students from 13 to 15 years of age. This is in contrast to Conrod et al.'s study [16], in which students aged 14 to 17 were studied. The reason for this difference is the age of onset, which is lower among Dutch youngsters than among their study sample.

In order to select those students fulfilling the selection criteria, a screening survey among all students attending grade 8 and grade 9 of the 15 schools was carried out. The students who scored more than one standard deviation above the sample mean on one of the four personality risk scales (AS, SS, NT, or IMP) of the Substance Use Risk Profile Scale (SURPS)

[25], were classified as belonging to a risk group for the development of alcohol problems. If a student scored high on more than one subscale, he or she was assigned to the personality group in which he or she showed the largest statistical deviation with respect to the z-scores.

Consent

Parents were informed of the study (screening and intervention) through a letter sent home from the schools asking them to contact the researchers by phone or e-mail if they did not wish their child to participate in the study (passive informed consent). Parents were told that the intervention was coping-skill training designed to reduce adolescent risk taking, with alcohol abuse as an example. To assure participants' confidentiality, parents were not explicitly informed about any of the selection variables of the study. On the day of the screening, students were given information on the screening, the ethical issues (confidentiality and the voluntary nature of participation), and the intervention. Parents and students provided active informed consent to participate in the intervention part of the study.

The study was evaluated by the Medical Ethical Commission for Mental Health (METIGG), which considered the study did not fall within the WMO Act (Medical Research Involving Human Subject Act). As a result no ethical approval was necessary. However, for the consent procedure, we adhered to the guidelines and advices of the METIGG.

Randomization

Randomization occurred at the school level to avoid contamination between conditions. An independent statistician assigned the participating schools randomly to one of the two conditions: intervention or control. Randomization was carried out using a randomization scheme, stratified by level of education and school size, with the schools as units of randomization.

Sample size

Power

The power calculation reflects the idea that we want to induce a reduction in the percentage of students engaging in binge drinking (drinking five or more glasses of alcohol on one occasion) at least once during the last four weeks, from the current estimated 50% (among life-time users grade 9/10; estimate based on the results of a national school survey, [1]) to 35%. For a 15% reduction after 12 months among the students in grade 9/10, a sample size of N=183 in each condition was required to test the hypothesis in a 2-sided test at alpha=0.05 and a power of (1-beta)=0.80. Because of the loss of power due to randomization of schools (and not students) and the increase in error because of applying a multiple imputation procedure to fill in missing values, 183*1.4=256 respondents per condition (intervention and control) needed to be included at baseline to test the effectiveness of the Dutch Preventure programme.

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Number of students

According to the power analyses, a net sample of 256 respondents in each condition was needed. On the assumption of a 40% participation rate, 45% of respondents belonging to one of the risk groups (estimates based on [16, 19]), a life time prevalence at baseline of 77%, and 93% of children present in the class at the data collection time (estimates based on [1]), a survey sample of N=3,972 students was needed.

Study intervention

To develop the Dutch Preventure programme, the principles and guidelines of the original Canada/UK programme were followed in collaboration with the original developers of Preventure.

Theoretical basis

Preventure incorporates the principles from motivational and cognitive behavioural therapy and is adapted to different personality profiles for substance abuse: anxiety sensitivity, negative thinking, sensation seeking, and impulsivity. The intervention is brief, as the literature strongly suggests that brief interventions can be very effective in changing drinking patterns and related problems. An effective component of successful brief interventions for alcohol abuse is the persuasiveness of individualized feedback. Therefore, Preventure provides pupils with personalized feedback on their results from a personality and motivational assessment. Preventure also includes cognitive behavioural skills training specifically relevant to each personality profile. The literature has shown that successful cognitive behavioural therapy can lead to reductions in anxiety sensitivity in anxiety patients, depressive cognitions in depressed patients, and impulsivity in adolescents with externalizing disorders [38, 39, 36].

The intervention consists of three main components: (1) psycho-education, (2) behavioural coping skills, and (3) cognitive coping skills [16]. In the coping skills sections, students are engaged in activities to induce automatic thoughts. Simultaneously, they are trained to use cognitive restructuring techniques to counter such thoughts. Cognitive restructuring training has been shown to have a positive impact on the reduction of alcohol and drug abuse and symptoms of psychological disorders [35].

Intervention condition

The intervention involved two group sessions, carried out at the participants' schools. The group sessions were adapted to one of the four personality profiles. This means that there were four different groups of two sessions each. Both group sessions lasted 90 minutes and were spread across two weeks. The intervention was provided by a qualified counsellor and a co-facilitator. The three counsellors and two co-facilitators had received two days training from Dr. P.J. Conrod, who developed the original intervention. Furthermore, all the

counsellors had practiced the two group sessions at a pilot school with students who met the inclusion criteria (drinkers with high-risk personality profiles).

The intervention used student manuals. The original student manuals, developed in Canada, were translated and adapted to the cultural and school context of the Netherlands. The examples, the real-life stories, and the illustrations used in the programme manuals were adapted to the Dutch situation. The student manuals consist of text, exercises, and real-life experiences or scenarios. The real-life scenarios were generated by previously organized focus groups of high-risk personality adolescents. In four focus groups (one group for each personality risk factor), students were asked to share their own experiences regarding, for example, alcohol and drugs. The student manuals had been tested during the pilot sessions at the pilot school. Students were asked to give their opinion on the content, the illustrations, and real-life stories used in the manuals.

In the first group session, psycho-educational strategies were used to educate students about the target personality variable (NT, AS, IMP, or SS) and the associated problematic coping behaviours, such as interpersonal dependence, aggression, risky behaviours, and substance misuse. Students were motivated to explore their personality and ways of coping with their personality through a goal-setting exercise. Thereafter, they were introduced to the cognitive behavioural model by analysing a personal experience according to the physical, cognitive, and behavioural responses.

In the second session, participants were encouraged to identify and challenge personality-specific cognitive thoughts that lead to problematic behaviours. For example, the impulsivity intervention focused on not thinking things through and aggressive thinking, and the sensation-seeking intervention focused on challenging cognitive thoughts associated with reward seeking and boredom susceptibility.

Control condition

Students assigned to the control group received no further intervention. An inventory among the participating schools will reveal whether other specific substance use prevention programmes were being used, apart from the common lessons in the curriculum, e.g. biology classes.

Data collection and instruments

The screening survey collected data by means of an online questionnaire on alcohol use, demographics, and personality risk factors. The data collection took place during a regular lesson (approximately 50 minutes), and questionnaires were administered by a research assistant from the Trimbos Institute. Those students randomly assigned to the experimental or control condition have completed, or will complete, the post-treatment survey after 2, 6, and 12 months. Data for the follow-up measurements have been, or will be, also collected

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online at school. The follow-up survey contains the same assessments as the screening survey. An overview of all measurements is given in Table 1.

As already mentioned, the SURPS [25] distinguishes four personality profiles. Each profile is assessed using five to seven items that could be answered on a 4-point scale, 1=*strongly disagree*, 2=*disagree*, 3=*agree*, 4=*strongly agree*. The SURPS scale has 23 non-overlapping items that assist in discriminating personality dimensions independent of substance use behaviour. Negative Thinking (7 items) refers to hopelessness, which might lead to depressive symptoms. A sample item on the Negative Thinking subscale is 'I feel that I'm a failure.' The Anxiety Sensitivity dimension (5 items) measures fear of bodily sensations, and an example item is 'It frightens me when I feel my heart beat change.' The Sensation Seeking subscale (6 items) measures the tendency to seek out thrilling experiences, e.g. 'I would like to learn how to drive a motorcycle.' The tendency to act without thinking is measured by the Impulsivity subscale (5 items), and an example of this subscale is 'I often don't think things through before I speak.' Studies in both adolescent and adult samples in several countries, including

Table 1. Overview of measurements

Measurement	Baseline (screening)	Follow-up I (2 months after baseline)	Follow-up II (6 months after baseline)	Follow-up III (12 months after baseline)
Demographic characteristics	*	*	*	*
Truancy Alcohol:	*	*	*	*
Drinking behaviour	*	*	*	*
Drinking motives	*	*	*	*
Drinking problems	*	*	*	*
Perceived parental rules	*	*	*	*
Drinking parents	*	*	*	*
Tobacco:	*	*	*	*
Smoking behaviour	*	*	*	*
Smoking parents	*	*	*	*
Perceived parental rules	*	*	*	*
Marijuana:	*	*	*	*
Marijuana-using behaviour	*	*	*	*
Marijuana parents	*	*	*	*
Other:	*	*	*	*
Personality	*	*	*	*
Anxiety	*	*	*	*
Psychological problems	*	*	*	*
Delinquency	*	*	*	*
Depression	*	*	*	*
Self control	*	*		

the Netherlands, have shown that this scale has good internal reliability, good convergent and discriminant validity, and adequate test–retest reliability [34, 40, 41, 25, 27]. The instrument was translated into Dutch by an English speaking language consultant, has been successfully applied [34], and was tested at schools before use in the screening survey.

Outcomes

When the data analysis takes place, the primary outcomes will be percentage reductions in binge drinking, weekly and weekend drinking, and drinking-related problems. To assess life-time alcohol use and binge drinking, two questions will be used that are widely used in school surveys, including the ESPAD study [2], Monitoring the Future [42], and the national school surveys in the Netherlands [1, 43]. The average standard units in the last week will be assessed with the Weekly Recall [44, 45]. Weekly and weekend alcohol use is defined by the quantity–frequency measure [46, 47]. To assess behavioural symptoms of adolescent problem drinking, the Rutgers Alcohol Problems Index (RAPI) [48] will be used. The RAPI has been well validated for use with both clinical and community adolescent samples [49-51, 48].

Other outcomes will include percentage reductions in depressive feelings, anxiety symptoms, problem behaviour, drinking motives, truancy, and delinquent behaviour. Depressive feelings will be measured with the widely used 20-item (Dutch version) of the Centre for Epidemiological Studies Depression Scale (CES-D) [52, 53]. The Childhood Anxiety Sensitivity Index (CASI) [54] is a self-report questionnaire to assess children's and adolescents' fear of anxiety symptoms. The CASI has good internal consistency and acceptable 2-week test–retest reliability [55]. The Strengths and Difficulties Questionnaire (SDQ) [56] will be used as a behavioural screening instrument for early detection of psychological problems. The DMQ-R [57] is the most widely used instrument to assess drinking motives among young people. The DMQ-R has been well validated in several international (e.g. [58]) and national studies (e.g. [51]).

Statistical Analyses

Descriptive analyses will be conducted to examine whether randomization resulted in a balanced distribution of important demographic characteristics and the outcome variables in the two conditions. To control for potential bias, possible confounders will be included in all further analyses.

Analyses will be performed according to the intention-to-treat and completers-only principles, controlling for sex, age, and educational level. Intention-to-treat means that all participants will be analysed in the condition to which they were assigned by randomization. Therefore, missing data at follow up will be imputed using regression imputation. With respect to the completers-only analyses, only the participants with scores on all time points will be included, without the inclusion of imputed data. In both the intention-to-treat and the

completers-only analyses, the effects of the intervention condition will be compared with those of the control condition. For continuous outcome measures, t-tests, or Man Whitney U if non-parametric distributions, will be performed. When correction for confounding variables is necessary, multivariate regression analyses will be performed. The fact that the data are clustered, because groups of respondents that are attending the same class and/or school are investigated, will be taken into account in the analyses.

Discussion

The present study protocol presents the design of a randomized controlled trial evaluating the effectiveness of a prevention programme called Preventure. The intervention programme aims to prevent adolescents from (problematic) alcohol drinking. It is hypothesized that, after one year of follow-up, students in the intervention condition will be engaging less in binge drinking and weekly drinking, and will have fewer drinking-related problems than those students in the control condition.

Strengths and limitations

A first strength of Preventure is that it is one of the few school-based programmes with proven effects on drinking behaviour of adolescents [16, 20]. Second, the programme is a selective prevention programme. In the field of substance use prevention in The Netherlands, there is a recognized need for selective prevention programmes [13]. Third, the intervention incorporates elements of motivational and cognitive behavioural theory, which have been proven to be effective in reducing alcohol abuse and associated psychological problems. Fourth, Preventure is a short intervention (two sessions), which makes it less time-consuming than regular prevention programmes and therefore easier to implement in schools. A limitation of the study is that the information on the behaviour of the adolescents is based on self-reports, which might lead to measurements errors. However, studies have shown that self-report data of adolescents about their own drinking, smoking, and drug use are generally reliable (e.g. [59, 60]).

A general issue with targeted interventions is the selection of participants and providing information to the participants and their parents in an accurate manner. In this study, neither the parents nor the teachers at the school were explicitly informed about the selection variables of the study, to avoid stigmatization of the students. This ethical issue should also be taken into account if the programme is implemented at other schools in the Netherlands in the future.

Implications for practice

If the Preventure prevention programme is effective, it can be implemented widely in schools in The Netherlands – for example, as part of the Dutch national school prevention programme The Healthy School and Drugs. The Healthy School and Drugs has a large network among institutions for care and treatment of drug addicts and schools.

Conclusion

This study has described a programme, currently on trial in the Netherlands, for preventing and reducing binge drinking in adolescence. Evaluation of the programme will provide insight into the effectiveness of Preventure in the Netherlands and the precursors of alcohol use among Dutch adolescents.

Acknowledgements

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Chapter 4

When I hear the beat, my spirit's on me like a live-wire
A thousand horses running wild in a city on fire
But it starts in your feet, then it goes to your head
If you can't feel it, then the roots are dead
Here comes the night time, Arcade Fire

CHAPTER 5

Effectiveness of a selective intervention program targeting personality risk factors for alcohol misuse among young adolescents: Results of a cluster randomized controlled trial

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Reinout W. Wiers
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Abstract

Aim: Preventure is a selective school based alcohol prevention programme targeting personality risk factors. In this study, the effectiveness of Preventure was tested on drinking behaviour of young adolescents in secondary education in The Netherlands.

Method: A cluster randomized controlled trial was carried out, with participants randomly assigned to a 2-session coping skills intervention or a control no-intervention condition. Fifteen secondary schools throughout The Netherlands; 7 schools in the intervention and 8 schools in the control condition. A total of 699 adolescents aged 13–15 participated, 343 allocated to the intervention and 356 to the control condition; with drinking experience and elevated scores in either negative thinking, anxiety sensitivity, impulsivity or sensation seeking. The effects of the intervention on the primary outcome past-month binge drinking, and the secondary outcomes binge drinking frequency, alcohol use, alcohol frequency and problem drinking, were examined. The primary analyses of interest were intervention main effects at 12 months post-intervention. In addition, intervention effects on the linear development of binge drinking using a latent-growth curve approach were examined.

Results: Binge drinking rates were not significantly different between the intervention (42.9%) and control group (49.2%) at 12 months follow-up (OR = 1.05, CI =0.99,1.11). Intention to treat analyses revealed no significant intervention effects on alcohol use (53.9% vs. 61.5%; OR = 0.99, CI = 0.86,1.14) and problem drinking (37.0% vs. 44.7%; OR = 1.01, CI = 0.92,1.10) at 12 months follow-up. The post-hoc latent-growth analyses revealed significant effects on the development of binge drinking (β = -.16, *p* = 0.05), and binge drinking frequency (β = -.14, *p* = 0.05).

Conclusions: The selective alcohol prevention programme Preventure does not reduce alcohol use and problem drinking among Dutch young adolescents, however it reduces the growth in binge drinking and binge drinking frequency over a 12-months' period.

Introduction

Binge drinking is a persistent problem among young adolescents in The Netherlands. Of the Dutch 12–16-year olds who drink alcohol, 68% also engage in binge drinking (i.e., consuming five or more alcoholic drinks on one occasion) [1]. In comparison to other European countries, The Netherlands is among the highest scoring countries when it comes to excessive alcohol use [2]. Binge drinking has been associated with an elevated risk of physical injury, brain damage, aggression and high-risk sexual behaviour [3–5]. Several systematic reviews have concluded that universal prevention programmes have small and often inconsistent effects on adolescents' drinking behaviour [6–9]. Meta-analyses of substance use prevention programmes indicated that selective prevention programmes generally yield higher effects than universal programmes (e.g. [6,7]), but the availability of these programmes is limited. Preventure is a selective prevention programme with a personality-targeted approach. Personality traits that have been specifically linked to alcohol use in young people include depression proneness (negative thinking; NT), anxiety sensitivity (AS), impulsivity (IMP) and sensation seeking (SS) [10,11]. These four distinct personality profiles have all been previously associated with high and problematic substance use behaviours [11–14]. Both anxiety sensitive and depression sensitive individuals, showed higher levels of drinking and drinking problems [11,13–17]. Sensation seekers were found to drink more, and they were at risk of heavy alcohol use [11,12,15]. Impulsive individuals showed an increased risk of early alcohol and drug use [15,18,19].

The Preventure programme specifically targets young adolescents with two risk factors for heavy alcohol consumption: early-onset of alcohol use [20,21] and one of the four substance use risk personalities for alcohol abuse (e.g. [22]). The Preventure programme identifies and treats high-risk adolescents, with the aim of preventing or intervening early before the high-risk adolescents engage in risky behaviours and/or these behaviours become problematic. The students that fall within the risk category of early-onset alcohol use combined with a high-risk personality profile for alcohol abuse, are offered a two-session coping skills intervention, that targets their dominant personality profile and is based on cognitive behaviour therapy and motivational interviewing. Preventure has proved effective in Canadian and British studies among high-school students [23–25]. The intervention was effective in reducing drinking rates and problem drinking among the groups scoring high on anxiety sensitivity and negative thinking, and in reducing binge drinking rates among the sensation seekers' group [23]. Two recent studies showed that the intervention significantly reduced drinking and binge drinking levels at six months post-intervention, reduced problem drinking symptoms after a 24-month follow-up period [26], and reduced growth in drinking quantity and binge drinking frequency over a 24-month period [27]. The main objective of the present

study is to determine the effectiveness of Preventure on reducing drinking behaviour of high-risk adolescents in secondary education in The Netherlands.

Method

Study design

The study was a cluster randomized controlled trial (RCT) with two arms. The participants were randomly assigned to either the intervention group (7 schools; n=343) or the control group (8 schools; n=356). Participants were screened during the baseline measurement. Students in the intervention condition attended two 90-minute sessions during school over two weeks. The intervention was based on cognitive behaviour therapy and motivational interviewing. The average size of each group session was six persons. Students in the control condition received no intervention. Three follow-up measurements were conducted at 2, 6 and 12 months after the intervention, using online surveys, administered in the classroom under supervision of a research assistant. The recruitment, inclusion, and randomization of the participants (schools and students) started in Spring 2009. The data were collected between September 2010 and December 2011.

Study sample

A total of 100 schools were selected randomly from a list of all public secondary schools in The Netherlands (n=405). Schools were included if the following criteria were met: 1) the school had at least 600 students, 2) < 25% of students were from migrant populations, and 3) the school did not offer special education. A total of 60 schools fulfilled the inclusion criteria, of which 15 schools (25%) were willing to participate. The main reasons for schools not participating were lack of time, participating in other studies and no interest in research in general. Students were eligible if they fulfilled the following inclusion criteria: 1) lifetime prevalence of alcohol use (i.e. having drunk at least one glass of alcohol), 2) belonged to one of the four personality high-risk groups for (future) heavy drinking (AS, SS, NT or IMP) and 3) informed consent obtained of the student and his or her parents. For a 15% reduction after 12 months among the students in grade 9/10, a sample size of N=183 in each condition was required to test the hypothesis in a 2-sided test at alpha=0.05 and a power of (1-beta)=0.80. Because of the loss of power due to randomization of schools (and not students) and the increase in error-risk because of applying a multiple imputation procedure to fill in missing values, 183*1.4=256 respondents per condition (intervention and control) needed to be included at baseline. In total, 4,844 students from grades 8 and 9 participated in the screening. The students who scored more than one standard deviation above the sample mean on one of the four personality risk scales [32] were classified as belonging to a risk group. In total, 1,488 students met the inclusion criteria. Informed consent was obtained

from 713 students (47.9%). In total, 699 students participated in the study (see Figure 1). Analyses revealed no significant differences in prevalence or demographic characteristics between consenting and non-consenting students.
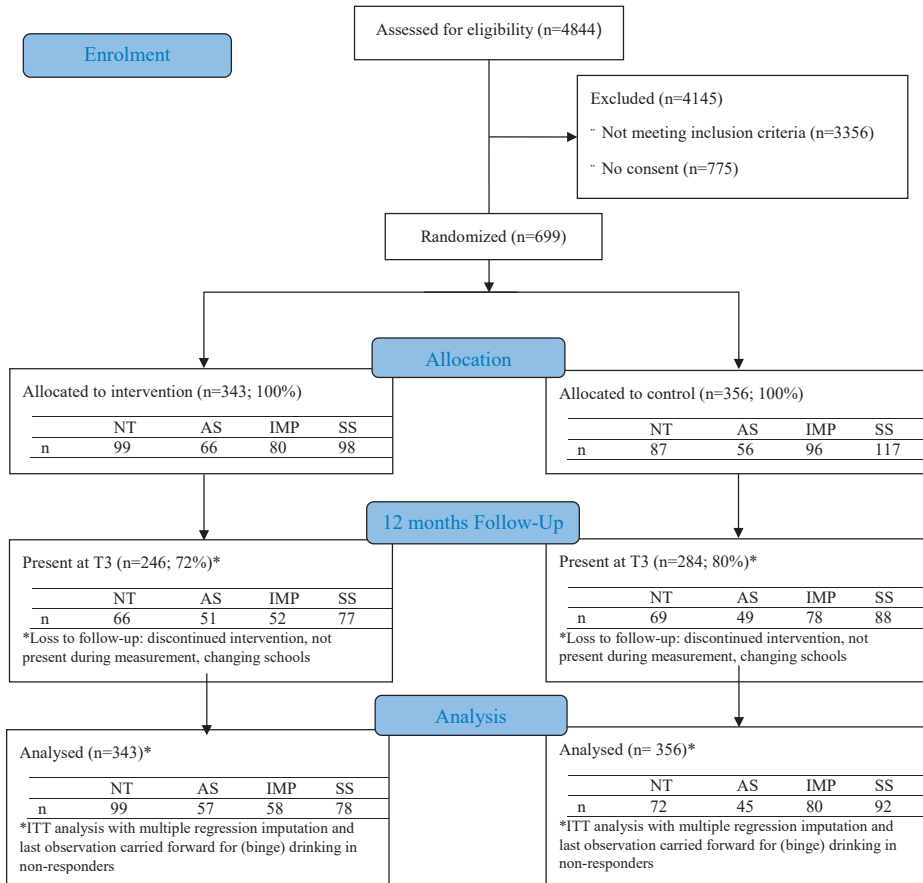

Figure 1. Flow diagram of recruitment and progress throughout the study

Study procedure

Randomization occurred at the school level to avoid contamination between conditions. Allocation of the schools to trial conditions was done by an independent member of the research group using a computer-generated allocation sequence. Randomization was carried out using a randomization scheme, stratified by level of education and school size, with the schools as units of randomization. In order to select students, a screening survey was carried out among all students attending grade 8 and grade 9 in the 15 participating schools. The independent researcher prepared a list of study participants and their allocated condition. Based on this list, the principal investigator prepared the mailings which informed study

participants about the study and the intervention they would receive. Adolescents were informed that the data would be processed anonymously, and respondent-specific codes were used to link the data from one time point to the next. Parents were informed of the study through a letter sent home from the schools asking them to contact the researchers by phone or e-mail if they did not wish their child to participate in the study (passive informed consent). Parents were told that the intervention was a coping-skills training designed to reduce adolescent risk taking, with alcohol abuse as an example. Parents and students provided active informed consent to participate in the intervention part of the study. The study was approved by the Medical Ethical Commission for Mental Health (METIGG). The trial is registered in The Dutch Trial Register (NTR1920).

Intervention

Preventure incorporates the principles from motivational interviewing and cognitive behavioural therapy and is adapted to different personality profiles for substance abuse: AS, NT, IMP, SS. The intervention is brief, using the effective component of persuasiveness of individualized feedback. Therefore, Preventure provides pupils with personalized feedback on their results from a personality assessment. The intervention also includes cognitive behavioural skills training specifically relevant to each personality profile. The literature has shown that successful cognitive behavioural therapy can lead to reductions in anxiety sensitivity in anxiety patients, depressive cognitions in depressed patients, and impulsivity in adolescents with externalizing disorders [28, 29, 30].

Intervention condition: the intervention involved two group sessions, carried out at the participants' schools, during school hours. The group sessions were tailored to one of the four personality profiles. Both group sessions lasted 90 minutes and were spread across two weeks. The average group size was six persons. The intervention used student manuals. In the first group session, psycho-educational strategies were used to educate students about the target personality variable, and the associated problematic coping behaviours, such as interpersonal dependence, aggression, risky behaviour, and substance misuse. Students were motivated to explore their personality and ways of coping with their personality through a goal-setting exercise. In the second session, participants were encouraged to identify and challenge personality-specific cognitive thoughts that lead to problematic behaviours. The content of the intervention is described in more detail in a study protocol paper [33].

Control condition: students assigned to the control group received no further intervention.

Treatment integrity

The intervention was provided by three qualified counsellors and two co-facilitators. The counsellors and co-facilitators attended a 2-day training session led by Dr P.J. Conrod and Dr N. Castellanos from King's College, London, who developed the original intervention. Furthermore, all the counsellors had practiced the two group sessions at a school with

supervision and feedback. These supervised interventions were run with students from a pilot school, not recruited for the Preventure trial. Also, each counsellor's first two group sessions at the intervention schools were observed by a supervisor who had participated in the Preventure training session. All the counsellors were provided with feedback during four peer reviewing meetings under the guidance of the same supervisor. At the first group session, 80% of participants were present, and at the second group session 71%. In total, 71% of the students followed both group sessions. Students who did not attend both group sessions were more likely to have recently been binge drinking (59% vs. 45%) (X^2(1) = 5.12, $\rho < .024$) and were more likely to skip one or more of the follow-up measurements (X^2(1) = 25.87, $\rho < .0001$) than students who attended both group sessions.

Outcome measures

Baseline assessment. The baseline questionnaire included demographic variables: age, sex, year of level, ethnicity and level of education. For baseline screening, the Substance Use Risk Profile Scale (SURPS; [32]) was used, which distinguishes four personality profiles. Each profile is assessed using five to seven items that can be answered on a 4-point scale. Negative thinking (7 items) refers to hopelessness, which might lead to depressive symptoms. The anxiety sensitivity dimension (5 items) measures fear of bodily sensations. The sensation seeking subscale (6 items) measures the tendency to seek out thrilling experiences. The tendency to act without thinking is measured by the impulsivity subscale (5 items). Studies in both adolescent and adult samples in several countries, including The Netherlands, have shown that this scale has good internal reliability, convergent and discriminant validity, and adequate test–retest reliability [15,16,32]. All four subscales demonstrated good internal consistency in the current sample (Cronbach's α=0.84 for NT, 0.72 for AS, 0.69 for IMP and 0.66 for SS). These reliability estimates converge with those from previous research (e.g. [16,34]) and are satisfactory for short scales [35].

Primary outcome measure. The primary outcome was binge drinking at 12 months follow-up measurement, assessed with the question 'How many times have you had five or more drinks on one occasion, during the past four weeks?', with the answer categories 'none', '1', '2', '3–4', '5–6', '7–8' and '9 or more'. Because the binge drinking variable was skewed to the low end, the item was recoded into a binominal variable (0 = 'none'; 1= '1 or more'). *Secondary outcome measures.* Alcohol use was assessed by 1-month prevalence [36] at 12 months follow up measurement by asking: 'In the past four weeks, did you drink any alcoholic beverage(s)?' Alcohol use was recoded into a binominal variable (0 = 'none'; 1= '1 or more'). Binge drinking frequency was assessed with the same question as binge drinking. Frequency of alcohol use was assessed with the question 'In the past four weeks, how often did you drink one or more alcoholic beverage(s)?', ranging from 0 to 40 or more times. The binge drinking frequency and alcohol frequency items were log-transformed to approxi-

mate a normal distribution. To assess drinking problems, the abbreviated Rutgers Alcohol Problems Index (RAPI) [37] was used. Participants could indicate on a scale ranging from 0 (never) to 5 (more than 6 times) how often they experienced each of 18 alcohol-related problems during their life. Item scores were summed. Because the variable was skewed, the item was recoded into a binominal variable (0 = 'absence'; 1= 'presence'). The original RAPI has been well validated for use with both clinical and community adolescent samples [37,38]. The abbreviated version correlates well with the original (.99).

Statistical analyses

First, descriptive analyses were conducted to examine whether randomization resulted in a balanced distribution of demographic and outcome variables over the two conditions. The randomization resulted in an uneven distribution in terms of age, sex and level of education. Hence, these variables were included as covariates in all subsequent analyses. To correct for the potential non-independence (complexity) as well as clustering of the data, the TYPE=COMPLEX procedure in Mplus was used [cf 16]. Next, to determine the effect of the intervention on alcohol use outcomes, we made use of the intention to treat principle (ITT). To test the robustness of the results, we applied two ITT methods. First, missing data were imputed using multiple regression imputation in Mplus 6.11 [39]. Second, missing data for the outcome variables were imputed by carrying the last observation forward (i.e., binge drinkers at baseline were assumed to still be binge drinkers at 12 month follow-up). The effects of the intervention condition were compared to the effects of the control condition using multivariate regression analyses in Mplus 6.11. For the dichotomous variables we used logistic regression analyses, with ML and the CATEGORICAL ARE option (reported in OR). For the continuous variables regression analyses were used, with the MLR estimator (reported in β). The primary analyses of interest were intervention main effects at 12 months post-test. The level of statistical significance was set at *p*-value < .05. Furthermore, by means of a latent-growth curve approach, post-hoc analyses were conducted to examine the effect of the Dutch version of Preventure on the linear increase in binge drinking and binge drinking frequency. A latent-growth model approaches the analysis of repeated measures from the perspective of an individual growth curve for each subject; each growth curve has a certain initial level (intercept) and a certain rate of change over time (slope) [40]. In this latent-growth model, the binge drinking outcome slope was regressed on the Preventure intervention condition variable, controlled for the alcohol use intercept and the covariates age, gender and education level. The fit of the models was assessed by the following fit indexes: 2, Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Root-Mean-Square Error of Approximation (RMSEA). Due to the sensitivity of the Chi-square goodness of-fit test to sample sizes, the fit indices CFI, TLI and RMSEA were used. Except for the values of RMSEA (which would be satisfactory if smaller than 0.08), goodness-of-fit values greater than 0.90 are considered an acceptable fit [41]. The Chi-square is thus reported, but seeing

that with large sample sizes the Chi-square value is often significant, we also report the CFI, TLI and RMSEA, which point towards a good model fit.

Results

Characteristics of the participants

Descriptive analyses revealed significant differences between the experimental conditions with regard to sex ($X^2(1) = 5.96$, $\rho = .015$), age (t (697) = 2.98, $\rho < .003$) and level of education ($X^2(1) = 24.77$, $\rho < .001$). The intervention condition included more girls, slightly younger students and more students with a low education level. Furthermore, the students in the intervention condition were more likely to engage in binge drinking at baseline ($X^2(1) = 10.43$, $\rho < .001$) than the students in the control condition. For other drinking measures, no significant differences between the intervention and control conditions were found (see Table 1).

Table 1. Baseline demographic characteristics of intervention and control condition

Outcome	Measure	Intervention (n = 343)	Control (n = 356)	
n=699		Mean	Mean	*p*-value
Demographics	Male (%)	47 (161)	57 (203)	<.015
	Age (M, SD)	13.9 (.98)	14.1 (.77)	<.003
	Dutch (%)	87 (289)	87 (310)	n.s.
	Low level of education (%)	43 (147)	26 (93)	<.001
Alcohol use	Total group (%)	60 (206)	59 (210)	n.s.
	NT (%)	55 (189)	59 (210)	n.s.
	AS (%)	52 (178)	49 (174)	n.s.
	IMP (%)	70 (240)	60 (213)	n.s.
	SS (%)	62 (213)	62 (221)	n.s.
Binge drinking	Total group (%)	49 (168)	37 (132)	<.001
	NT (%)	47 (161)	36 (128)	n.s.
	AS (%)	46 (158)	35 (125)	n.s.
	IMP (%)	51 (175)	42 (150)	n.s.
	SS (%)	52 (178)	34 (121)	<.01

Note. NT = negative thinking; AS = anxiety sensitivity; IMP = impulsivity, SS = sensation seeking.

Intervention effects on binge drinking, alcohol use and problem drinking

Tables 2 and 3 present the results of the intervention on the primary and secondary alcohol use outcomes for the intervention and control conditions. Logistic regression analyses revealed no significant effects on any primary or secondary outcome measures at 12 months post-intervention in the ITT sample.

Table 2. Effects of Preventure on alcohol use, binge drinking and problem drinking at 12-month follow-up (T3) among alcohol users at baseline

	Intervention % (n)	Control % (n)	OR (95% CI)*	p	OR (95% CI)†	p
ITT sample ‡	(n=343)	(n=356)				
Primary outcome: binge drinking	42.9 (147)	49.2 (175)	1.05 (0.99, 1.11)	.14	1.11 (1.02, 1.21)	.17
Secondary outcome: alcohol use	53.9 (185)	61.5 (219)	0.99 (0.86, 1.14)	.88	0.98 (0.81, 1.17)	.78
Secondary outcome: problem drinking	37.0 (127)	44.7 (159)	1.03 (0.92, 1.10)	.85	0.96 (0.86, 1.08)	.51
ITT sample **	(n=343)	(n=356)				
Primary outcome: binge drinking	42.9 (147)	49.2 (175)	1.03 (1.01, 1.04)	.00	1.07 (1.02, 1.14)	.00
Secondary outcome: alcohol use	53.9 (185)	61.5 (219)	1.01 (0.99, 1.04)	.59.	0.98 (0.89, 1.09)	.76
Secondary outcome: problem drinking	37.0 (127)	44.7 (159)	1.05 (0.94, 1.18)	.36	0.99 (0.88, 1.12)	.87

Note. *Adjusted for sex, age, education and cluster effects. † Unadjusted for sex, age, education and cluster effects. OR = odds ratio, CI = confidence interval. ‡ Missing data were imputed using multiple regression imputation. ** Missing data on outcome variables were handled by the last observation carried forward method.

Table 3. Effects of Preventure on binge drinking frequency and alcohol frequency at 12-month follow-up (T3) among alcohol users at baseline

	Intervention % (n)	Control % (n)	β*	SE β	p	β†	SE β	p
ITT multiple imputation‡	N=343	N=356						
Secondary outcome: binge drinking frequency	42.9 (147)	46.0 (164)	-0.11	0.05	0.16	0.13	0.08	0.18
Secondary outcome: alcohol frequency	45.2 (155)	51.4 (183)	0.01	0.06	0.91	0.01	0.09	0.93
ITT last observation carried forward **								
Secondary outcome: binge drinking frequency	42.9 (147)	46.0 (164)	0.11	0.02	0.19	-0.12	0.01	0.18
Secondary outcome: alcohol frequency	45.2 (155)	51.4 (183)	0.03	0.04	0.39	0.03	0.04	0.36

Note. *Adjusted for sex, age, education and cluster effects. † Unadjusted for sex, age, education and cluster effects. β = standardized logistic regression coefficient. ‡ Missing data were imputed using multiple regression imputation. ** Missing data on outcome variables were handled by the last observation carried forward method.

Intervention effects on growth over time

Post-hoc analyses were conducted, by means of a latent-growth curve approach, to examine the effect of Preventure on the linear increase in alcohol use. In this model, the binge drinking slope was regressed on the Preventure intervention variable. The fit between the model and the data was excellent (X^2 [N = 699] = 403.691, p < 0.001; RMSEA = 0.024, CFI = 0.996, TLI = 0.994). The intercept and slope for binge drinking were significant (respectively, $\beta 0$ = 1.22, p < 0.001 and $\beta 1$ = 0.50, p < 0.001), indicating that the participants on average scored greater than zero on level of binge drinking at baseline and that levels of binge drinking increased over time. A quadratic trend was also tested, but was non-significant and therefore omitted. There was a significant effect of the intervention on the binge drinking slope (β = -.16, p = 0.05), indicating that adolescents who received the intervention increased their binge drinking behaviour less than those in the control condition. The fit between model and data was excellent (X^2 [N = 699] = 26.190, p < 0.01; RMSEA = 0.040, CFI = 0.979, TLI = 0.962). Furthermore, the intercept and slope for binge drinking frequency were significant (respectively, $\beta 0$ = 1.05, p < 0.00 and $\beta 1$ = 0.58, p < 0.00). The fit between the model and the data was good (X^2 [N = 699] = 14.048, p < 0.02; RMSEA = 0.060, CFI = 0.986, TLI = 0.979). There was a significant effect of intervention on the binge drinking frequency slope (β = -.14, p = 0.05), with good model fit statistics (X^2 [N = 699] = 30.228, p < 0.01; RMSEA = 0.046, CFI = 0.981, TLI = 0.966). No significant effects were found on the intercepts and slopes for the outcome measures alcohol use and drinking problems.

Discussion

This study evaluated the effectiveness of the selective alcohol prevention programme Preventure in the Netherlands. Main results depended on the analysis-strategy used: On the one hand, logistic regression analyses revealed no significant effects on the primary outcome binge drinking, and the secondary outcome measures alcohol use, problem drinking, alcohol and binge drinking frequency at 12 months post-intervention. On the other hand, latent-growth analysis revealed that the intervention overall resulted in significantly less growth in binge drinking and binge drinking frequency over 12 months' time. Thus, while using a traditional approach with one follow-up time point leads to the conclusion that Preventure is not effective in changing (binge) drinking behaviour, the use of LGC modelling techniques shows a sustaining preventive effect on alcohol use over a one-year time period. LGC modelling techniques allow for estimation of average growth trajectories of alcohol use over time as well as individual differences in these trajectories [39, 42]. The estimation of variances in growth trajectories increases the reliability of outcome measures in comparison with traditional statistical techniques, such as regression analyses [43]. Simply relying on an individual time point to capture an individual's substance use pattern (and an intervention effect) is not state of the

art in recent prevention trials [e.g. 27]. Conform the CONSORT statement we used regression analyses as the primarily analyses, and the latent growth analyses as post-hoc analyses.

The findings of the current study are partially in line with previous studies of Conrod and colleagues. According to trials among Canadian and British young adolescents, Preventure was effective in preventing the growth of binge drinking, at four months [23] and six months post-intervention [24]. In our study, no effects on binge drinking were found at 12 months post-intervention. Latent-growth models in Conrod and colleagues' study showed that the intervention delayed the natural increase in binge drinking in the first six months after the intervention [24]. The latent-growth models in our study indicated a delay in the increase in binge drinking and binge drinking frequency over a period of 12 months.

In our study, no significant effects were revealed for problem drinking. This is consistent with the Preventure study among adolescents in England (after 6 and 12 months post-intervention). [24] However, in the same study, Conrod and colleagues found intervention effects in reducing problem drinking symptoms at 24 months post-intervention [26]. In the Canadian study, intervention effects on drinking problems were found in the short term (four months), but this study was conducted among an older student population, in which problematic drinking patterns were more likely to be already established [23]. These previous findings may implicate that curbing the growth of drinking in early onset drinkers may delay the onset of problematic drinking over the longer term. Longer-term follow-up of the current sample might reveal effects on high-risk drinking outcomes typical for older adolescents.

Some differences between conditions in our study and those of Conrod and colleagues should be noted, to give a possible explanation for the differences in effect. First, the British study was aimed at drinkers and non-drinkers, whereas our study was aimed at drinkers only. The Canadian trial was conducted among drinkers only [23], but with an older population, and only short-term effects were measured. Second, in Dutch society, laws and norms regarding substance use are more liberal, and actual substance use in young adolescence is high compared to other countries; this might have affected the study outcomes. Third, compared to the British studies, the counsellors in our study were less observed and supervised. In our study, each counsellor's first two sessions were observed, whereas in the British trials all the sessions were supervised. This might explain the differences in effects of the Dutch trial and the British trials.

Limitations

The current study has some limitations. First, our study was confined to students who participated voluntarily in the intervention and had parental consent. Fifty-two percent of the potential participants were lost due to this source of attrition. This procedure could have caused a sample selection bias, because the participating students were probably more motivated than the non-participating students. Second, the use of self-reports might have led to measurement errors, due to situational and cognitive influences [44]. To overcome
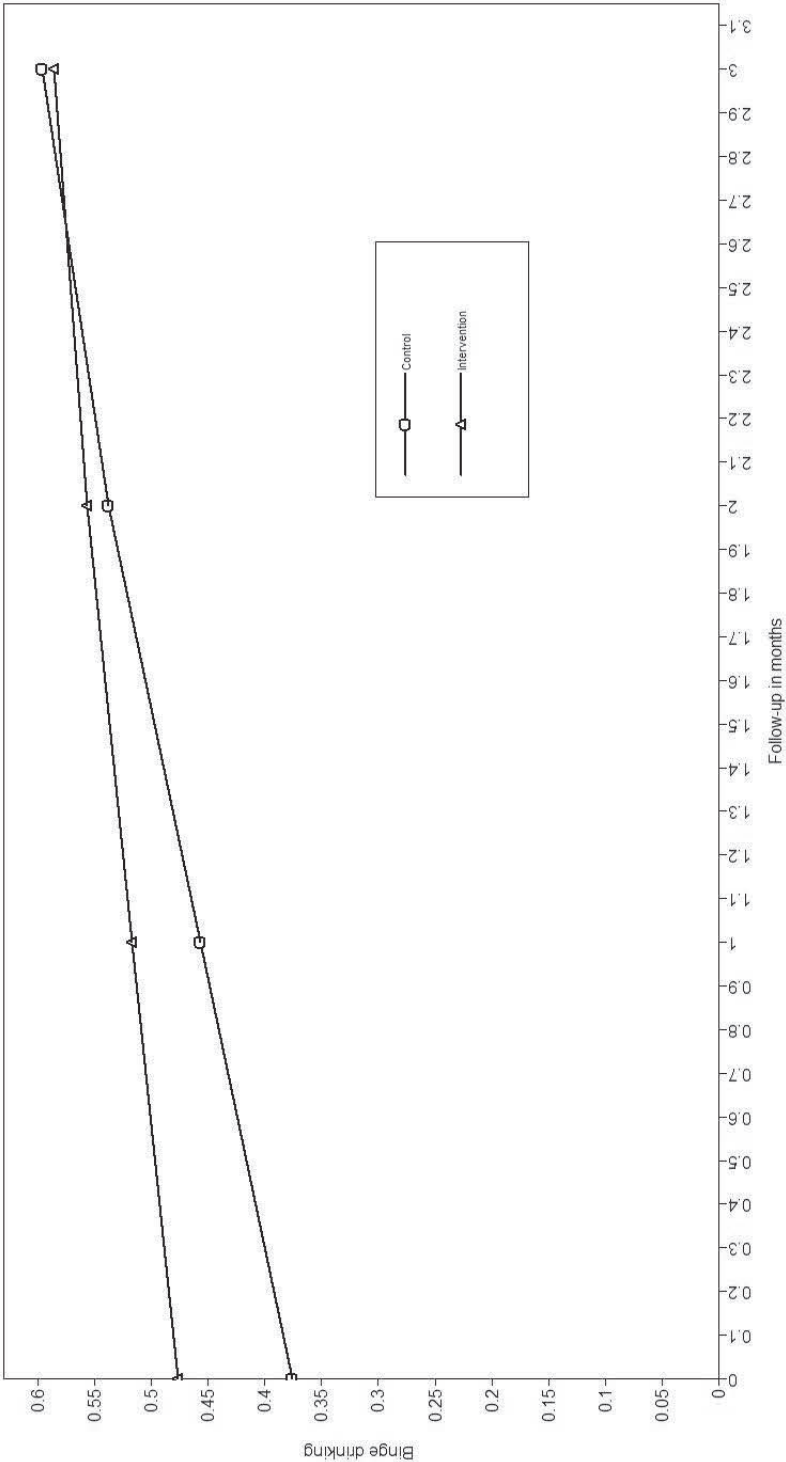
Figure 2. Latent growth trajectories for binge drinking in the past month

situational influences (e.g. social desirability) and to optimize measurement validity, we guaranteed full confidentiality (anonymity) to our participants (cf [31,45]). Third, the intervention and control conditions differed at baseline on sex, age, level of education and binge drinking status. The intervention condition included more girls, slightly younger students and more students with a low education level, and the students were more likely to engage in binge drinking. Randomization at school level is probably responsible for this unequal distribution. A possible solution for future trials might be to randomize within schools, although one should be careful to avoid contamination effects. Finally, this study did not examine the efficacy of the intervention using a placebo-controlled design. Future research is warranted to compare the outcomes with another evidence-based alcohol prevention programme or with an attention-only control intervention [7].

Based on the more sensitive growth analyses, we may conclude that Preventure in the Dutch setting is a promising intervention to curb the increase in binge drinking among young adolescents up until one year after the intervention. Instead of treating youth as uniform, Preventure takes into account the different dispositions of the target group. Preventure is complementary to universal alcohol prevention. Nearly half of the target population (young adolescents) belongs to one of the four personality traits. So the Preventure programme would probably enable a relatively large reduction in the prevalence of binge drinking in the total population. The Preventure approach strengthens the prevention efforts to reduce alcohol misuse among young adolescents. Future research could be focused on populations with a higher proportion of high-risk adolescents, such as the setting of special education or youth with mild mentally disabilities.

Acknowledgements

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Chapter 5

I wrote all night
Like the fire of my words
Could burn a hole up to heaven
I don't write all night burning holes
Up to heaven no more
C'est la Vie, Phosphorescent

CHAPTER 6

Effectiveness of a selective alcohol prevention program targeting personality risk factors: Results of interaction analyses

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Patricia Conrod
Rutger Engels
Reinout W. Wiers
Marloes Kleinjan

Abstract

Aim: To explore whether specific groups of adolescents (i.e., scoring high on personality risk traits, having a lower education level, or being male) benefit more from the Preventure intervention with regard to curbing their drinking behaviour.

Method: A clustered randomized controlled trial, with participants randomly assigned to a 2-session coping skills intervention or a control no-intervention condition. Fifteen secondary schools throughout The Netherlands; 7 schools in the intervention and 8 schools in the control condition. 699 adolescents aged 13–15; 343 allocated to the intervention and 356 to the control condition; with drinking experience and elevated scores in either negative thinking, anxiety sensitivity, impulsivity or sensation seeking. Differential effectiveness of the Preventure program was examined for the personality traits group, education level and gender on past-month binge drinking (main outcome), binge frequency, alcohol use, alcohol frequency and problem drinking, at 12 months post-intervention. Preventure is a selective school-based alcohol prevention programme targeting personality risk factors. The comparator was a no-intervention control.

Results: Intervention effects were moderated by the personality traits group and by education level. More specifically, significant intervention effects were found on reducing alcohol use within the anxiety sensitivity group (OR = 2.14, CI = 1.40, 3.29) and reducing binge drinking (OR = 1.76, CI = 1.38, 2.24) and binge drinking frequency (β = 0.24, *P* = 0.04) within the sensation seeking group at 12 months post-intervention. Also, lower educated young adolescents reduced binge drinking (OR = 1.47, CI = 1.14, 1.88), binge drinking frequency (β = 0.25, *P* = 0.04), alcohol use (OR = 1.32, CI = 1.06, 1.65) and alcohol use frequency (β = 0.47, *P* = 0.01), but not those in the higher education group. Post-hoc latent-growth analyses revealed significant effects on the development of binge drinking (β = -0.19, *P* = 0.02) and binge drinking frequency (β = -0.10, *P* = 0.03) within the SS personality trait.

Conclusion: The alcohol selective prevention program Preventure appears to have effect on the prevalence of binge drinking and alcohol use among specific groups in young adolescents in the Netherlands, particularly the SS personality trait and lower educated adolescents.

Introduction

Preventure is a selective prevention programme with a personality-targeted approach. It targets young adolescents with two risk factors for heavy alcohol consumption: early-onset alcohol use [1,2] and personality risk for alcohol abuse (e.g. [3]). Preventure has proven to be effective in Canadian, British and Australian studies when offered to high-school students [4–6]. In a recent study on the effectiveness of Preventure in The Netherlands, no program effects were found when looking at the incidence of alcohol use at the follow-up points separately [7]. By modeling the development of alcohol use over time using latent growth modeling, positive program effects were found. The exposure to the intervention resulted in significantly less growth in binge drinking and binge drinking frequency over the whole group of young adolescents [7]. In the current post-hoc analyses of the Dutch Preventure study, we explored whether certain theory-based high-risk groups would benefit more from the Preventure intervention than others.

Specific characteristics of study participants may moderate the relationship between the Preventure intervention and substance use behaviours [5,6,8]. The risk moderation hypothesis suggests that prevention programs should be more effective in high-risk groups compared to lower risk groups. On the basis of previously reported moderators in the literature [5,9,10], we specifically examined participants' personality traits, educational level and gender as possible moderators of intervention effects.

Two personality dimensions were previously found to be predictive of heavy alcohol use and alcohol use disorders, namely (1) an impulsive sensation seeking dimension, and (2) a behavioural inhibition dimension [4]. These two broad personality dimensions are either more proximal to alcohol use and misuse or they map onto specific motivational processes underlying alcohol use or misuse [4]. The impulsive sensation seeking dimension is related to drinking problems through negative affect coping motives. In contrast, the inhibition dimension is associated with positive affect related drinking, which is in turn associated with heavier drinking and drinking problems [4]. Within these two dimensions, Conrod and colleagues [11,12] distinguished four personality profiles at higher risk of developing alcohol problems: Sensation Seeking (SS), Impulsivity (IMP), Anxiety Sensitivity (AS) and Negative Thinking (NT). Both anxiety sensitive and hopeless individuals showed higher levels of alcohol use and drinking problems [12,14–16]. Sensation seekers were found to drink earlier, at greater frequency, and they were at risk of heavy alcohol use (binge drinking) [12,13,16]. Impulsive individuals showed an increased risk of early alcohol and drug use [16,17,18]. Consistent with the Canadian, British and Australian studies [4–6], we hypothesized that Preventure would be effective in reducing binge drinking rates among the sensation seekers' trait, and reducing drinking rates and problem drinking among the anxiety sensitivity and negative thinking personality traits[4].

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A unique feature of the education system in the Netherlands is that the population of secondary school pupils is divided into different education levels and there are important differences in substance use behaviours between adolescents from lower and higher educational backgrounds [19,20,21]. For example, a great proportion of pupils from lower education levels report binge drinking; 75% of pupils aged 13-15 with preparatory vocational training (lower educational level) engage in binge drinking, compared to 56% of students with pre-university education (higher educational level) [21]. In other Dutch prevention trials, [10,22,23], education level was found to moderate intervention effects. Because binge drinking is more common among pupils from lower educated levels, and previous trials indicated that lower educated students might benefit more from alcohol prevention programmes [22], we hypothesized that Preventure would be more effective in reducing binge drinking in the group of lower educated students at follow-up compared to students with a higher education level. Finally, boys and girls have different drinking patterns. For instance, boys tend to drink more frequently and are more engaged in binge drinking compared to girls [21], at least at the time this trial was conducted. In general, externalizing risk factors, such as low self-regulatory capacities, are more common among boys [24,25] and internalizing factors, like low self-esteem, are more present among girls [24,26]. Furthermore, girls are more likely to use substances as a way to cope with stress, while boys are more likely to use out of enhancement motives [9]. Because the intervention matches those differences expected for the personality types, we expected boys and girls to benefit both from the Preventure program.

With the exploration of these certain theory-based high-risk groups, the Preventure programme can possibly be implemented more effective and more tailored into the Dutch school setting.

Method

Study sample

A total of 100 schools were selected randomly from all public secondary schools in The Netherlands (N=405). Sixty schools fulfilled the inclusion criteria: 1) at least 600 students, 2) < 25% of students from migrant populations, and 3) no special education. Fifteen schools (25%) were willing to participate. A screening survey was carried out among all students attending grade 8 and grade 9 in the participating schools. The students who reported to have drunk at least one glass of alcohol, and scored more than one standard deviation above the sample mean on one of the four personality risk scales were classified as belonging to a risk group [27]. In total, 4,844 students participated in the screening, and 699 students participated in the study (see Figure 1). Analyses revealed no significant differences in prevalence or demographic characteristics between consenting and non-consenting students. Randomization occurred at school level to avoid contamination between conditions.

Parents and students provided active informed consent to participate in the intervention part of the study. The study was approved by the Medical Ethical Commission for Mental Health (METIGG). The design, including the power analyses, is described in more detail in earlier reports [28,7]. The trial is registered in The Netherlands Trial Register (NTR1920).

A total of 581 students (83%) completed follow-up measures after 2 months, 552 students (79%) after 6 months and 530 students (76%) at the 12-month follow-up. The students who only completed the screening questionnaire (7% of all respondents) were more likely to have a lower level of education than those who completed at least one of the three follow-up questionnaires (53% vs. 34%, $X^2(1) = 8.20$, $\rho < .004$).
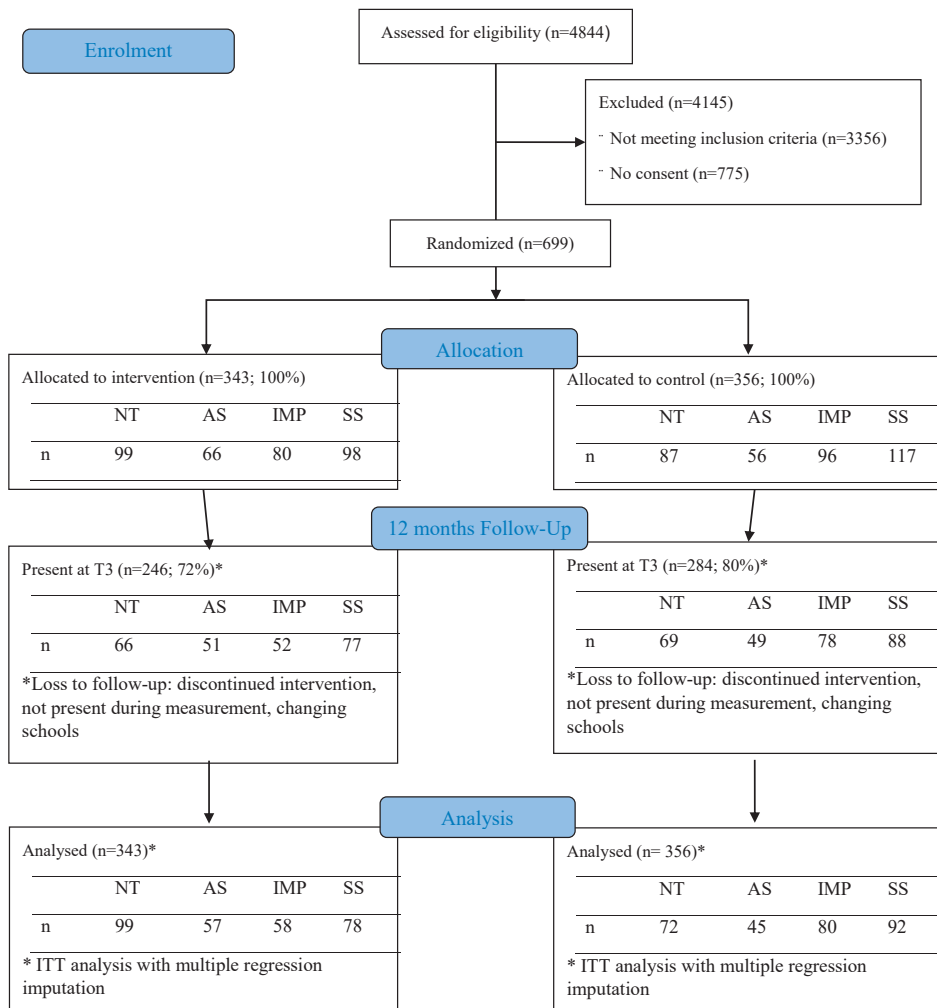
Enrolment

Assessed for eligibility (n=4844)

Excluded (n=4145)
- Not meeting inclusion criteria (n=3356)
- No consent (n=775)

Randomized (n=699)

Allocation

Allocated to intervention (n=343; 100%)

	NT	AS	IMP	SS
n	99	66	80	98

Allocated to control (n=356; 100%)

	NT	AS	IMP	SS
n	87	56	96	117

12 months Follow-Up

Present at T3 (n=246; 72%)*

	NT	AS	IMP	SS
n	66	51	52	77

*Loss to follow-up: discontinued intervention, not present during measurement, changing schools

Present at T3 (n=284; 80%)*

	NT	AS	IMP	SS
n	69	49	78	88

*Loss to follow-up: discontinued intervention, not present during measurement, changing schools

Analysis

Analysed (n=343)*

	NT	AS	IMP	SS
n	99	57	58	78

* ITT analysis with multiple regression imputation

Analysed (n= 356)*

	NT	AS	IMP	SS
n	72	45	80	92

* ITT analysis with multiple regression imputation

Figure 1. Flow diagram of recruitment and progress throughout the study

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Intervention

Preventure is a brief intervention using motivational interviewing strategies and cognitive behavioural skills training, that is tailored to one of the four personality profiles [6,29]. It focuses on changing coping strategies rather than substance use specifically. The intervention involved two 90-minutes group sessions, carried out at the participants' schools, during school hours. Group-sessions were supported by student manuals, in which thoughts and exercises could be logged. In the first group session, psycho-educational strategies were used to educate students about the target personality variable, and the associated problematic coping behaviours, such as risky behaviour, and substance misuse. Students were motivated to explore ways of coping with their personality through a goal-setting exercise. In the second session, participants were encouraged to identify and challenge personality-specific cognitive thoughts that lead to problematic behaviours. Students assigned to the control group received no further intervention.

Treatment integrity

The intervention was provided by three qualified counsellors and two co-facilitators. The counsellors were observed by a supervisor at their first two group sessions at each school, and were provided with feedback through four peer reviewing meetings during the implementation. Eighty percent (80%) of participants were present for the first intervention session and 71% for the second session. In total, 71% of the students followed both group sessions. Students who did not attend both group sessions (29%) were more likely to have recently been binge drinking (59% vs. 45%) (X^2(1) = 5.12, ρ < .024) and were more likely to skip one or more of the follow-up measurements (X^2(1) = 25.87, ρ < .0001) than students who attended both group sessions.

Outcome measures

Baseline assessment. The baseline questionnaire included demographic variables: age, sex, year of level, ethnicity and level of education. For baseline screening, the Substance Use Risk Profile Scale (SURPS; [27]) was used, which distinguishes four personality profiles. Each profile is assessed using five to seven items that can be answered on a 4-point scale. Studies in both adolescent and adult samples in several countries have shown that this scale has good internal reliability, convergent and discriminant validity, and adequate test–retest reliability [16,27,30]. All four subscales demonstrated good internal consistency in the current sample (Cronbach's α=0.84 for NT, 0.72 for AS, 0.69 for IMP and 0.66 for SS). These reliability estimates converge with those from previous research (e.g. [30,31]) and are satisfactory for short scales [32].

Primary outcome measure. The primary outcome was binge drinking at 12 months follow-up measurement, assessed with the question 'How many times have you had five or more

drinks on one occasion, during the past four weeks?', with the answer categories 'none', '1', '2', '3–4', '5–6', '7–8' and '9 or more'. Because the binge drinking variable was skewed to the low end, the item was recoded into a binominal variable (0 = 'none'; 1= '1 or more').
Secondary outcome measures. Alcohol use was assessed by 1-month prevalence [33] at 12 months follow up measurement by asking: 'In the past four weeks, did you drink any alcoholic beverage(s)?' Alcohol use was recoded into a binominal variable (0 = 'none'; 1= '1 or more'). Binge drinking frequency was assessed with the same question as binge drinking. Frequency of alcohol use was assessed with the question 'In the past four weeks, how often did you drink one or more alcoholic beverage(s)?', ranging from 0 to 40 or more times. The binge drinking frequency and alcohol frequency items were log-transformed to approximate a normal distribution. To assess drinking problems, the abbreviated Rutgers Alcohol Problems Index (RAPI) [34] was used. Participants could indicate on a scale ranging from 0 (never) to 5 (more than 6 times) how often they experienced each of 18 alcohol-related problems during their life. Item scores were summed. Because the variable was skewed, the item was recoded into a binominal variable (0 = 'absence'; 1= 'presence'). The original RAPI has been well validated for use with both clinical and community adolescent samples [34,35].

Statistical analyses

Descriptive analyses were conducted to examine whether randomization resulted in a balanced distribution of demographic and outcome variables over the two conditions. The randomization resulted in an uneven distribution in terms of age, sex and level of education. Hence, these variables were included as covariates in all subsequent analyses. As the intervention condition showed higher binge drinking at baseline than the control condition, binge drinking was also used as covariate. To correct for the potential non-independence (complexity) as well as clustering of the data, the TYPE=COMPLEX procedure in Mplus was used [cf 30]. Next, to determine the effect of the intervention on the alcohol use outcomes we made use of the intention to treat principle (ITT) [cf 10, 37]. Missing data were imputed using multiple regression imputation in Mplus 6.11 [36]. To examine moderation effects of different high-risk groups, intervention interaction analyses were conducted with the variables sex, level of education and the four personality traits AS, NT, IMP and SS, for all the primary and secondary outcome measurements. To test for interaction effects, we computed product terms of study condition with the variables sex, level of education and the four personality traits AS, NT, IMP and SS, respectively. Interaction effects were included separately in the regression analyses [cf 4]. The level of statistical significance was set at *p*-value < .05. We chose not to correct for multiple testing seeing that this is the first time the Preventure Programme was tested in the Netherlands and the interaction analyses are therefore of a more exploratory nature. Valuable information on potential subgroups for which the program could be more effective would be lost if we correct for multiple testing. The effects of the intervention condition were compared to the effects of the control condition using multi-

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variate regression analyses in Mplus 6.11. For the dichotomous variables we used logistic regression analyses, with ML and the CATEGORICAL ARE option (reported in OR). For the continuous variables regression analyses were used, with the MLR estimator (reported in β). The main effects of the variables involved in interaction analyses were also included in the models assessing interactions, as were all covariates. Furthermore, post-hoc latent growth analyses were conducted to examine the effect of Preventure on the linear increase in alcohol use. A latent-growth model approaches the analysis of repeated measures from the perspective of an individual growth curve for each subject; each growth curve has a certain initial level (intercept) and a certain rate of change over time (slope) [38]. In this latent growth model, the alcohol outcome slope was regressed on the Preventure intervention condition variable, controlled for the other outcome measures and the covariates age, sex and education. The fit of the models was reported by X^2 and, because with large sample sizes the X^2 is often significant, we also reported the CFI, TLI and the RMSEA.

Results

Descriptive analyses

Descriptive analyses revealed significant differences between the experimental conditions with regard to sex ($X^2(1) = 5.96$, ρ = .015), age (t (697) = 2.98, ρ < .003) and level of education ($X^2(1) = 24.77$, ρ < .001). The intervention condition included more girls, slightly younger students and more students with a low education level. Furthermore, the students in the intervention condition were more likely to engage in binge drinking at baseline ($X^2(1) = 10.43$, ρ < .001) than the students in the control condition (see Table 1).

Moderators

Interaction analyses examined if adolescents' personality traits, level of education or gender moderated the relationship between the intervention condition and substance use. Significant Intervention x Personality Group interactions were found for anxiety sensitivity (AS) and sensation seeking (SS) for binge drinking, binge drinking frequency and alcohol use at 12 months post-intervention (see Table 2). For NT and IMP, the intervention effects were not significant. Intervention x education level analyses indicated significant interaction effects on binge drinking, binge drinking frequency and alcohol frequency. Young adolescents with lower education were less engaged in binge drinking, and used alcohol less frequent than adolescents with higher level of education, after receiving the intervention (see Table 3).
No significant interaction effects were found for the outcome variable problem drinking, and no significant interaction effects were found for boys and girls.

Table 1. Baseline demographic characteristics of intervention and control condition

Outcome	Measure	Intervention	Control	
n=699		Mean (SD) / %	Mean (SD) / %	*p*-value
Demographics	Male	47%	57%	<.015
	Age	13.9 (.98)	14.1 (.77)	<.003
	Dutch	87%	87%	n.s.
	Low level of education	43%	26%	<.001
Alcohol use	Total group	60%	59%	n.s.
	NT	55%	59%	n.s.
	AS	52%	49%	n.s.
	IMP	70%	60%	n.s.
	SS	62%	62%	n.s.
Binge drinking	Total group	49%	37%	<.001
	NT	47%	36%	n.s.
	AS	46%	35%	n.s.
	IMP	51%	42%	n.s.
	SS	52%	34%	<.01

Note. NT = negative thinking; AS = anxiety sensitivity; IMP = impulsivity, SS = sensation seeking.

Intervention effects on growth over time

Analyses were conducted to examine the effect of Preventure on the linear increase in alcohol use among subgroups, by means of a latent-growth curve approach. The intercept and slope for binge drinking (intercept = 1.22, $p < 0.001$ and slope = 0.50, $p < 0.001$) and binge drinking frequency (intercept = 1.05, $p < 0.000$ and slope = 0.58, $p < 0.000$) were significant, indicating that levels of binge drinking and binge drinking frequency increased over time. The fit between the model and the data was excellent for both binge drinking (X^2 [N = 699] = 403.691, $p < 0.001$; RMSEA = 0.024 (0.000-0.068), CFI = 0.996, TLI = 0.994) and binge drinking frequency (X^2 [N = 699] = 14.048, $p < 0.02$; RMSEA = 0.060 (SD = 0.005), CFI = 0.986, TLI = 0.979).For sensation seekers, there was a significant effect of the intervention on the binge drinking slope (β = -.07, $p = 0.02$), and binge drinking frequency slope (β = -.10, $p = 0.03$). This indicates that adolescents with the personality trait SS who received the intervention increased their binge drinking behaviour less than those adolescents with the same personality trait in the control condition. The fit between model and data was good for both binge drinking (X^2 [N = 699] = 29.095, $p < 0.03$; RMSEA = 0.033 (0.000-0.091), CFI = 0.981, TLI = 0.964) and binge drinking frequency (X^2 [N = 699] = 33.571, $p < 0.01$; RMSEA = 0.039 (SD = 0.016), CFI = 0.982, TLI = 0.967). No significant effects were found on the intercepts and slopes for the outcome measures alcohol use and drinking problems, nor for the other personality traits IMP, NT and AS.

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Table 2. Interaction effects personality traits on alcohol outcomes at 12-month follow-up (T3) among alcohol users at baseline

		Binge drinking		Alcohol use	
		OR (95%CI)	*p*	OR (95%CI)	*p*
AS	Sex	0.96 (0.69,1.33)	.81	0.55 (0.38, 0.79)	.00
	Age	1.40 (1.07,1.83)	.01	1.60 (1.14, 2.25)	.01
	Edu	0.90 (0.75,1.09)	.28	1.04 (0.72, 1.50)	.74
	Cond	0.95 (0.60,1.50)	.81	0.80 (0.44, 1.44)	.45
	AS	0.64 (0.38,1.10)	.09	0.47 (0.28, 0.78)	.00
	CxAS	0.98 (0.44, 2.18)	.96	2.14 (1.40, 3.29)	.03
NT	Sex	1.01 (0.94, 1.09)	.76	0.61 (0.42, 0.88)	.01
	Age	1.16 (1.03, 1.31)	.01	1.57 (1.13, 2.19)	.01
	Edu	0.95 (0.85, 1.06)	.32	1.03 (0.81, 1.30)	.80
	Cond	0.97 (0.86, 1.09)	.64	0.88 (0.47, 1.65)	.69
	NT	0.99 (0.90, 1.09)	.87	1.13 (0.68, 1.87)	.64
	CxNT	1.03 (0.89,1.20)	.66	1.02 (0.89,1.18)	.76
IMP	Sex	1.02 (0.76, 1.37)	.91	0.58 (0.41, 0.83)	.00
	Age	1.41 (0.91, 2.18)	.01	1.60 (1.14, 2.23)	.01
	Edu	0.90 (0.75, 1.09)	.29	1.03 (0.82, 1.30)	.80
	Cond	0.87 (0.53, 1.43)	.59	0.98 (0.51, 1.87)	.95
	IMP	1.14 (0.74, 1.75)	.55	1.34 (0.74, 2.44)	.33
	CxIMP	1.05 (0.93,1.20)	.42	0.96 (0.82,1.13)	.61
SS	Sex	1.04 (0.77, 1.41)	.80	0.58 (0.39, 0.86)	.01
	Age	1.41 (1.06, 1.86)	.02	1.59 (1.14, 2.20)	.01
	Edu	0.91 (0.67, 1.24)	.34	1.03 (0.82, 1.30)	.79
	Cond	1.06 (0.72, 1.57)	.77	1.03 (0.55, 1.96)	.92
	SS	1.21 (0.77, 1.90)	.42	1.14 (0.68, 1.94)	.61
	CxSS	1.76 (1.38, 2.24)	.04	0.68 (0.31, 1.46)	.32

Note. Adjusted for cluster effects. AS = anxiety sensitivity, NT = negative thinking, IMP = impulsivity, SS = sensation seeking. OR = odds ratio, CI = confidence interval, β = standardized logistic regression coefficient, Edu = Education, C = Condition.

Table 3. Interaction effects education on alcohol use outcomes at 12-month follow-up (T3) among alcohol users at baseline

	Binge drinking		Alcohol use	
	OR (95%CI)	*p*	OR (95%CI)	*p*
Sex	1.01 (0.93, 1.09)	.83	0.58 (0.40, 0.84)	.00
Age	1.44 (1.11, 1,88)	.01	1.65 (1.21, 2.26)	.00
Condition	0.88 (0.70, 1.11)	.28	0.47 (0.12, 1.88)	.28
Education	0.90 (0.76, 1.06)	.20	0.89 (0.67, 1.18)	.43
Cond x Edu	1.47 (1.14, 1.88)	.04	1.32 (1.06, 1.65)	.05

Note. Adjusted for cluster effects. OR = odds ratio, CI = confidence interval, β = standardized logistic regression coefficient, Cond = Condition, Edu = Education.

Problem drinking		Binge drinking frequency		Alcohol frequency	
OR (95%CI)	p	β (SE β)	p	β (SE β)	p
0.89 (0.60, 1.32)	.56	.03 (.03)	.40	-.06 (.04)	.11
1.53 (1.18, 1.99)	.00	.14 (.05)	.00	.18 (.05)	.00
1.17 (0.97, 1.41)	.10	-.09 (.04)	.04	-.03 (.05)	.53
1.00 (0.65, 1.54)	.99	-.01 (.05)	.78	-.02 (.05)	.68
0.95 (0.54, 1.68)	.86	-.09 (.05)	.05	-.12 (.04)	.00
0.81 (0.37, 1.78)	.59	.03 (.05)	.52	.08 (.04)	.04
0.92 (0.61, 1.38)	.68	.04 (.03)	.18	-.04 (.04)	.32
1.55 (1.18, 2.02)	.00	.14 (.05)	.00	.17 (.05)	.00
1.17 (0.97, 1.41)	.09	-.09 (.05)	.05	-.02 (.05)	.69
1.03 (0.65, 1.64)	.90	-.02 (.05)	.78	-.01 (.06)	.82
1.10 (0.75, 1.61)	.62	-.03 (.04)	.46	.01 (.04)	.85
0.96 (0.84,1.09)	.52	.02 (.06)	.69	.03 (.05)	.56
0.91 (0.61, 1.34)	.63	.04 (.03)	.20	-.04 (.04)	.23
1.54 (1.19, 1.99)	.00	.09 (.03)	.00	.17 (.05)	.00
1.17 (0.98, 1.40)	.09	-.05 (.02)	.04	-.02 (.05)	.65
0.87 (0.58, 1.29)	.48	-.03 (.06)	.64	.00 (.06)	.99
0.92 (0.47, 1.81)	.81	.04 (.05)	.47	.02 (.05)	.65
1.07 (0.92,1.25)	.36	.05 (.06)	.33	-.00 (.06)	.95
0.91 (0.57, 1.44)	.69	.04 (.03)	.20	-.04 (.04)	.26
1.54 (1.18, 2.01)	.00	.14 (.05)	.00	.17 (.05)	.00
1.17 (0.97, 1.41)	.09	-.09 (.05)	.06	-.02 (.05)	.70
0.96 (0.64, 1.44)	.85	.03 (.04)	.41	.03 (.05)	.54
1.02 (0.62, 1.69)	.93	.06 (.04)	.10	.06 (.04)	.15
1.01 (0.53, 1.92)	.98	.24 (.05)	.04	-.08 (.05)	.06

Problem drinking		Binge drinking frequency		Alcohol frequency	
OR (95%CI)	p	β (SE β)	p	β (SE β)	p
0.91 (0.61, 1.37)	.66	.04 (.03)	.18	-.04 (.04)	.25
1.55 (1.19, 2.03)	.00	.15 (.05)	.00	.18 (.05)	.00
0.83 (0.30, 2.37)	.74	-.14 (.09)	.11	-.15 (.13)	.25
1.14 (0.89, 1.46)	.30	-.16 (.06)	.01	-.09 (.06)	.15
1.06 (.075, 1.51)	.74	.25 (.09)	.04	.47 (.11)	.01

Discussion

In a previous study on the effectiveness of Preventure in the Dutch setting, no program effects were found when looking at the incidence of alcohol use at the follow-up points separately [7]. By taking the development of alcohol use over time into account, significant program effects were found over the whole group of young adolescents [7]. In the current secondary analyses of the Preventure programme, we explored whether certain theory-based subgroups would benefit more from the Preventure intervention than others. The interaction analyses revealed that the Dutch Preventure intervention had beneficial effects for young adolescents with the personality traits anxiety sensitivity and sensation seeking. Adolescents scoring high on SS seemed to benefit most from Preventure when it comes to binge drinking and binge drinking frequency outcomes. Adolescents scoring high on AS benefit most from Preventure with regard to the outcome alcohol use at 12 months post-intervention. Post-hoc latent growth analyses revealed that the intervention resulted in significantly less growth in binge drinking and binge drinking frequency over 12 months' time within adolescents scoring high on SS. In our study we used both regression analyses and latent growth analyses. Combining these two approaches increased the reliability of the outcome measurements and provided a more complete picture of the intervention effects of the Preventure programme. In order to meet the CONSORT statement we used regression analyses as the primary analyses, and the latent growth analyses as post-hoc analyses.

The findings of the current study are in line with previous studies of Conrod and colleagues. According to trials among Canadian and British young adolescents [4,5], Preventure was particularly effective in preventing the incidence of binge drinking in those students with an sensation seeking personality, and preventing alcohol use among students with an anxiety sensitivity personality, after four and six months post-intervention. Consistent with the British trial [6], the Preventure programme had an impact in reducing the relationship between SS and the growth in binge drinking after 12 months. No significant effects were found for the personality traits impulsivity (IMP) and negative thinking (NT) at the different follow-up points, nor did the intervention significantly impact the relationship between the personality traits IMP, NT and AS, and the growth in binge drinking, which is in line with the findings of Conrod et al. [4-6].

So, consistent with the Canadian and British trials, there was some evidence that intervention effects for AS were stronger in relation to alcohol onset measures, and intervention effects for SS were more consistently revealed for binge drinking outcomes. The personality-specific intervention was effective in reducing the drinking behaviour that is most problematic for each personality type. These findings provide further support for the necessity of personality targeting interventions for preventing alcohol misuse among young adolescents.

No significant effects were revealed on problem drinking for the personality traits. We expected these to be present particularly among the AS and NT personality traits. Conrod and colleagues only found effects in reducing problem drinking at the longer term, after 24 months post-intervention [6,29]. This may implicate that curbing the growth of drinking in early onset drinkers may delay the onset of problem drinking over the longer term. Future research is needed to examine outcomes beyond 12 months post-intervention to see whether the intervention is effective for alcohol-related problems at later ages for AS and NT. Because of the different education levels within the Dutch school system, we tested the differences between students receiving education at a 'high level' (e.g. pre-university education) and students receiving education at a 'lower level' (e.g. vocational training). Conrod et al. [4-6,29] did not distinguish between different levels of education, because of the different school systems in Canada and England. In our study, the significant effects were found mainly among students with lower-level education. It seems that students in this education category benefit more from the intervention than students with higher education, perhaps because they are more engaged in alcohol drinking and binge drinking than students with higher level of education [21]. These findings are consistent with findings from a previously tested Dutch alcohol parent and student prevention program. In this study moderation effects were found for educational level on heavy weekly alcohol use, indicating that lower educated adolescents profited more from the alcohol intervention than students with a higher education level [10,22]. Our results can be interpreted as indicating that Preventure is most effective among young adolescents at a lower level of education, and is best suited for this type of education. Consistent with previous studies of Conrod and colleagues [4-6,29], and as expected, no significant moderation effects were found for gender.

Limitations

The current study has some limitations. First, our study was confined to students who voluntarily participated in the intervention and for whom parental consent was obtained. Fifty-two percent of the potential participants did not consent or failed to obtain parental consent. For the group of students who were identified as high-risk based on the screening, no differences were found on demographic variables or the prevalence of alcohol use between those who participated in the study and those who did not provide consent. However, the group of students who participated can be a selective group, because they can differ on other characteristics which were not measured. The results may therefore not be generalizable to the whole group of students who are screened positive for one of the personality traits. Second, the use of self-reports might have led to measurement errors, due to situational and cognitive influences [39]. To overcome situational influences (e.g. social desirability) and to optimize measurement validity, we guaranteed full confidentiality (anonymity) to our participants (e.g. [22,40]). Third, the intervention and control conditions differed at baseline on sex, age, level of education and binge drinking status. The intervention condition included

more girls, slightly younger students and more students with a low education level, and the students were more likely to engage in binge drinking. Randomization at school level is probably responsible for this unequal distribution. Therefore, cluster level effects were accounted for in the analyses. A possible solution for future trials might be to randomize within schools, although one should be careful to avoid contamination effects.
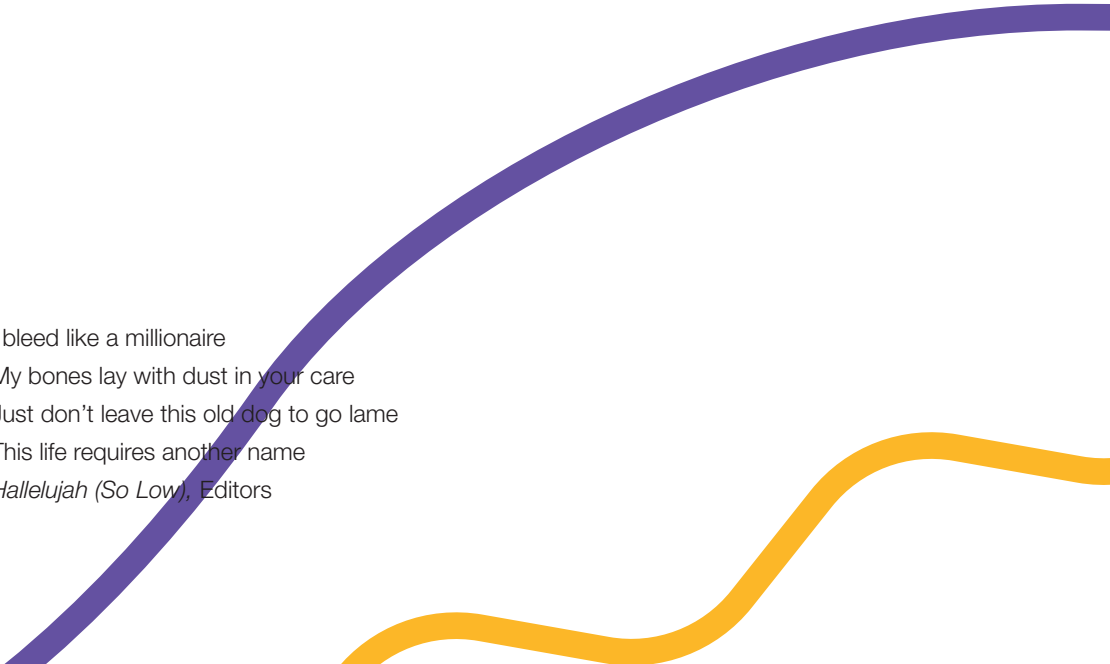
Conclusion

Preventure has been evaluated in different countries [4,7,29], and the results on alcohol misuse appear to be fairly robust. Our results show that the personality targeted Preventure is a promising intervention in the Dutch setting, especially for secondary schools with a lower level of education (vocational schools). Preventure is complementary to universal alcohol prevention programmes. Whereas universal alcohol prevention is most effective in increasing knowledge and changing attitudes among young adolescents in general, selective prevention seems to be more effective in changing alcohol misuse behaviour among high-risk young adolescents more specifically. Future research could be focused on populations with a higher proportion of high-risk adolescents, such as the setting of special education or youth with mild mentally disabilities.

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Chapter 6

I bleed like a millionaire
My bones lay with dust in your care
Just don't leave this old dog to go lame
This life requires another name
Hallelujah (So Low), Editors

CHAPTER 7

General discussion
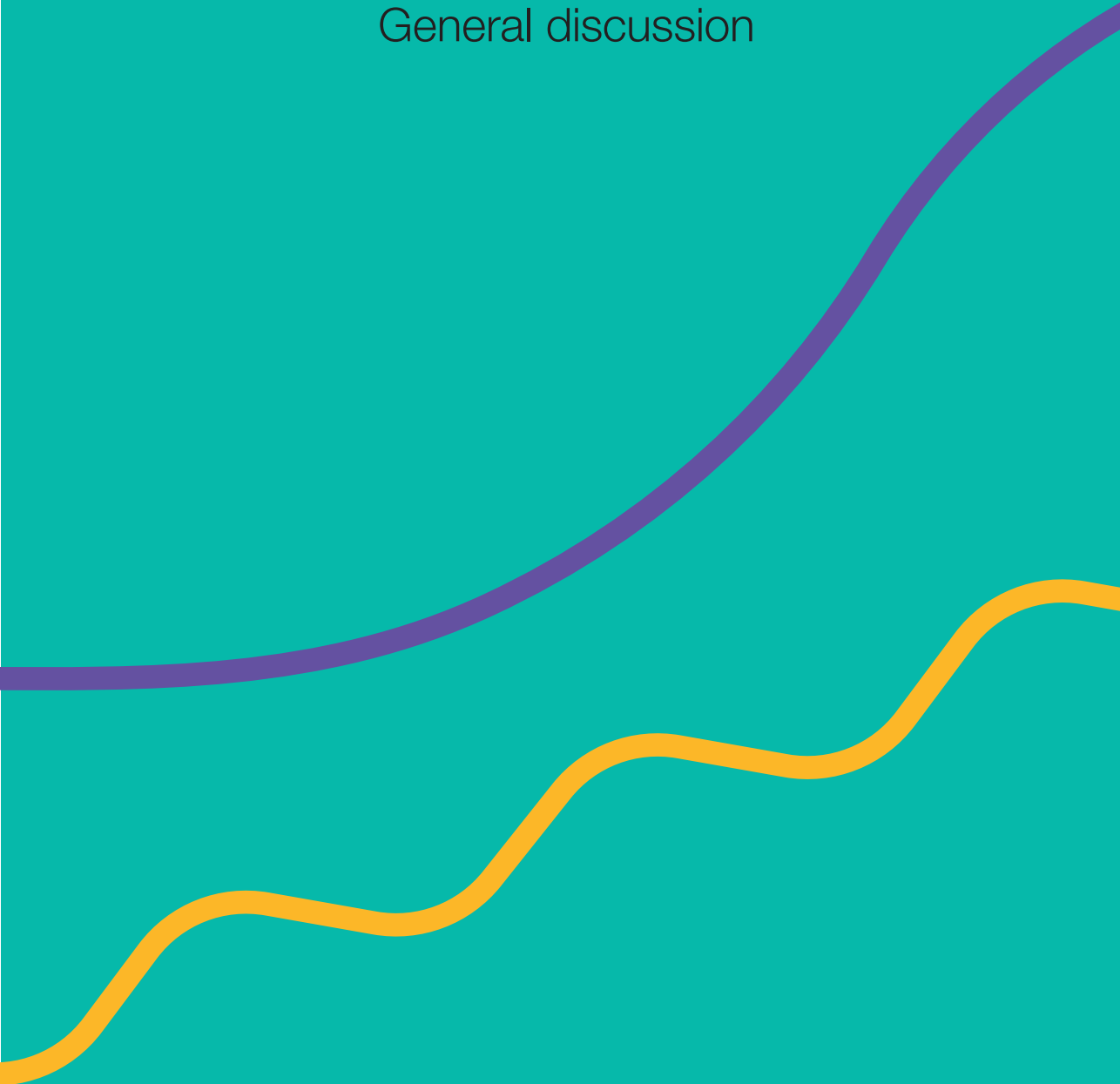
General discussion

The central theme of this thesis is alcohol prevention in adolescence. In the last decades, various prevention programmes have been developed to prevent young adolescents from initiating alcohol use at an early age, and to prevent them from developing unhealthy drinking patterns once they have initiated drinking. Until today, efforts to control adolescents drinking behaviour mainly fall under universal prevention, which means prevention for the group of adolescents in general. Far fewer efforts have been done for adolescents who are at higher risk for initiating alcohol misuse at an early age and developing alcohol related problems at a later age; the so-called selective and indicated prevention (targeted prevention). A discussion that is often held in the field of substance use prevention is what is most effective, focusing on the entire group of young adolescents, or focusing on the group of young adolescents that is most at risk of alcohol abuse. The current thesis contributes to finding an answer to this question, as well as discussing the results of an effectiveness study on a selective alcohol prevention programme.

This general discussion starts with a summary of the main findings of the current thesis, followed by an elaboration of the findings grouped in three main themes: 1) universal versus targeted alcohol prevention: a prevention paradox, 2) personality traits related to alcohol misuse, 3) selective alcohol prevention based on personality traits. Further, the implications of these findings for practice and the development of interventions on alcohol prevention are discussed. Finally, the limitations of the current thesis are described, followed by suggestions for future research into the assessment of risk factors for adolescent alcohol misuse and ways to improve adolescent alcohol prevention effectiveness.

Summary of the main findings

In **chapter 2** the results of a meta-analysis of studies on the effects of school-based programmes on the alcohol use of adolescents, are described. Research examining school-based programmes, targeting adolescents (mean age 11-18 years old) and evaluating alcohol use, was included in the meta-analysis. The results from this meta-analysis revealed that targeted prevention (selective and indicated prevention) seems to be more effective than universal prevention in preventing or reducing alcohol abuse among adolescents, although the effect sizes were relatively small. Selective prevention strategies target sub-groups of the general population, at risk for substance misuse, and indicated prevention interventions identify individuals who are experiencing early signs of substance misuse and other related problem behaviours associated with substance misuse and target them with special programmes. In addition, different groups of adolescents at risk for alcohol abuse

were distinguished (adolescents with low socio economic status, ethnic minority, problem behaviour, experience with alcohol use, and at risk personality), in order to examine which of these different groups at risk benefit more from targeted prevention. This phenomenon was observed in the group of adolescents who had experiences with alcohol use. Hence, targeted alcohol prevention (selective and indicated prevention) seems to be more effective among adolescents who initiated alcohol use at an early age.

In **chapter 3**, drinking motives were examined as possible mediators of the association between personality traits (negative thinking, anxiety sensitivity, impulsivity, and sensation seeking) and alcohol frequency, binge drinking, and alcohol-related problems. For the first time, to our knowledge, were these associations tested in a sample of young adolescents (aged 13-15), as most of these studies have been conducted among college students. Structural equation modelling was applied using a sample of high school students (n=3,053) who reported on their lifetime use of alcohol. Results of this study revealed that among young adolescents, coping motives, social motives and enhancement motives seems to play a prominent mediating role between personality traits and the alcohol outcomes. Multi-group analyses revealed that the role of drinking motives in the relation between personality and alcohol outcomes were largely similar between the sexes, though some differences were found for binge drinking. More specifically, for young males, enhancement motives seems to play a more prominent mediation role between personality and binge drinking, while for young females, coping motives play a more mediating role between personality and binge drinking. Hence, already in early adolescence, personality traits are found to be associated with drinking motives, which in turn are related to alcohol use. This provides indications that it is important to intervene in early adolescence with interventions focusing on personality traits in combination with drinking motives.

In **chapter 4**, the study protocol of the Preventure effectiveness trial is described. It presents the design and implementation of a Randomized Controlled Trial (RCT) to evaluate the effectiveness of the selective alcohol prevention programme Preventure in The Netherlands. An RCT has been conducted among a sample of 13 to 15-year-old adolescents in fifteen secondary schools. Schools were randomly assigned to the intervention and control conditions. The intervention condition consisted of two 90-minute group sessions, carried out at the participants' schools and provided by a qualified counsellor and a co-facilitator. The intervention targeted young adolescents who demonstrated personality risk for alcohol abuse. The group sessions were adapted to four high-risk personality profiles, and it contains components of motivational interviewing and cognitive behavioural therapy. The primary outcomes of interest were: the percentage reduction in binge drinking, weekly drinking and drinking-related problems after 2, 6, and 12 months, by means of an online questionnaire.

In **chapter 5** and **chapter 6** the findings of the Preventure trial in The Netherlands are described. The Intention to Treat analyses revealed no significant intervention effects on binge drinking, alcohol use and problem drinking at 12 months follow-up. Post-hoc latent-

growth analyses revealed significant effects on the development of binge drinking, and binge drinking frequency at 12 months follow-up. The intervention effects were moderated by personality traits and by education level. More specifically, significant post-hoc interaction analyses showed intervention effects on reducing alcohol use within the anxiety sensitivity group and reducing binge drinking and binge drinking frequency within the sensation seeking group at 12 months post-intervention. Also, lower educated young adolescents reduced binge drinking, binge drinking frequency, alcohol use, and alcohol use frequency, whereas those in the higher education group did not. Post-hoc latent-growth analyses revealed significant effects on the development of binge drinking and binge drinking frequency within the sensation seeking personality trait.

Table 1. Summary of the main findings of the current thesis

Findings	Chapter
Targeted prevention (selective and indicated prevention) seems to be more effective than universal prevention in preventing or reducing alcohol abuse among adolescents.	2
Targeted alcohol prevention seems to be more effective than universal prevention among adolescents who initiated alcohol use at an early age.	2
Already in early adolescence, personality traits are found to be associated with drinking motives, which in turn are related to alcohol use.	3
Intention to Treat analyses revealed no significant effects of the Preventure programme on alcohol outcomes. Post-hoc latent-growth analyses revealed significant effects on the development of binge drinking outcomes.	5
The intervention effects of the Preventure programme were moderated by the personality traits anxiety sensitivity and sensation seeking, and by education level.	6

Reflection on the main findings

Universal versus targeted prevention: the prevention paradox

In the field of substance use prevention, universal based prevention programmes are the most common and the most applied. Although widely used, the scientific evidence that universal prevention programmes aimed at youngsters effectively affect drinking behaviour and drinking related problems is often point of debate. Several meta-analyses show that well-designed theory-based universal programmes impact alcohol use and binge drinking [e.g., 1, 2, 3]. However, the question is whether these universal prevention programmes with an impact on delaying initiation of substance use among low-risk individuals, are also effective for adolescents who have already initiated use and are at an increased risk for developing harmful drinking patterns (e.g. binge drinking). For the latter group of adoles-

cents, a targeted approach that is tailored to their specific needs and focusses on reducing or eliminating personal high-risk factors might sort a bigger effect. Several meta-analyses studies have generally found selective and indicated programmes to be more effective than universal programmes [e.g., 3, 4]. The results from the meta-analysis in the current thesis confirm these findings.

This raises the question whether future prevention efforts should exclusively focus on targeted prevention. The answer to this question is not unambiguous. Selective and indicated programmes are often more costly, as they require specialized data collection, data management, analysis, and a commitment to provide identified youth with often intensive services delivered by highly trained prevention specialists [e.g., 4]. On the other hand, several meta-analyses studies showed, based on cost-benefit ratios, that this investment ultimately has a higher yield [e.g., 5, 3]. Programmes that target students and families of students at risk may be a more cost-effective strategy than universal prevention strategies, because most of the costs have been invested in the group that needs it the most. This brings us to the concept of the prevention paradox, which will now be discussed.

The Prevention Paradox

Two different approaches for prevention can be distinguished: a population strategy and a high-risk strategy [e.g., 6]. A population strategy (or universal prevention) aims to reduce general consumption and overall problems through interventions directed to the general population. Conversely, a high-risk strategy (or selective and indicated prevention) aims to reduce consumption and problems through targeted interventions in a small group of individuals who are at high-risk. The so called 'prevention paradox' is observed when a large number of people at low risk contribute more cases of a disease or negative health outcome in a population compared to a small number of people at high-risk. According to this paradox, greater societal gain will be obtained by achieving a small reduction in alcohol misuse within a larger group of 'risky' drinkers with less serious problems than by trying to reduce problems among a smaller number of heavy drinkers with more serious problems. Heavy drinkers have a higher individual risk of adverse outcomes, while low-risk drinkers account for most of the problems, because they are more numerous in the total population [7, 8, 9].

The scientific literature on existence of the prevention paradox is limited; the number of empirical studies is rather small and the findings are not entirely consistent [6, 7]. A question is whether the prevention paradox also applies to young adolescents. There is some preliminary evidence that the prevention paradox, based on measures of annual consumption and heavy episodic drinking, seems not to be valid for adolescents [6, 10]. Results from these studies showed that a minority of adolescents with frequent heavy episodic drinking

accounted for a large proportion of all problems. The drinking patterns among adolescents are quite different from the patterns among adults. Heavy drinking (e.g. binge drinking) is common among young adolescents. Of the 45% of the 12 to 16 years old adolescents in the Netherlands who drank alcohol, 70% was engaged in binge drinking [11]. As heavy episodic drinking is common among young adolescents, general prevention initiatives alone are not sufficient for this target group. A 'second order prevention paradox' seems to be more appropriate: a preventive strategy aimed at the majority of the population, with a focus on heavy-drinking occasions rather than on mean consumption [10, 8]. Therefore, a more comprehensive prevention strategy, including efforts to reach young high consumers, is needed. This recommendation is supported by Shamblen and Derzon [3], who examined the effectiveness of universal, selective and indicated prevention for tobacco use, alcohol use and marijuana use. With regard to marijuana use, selective and indicated programming is more effective and cost-effective than universal prevention, due to the often low base-rate of use in the population. In contrast, alcohol use is more strongly affected by universal prevention, combined with selective and indicated programming [3], because alcohol use is the most commonly abused substance among youth. This is the so-called *stepped prevention* approach, and is now being discussed.

Stepped Prevention Approach

Instead of separate approaches of universal, selective or indicated prevention, an approach that incorporates all three levels of these programmes is suggested to prevent substance use most effectively [e.g., 12, 3]. By creating a 'stepped prevention' system, the universal, selective and indicated components can strengthen each other [12]. For example, while universal programming is provided for low-risk students, at the same time high-risk students receive indicated counselling at school. Although this approach may be cost prohibitive and complicated with regard to implementation issues, it has yielded evidence of effectiveness [12, 3, 4, 13]. Young adolescents with low risk for alcohol abuse will in general benefit sufficiently from universal prevention. Though, universal prevention strategies are often not suited to sufficiently address more complex and vulnerable groups. High-risk young adolescents need a specific, more intensive and tailor made approach to sort effects. Besides, young adolescents who already are experiencing alcohol abuse problems, need an approach that is more focused on assistance and counseling. With a stepped alcohol prevention approach, all target groups can sufficiently and effectively be addressed [12.3,4,13].

Although selective and indicated prevention programmes seem to have an added value to universal prevention methods, insufficient programmes are available in the substance use prevention field in the Netherlands. Some indicated prevention programmes, that have been tested in the Netherlands, are promising. Though, especially concerning selective (school based) alcohol prevention programmes, the range of programmes is low and strong evidence is still lacking. The Preventure programme could fill in this gap. This selective alcohol preven-

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tion programme is aimed at high-risk personality traits. The concept of high-risk personality traits and the relationship with alcohol misuse will be discussed in the following paragraph.

Personality traits related to alcohol misuse

The SURPS assessment has been developed (Substance Use Risk Profile Scale; [14]), which provide scores on four personality dimensions: sensation seeking, impulsivity, hopelessness and anxiety sensitivity. Various studies suggest that all four personality factors are uniquely associated with alcohol use [15, 16, 14, 17, 18]. In a recent review on personality traits and binge drinking, the SURPS-scale was recommended, referring to adequate psychometric properties [19].

Sensation seeking is a personality factor that has been consistently associated with heavier alcohol drinking and with increased risk for adverse drinking consequences [17, 20]. Impulsivity is a risk factor for abuse of immediately reinforcing drugs due to a self-regulation deficit [21], and is linked to elevated risk for early-onset alcohol and drug problems [17]. There is evidence that those high in sensation seeking are not necessarily also impulsive, but the two personality traits do co-occur [21]. Their joint presence has been labelled as 'disinhibited personality' [22]. Both sensation seeking as impulsivity have been associated with binge drinking. Multiple recent studies have observed higher scores in binge drinkers in both impulsivity and sensation seeking [e.g., 19, 23, 16, 24]. Besides, the scores of impulsivity and sensation seeking are related to the number of drinks consumed per episode and the frequency of binge drinking [25, 26, 22]).

From the motivational theory it is argued that drinking motives are the common, most proximal pathway to alcohol use and alcohol abuse through which more distal risk factors, such as personality, exert their influences. Using Cooper's [27, 28] classification of drinking motives, sensation seeking has been shown to be associated with elevated enhancement-motivated drinking among adolescents [29]. Enhancement motives are considered "risky" reasons for alcohol use given their established relations with heavier drinking and alcohol problems [29]. Impulsivity has also been shown to be associated with elevated enhancement-motivated drinking among young adults [21]. This is in line with our findings in this thesis of the mediational analyses of personality risk profiles, alcohol-related outcomes, and drinking motives. For the first time insight was given on these relations within the group of young adolescents. The results of our analyses revealed that both impulsivity and sensation seeking have a significant association with enhancement motives. Besides, sensation seeking was related to social motives, and impulsivity was associated with social and coping motives.

Other two personality traits are hopelessness (negative thinking) and anxiety sensitivity. Both personality traits have been associated with increased drinking levels and a higher incidence of problem drinking symptoms [16, 17, 30]. Anxiety sensitivity is also associated with binge drinking as it predicts future binge drinking [30]. Anxiety sensitivity has been shown to be

associated with elevated coping-motivated drinking and conformity-motivated drinking [31, 32, 33]. Coping and conformity motives are considered "risky" reasons for alcohol use given their established relations with heavier drinking and/or alcohol problems [28]. This is partly supported by the findings of our mediation analyses. Negative thinking had an association with both coping motives and conformity motives, while anxiety sensitivity only was associated with conformity motives.

Another well-known personality classification is the Big Five Personality Model. This model considers five dimensions: extraversion, neuroticism/emotional instability, conscientiousness, openness to new experiences, and agreeableness. Each of the Big Five personality traits contains two separate correlated aspects reflecting a level of personality below the broad domains but above the many facet scales that are also part of the Big Five. These aspects are labeled as follows: Volatility and Withdrawal for Neuroticism; Enthusiasm and Assertiveness for Extraversion; Intellect and Openness for Openness; Industriousness and Orderliness for Conscientiousness; and Compassion and Politeness for Agreeableness [34]. The associations between the dimensions of the Big Five model and alcohol misuse is inconclusive. High extraversion is the feature most consistently associated with binge drinking, binge drinking frequency and negative consequences [e.g., 35]. The few studies that investigated the role of the five factor models and alcohol misuse shows that conscientiousness has been related to binge drinking, especially in men [36], and openness is associated with binge drinking in women [37].

In a recent study by Zhang and colleagues [32], the personality traits of the Big Five model were used to predict heavy alcohol use (binge drinking), using a sample of young adults from a 15 years' cohort. Two new profiles were determined which were the most predictive for alcohol misuse. 'Resilient', characterized by scoring high on extraversion, openness, and agreeableness, and scoring low on Neuroticism; and 'Reserved', characterized by scoring high on conscientiousness and neuroticism and relatively low on the other three factors. Both profiles were related to frequent heavy drinking, and the reserved profile was associated with higher risk for alcoholism [19, 32]. This classification of two profiles corresponds approximately with the SURPS-scale, whereas the resilient profile incorporates the extraverted, behavioural disinhibition traits (impulsivity and sensation seeking), and the reserved profile the neurotic-anxiety personality traits (negative thinking and anxiety sensitivity).

Concluding, there is heterogeneity in the scales used for personality assessment, based on various theoretical models. The SURPS-scale integrates those dimensions that represent the main risk factors for alcohol misuse and has been extensively investigated in relation to alcohol use. The Big Five Personality model is less researched on relationships with alcohol use, and the association is less conclusive, than the SURPS-scale. The SURPS personality

traits impulsivity, sensation seeking, negative thinking and anxiety sensitivity are related to alcohol misuse and are strong predictors for future heavy drinking and alcohol related problems among young adolescents. For an overall explanatory model of personality traits and alcohol misuse, drinking motives should be incorporated, since these seem to be important mediating variables in the relationships between personality and heavy alcohol use.

An example of an intervention aimed at personality traits and drinking motives, is Preventure, and will now be discussed.

Selective alcohol prevention based on personality traits

The Preventure programme

The Preventure programme specifically targets young adolescents with two risk factors for heavy alcohol consumption: early-onset of alcohol use [38, 39] and the presence of at least one of the four substance use risk personality traits for alcohol abuse [40]. The Preventure programme identifies and treats high-risk adolescents, with the aim of preventing or intervening early before the high-risk adolescents engage in risky behaviours and/or these behaviours become problematic. The adolescents that fall within the risk category of early-onset alcohol use combined with a high-risk personality profile for alcohol abuse, are offered a coping skills intervention, that targets their dominant personality profile. The programme is based on the principles of motivational interviewing and cognitive behaviour therapy.

Effectiveness of Preventure

Our effectiveness study of the Preventure programme in the Dutch school setting was the first study outside the setting where it has been originally developed (England and Canada) by Patricia Conrod and her colleagues.

The findings of our RCT partly correspond with the studies of Conrod and colleagues. In our study, no effects on binge drinking were found at 12 months post-intervention. According to trials among Canadian and British young adolescents, Preventure was effective in preventing the growth of binge drinking, at four months [17] and six months post-intervention [41]. The latent-growth models in our study indicated a delay in the increase in binge drinking and binge drinking frequency over a period of 12 months. Latent-growth models in Conrod and colleagues' study showed that the intervention delayed the natural increase in binge drinking in the first six months after the intervention [41]. In our study, no significant effects were revealed for problem drinking. This is consistent with the Preventure study among adolescents in England (after 6 and 12 months post-intervention). However, in the same sample, Conrod and colleagues found intervention effects in reducing problem drinking symptoms at 24 months post-intervention [42]. In the Canadian study, intervention effects on drinking problems were found in the short term (four months), but this study was conducted among an older student population, in which problematic drinking patterns were more likely to be already established [17]. This may implicate that curbing the growth of drinking in early onset

drinkers may delay the onset of problematic drinking over the longer term. Longer-term follow-up of the sample of our study might reveal effects on high-risk drinking outcomes typical for older adolescents.

Moderators of the intervention effect

In secondary analyses we explored whether certain theory-based subgroups would benefit more from the Preventure intervention than others. Interaction analyses revealed that the Dutch Preventure intervention had beneficial effects for young adolescents with the personality traits anxiety sensitivity (alcohol use) and sensation seeking (binge drinking and binge drinking frequency). Latent growth analyses revealed that the intervention resulted in significantly less growth in binge drinking and binge drinking frequency over 12 months' time within adolescents scoring high on sensation seeking. The findings of the subgroup analyses are in line with previous studies of Conrod and colleagues, preventing the incidence of binge drinking in those students with a sensation seeking personality, preventing alcohol use among students with an anxiety sensitivity personality [17, 41], and reducing the relationship between sensation seeking and the growth in binge drinking [42].

No significant effects were found for the personality traits impulsivity and negative thinking, at the different follow-up points, neither in our study nor in the Canadian and British trials. This is in line with the earlier mentioned personality classifications and their relations to alcohol misuse, that adolescents with an active sensitivity for new and exciting situations, and neuroticism-anxiety have the highest risk for alcohol abuse [43, 32], in contrast to the other personality traits impulsivity and negative thinking.

Level of education

Because of the different education levels within the Dutch school system, we tested the differences between students receiving education at a 'high level' (e.g. pre-university education) and students receiving education at a 'lower level' (e.g. vocational training). Conrod and colleagues did not distinguish between different levels of education, which can be explaind by the different school systems in Canada and England. In our study, the significant effects were found mainly among students with lower-level education. It seems that students in this education category benefit more from the intervention than students with higher education. These findings are consistent with findings from a previously tested Dutch alcohol prevention programme. In this study moderation effects were found for educational level on heavy weekly alcohol use, indicating that lower educated adolescents profited more from the alcohol intervention than students with a higher education level [44, 45]. A possible explanation for the differences in effect between the education levels, is that students from lower-level education are more engaged in alcohol drinking and binge drinking than students with higher level of education [11], so there is more improvement to be gained. The findings of our study can be interpreted as indicating that the Preventure approach is most effec-

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tive among young adolescents at a lower level of education, and is potentially especially suited for this type of education. Another possible explanation for the differences in effect between education levels, is that among lower educated students the personality profiles are probably more profound. Psychological problems, including depression, anxiety sensitivity and hyperactivity, are more common among lower educated students [46]. Psychological problems decrease considerably as the school level of young people increases. The biggest differences are found between vocational education (VMBO-b) and pre-university education (VWO) students.

Differences between the Dutch study and previous studies on Preventure
Although part of our findings in our study (in particular the post-hoc analyses) are in line with the previous studies on Preventure, our main findings are not as robust as the findings of Conrod and her colleagues. Some possible explanations for the differences in effects can be given. First, the British study was aimed at drinkers and non-drinkers, whereas our study was aimed at drinkers only. The Canadian trial was conducted among drinkers only, but with an older population. For older adolescents the principles of the intervention (e.g. cognitive behaviour therapy) could be more effective than for younger adolescents. Second, at the time of our study, substance use among young adolescence in The Netherlands was high compared to other European countries [47]; this might have affected the study outcomes. In our study the participants were more engaged in alcohol drinking and binge drinking already, which probably affected the preventive effect of the intervention. Third, compared to the British studies, the counsellors in our study were less intensively monitored and supervised. In our study, in particular for reasons of generalization once study funding is out there, each counsellor's first two sessions were observed, whereas in the British trials all the sessions were supervised. Besides, the researchers in the Canadian and British studies were more involved in the implementation of the intervention. Some researchers were counsellors of the group sessions with the students at the schools. A strong involvement of the researchers in the implementation process can probably influence the outcomes. In the Dutch study, the implementation and the research processes were more separated. There are indications that program evaluations in which the program developers were involved show more or stronger effects than prevention programs tested by independent researchers [e.g., 48, 49]. A possible explanation for this might be that program developers achieve higher implementation quality because they are highly motivated and acquainted with the prevention program.

In addition to the above mentioned differences in effects, Conrod and colleagues also found effects of the Preventure programme on psychosocial and behavioural factors, e.g. anxiety and depression symptoms, conduct problems, truancy and shop lifting. For example, small effects were found in the negative thinking group on depression scores and in the anxiety sensitivity group on panic attacks and truancy [50]. In our study we did not find the same

results. An intervention effect was found on anxiety rates in the anxiety sensitivity group, while a not expected negative intervention effect on depression rates was found in the negative thinking group [51]. A possible explanation for the lack of the evident effects on mental health problems, could be that effective interventions for internalizing problem behaviours are, mostly, extended multi-year programmes, focusing on at-risk groups, targeting risk and protective factors, and focusing on multiple domains i.e. school and home environment [e.g., 52].

In conclusion

Contrary to Conrod and colleagues, we did not find significant main effects when we tested the effectiveness of Preventure at 12 months post intervention. However, by using latent growth curve modelling techniques, overall significant intervention effects were generated for binge drinking and binge drinking frequency. On the one hand, these post-hoc findings stress the importance of using multiple appropriate statistical techniques to obtain higher precision in intervention effectiveness and minimize the danger of inaccurate conclusions about intervention effectiveness. On the other hand, the findings in our study are not as robust as the findings of Conrod and her colleagues, which might pose the question whether Preventure is suitable for implementation in the Dutch school context. In this regard, it is important to realize that most of the prevention efforts to control adolescents drinking behaviour fall under universal prevention strategies, targeting the whole group of adolescents. The availability of evidence based prevention programmes targeting the group of high-risk adolescents in the Netherlands is limited. To gain more effect among the whole group of adolescents, more tailor made prevention is needed, to target those groups most vulnerable for alcohol misuse as well. Currently, the Preventure programme is one of the few selective approaches with potential. In the post-hoc latent growth analysis, effects were mainly found on binge drinking and binge drinking frequency. As frequent and heavy adolescent drinking is predictive of alcohol dependence in young adulthood and can lead to several severe physical and mental harms, this indicative finding is a potentially important one. Moreover, the post-hoc analyses revealed that the Preventure approach seems more effective in specific high-risk groups: adolescents with elevated personality traits, and the group of lower educated adolescents. Especially the latter group is an essential group. Low-educated adolescents are a vulnerable group for alcohol abuse, addiction and adjacent problems. Most of the problems within this group are often clustered, and coping skills are often lacking in this group. Universal prevention strategies are often not suited to sufficiently address more complex and vulnerable groups, and for such groups more tailored prevention is needed, for example in the form of a personality driven approach.

To enhance the effectiveness of the Preventure programme, several adaptations could be made, especially regarding the vulnerable group of special educated adolescents. Those adaptations, together with other future directions, will now be discussed.

Chapter 7

Future directions

Implications for intervention development

The Preventure programme has its potential, as we have found indications for effects. One of the features of the programme is that it is a very brief intervention. A more comprehensive version of the programme could potentially enhance its effectiveness. The current programme consists of two 90-minutes sessions and could be extended to three to four sessions. During these extra sessions, the participants will have more opportunities to practice the principles of cognitive behaviour therapy, one of the key components of the Preventure intervention. Another adaptation is the involvement of parents. To stimulate the transfer to home, a component for parents could be added to the intervention. For example, informing the parents about the goals of the intervention and the content of the sessions, and to add homework assignments for the adolescents to do with their parents. This can stimulate the parents to support their children with practicing the cognitive behavioural principles of the intervention in the home setting.

Other vulnerable groups

The post-hoc analyses revealed that the Preventure approach is probably more effective among adolescents from vocational schools. It is worthwhile to explore whether the Preventure approach has its benefits within other groups of special educated groups of adolescents, e.g. adolescents with psychiatric and/or behavioural problems, or adolescents with a mild intellectual disability. Demonstration schools ("Praktijkonderwijs"), and schools for students with special needs ("Speciaal Onderwijs") have a population of students with a variety of conditions, including students with psychiatric disorders, problem behaviours, learning difficulties and mild intellectual disabilities. The underlying psychosocial characteristics, like anxiety, susceptibility to depression and disinhibited personality features, are more latent within these populations of students. Therefore, the personality traits-oriented approach could probably be more effective for these groups of adolescents, as well as the methods used in the intervention, i.e. cognitive behaviour therapy. To fit well with these target groups, necessary adjustments of the programme are needed for every specific group of special educated adolescents. The intervention should be adapted to the needs and levels of these students.

First, an increased intervention dose is potentially needed. The current Preventure programme consists of two sessions of both 90 minutes. For the more vulnerable target groups more sessions are preferable, so the students have more opportunities to practice the principles of the intervention (i.e. cognitive behaviour therapy). Secondly, to practice the principles of the intervention in real life assignments from psychomotor therapy (PMT) can be added. For example, recognizing automatic thoughts, or feeling anxious can be practiced with assign-

ments in real life. Thirdly, the length of the sessions should be adjusted to the maximum of 30-45 minutes, because of the limited tension curve of these students. Fourthly, the level of the intervention and the language use should be substantially adapted, e.g. by use of shorter sentences and avoiding difficult language use.

For the group of young adolescents with mild intellectual disabilities, the Preventure approach has been adapted yet. Schijven and her colleagues (2015) have adjusted the Preventure intervention for this specific target group to eleven sessions, six individual sessions and five group sessions. Assignments from psychomotor therapy have been added. The intervention is now being tested among adolescents (14-21 years) with mild to borderline intellectual disabilities and behavioural problems, admitted to treatment facilities in the Netherlands (youth care institutions), by means of a randomized controlled trial [53, 54].

Implications for practice

Our recommendation is to extend the range of (school based) prevention programmes in the Netherlands with targeted prevention programmes. The focus should not be on universal or targeted prevention alone. To be more effective, a comprehensive prevention strategy is needed, that means a universal approach that includes efforts to reach the high-risk consumers as well. In this so called stepped prevention approach, the universal prevention and targeted prevention efforts can reinforce each other. Universal prevention strategies within a general population enables to trace a high-risk target group. On the other hand, with this approach the high-risk group that will not be reached with targeted prevention strategies will receive universal prevention methods anyway. However, strong evidence for a stepped alcohol prevention strategy is still lacking and inconclusive. A recent Australian study by Teesson and her colleagues [55] evaluated for the first time a combined universal and selective approach to alcohol prevention. Young adolescents received universal prevention, selective prevention (the Preventure programme), or combined prevention (universal prevention and Preventure). In all conditions, significantly lower growth in drinking and binge drinking was observed. Thus, findings of this study revealed no advantage of the combined approach over universal or selective prevention alone [55]. A possible explanation may be that universal and targeted prevention are not suitable and effective for the same age groups. A recent study by Onrust and colleagues [56] showed that it makes good sense to adopt a developmental perspective when designing and offering universal and targeted preventive interventions for substance use among adolescents. The distinctive phases in adolescence hold developmental windows in which different prevention strategies fitting in with the primary developmental tasks and changes defining each phase. For example, for young adolescents aged 13 to 15 years in Western societies with low base rate of drinking, a universal prevention approach on alcohol is little to ineffective [56]. Focusing on for example peer influences on substance use might not be very beneficial, as mid-adolescents are so much oriented

on the needs, expectations, and opinions of their peers. They want to be part of the group, so refusal skill training is less effective at this age. According to Onrust and her colleagues, a targeted prevention approach for this age group seems to be more effective. High-risk students in this age group appear to benefit most from programmes based on the principles of cognitive behavioural therapy and teaching students to cope with stress and anxiety.

The Healthy Schools and Drugs Programme
To make the implementation of a combined approach efficient and more effective, it is advisable to connect well with existing systems, such as The Healthy School and Drugs programme in the Netherlands. Within the Healthy School and Drugs programme, the Preventure approach can complement the existing universal interventions, keeping the developmental stages of adolescents in mind. In recent years, the Healthy School and Drugs programme has been adapted to the new insights about substance use and the development perspective of young people [e.g., 56]. Each age group has a tailor made intervention based on the specific age related characteristics and underlying determinants.

As the post-hoc analyses in our study gave an indication that Preventure seems to be most suitable for the lower educated adolescents, it is preferable to implement the programme at lower education schools (e.g., secondary vocational education). As part of the selection procedure, the students should not only be selected at their personality profile, but also at their alcohol use. As Preventure, and targeted prevention in general, is more effective for the group of adolescents who already have experience with alcohol use. This is not only supported by the meta-analyses study in this thesis, but also supported by the findings from the research of Onrust et al. [56]. Their findings imply that behavioural change in middle adolescence appears only to be achievable with individuals already demonstrating alcohol use.

Although we have found the strongest effects in our study for the personality traits sensation seeking and anxiety sensitivity, the recommendation can be made to select all four personality profiles in schools. Especially within the vulnerable groups of adolescents with mild intellectual disabilities or adolescents with psychiatric and/or behaviour problems, the distinction in the four profile groups can be more present and profound. For these groups, the Preventure approach can probably also be effective on impulsivity and depression symptoms.

Ethical consideration
A general issue with targeted interventions is the selection of participants and providing information to the participants and their parents in an accurate manner. In this study, neither the parents nor the teachers at the schools were explicitly informed about the selection variables of the study, to avoid stigmatization of the students. This procedure has been approved by

the ethical commission. The students in the Preventure study were selected on basis of their personality traits. Scoring high on a personality trait does not mean that a student already has problems related to those personality traits. For example, a student scoring high on the trait negative thinking does not necessarily have symptoms of depression. Informing the pupil's environment about his or her personality trait can unintentionally create the side effect that this environment is worried or that it will treat the pupil differently. Therefore, the information about the personality traits of the pupils should be carefully handled. This issue should be taken into account if the Preventure programme is implemented at other schools in the Netherlands.

Directions for future research

Improvement of the programme

The Preventure programme is a brief intervention. As recommended, the intervention could be extended to more sessions. Instead of two sessions, three to four sessions would be advisable. Another adjustment is the involvement of parents. For example with homework assignments the adolescents can practice the principles of the intervention in the home setting. Future research is needed to explore whether this increased intervention dose and parent involvement will enhance the effectiveness of the programme. Not only on the alcohol outcome measures. A more comprehensive version of the Preventure programme could probably enhance its effectiveness on mental health outcomes as well.

Long-term effects

Our study revealed the effects of the Preventure programme at 12 months post-intervention, through post hoc analyses. Future research is needed to determine the effects over a longer period, especially regarding problem drinking. In our study, no significant effects were revealed for problem drinking. Conrod and her colleagues found intervention effects in reducing problem drinking symptoms at 24 months post-intervention, and in the study conducted among an older student population. This may implicate that curbing the growth of drinking in early onset drinkers may delay the onset of problematic drinking over the longer term. Longer-term follow-up of the current sample might reveal effects on high-risk drinking outcomes typical for older adolescents, with the assumption that patterns of problematic drinking are more likely to be already established among older adolescents.

Vulnerable target groups

As mentioned above, for future directions it is recommended to explore the effectiveness of the Preventure approach for vulnerable groups of young adolescents, e.g. adolescents with psychiatric and/or behavioural problems, or adolescents with a mild intellectual disability. The personality traits-oriented approach could be suitable for these groups of adolescents, as well as the methods used in the intervention, cognitive behaviour therapy

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and motivational interviewing. To know whether the Preventure approach is also effective for these groups, future research on the Preventure approach should be focused on these adolescents. The education system in The Netherlands gives the opportunity to investigate the different groups in the different settings, e.g. demonstration schools and schools for students with special needs. Effects on psychosocial factors could possibly be expected, as these underlying factors are more present among these groups of vulnerable adolescents. Especially regarding the effects on the personality traits negative thinking and impulsivity, as we did not find effects on these traits among the regular group of adolescents.

When adapting the Preventure programme for other (vulnerable) target groups and testing the programme among these groups, it is advisable to do this in co-creation with the target group. In this case the target group consists of school teachers, students and prevention workers. For the adaptation of an existing effective intervention for use with a different target population, a framework for co-producing and prototyping interventions can be used [57, 58].

Stepped prevention approach

A combined approach of universal and targeted alcohol prevention is recommended in the thesis, however, strong evidence for this so called stepped prevention strategy is not yet available. More research is needed to study the effects of an approach where all students and the students at risk are targeted in schools at the same time. A recommendation-able option would be to study the universal intervention of The Healthy School and Drug programme in special needs education schools, combined with the Preventure approach for the students at higher risk. This could not only gain inside in the effects of the stepped prevention approach, but also inside in the effects among vulnerable young adolescents, and the effects on other alcohol related problems and psycho-social factors.

Limitations of this thesis

The general limitations with respect to the presented studies in the current thesis will be discussed. For the study-specific limitations we refer to the limitations presented in the relevant chapters.

Method

Although a randomized clinical trial is the best design for testing the effects of interventions, this method may still be subjected to some demerits. First, our study was confined to students who participated voluntarily in the intervention and had parental consent. Fifty-two percent of the potential participants were lost due to this source of attrition. This procedure could have caused a sample selection bias, because the participating students were prob-

ably more motivated than the non-participating students. Second, the use of self-reports might have led to measurement errors, due to situational and cognitive influences [59]. To overcome situational influences (e.g. social desirability) and to optimize measurement validity, we guaranteed full confidentiality (anonymity) to our participants. Besides, self-reports have been found to be a reliable method to measure alcohol use when confidentiality is assured [e.g., 60, 45]. Third, the intervention and control conditions differed at baseline on sex, age, level of education and binge drinking status. The intervention condition included more girls, slightly younger students and more students with a low education level, and the students were more likely to engage in binge drinking. Randomization at school level is probably responsible for this unequal distribution. A possible solution for future trials might be to randomize within schools, although one should be careful to avoid contamination effects. Fourthly, adolescents who retained in our study were less likely to engage in binge drinking, than those lost to follow-up. However, besides school withdrawal, attrition was limited and not related to condition. Also, we analysed all participants in the condition to which they were allocated. Therefore, it seems unlikely that our attrition affected study conclusions.

SURPS

In our study we used a translated version of the Substance Use Risk Profile Scale (SURPS: [14]. The SURPS has been translated in Dutch by Malmberg and colleagues [61]. Based on factor analyses the original structure of the SURPS had to be revised by deleting two of the original items (i.e., 'I feel that I'm a failure' and 'I feel I have to be manipulative to get what I want'). This might have resulted in differences between our research and research that included the original 23 scale items.

Generalizability

First, in advance of the randomization, a self-selection process may have taken place, which could have impaired the external validity of the study. We do not know how the intervention works in schools that did not voluntarily take part in the Preventure study; as such, participating schools might not be representative for all schools in the Netherlands. This may limit the generalizability of our findings. Second, one should be careful in generalizing the effects of the Preventure intervention to other countries, since our findings may not reflect the situation in other drinking cultures. In our study other results were found than in the previous studies by Conrod et al. [17, 42]. Therefore, evidence-based interventions in one culture should always be re-examined in another culture or community.

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General conclusion

The results of this dissertation provide indications that targeted prevention (selective and indicated prevention) is more effective than universal prevention in preventing or reducing alcohol abuse among young adolescents. Investing in relatively small high-risk groups can yield profit at the population level of young adolescents, and can be complimenting to universal prevention efforts; the so called second order prevention paradox. One of the selective alcohol prevention approaches with potential is the Preventure programme. The results of the effectiveness study provided prudent indications that Preventure is effective in reducing binge drinking in young adolescents with a high-risk personality profile, and among the group of lower educated young adolescents.

Relevance

The results from this dissertation show that selective alcohol prevention is a good supplement to universal prevention. The availability of evidence-based alcohol prevention programs for high-risk adolescents in the Netherlands is scarce. The Preventure programme can have an added value for the prevention field in The Netherlands. This on personality traits driven approach can fill the gap of the availability of evidence based alcohol prevention programs for high-risk groups. The Preventure approach could also be suitable for vulnerable groups for which little to no evidence-based interventions are available, such as youngsters with a mild intellectual disability, and students in practical education and secondary special education. It is recommended to further develop this prevention programme for these target groups and to invest in effectiveness research.

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Lief, trek iets moois aan,
Want we gaan.
Dansen op de vulkaan, De Dijk

CHAPTER 8

Nederlandse samenvatting
(Dutch summary)
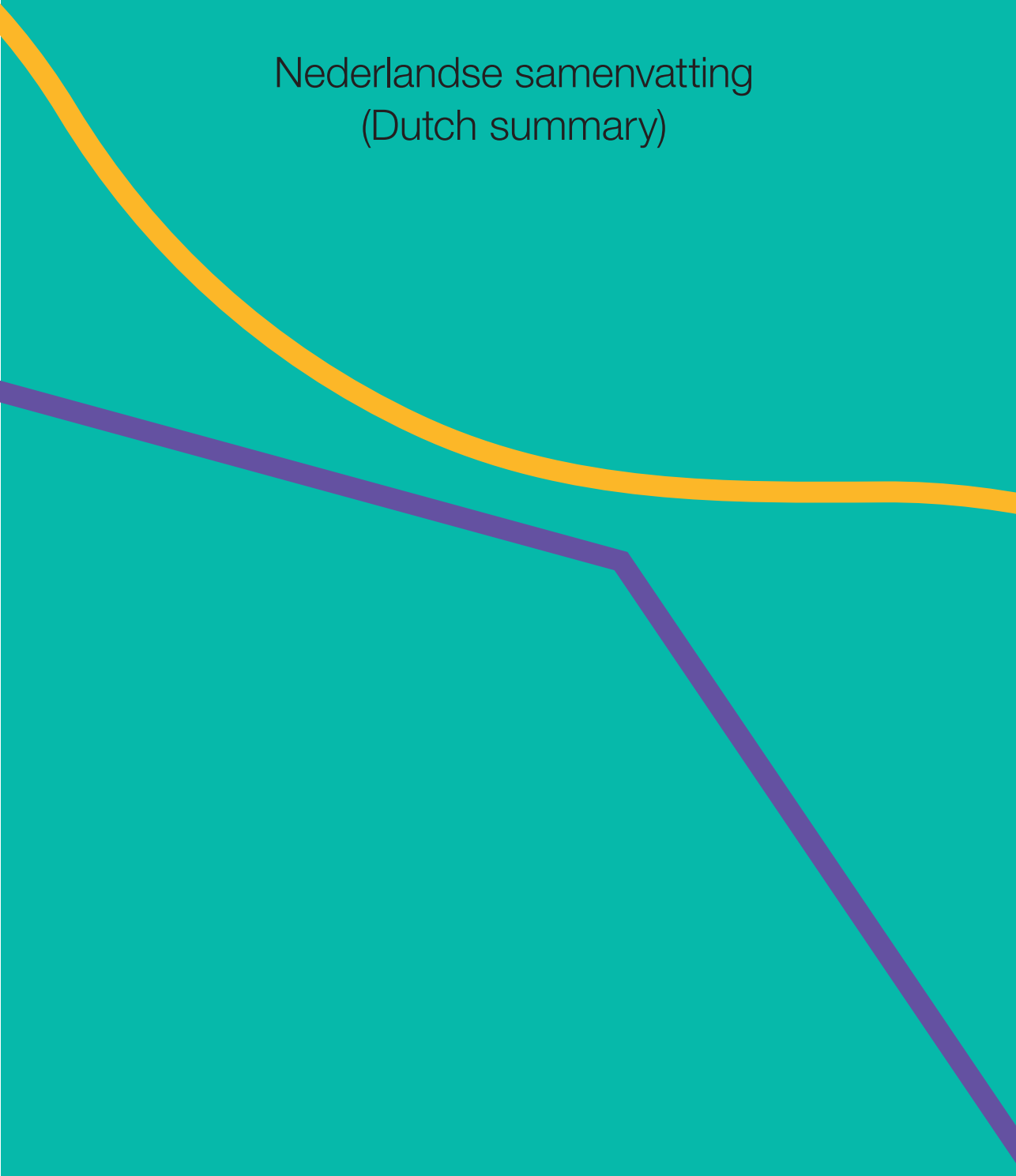
Samenvatting

Het centrale thema van dit proefschrift is alcoholpreventie onder jonge adolescenten. In de laatste decennia zijn verschillende preventieprogramma's ontwikkeld om te voorkomen dat adolescenten al op jonge leeftijd beginnen met alcohol drinken en om te voorkomen dat ze ongezonde drinkpatronen ontwikkelen zodra ze begonnen zijn met drinken. Tot op heden vallen inspanningen om het drinkgedrag van adolescenten onder controle te houden voornamelijk onder universele preventie, wat betekent dat de preventie zich richt op de groep adolescenten in het algemeen. Er zijn veel minder preventieprogramma's beschikbaar voor jonge adolescenten die een hoger risico lopen om al op jonge leeftijd veel alcohol te drinken en om alcohol gerelateerde problemen op latere leeftijd te ontwikkelen. Preventie gericht op hoog-risico groepen noemen we selectieve en geïndiceerde preventie. Een discussie die vaak wordt gevoerd binnen het preventieveld is wat het meest effectief is: inzetten op de hele groep jonge adolescenten of meer de focus leggen op de groep jonge adolescenten die het meeste risico loopt op alcoholmisbruik en problemen die hier mee samengaan. Met het hier voorliggende proefschrift wordt een bijdrage geleverd aan deze discussie. Ook worden de resultaten besproken van een effectiviteitsstudie naar een selectief alcohol-preventieprogramma.

In **hoofdstuk 2** worden de resultaten beschreven van een meta-analyse van studies naar de effecten van school-gerichte alcoholpreventieprogramma's onder adolescenten. Onderzoek naar school-gerichte programma's, gericht op adolescenten (gemiddelde leeftijd 11-18 jaar oud) en hun alcoholgebruik, werd opgenomen in de meta-analyse. De resultaten van deze meta-analyse lieten zien dat preventie gericht op hoog-risicogroepen doeltreffender lijkt dan universele preventie bij het voorkomen of verminderen van alcoholmisbruik bij adolescenten. Selectieve preventiestrategieën richten zich op subgroepen van de algemene bevolking met risico op alcoholmisbruik, geïndiceerde preventie-interventies richten zich op personen die vroege tekenen van verslaving en/of gerelateerd probleemgedrag vertonen hetgeen geassocieerd wordt met alcoholmisbruik. Daarnaast werden verschillende groepen adolescenten met een risico op alcoholmisbruik onderscheiden: adolescenten met een lage sociaal-economische status, een migratie-achtergrond, probleemgedrag, ervaring met alcoholgebruik en een risicopersoonlijkheid. Dit onderscheid werd gemaakt om te onderzoeken welke van deze verschillende risicogroepen het meest profiteren van selectieve en geïndiceerde alcoholpreventie Adolescenten die al ervaring hadden met alcoholgebruik lijken meer te profiteren van selectieve en geïndiceerde preventie. Alcoholpreventie gericht op hoog-risicogroepen lijkt effectiever te zijn bij adolescenten die al op jonge leeftijd met alcohol drinken zijn begonnen.

In **hoofdstuk 3** werden motieven om te drinken onderzocht als mogelijke mediatoren van de associatie tussen persoonlijkheidskenmerken (negatief denken, angstgevoeligheid, impulsiviteit en sensatie zoeken) enerzijds en alcoholfrequentie, binge drinken (meer dan vijf

eenheden alcohol per gelegenheid) en alcohol gerelateerde problemen anderzijds. Motieven om te drinken zijn: een sociale beloning krijgen (sociaal drinken), je positieve stemming verbeteren (enhancement), om te gaan met negatieve emoties (coping) en om sociale afwijzing te voorkomen (conformity). Voor het eerst, voor zover ons bekend, werden deze associaties getest in een steekproef van jonge adolescenten die ervaring hadden met alcoholgebruik (3.053 scholieren tussen de 13 en 15 jaar oud). Resultaten van dit onderzoek lieten zien dat onder jonge adolescenten, coping-motieven, sociale motieven en enhancement motieven een prominente mediatie rol lijken te spelen tussen persoonlijkheidskenmerken en de uitkomstmaten op alcoholgebruik. De rol van drinkmotieven in de relatie tussen persoonlijkheid en alcoholuitkomsten was grotendeels gelijk voor jongens en voor meisjes, hoewel enkele verschillen werden gevonden voor binge drinken. Meer in het bijzonder lijken voor jongens enhancement motieven een grotere mediatie rol te spelen tussen persoonlijkheid en binge drinken, terwijl voor meisjes coping-motieven een grotere mediatie rol spelen tussen persoonlijkheid en binge drinken. Al in de vroege adolescentie worden persoonlijkheidskenmerken geassocieerd met drinkmotieven, die op hun beurt weer verband houden met alcoholmisbruik. Deze resultaten wijzen er op dat interventies gericht op persoonlijkheidskenmerken in combinatie met drinkmotieven bij kunnen dragen aan alcoholpreventie in de vroege adolescentie.

In **hoofdstuk 4** wordt het studieprotocol van de effectiviteitsstudie naar het preventieprogramma Preventure beschreven. Preventure is een interventie gericht op jonge adolescenten die hoog scoren op één van de vier persoonlijkheidsprofielen: negatief denken, angstgevoeligheid, lage impulscontrole en sensatie zoeken. De interventie bestaat uit twee groepssessies gericht op motivationele gespreksvoering en cognitieve gedragstherapie. Het studieprotocol beschrijft het design en de implementatie van een Randomized Controlled Trial (RCT) om de effectiviteit van het selectieve alcoholpreventieprogramma Preventure in Nederland te evalueren. Een RCT is uitgevoerd onder een steekproef van 13 tot 15-jarige adolescenten op vijftien middelbare scholen in Nederland. Scholen werden willekeurig toegewezen aan de interventie- en controleconditie. De interventieconditie bestond uit twee groepssessies van 90 minuten, uitgevoerd op de scholen van de deelnemers en uitgevoerd door een gekwalificeerde counselor en een co-facilitator. De belangrijkste uitkomstmaten voor het onderzoek waren: het percentage vermindering van alcoholgebruik, binge drinken, alcoholfrequentie, frequentie van binge drinken en drink gerelateerde problemen. Follow-up metingen waren er 2, 6 en 12 maanden na het uitvoeren van de groepssessies op de scholen.

In **hoofdstuk 5** en **hoofdstuk 6** worden de resultaten van de Preventure-studie in Nederland beschreven. De analyses zijn op twee manieren uitgevoerd. Eerst is een vergelijking gemaakt tussen de interventiegroep en de controlegroep na 12 maanden follow-up. Deze analyses toonden geen significante interventie-effecten aan voor binge drinken, alcoholgebruik en probleemdrinken. Daarnaast is de ontwikkeling van alcoholgebruik over de tijd in kaart gebracht door middel van post-hoc latente groeicurve analyses. Deze analyses lieten

significante effecten van de interventie zien op de ontwikkeling van binge drinken en frequentie van binge drinken, over 12 maanden follow-up. Bij jongeren die de interventie kregen nam het binge drinken minder snel toe gedurende de 12 maanden, dan bij de jongeren die de interventie niet kregen. De interventie-effecten werden versterkt door persoonlijkheidskenmerken en door opleidingsniveau. Meer specifiek werden interventie-effecten gevonden voor het verminderen van alcoholgebruik binnen de groep van angstgevoeligen, en voor het verminderen van binge drinken en frequentie van binge drinken binnen de groep van sensatiezoekers. Ook verminderde onder de groep van jonge adolescenten op het vmbo het binge drinken, frequentie van binge drinken, alcoholgebruik en frequentie van alcoholgebruik, meer dan onder de groep van jonge adolescenten op havo, vwo en gymnasium.

Tabel 1. Samenvatting van de belangrijkste bevindingen in dit proefschrift

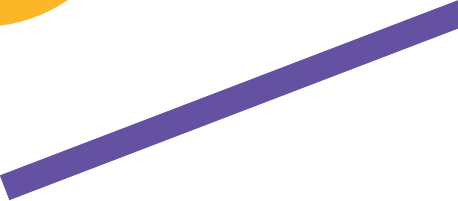| Bevindingen	Hoofdstuk
Preventie gericht op hoog-risicogroepen (selectieve en geïndiceerde preventie) lijkt effectiever te zijn dan universele preventie bij het voorkomen of verminderen van alcoholmisbruik bij adolescenten.	2
Alcoholpreventie gericht op hoog-risicogroepen lijkt effectiever te zijn dan universele preventie bij adolescenten die al op jonge leeftijd met alcohol zijn begonnen.	2
Reeds in de vroege adolescentie blijken persoonlijkheidskenmerken samen te hangen met drinkmotieven, die op hun beurt weer verband houden met alcoholgebruik.	3
Intention to Treat-analyses brachten geen significante effecten van het Preventure-programma op alcohol-uitkomsten aan het licht. Post-hoc latente groeicurve analyses hebben significante effecten op de ontwikkeling van binge drinken aangetoond.	5
De interventie-effecten van het Preventure-programma waren sterker voor jonge adolescenten met de persoonlijkheidsprofielen angstgevoeligheid en sensatie-zoekend gedrag en voor jonge adolescenten met een lager opleidingsniveau.	6

Conclusie

De resultaten van dit proefschrift geven aanwijzingen dat preventie gericht op hoog-risico groepen (selectieve en geïndiceerde preventie) effectiever lijkt dan universele preventie bij het voorkomen of verminderen van alcoholmisbruik bij adolescenten. Investeren in een preventieaanpak gericht op hoog-risicogroepen vormt een goede aanvulling op universele preventieprogramma's, om zodoende de gezondheidswinst op populatieniveau van jonge

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adolescenten te optimaliseren. Dit wordt ook wel de 'preventieparadox van de tweede orde' genoemd. Een preventiestrategie waarbij naast preventie gericht op de algehele populatie jonge adolescenten, extra inspanningen worden gedaan om jonge hoog-risico groepen te bereiken. Een veelbelovende selectieve alcohol-preventieaanpak is het Preventure-programma. De resultaten van het effectiviteitsonderzoek geven aanwijzingen dat Preventure effectief is in het terugdringen van binge drinken bij jonge adolescenten met een hoog-risico persoonlijkheidsprofiel en bij de groep van lager opgeleide jonge adolescenten.

Relevantie

Momenteel zijn er weinig evidence-based alcohol-preventieprogramma's beschikbaar in Nederland voor hoog-risico adolescenten. Het selectieve alcohol-preventieprogramma Preventure kan een toegevoegde waarde hebben voor het preventieveld in Nederland. Het kan de 'witte vlekken' wegnemen in de beschikbaarheid van evidence-based alcohol-preventieprogramma's voor hoog-risicogroepen. De op persoonlijkheidsprofielen gerichte aanpak van Preventure zou ook geschikt kunnen zijn voor kwetsbare groepen waar nog weinig tot geen evidence-based interventies voor beschikbaar zijn, zoals jongeren met een licht verstandelijke beperking en leerlingen binnen het Praktijkonderwijs en het Voortgezet Speciaal Onderwijs. Het verdient aanbeveling de interventie voor deze doelgroepen door te ontwikkelen en te onderzoeken op effectiviteit.

Nobody said it was easy
No one ever said it would be this hard
The Scientist, Coldplay

CHAPTER 9

Dankwoord
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Dankwoord

"Naar voren bewegen", dat is de letterlijke betekenis van promoveren vanuit het Latijn. Ik heb me voortbewogen, dat klopt, soms drie stappen vooruit en dan weer vier stappen naar achteren. Soms was er ineens die snelle sprint, dan stonden weer de nodige horden op de baan. Met een lange adem ben ik richting de finish gegaan.

Het was een lang parcours. Ik wist, zoals menig promovendus met mij, niet echt waar ik aan begon. De vele kilometers naar de 15 scholen in alle uithoeken van Nederland die zo enorm bereidwillig waren mee te doen. De 4.844 leerlingen die geduldig een vragenlijst hebben ingevuld. De vele vrijdagen analyseren. Het dagenlang schrijven in een bibliotheek in Zweden tussen de 'cappuccino vaders' en thuiskomen met de eerste drie zinnen van de inleiding. De bemoedigende woorden van mijn toen 8-jarige zonen: "Pap, waarom duurt dit zo lang, dit kunnen wij in een maand". De vele rondjes hardlopen om het hoofd leeg te maken en te ordenen. Tot het publiceren van mijn eerste artikel en het presenteren van de resultaten op congressen in Lissabon.

Het was uiteindelijk een mooie duurloop. Alle mensen die mij onderweg op welke manier dan ook hebben ondersteund, door af en toe een spons in mijn gezicht te gooien, ben ik ongelooflijk dankbaar. Deze steun heeft geleid tot dit eindresultaat. Zonder iemand daarbij iets tekort te doen, of iemand vergeten te noemen, wil ik eenieder op dezelfde manier, hetzelfde zeggen. Vanuit de grond van mijn hart:

Bedankt!!

Jeroen, juli 2019

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Lammers, J., Goossens, F., Conrod, P., Engels, R., Wiers, R. W., & Kleinjan, M. (2017). Effectiveness of a selective alcohol prevention program targeting personality risk factors: results of interaction analyses. Addictive Behaviors, 71: 82-88. doi:10.1016/j.addbeh.2017.02.030

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Curriculum vitae

Jeroen Lammers was born on the 6th of March 1970, in Wisch (Silvolde), The Netherlands. In 1989 he graduated from secondary school at the Isala College in Silvolde. In the same year he started his training Health Sciences, specialization Health Education, at the University of Maastricht. During this training his interest in Global Health Education resulted in a research internship at the Centro de Salud in Tela, Honduras, under supervision of Ir. Martien van Dongen, and was followed by a practical internship at ADEMUSA (NGO) in San Salvador, El Salvador. He graduated in 1995. During his work at the University of Maastricht, CAD Maastricht, GGD Heerlen and GGD Midden-Nederland, his common thread was addiction prevention and mental health promotion, and research among young adolescents. He started working at the Trimbos Institute in 2006. As a project manager of the national programmes The Healthy School and Drugs, and Well-being at School, he initiated the development, implementation and evaluation of interventions for young adolescents on addiction and mental health. In 2010 he started his PhD research, which was funded by ZonMw, under supervision of Prof. Rutger Engels, Prof. Marloes Kleinjan and Prof. Reinout Wiers. The results of his PhD research project have been described in this thesis. During his studies in Maastricht Jeroen met Loes. They live together in Soest with their two adolescent sons, Pim and Teun (both 2002).

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WARNING
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MAY CAUSE
ADDICTION

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