Prevention of alcohol use in early adolescents:

A joint venture of school and parents

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Prevention of alcohol use in early adolescents:
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(met een samenvatting in het Nederlands)

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1. General Introduction

Initiation of alcohol use at a young age not only elicits progress into more regular drinking (Takakura & Wake, 2003; Van Dorsselaer et al., 2010), but is also a strong predictor of other alcohol-related problems. For example, early adolescent alcohol use has been linked to harmful physiological, social, and psychsological functioning throughout adolescence and into adulthood. This includes violent and delinquent behaviors (Komro, Tobler, Maldonado-Molina, & Perry, 2010), addiction problems (DeWit, Adlaf, Offord, & Ogborne, 2000), risky sexual behaviors (Mason et al., 2010), suicide attempts (Swahn, Bossarte, Ashby, & Meyers, 2010) and co-morbid substance use (Komro et al., 2010). Moreover, recent studies have demonstrated detrimental effects of early drinking on brain development that is associated with, for example, learning abilities (Bava & Tapert, 2010; Brown & Tapert, 2004; Clark, Thatcher, & Tapert, 2008). Considering these risks, the younger an adolescent initiates drinking, the more severe the consequences (Flory, Lynam, Milich, Leukefeld, & Clayton, 2004; Hingson, Heeren, & Winter, 2006; Grant & Dawson 1997; Pitkänen, Lyyra, & Pulkkinen, 2005). For example, Flory et al. (2004) found that adolescents who began using alcohol by the age of 12 were arrested more often and had a greater likelihood of substance use disorders at ages 20-22 years compared to adolescents who did not drink or who postponed drinking until the age of 14. In addition, each additional year of delayed drinking reduced the likelihood of alcohol dependence by 14% (Grant & Dawson, 1997). Therefore, interventions aimed at preventing, or at least delaying, alcohol use among early adolescents are crucial from a public health point of view.

1.1 Central theme of this thesis

The central theme of this thesis is alcohol prevention in adolescence. This thesis provides elaborated insight into two alcohol interventions, an adolescent and a parent intervention, that were carried out in the Netherlands. Key questions herein include:

- Is the intervention effective?
- How can an intervention achieve its effect?
- For whom is the intervention effective?

Although these questions seem obvious when conducting intervention research, it remains relatively uncommon to investigate alcohol interventions using such a comprehensive approach. However, addressing these questions clearly will contribute to the understanding of the intervention; specifically, we can address effectively adolescents' drinking and the implications of intervention for public health.

1.2 Alcohol use in the Netherlands

Dutch adolescents ranked among the highest in alcohol use compared to other European youngsters (Currie et al., 2004). From 1992 to 2005, the number of drinking youngsters under the age of 16 increased significantly from 69.3% to 86%. However, the greatest increase was found in the youngest age group of 12-14 year old adolescents. In this young age group, the number of drinking kids increased from 53.1% in 1992 to 70.7% in 2005 (Monshouwer, Van Dorsselear, Gorter, Verdurmen, & Vollebergh, 2004; Van Dorsselaer, Zeijl, Van den Eeckhout, Ter Bogt, & Vollebergh, 2007). This increase in alcohol use, particularly among early adolescents, eventually gave reason for the Dutch government to launch several campaigns to target underage drinking, primarily by addressing the parents of young adolescents. From 2006 onwards, a shift in the message to parents took place from 'teach your child to drink alcohol in a responsible way' to 'postpone the onset of drinking until at least the age of 16.' It seems that these initiatives gradually began to pay off as the percentage of parents that allowed their underage child to drink a sip of alcohol decreased from 63% in 2007 to 43% in 2009 (Van Dorsselaer et al., 2010). Moreover, recent national studies showed a decrease in alcohol use, especially among the younger age groups. For example, in 2009 the lifetime prevalence of alcohol use among 12-year-old adolescents decreased by 30% and only one third of these adolescents drank on a monthly basis compared to reported drinking behaviors in 2003 (Van Dorsselaer et al., 2010). Although declining, the rate of alcohol use among early adolescents in the Netherlands remains high. For example, in 2009, 20% of 13-year-old

adolescents drank on a monthly basis and this percentage increased to 71% for 16 year olds (Van Dorsselaer et al., 2010). Moreover, among monthly drinkers, a significant number of adolescents drank five glasses or more on one occasion (67%). Further, once adolescents start drinking alcohol, they tend to accelerate quickly to heavier drinking.

1.3 Tools for prevention

Theory should always form the basis of a search of detecting tools that are useful for the prevention of alcohol use among adolescents. Further, new scientific insights into relevant factors that predict the onset of drinking may be used to improve existing, preferably evidence-based, prevention programs or to develop new programs. Therefore, the interventions considered in this thesis are based on exactly these premises.

1.3.1 Targeting adolescents in alcohol prevention

Many interventions are implemented in the Netherlands to reduce alcohol consumption by young people. The continuing high, and even increasing, pattern of alcohol consumption in the youngest groups however emphasize the need for constant update and improvement of such interventions. One of these interventions is the Healthy School and Drugs program (HSD). The HSD program is a Dutch school-based drug prevention program that is widely implemented among secondary schools in the Netherlands. This program was originally based on the theory of planned behavior (Ajzen & Fishbein, 1980) and Bandura's social cognitive theory (Bandura, 1986). By targeting adolescents' attitudes (a person's judgment of possible behavior) and self-control (a person's confidence in succeeding in accomplishing a certain behavior), which are both strong predictors of adolescents alcohol use (Kam, Matsunaga, Hecht, & Ndiaye, 2009; Pasch, Perry, Stigler, & Komro, 2009; Stephens, Mounts, Lamborn, & Dornbusch, 2009), the HSD aims to influence adolescents' alcohol and drug use.

The effectiveness of the Healthy School and Drugs program was tested in a quasi-experimental design (Cuijpers, Jonkers, de Weerdt, & de Jong, 2002). Although this study did not entirely meet current requirements for effectiveness studies (e.g., schools were not randomized to conditions), it is the only drug prevention program that has been

tested for effectiveness in the Netherlands (Verdurmen et al., 2003). Findings revealed no differences between the experimental and control schools on weekly alcohol use one and two years after baseline. However, three years after baseline, the prevalence of weekly alcohol use at the experimental schools was lower than the control schools and less alcohol was consumed per week at the experimental schools (Cuijpers et al., 2002). However, there were reasons to improve the existing HSD program. First, age of first alcohol use had been declining in the Netherlands; therefore, there was a need to target younger age groups. Specifically, the alcohol module in the HSD program was offered in the second year of high school and, thus, should be offered in the first year. Second, studies showed that programs using interactive delivery methods are most effective (Cuijpers, 2002). In addition, the use of e-learning has been proven to yield better results than traditional methods (Clark & Mayer, 2003). Another point for improvement of the existing intervention was the lack of evidence-based strategies that targeted the parents of youngsters under the age of 16.

1.3.2 The role of parents in adolescents' underage drinking

In the Netherlands, the interest for parenting practices that relate to adolescents' alcohol use, so called alcohol-specific parenting practices, has significantly increased in recent years. Although parenting, in general, such as parental monitoring and closeness (Habib et al., 2010), is relevant for a child's drinking behavior, it is mainly through alcohol-specific parenting that parents can exert influence on their offspring's drinking (Van der Vorst, Engels, Meeus, Dekovic, & Van Leeuwe, 2005; Van der Vorst, Engels, Meeus, & Dekovic, 2006). Previous studies that examined alcohol-specific parenting practices generally differentiated between four parenting practices; rules about alcohol use of the child, attitudes toward alcohol use of the child, frequency of parent-child communication about alcohol use, and the quality of such communication (Ryan, Jorm, & Lubman, 2010; Spijkerman, van den Eijnden, & Huiberts, 2008; Van der Vorst et al., 2005). However, apart from alcohol-specific parenting, parents may also act as role models for their offspring by their own engagement in drinking behaviors (e.g., Duncan, Duncan, & Strycker, 2006).

Parental alcohol use

There is evidence that parental alcohol use influences the alcohol consumption in their offspring. This effect is explained both directly by modeling (Bandura, 1986; Duncan et al., 2006; Webb & Bear, 1995) and indirectly through alcohol-specific parenting behavior (Ennett, Bauman, Foshee, Pemberton, & Hicks, 2001; Van der Vorst et al., 2006; Verdurmen, Smit, Van Dorsselear, Monshouwer, & Schulten, 2008). That is, children may imitate parental behavior (directly) when they see their parents drink or when they drink together (Zhang et al., 1999; Van der Vorst, Engels, Burk, 2010). Moreover, by using alcohol themselves, parents also set a clear pro-alcohol norm. Indirectly, drinking parents engage to a lesser extent in alcohol-specific parenting practices (Ennet, Bauman, Foshee, et al., 2001; Van der Vorst et al., 2006; Verdurmen et al., 2008). Although most studies show evidence of a relation between parental alcohol use and adolescent drinking (Ellickson & Hayes, 1991; Kandel & Andrews, 1987; Ary, Tidlesley, Hops, & Andrews, 1993; Engels, Knibbe, & Drop 1999; White et al., 2000; Seljamo et al., 2006), other studies do not (Peterson, Hawkins, Abbott, & Catalano, 1994; Power, Stewart, Hughes, & Arbona, 2005; Reifman, Barnes, Dintcheff, Farrell, & Uhteg, 1998). Overall, the relation between parental drinking and adolescent alcohol use remains inconsistent. Further, these findings may be explained by the way parental drinking is operationalized, the specific stage of adolescent drinking (Power et al., 2005), the other variables included in the analysis, and whether parent or child reports are used.

Rules and attitudes about alcohol

One of the most consistent predictors of alcohol use is a lack of restrictive parenting, mainly in younger adolescents (Habib et al., 2010; Van der Vorst et al., 2006; Yu, 2003); however, this is also seen in older adolescents (Abar & Turrisi, 2008). That is, adolescents with parents who set restrictive alcohol-specific rules are less likely to start drinking during early adolescence and tend to drink less compared to adolescents with permissive parents (Järvinen & Östergaard, 2009; Van der Vorst, et al., 2006; Yu, 2003). Although parental influences, with respect to alcohol-specific rule-setting, diminish but do continue through adolescence, Dutch studies have shown that parental permissiveness increases

when adolescents grow older (Monshouwer, Verdurmen, Dorsselaer, Smit, Gorter, & Vollebergh, 2008; Van der Vorst et al., 2006). For example, 7% of 12 to 13 year olds are allowed to drink one glass of alcohol at home, compared to 29% of 14 to 15 year olds (Monshouwer et al., 2008).

A similar protective association has been found between adolescents' drinking and restrictive parental attitudes; having a restrictive attitude about alcohol is associated with less alcohol involvement in their offspring (Moore, Rothwell, Segrott, 2010; Spijkerman, van den Eijnden, Overbeek, & Engels, 2007). In addition, Yu (2003) demonstrated that negative attitudes of parents are most significant in adolescents' decisions to start drinking. Thus, restrictive rules and attitudes about alcohol use appear to be significant parenting practices, particularly for youngsters in the initiation phase of alcohol use.

Quality of communication

The most direct way for parents to express their rules about alcohol is by communicating them via alcohol-specific communication (Ennett, Bauman, Foshee, et al., 2001). Further, the way parents talk about alcohol with their child (i.e., the level of mutual understanding and respect) is referred to as the quality of communication. Longitudinal research on the perceived quality of parent-child communication about alcohol and adolescent drinking is relatively scarce. Although one cross-sectional study revealed that a higher quality of communication is related to a lower level of drinking (e.g., Spijkerman, et al., 2008), no evidence has been provided for a longitudinal association (Van den Eijnden, Van de Mheen, Vet & Vermulst, 2011). Thus, it has yet to be proven that the quality of parent-child communication about alcohol use is of importance for the child's drinking behavior.

Frequency of communication

Another aspect of parent-child communication about alcohol is frequency. In line with a review of significant parenting factors (Ryan et al., 2010), a study by Van den Eijnden et al. (2011) did not show a significant effect of frequency of communication on adolescents' alcohol use two years later. However, Van der Vorst et al. (2005) and Spijkerman et al. (2008) found in their cross-sectional research that communicating more frequently about

alcohol was associated with higher levels of alcohol use in adolescents. Longitudinally, Van der Vorst, Burk & Engels (2010) revealed that this was only apparent in a sample of heavy drinking males. Thus, although cross-sectional studies indicate a positive association between the frequency of communication and adolescent drinking, longitudinally this relation has only been established in a subsample of heavy drinking males.

Factors influencing alcohol-specific parenting

There are factors that are known to influence alcohol-specific parenting behaviors in parents. For example, parental worries and parents' confidence in the efficacy of their own parenting behaviors (i.e., self-efficacy) are likely to be related to their parenting behaviors and their child's drinking. However, apart from one cross-sectional study (Bogenschneider, Wu, Raffaelli, & Tsay, 1998a), no research is available about the relation between parental worries, their subsequent alcohol-specific parenting behaviors and adolescent alcohol use. Furthermore, studies on the role of parental self-efficacy are also relatively scarce. Nevertheless, it is known that parents who feel more confident about the ability to influence their child's behavior show more effective parenting (Järvinen & Östergaard, 2009; Jones & Prinz, 2005) and have children who drink less alcohol (Van der Vorst et al., 2005). In order to obtain a complete understanding of alcohol-specific parenting, it is necessary to investigate the role of parental self-efficacy and worries about their child's behavior in relation to alcohol-specific parenting and adolescent drinking. This knowledge may contribute to the refinement of alcohol interventions directed at parents.

In sum, restrictive parenting (e.g., rules and attitudes about alcohol) appear to be the most consistent factor associated with early drinking onset. Therefore, it is of importance to examine whether informing parents about the importance of strict parenting, with respect to their offspring's alcohol use, is an effective way to postpone the onset of drinking. At present, we dispose of very few evidence-based interventions that focus on influencing parents of young adolescents to reduce alcohol use. Moreover, in the Netherlands, there has been no research on the effectiveness of interventions that focus

on parents (Cuijpers, Scholten, & Conijn, 2006; Van der Vorst, Smit, van den Eijnden, 2011). Given the fact that parents appear to be of crucial importance in the initiation of drinking alcohol among adolescents, such studies are urgently warranted.

1.4 What do we know about alcohol prevention?

1.4.1 What works?

The existing literature is clear about the importance of targeting not only adolescents, but also their parents in the prevention of alcohol use. That is, international studies show little evidence for the effectiveness of student interventions alone (Foxcroft, Ireland, Lister-Sharp, Lowe, & Breen, 2003; Lopez, Schwarts, Prado, Campo, & Pantin, 2008; Spoth, Greenberg, & Turrisi, 2008a), though some yielded promising results (Lopez, et al., 2008; Spoth et al., 2008a). Mainly interventions that focused on adolescents' norms about alcohol use, their development of refusal skills and positive peer relations showed to be effective in curbing adolescents' alcohol use. Yet, the Project Towards No Drug Abuse (Susman, Steven, Dent, & Stacy, 2002) was the only program that effectively delayed the initiation of alcohol among adolescents in early high school (Spoth et al., 2008a). On a national level, the Healthy School and Drugs program is the only one that significantly reduced the average number of alcohol drinks per week. However, it did not diminish the proportion of weekly users (Cuijpers et al., 2002).

Interventions targeting parents appear to be more promising (Smit, Verdurmen, Monshouwer, & Smit, 2008). For example, a prevention program targeting parents' strict rule enforcement and attitudes regarding alcohol use effectively reduced underage drinking in Swedish youth (Örebro Prevention Program (ÖPP); Koutakis, Stattin, & Kerr, 2008). Yet, prevention programs that involve parents as well as their children appear to be most successful in preventing the onset of drinking in adolescents (Smit et al., 2008; Spoth et al., 2008a; Norman & Turner, 1993; Wu, Stanton, Galbraith, et al., 2003). Interventions targeting parents as well as adolescents result in effect sizes two to nine times higher compared to interventions targeting adolescents only (Kumpfer, Alvarado, & Whitesite, 2003). This finding is supported by studies that have examined the effect of a combined parent-adolescent approach compared to a single approach (parents or

adolescents only; Turissi, Larimer, Mallett, et al., 2009; Wu et al., 2003) In addition, Pasch et al. (2009) showed that, among other factors, adolescents' self-control and parental monitoring are particularly relevant for alcohol interventions to target in order to delay the onset of drinking. Thus, it is most promising to target adolescents as well as their parents in interventions aiming to curb adolescents' drinking.

In addition to the question who should be targeted by alcohol interventions, it is imperative to know where (context) and when (age) the intervention may have most beneficial effects. Programs that are designed to prevent the initiation of alcohol use through universal practices, i.e. those applying to all students, are often carried out in the school context. School-based prevention programs have the advantage of reaching a large number of adolescents in a relatively easy way and are less prone to attrition (Spoth, Redmond, Clair, Shin, Greenberg, & Feinberg, 2011). Therefore, many interventions targeting drinking behavior in adolescents make use of the school setting. Moreover, it is suggested that preventive interventions should be provided during the transition from primary school to high school, when pressure and opportunity to engage in drinking behavior increases (Lochman and Steenhoven, 2002; Moore et al., 2010; Pasch et al., 2009). Thus, interventions targeting the onset of drinking in adolescents can best be carried out in the school context and during the transition to high school.

1.4.2 How can an intervention achieve its effects?

Interventions that intend to change a specific outcome, such as the onset of drinking, generally do so by aiming to modify theory-based factors that relate to the initiation of alcohol use. Insight into through what processes an intervention achieves its effects is usually generated by detecting these specific factors that are changed by the intervention, and that subsequently cause the change in outcome, the so called mediators (MacKinnon, 2008). Identifying mediating processes that underlie the effectiveness of an intervention (1) is relevant to test whether the intervention modifies the theory-based determinants as hypothesized, (2) may provide insight into how the intervention achieves its effects, (3) reveals which mediating factors are the most important for realizing change in outcome and (4) may manifest how the intervention affects either adolescents and/or parents, which may be relevant for implementation

purposes (Spoth et al., 2008a). Randomized clinical trials including pre-, post- and in-between measurements of mechanisms and outcomes are the best design to evaluate mediating effects (Kadzin, 2007).

Previous studies showed that self-control and attitudes about alcohol are both strong predictors of adolescents' alcohol use (e.g. Kam et al., 2009; Pasch et al., 2009; Stephens et al., 2009) and are often targeted in alcohol interventions (Foxcroft et al., 2003; Lemstra, Bennett, Nannapaneni, et al., 2010; Perry, Williams, Veblen-Mortensen, et al., 1996 (project Northland); Tobler, Roona, Ochshorn, et al., 2000). More consistent effects of interventions that target adolescents and their parents have been found on the increase in adolescents' self-control compared to the effect on their attitudes about alcohol. Recent studies that tested mediation effects of family interventions (e.g. Project Northland and Preparing for Drug Free Years) on alcohol use found no mediation effect of attitude (Komro, Perry, Williams, et al., 2001; Turrisi et al., 2009) and promising findings with respect to mediation trough self-control (Komro et al., 2001; Spoth, Redmond, & Shin, 1998). The Dutch Healthy School and Drugs prevention program showed that only self-control, but not attitude, was significantly changed by the intervention (Cuijpers et al., 2002). Thus, alcohol interventions targeting adolescents seem to change adolescents' self-control more consistently than their attitudes about alcohol.

Relatively little is known about how parenting practices can be changed by interventions targeting parents in order to curb adolescents' drinking. Research showed that alcohol interventions targeting parents did change parental attitudes (Ennett, Bauman, Pemberton, et al., 2001b; Park, Kosterman, Hawkins, et al., 2000) and rule-setting (Ennett et al., 2001b) about alcohol use, but these changes could not account for changes in alcohol use. In addition, Perry et al. (1996) revealed that their effective multi-component intervention resulted in a significant increase in parental rule-setting reported by adolescents after two years. Finally, Koutakis et al. (2008) demonstrated an increase in restrictive attitudes in parents, but without testing actual mediation. Thus, former studies lead to the expectation that interventions targeting parents can change parental rule-setting and attitudes, but it remains to be proven that this effect also contributes to postponing alcohol use in their children.

1.4.3 For whom is the intervention effective?

Many alcohol prevention programs showed actual effects on early adolescent alcohol consumption, whereby these findings apply to the targeted general population of adolescents and their parents (Smit et al., 2008; Spoth et al., 2008a). Relatively little attention, however, has been paid to the question whether all adolescents benefit from these interventions to the same extent. Interventions may have differential effects on different groups of adolescents, and may be particularly effective or ineffective among specific subgroups (Kraemer, Wilson, Fairburn, & Agras, 2002).

Investigating moderators of effects is important as it can establish whether groups at higher risk may be more likely to benefit from the intervention than groups at lower risk, as high risk groups are more inclined to develop the targeted behavior (i.e. Spoth, Shin, Guyll, Redmond, & Azevedo, 2006; Stice, Shaw, Bohon, Nathan Marti, & Rohde, 2009). Therefore, testing the moderation effect of universal prevention programs is required to confirm that the intervention indeed has positive effects across subgroups (e.g., Kraemer, Frank, & Kupfer, 2006; Spoth et al., 2006). Insight into subgroups that benefit most from an intervention facilitates in finding the best target groups for implementing this intervention (Kraemer et al., 2002).

Generally, two types of moderators can be distinguished. First, certain risk factors in adolescents or their parents (e.g. gender and level of education) may moderate the intervention effects. Second, theoretically relevant factors that are targeted in the intervention to induce its effect (e.g. rules about alcohol and self-control) may act as potential moderators, as well.

Risk factors

According to the risk moderation hypothesis, an intervention would be more effective among high-risk groups than among moderate and low risk groups with regard to early alcohol use. With respect to risk moderators, this indicates that interventions would be more effective among boys (Gruber, DiClemente, Anderson, Lodico, 1996; Monshouwer et al., 2008), students in lower education (Crum, Ensminger, Ro, & McCord, 1998; Van Dorsselaer et al., 2007; Vereecken, Maes, De Bacquer, 2004), adolescents exhibiting externalizing behavior (Bui, Ellickson, & Bell, 2000; Mason, Kosterman, Hawkins,

Haggerty, & Spoth, 2003) and in adolescents with heavy drinking parents (van der Zwaluw, Scholte, Vermulst, et al., 2008; Latendresse, Rose, Viken, et al., 2008). However, previous studies examining the moderation effects of gender yielded contradictory findings. Alcohol intervention studies found a more favorable effect among boys (Vigla-Taglianti, Vadrucci, Faggiano, et al., 2009), no differential effect (Jones, Olson, Forehand, et al., 2005; Koutakis et al., 2008; Kulis, Nieri, Yabiku, Stromwall, & Marsiglia, 2007; Trudeau, Spoth, Lillehoj, Redmond, & Wickrama, 2003; Turrisi et al., 2009) or more favorable effects in girls (DeGarmo, Eddy, Reid, Fetrow, 2009; Lillehoj et al., 2004; Mason, Kosterman, Haggerty, et al., 2009; Trudeau, Randall, & Azevedo, 2007). In addition, as to our knowledge, no studies are available that have examined the level of education of adolescents and/or parents, externalizing behavior and parental drinking as a moderator for alcohol prevention outcomes. In sum, although little empirical evidence is available, groups at higher risk for early drinking may be more likely to benefit from an intervention than groups at lower risk, as they are more inclined to develop the targeted behavior (i.e. Spoth et al., 2006; Stice et al., 2009).

Intervention-induced factors

Factors that were targeted by the intervention and proved to be accountable for the effect of the intervention can also be taken into account as moderators. Examination of moderation effects of the intervention-induced factors provides theoretical evidence for the justification of targeting particularly these factors. Several studies point at the importance of testing self-control of adolescents as a moderator in intervention trials (e.g. Brown, Carello, Vik, & Porter, 1998; Demmel, Beck, Richter, & Reker, 2004). Earlier studies have confirmed that a lower level of self-control at baseline indeed appeared to be related to a higher amount of change in the desired direction during the intervention (Brown et al., 1998; Demmel et al., 2004). However, in the above mentioned studies, self-control in adolescents was not a target of the specific interventions. In addition, as to our knowledge, no data are available with respect to the differential effects of family-school intervention based on the level of restrictive rule setting at baseline. Nevertheless, it can be assumed that participants with initial low levels of the targeted factors have more favorable effects of the intervention as more change can be induced.

1.5 Prevention of Alcohol use in Students (PAS): the interventions

Two alcohol prevention programs are considered in this thesis; one targeting parents and one targeting adolescents. The separate as well as the combined effect of these interventions are examined in a cluster-randomized trial using four conditions: (1) parent intervention, (2) student intervention, (3) interventions 1 and 2 combined and (4) regular curriculum as control condition. Schools in the control condition were contracted not to start any alcohol related interventions throughout the study period. However, as basic information about alcohol use is part of the standard curriculum in the Netherlands, which involves the previously supported message of learning to drink alcohol safely instead of prohibit it, they were allowed to continue this practice.

1.5.1 Student intervention

The student intervention is the renewed digital alcohol module of the Dutch prevention program, the Healthy School and Drugs (HSD). The HSD program consists of five components, (1) a coordinating committee (school staff, a health official, and a parent), (2) three series of educational lessons about tobacco, alcohol and cannabis/ecstasy/gambling, (3) school regulations on drug use, (4) system of detection of drug problems and (5) parental involvement. The educational lessons are based on principles of the theory of planned behavior (Ajzen & Fisbein, 1980) and social cognitive theory (Bandura, 1986), and target the students' abilities to develop a healthy attitude towards substance use and to train their refusal skills. For the development of a student intervention to delay the onset of drinking in early adolescents, a digital alcohol program was developed based on the educational lessens about alcohol use of the HSD program. In each school the teachers were trained to offer the intervention and they received a course manual. The teachers then conducted the intervention (four lessons) in all first year classes in March/April 2007. A booster session (hardcopy) was provided one year later in March/April 2008.

1.5.2 Parent intervention

This intervention targets parental rules for their children's alcohol use. The intervention concerned a less intensive version modelled after a Swedish intervention, the Örebro Prevention program (for details, see Koutakis et al., 2008). All available material was received from the authors in Sweden, translated into Dutch and adapted for use in the Dutch context. The intervention was carried out at the first parents meeting at the beginning of the first three school years (September/October 2006, 2007 and 2008), during which other school-related topics were also discussed. Integrating the parent intervention in a regular parents meeting ensures a high attendance of parents, and is consonant with the real world realities of the school system. Parental rules on their offspring's drinking are strongly affected by parents' attitudes about underage drinking, and by their self-confidence regarding the effectiveness of their parenting behavior (Van der Vorst et al., 2005). Therefore, the intervention was designed to encompass the following three elements:

1. In the regular parents' meeting, a short presentation (20 minutes) was given containing information about the adverse effects of alcohol use at a young age and the negative effects of permissive parental attitudes towards children's alcohol use. The presentation was given by an expert on alcohol use.

2. After the plenary meeting the parents of the students of the same class joined the mentor of that class in a class meeting to discuss rules and reach consensus on a set of shared rules. To this end, the mentor presented a list of plausible rules, and the subsequent discussion was directed at reaching agreement. Mentors were trained by prevention professionals.

3. An information leaflet with a summary of the presentation and a report of the outcome of the class meeting was sent to parents' home addresses. This information leaflet was a reminder of the information given in the presentation and the rules agreed upon in the class meeting, and secondly, parents who did not attend the parents' meeting were provided with the same information.

Table 1.1 *Characteristics of the Parent and Student Intervention Considered in this Thesis*

	Parent intervention	Student intervention
Based on	Örebro Prevention program (Koutakis et al., 2008)	Healthy School and Drugs program (Cuijpers et al., 2002)
Time	September/October 2006, 2007 and 2008	March/April 2007 and 2008
Targeted behaviors	Attitude and rules about alcohol	Attitude and self-control
Content	Year 1, 2 and 3: - Presentation at general parents meeting - Class meeting - Information leaflet	Year 1: - - Four digital lessons Year 2: - - Hardcopy booster

1.6 Research questions

1.6.1 Prevention of Alcohol use in Students

The objective of the present thesis is to study the effectiveness of two interventions, a student and a parent intervention offered separately and jointly, for postponing the onset of drinking in adolescents under the age of 16. In particular, we aim to examine the effectiveness of an intervention focusing on the adolescents in high school and an intervention focusing on the restrictive parenting in parents in relation to the alcohol use of their children under the age of 16. Accordingly, the research questions that will be addressed by this thesis are as follows:

(1) What is the effectiveness of two alcohol prevention programs; the student intervention that targets early adolescents in secondary education and the parent intervention that targets their parents offered separately and simultaneously?

(2) Is the effectiveness of the student and parent intervention mediated by intermediate factors that were targeted by the interventions, namely attitudes about alcohol and self-control in the student intervention and attitudes and rules about alcohol in the parent intervention?

(3) Is the effectiveness of these interventions moderated by particular child (level of education, gender, externalized behavior and level of self-control) or parent (level of education, heavy drinking, attitudes and rules about alcohol) characteristics?

1.6.2 Part II. Alcohol-specific parenting: a closer look

In the second part of this thesis we take a closer look at parenting practices related to adolescents drinking behavior. Targeting parents in the prevention of alcohol use among adolescents is a relatively new phenomenal. Informing parents about what they can do in terms of parenting behavior seems to be an effective way to prevent alcohol use in their offspring. Yet, there is still a lot unknown or unclear about how alcohol-specific parenting relates to adolescents drinking behavior, e.g. how different alcohol-specific parenting practices coincide together and how it relates to parental worries and their self-efficacy? More knowledge on how and when parenting practices can exert influence may lead to further improvement of prevention programs targeting parents for the benefit of their child's health. Taking a closer look at alcohol-specific parenting practices is therefore a warranty. Research questions of interest were:

(4) What can parents do in terms of alcohol-specific parenting, to curb adolescents' alcohol use, i.e. what combination of different alcohol-specific parenting practices is most optimal?

(5) How is alcohol-specific parenting influenced by parental worries and their self-confidence regarding their parenting behavior?

1.7 Outline of this thesis

1.7.1 Prevention of Alcohol use in Students

The PAS alcohol intervention, including a students and parent intervention, forms the basis for this thesis. In **chapter 2**, the effectiveness of the parent and the student intervention, aiming at decreasing the onset of (heavy) weekly drinking among adolescents 10 and 22 months after baseline, are investigated separately and jointly in comparison to a control group.

Chapter 3 investigates whether the two separate and the combined students and parent intervention modified the intermediate factors determining the onset of drinking. In addition, it is examined to what extent these modifications in the intermediate factors can explain the effect of the intervention on the onset of weekly drinking.

Chapter 4 investigates the moderating role of risk factors (gender, level of education, externalizing behavior and parental alcohol use) on the effectiveness of the PAS intervention with regard to the onset of (heavy) weekly drinking at the 22-month follow-up.

The effect of alcohol interventions differs according to the time-interval between baseline and follow-up. Some family-based prevention programs showed an increase in the effectiveness with the passing of time (e.g. Park et al.,2000; Spoth et al., 2011), whereas others showed that the effectiveness with respect to alcohol initiation decayed (Perry, Williams, Komro, et al., 2002; Bauman, Ennett, Foshee, et al., 2002) or diminished (Spoth, Redmond, & Shin, 2001) over time. Therefore, **chapter 5** describes whether the effects of the PAS intervention have increased, sustained or diminished on the long-term, 34 months after baseline measurement.

C**hapter 6** examines whether the hypothesized intermediate factors accountable for the effect of the combined PAS intervention, moderate the effects of the different intervention conditions (parent and student intervention separately and simultaneously) at 34 months after baseline.

In the Netherlands there is a tradition whereby parents were told to teach their underage children to drink alcohol responsibly by providing small amounts of alcohol at home under supervision. The message of the student and parent intervention considered in this thesis, however, was to postpone the onset of drinking until youngster turn 16. Therefore, it is important to know what the effect of the PAS intervention is once adolescents have turned 16. Do they still drink more responsibly due to the combined intervention, or will they catch up their drinking behavior, as a result of not having learned to drink? **Chapter 7** reports on the effect of the PAS intervention 50 months after baseline measurement, when the adolescents are 16 years of age.

1.7.2 Alcohol-specific parenting: a closer look

Chapters 8 to 10 aim to provide more insight into parenting practices related to adolescents' alcohol use, i.e. alcohol-specific parenting. **Chapter 8** describes associations between alcohol-specific socialization practices and heavy parental alcohol use and the onset of alcohol use in their early adolescent children. By doing so, parental alcohol use is taken into account, both as a correlate and as a moderator of alcohol-specific socialization of their children.

Most parents are familiar with worries about their child's wellbeing at some point in their life. Mainly when the child is in the adolescent years and spends more time outside the supervision of parents (Steinberg, Lamborn, Dornbusch, & Darling, 1992), parents often show more worries regarding their child's well-being. Yet it is unknown how these worries relate to the actual behavior of the child and the subsequent parenting behavior of parents. **Chapter 9** provides more insight into the relation of parental worries and adolescents' drinking. Furthermore, it is tested to what extent this relation is mediated by alcohol-specific parenting behavior, i.e. rules about alcohol, frequency and quality of communication, and whether this relation is different for parents with a low and high self-efficacy regarding their parenting behavior.

Although most studies investigate the relative influence of different alcohol-specific socialization practices, it is likely that specific parenting practices coincide together. **Chapter 10** aims to distinguish specific developmental parenting profiles based on rule-setting behavior and communication about alcohol from early to mid adolescence, and describes how these parenting profiles influence adolescents' drinking from initiation to habituation.

The results of the presented studies are discussed and integrated in the general discussion (**chapter 11**), which also offers implications for practice and future research.

Part I

Prevention of Alcohol use in Students (PAS)

2. Preventing heavy alcohol use in adolescents (PAS): cluster randomized trial of a parent and student intervention offered separately and simultaneously

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The aim of this study is to evaluate the effectiveness of two preventive interventions to reduce heavy drinking in first- and second-year high school students. *Design and setting* Cluster randomized controlled trial using four conditions for comparing two active interventions with a control group from 152 classes of 19 high schools in the Netherlands. *Participants* A total of 3490 first-year high school students (mean 12.68 years, SD = 0.51) and their parents. *Intervention conditions* (i) Parent intervention (modeled on the Swedish Örebro Prevention Program) aimed at encouraging parental rule-setting concerning their children's alcohol consumption; (ii) student intervention consisting of four digital lessons based on the principles of the theory of planned behavior and social cognitive theory; (iii) interventions 1 and 2 combined; and (iv) the regular curriculum as control condition. *Main outcome measures* Incidence of heavy) weekly alcohol use and frequency of monthly drinking at 10 and 22 months after baseline measurement. *Findings* A total of 2937 students were eligible for analyses in this study. At first follow-up, only the combined student–parent intervention showed substantial and statistically significant effects on heavy weekly drinking, weekly drinking and frequency of drinking. At second follow-up these results were replicated, except for the effects of the combined intervention on heavy weekly drinking. These findings were consistent across intention-to-treat and completers-only analyses. *Conclusions* Results suggest that adolescents as well as their parents should be targeted in order to delay the onset of drinking, preferably prior to onset of weekly drinking.

2.1 Introduction

Alcohol use of Dutch adolescents ranks among the highest in Europe (Van Dorsselaer et al., 2007). At the age of 13, two out of three adolescents in the Netherlands have had their first drink and one out of five have been drunk at least once in their life (Monshouwer et al., 2008). A lower age of onset is associated with a greater risk of alcohol abuse 10 years later (Behrendt, Wittchen, Hofler et al., 2009a). Also, each additional year of delayed drinking reduces the likelihood of dependence by 14% (Grant & Dawson, 1997); therefore, from a public health viewpoint, prevention of alcohol use in young adolescents is crucial. Recently, the importance of targeting not only children, but also their parents has been established clearly. Parents play a pivotal role when it comes to providing access to alcohol for early adolescents. Further, when parents set restrictive rules about alcohol use, their offspring are more likely to postpone drinking (Jackson, Henrikson, & Dickinson, 1999; Van der Vorst et al., 2006; Yu, 2003). Thus, to discourage alcohol use in early adolescents, it is imperative to consider both adolescents and their parents in interventions.

Although there is little evidence for the effectiveness of student interventions alone (Cuijpers et al., 2002; Foxcroft et al., 2003; Lopez et al., 2008; Spoth et al., 2008a), some studies show promising results (Lopez et al., 2008; Spoth et al., 2008a). However, interventions targeting parents appear to be even more promising (Smit et al., 2008). A Swedish study, using a quasi-experimental design, demonstrated that the Örebro Prevention Program (ÖPP), stimulating parents to maintain strict attitudes towards their children's alcohol use, is effective in reducing underage drunkenness (Koutakis et al., 2008). In addition, reviews (Norman & Turner, 1993; Wu et al., 2003) suggest that interventions offered jointly to students and their parents are most effective in preventing alcohol use in adolescents. Thus, the effectiveness of ÖPP might be enhanced by combining it with an intervention targeting the students.

The present study puts these expectations to test in a cluster-randomized trial (CRT) in the Netherlands, using an adapted version of the ÖPP and combining this with a student intervention. The student intervention is a renewed digital alcohol program, based on the alcohol module of the Healthy School and Drugs program (HSD; Cuijpers et al., 2002). The HSD is a multi-component school-based drug prevention program

developed in the late 1980s, which is used currently by approximately 50% of Dutch secondary schools. The intervention directed at parents is a Dutch adaptation of the ÖPP (Koutakis, et al., 2008), tested more rigorously. The major asset of this study is that it informs us about the generalizability of the evidence-based Swedish parent intervention across countries. The Netherlands is an interesting comparison country, as Dutch students—in contrast to Swedish students—are among the heaviest drinkers in Europe (Currie, Gabhainn, Godeau, et al., 2008), while Dutch policy towards adolescent drinking in general has been lenient. This is reflected in the existing Dutch alcohol intervention programs encouraging parents to teach their children to drink moderately. Only recently, i.e. in the last 3 years following the results of the international comparative studies, has this policy been challenged, as adolescents' drinking has become a truly disturbing public health issue in the Netherlands. Thus, it would be useful to know if a parent intervention that proved effective in Sweden, where adolescents tend to drink little at young ages, would still hold in a country such as the Netherlands, where adolescents already drink heavily on a regular basis before the age of 16 years.

The effectiveness of two active interventions is compared to the regular curriculum of Dutch high schools in a CRT of 3490 students, in 152 classes of 19 participating schools. The relevant clinical outcomes are the onset of heavy weekly drinking, weekly drinking and monthly frequency of drinking after 10 and 22 months.

2.2 Method

2.2.1 Procedure and participants

In April 2006, 80 schools were selected randomly from the list of all public secondary schools, and were invited to participate in the study if the following inclusion criteria were met: (i) at least 100 first-year students, (ii) <25% students from migrant populations and (iii) not offering special education. A total of 20 schools from different regions in the Netherlands were willing to participate. It was calculated that five schools, including 696 students per condition, were needed to power the trial to detect a reduction of 10% in weekly heavy drinking and weekly drinking relative to the usual care condition in a one-tailed test with a = 0.05 at a power of (1b) = 0.80, while accounting for 20% initial non-

response, 30% loss to follow-up and the loss of power if schools (not students) were randomized.

Both students and their parents were involved in this study, but students were the unit of analysis. Student data were collected by trained research assistants in classrooms using online questionnaires, available on a secured website. Questionnaires for parents were sent to their home addresses, together with a letter of consent. This letter informed parents about the participation of the school in the project and parents were given the opportunity to refuse participation of their child (0.01% refusal). A written reminder followed the questionnaire 3 weeks later; after another 2 weeks, non-responding parents were contacted by telephone. Both parental and student data were gathered in September/October 2006, before any intervention was carried out, and again 10 and 22 months later (June/July 2007/2008). The trial protocol (NTR649) was approved by the Medical Ethical Committee.

2.2.2 Randomization

An independent statistician assigned the participating schools randomly to one of the following conditions: (i) parent intervention, (ii) student intervention, (iii) parent and student intervention (combined intervention) and (iv) control condition. An inventory among the participating schools about the use of other alcohol-related programs revealed that no specific alcohol prevention programs were used, except for the common lessons included in the biology classes addressing the biological effects of alcohol. Randomization was carried out centrally, using a blocked randomization scheme (block size 5) stratified by level of education, with the schools as units of randomization. Within each participating school, all first-year students participated in the intervention. After randomization, one school could not participate because of reasons unrelated to the study. This school was randomized originally to the control condition.

2.2.3 Interventions

Parent intervention (PI). This intervention targets parental rules for their children's alcohol use. The intervention was modeled on the Swedish Örebro Prevention Program

(ÖPP; Koutakis et al., 2008). All available material was received from the authors in Sweden, translated into Dutch and adapted for use in the Dutch context. The intervention was carried out at the first parents' meeting at the beginning of the first 2 school years (September/October 2006 and 2007), during which other school-related topics were also discussed. Parental rules on their offspring's drinking are affected strongly by parents' attitudes about underage drinking, and by their self-confidence (Van der Vorst et al., 2005). Therefore, in line with ÖPP, the intervention was designed to encompass the following three elements:

1. In the regular parents' meeting, a short presentation (20 minutes) was given containing information about the adverse effects of alcohol use at a young age and the negative effects of permissive parental attitudes towards children's alcohol use. The presentation was given by an expert on alcohol use.

2. After the plenary meeting the parents of the students of the same class joined the mentor of that class in a class meeting to discuss rules and reach consensus on a set of shared rules. To this end, the mentor presented a list of plausible rules, and the subsequent discussion was directed at reaching agreement. Mentors were trained by prevention professionals.

3. An information leaflet with a summary of the presentation and a report of the outcome of the class meeting was sent to parents' home addresses for two reasons: first, as a reminder of the information given in the presentation and the rules agreed upon in the class meeting, and secondly, parents who did not attend the parents' meeting were provided with the same information.

Different from ÖPP, we focused upon reducing alcohol use only, whereas ÖPP targeted reducing alcohol use as well as encouraging involvement in organized activities.

Student intervention (SI). The SI is a renewed digital alcohol program based upon the alcohol module of the well-established Healthy School and Drugs (HSD) Dutch prevention program. The HSD program is comprised originally of five components: (i) a coordinating committee (school staff, a health official and a parent); (ii) three series of educational lessons about tobacco, alcohol (current SI) and cannabis/ecstasy/gambling; (iii) school regulations on drug use; (iv) system of detection of drug problems; and (v) parental involvement. The current SI is developed to postpone the use of alcohol in early adolescents, based on the principles of the theory of planned behavior (Ajzen & Fishbein,

1980) and social cognitive theory (Bandura, 1986), and targets the students' abilities to develop a healthy attitude towards alcohol use and to train their refusal skills. The use of e-learning plays a central role in the intervention and is likely to be associated with good results overall (Clark & Mayer, 2003). Trained teachers conducted the intervention (four lessons) in all first-year classes in March/ April 2007. One year later, a booster lesson (using hard copy) was carried out in class, which involved a repetition of the digital alcohol program.

Combined intervention (CI). Schools in this condition carried out both the PI and SI.

Control condition (CC). Schools in the control condition were contracted not to start any alcohol-related interventions throughout the study period. However, because basic information about alcohol use is part of the standard curriculum in the Netherlands, schools were allowed to continue this practice (business-as-usual).We did not consider this a threat to the results of our study, as most existing alcohol programs in the Netherlands were based upon the assumption that parents should teach their children to drink moderately, while our program informed parents about the effectiveness of applying strict rules and prohibiting the use of alcohol in order to postpone the onset of alcohol.

2.2.4 Outcome measures

The primary and secondary outcomes were onset of heavy weekly and weekly alcohol use, respectively. In addition, frequency of drinking was analyzed as a continuous outcome measure. Heavy weekly drinking was measured by asking how many glasses of alcohol the student usually drank on a weekend day (Engels et al., 1999). In accordance with the definition of heavy drinking in adults, separate outcome variables for boys and girls was used. Because the definition of 'heavy' in drinking alcohol in adolescents changes by age, a higher cut-off was used at the second follow-up (Singer & Willet, 2003). Boys drinking at least three and four glasses and girls drinking at least two and three glasses every week were considered to be heavy drinkers at the first and second follow-ups, respectively. The scales were recoded into dichotomous variables with 0 = 'no heavy weekly drinking' and 1 = 'heavy weekly drinking'.

Weekly alcohol use was defined by the quantity– frequency measure (Engels et al., 1999; Engels & Knibbe, 2000). The scale was recoded into 0 = 'no weekly user' and 1 = 'weekly user' if at least one glass of alcohol was consumed on a weekly basis. Onset of (heavy) weekly alcohol use was defined if students who were not weekly drinkers at baseline became (heavy) weekly drinkers at follow-up. Self-report measures of adolescents on alcohol use have proved to be reliable and valid methods to measure alcohol use (Del Boca & Darkes, 2003; Wagenaar, Komro, McGovern, Williams, & Perry, 1993).

Dichotomous measures are clinically useful and allow for the calculation of important outcome measures, such as number needed to treat (NNT) (Pinson & Gray, 2003), that should be reported according to the CONSORT (Consolidated Standards of Reporting Trials) guidelines (Altman, Schulz, Moher, et al., 2001).

In addition, frequency of drinking was measured by the number of drinking occasions (minimum of one glass) in the last month, indicated from zero to 40 or more on a 14-point scale (O'Malley, Bachman, & Johnston, 1983).

2.2.5 Analyses

Data were analyzed (using Stata/SE version 9.2) in accordance with the intent-to-treat principle, but also in the completers-only framework. Missing data were handled by regressing imputation as implemented in Stata. Intention-to-treat analysis requires that all participants are analyzed in the condition to which they were randomized. Therefore, missing observations at follow-up were imputed using regression imputation with best predictors of both the clinical end-point and dropout. The first set of predictors is needed to replace missing observations with the most likely values; the second is needed to correct for bias that may have been caused by differential loss-to follow-up (cf. Demirtas, 2004). A completers-only framework is used to assess the effects of the interventions in the group of students who participated in all measurements, without the inclusion of imputed observations.

Descriptive analyses per condition were conducted to check whether randomization had resulted in a balanced distribution of important characteristics of the students across the four conditions. The randomization resulted in a slightly uneven distribution across

the active conditions compared to the control condition in terms of age, sex and level of education (Table 2.1). Therefore, all subsequent analyses were conducted with these variables as covariates to control for any possible bias stemming from the imbalance.

The cluster effect—students were 'nested' in classes— was handled by obtaining robust variance-related estimates based on the first-order Taylor-series linearization method using Stata's procedures for design-based analyses. We corrected for the cluster effects at class-level, as the interventions were carried out in classes. For the main analyses, we compared each of the experimental conditions with the control condition. Odds ratios (ORs) of heavy weekly drinking were obtained using logistic regression of the binary outcome (case, not a case) on the treatment dummies, while adjusting for the confounders and the nested data. NNT represents the number of students who need to receive the intervention rather than its alternative (regular curriculum) in order to avoid one adverse outcome (Pinson & Gray, 2003). NNT was obtained as the inverse of the risk difference. Betas of frequency of drinking were calculated by using multiple linear regression while controlling for confounders and nested data.

2.3 Results

2.3.1 Participant flow

A total of 3490 students were asked to participate in the study. Of these, 122 students did not participate due to their parents' refusal or their absence from school on the day the questionnaire was administered (Figure 2.1). This resulted in a response rate of 97% (n = 3368) at baseline.

We wanted to ascertain the relative impacts of the interventions on the incidences of (heavy) weekly drinking. This required the relevant study cohort to consist of students who did not meet the criteria for weekly drinking at baseline, and were therefore 'at risk' to become manifest as new cases of drinking at follow-up. Therefore, we needed to exclude 431 (12.7%) students, because they were either already weekly drinkers at baseline (306) or they responded inconsistently on the quantity–frequency items measuring weekly drinking (125). This resulted in a total of 2937 students eligible for analyses.

A total of 2771 students (94.3%) at T1 and 2570 students (87.5%) at T2 stayed in the program and completed the follow-up assessment after 10 and 22 months, respectively. Intention-to-treat analyses were based on 2937 students not manifesting (heavy) weekly drinking at baseline.

Table 2.1 *Baseline Characteristics at Cluster and Individual level*

	Conditions			
Variable	PI	SI	CI	CC
Class characteristics				
Number	30	39	36	47
Size: mean	22.9	19.8	19.4	16.6
Individual characteristics				
Number	689	771	698	779
Male, *n* (%)	302 (46.1)	348 (47.7)	380 (59.5)	378 (50.6) ª
Age, years: mean (s.d.)	12.6 (0.46)	12.7 (0.49)	12.7 (0.50)	12.7 (0.50) ª
Low level of education, *n* (%)	198 (28.7)	307 (39.9)	230 (32.9)	443 (56.9) ª

PI = parent intervention, SI = student intervention, CI = parent and student intervention, CC = control condition. ª Significantly different from the active interventions at p < .05.

2.3.2 Characteristics of the sample at baseline

Socio-demographic characteristics at class and individual levels for each condition are presented in Table 2.1. The total student sample had a mean age of 12.66 [standard deviation (SD) = 0.49], consisting of 51% boys, and 40% in lower secondary education.

2.3.3 Loss to follow-up

Students who did not participate in the first (166; 5.6%) or second (367; 12.5%) follow-ups differed from completers in terms of drinking a higher average number of glasses per week (T1: t = 5.28, P < 0.001; T2: t = 3.93, P < 0.001), being in lower levels of education (T1: c2 (1) = 6.28, P = 0.012; T2: c2 (1) = 50.10, P < 0.001), and being older (T1: t = 2.46, P = 0.013; T2: t = 4.51, P < 0.001), as assessed at baseline. No differences were found for sex (T1: c2 (1) = 1.77, P = 0.183; T2: c2 (1) = 0.29, P = 0.591) and monthly frequency of drinking (T1: t = -0.37, P = 0.715; T2: t = 1.30, P = 0.096).

2.3.4 Effects on secondary outcome

Significantly fewer students in the CI had started to drink on a weekly basis relative to the CC atT1 (Table 2.4) andT2. No significant effects of either the PI or SI were found. At T1, these results were replicated in the completers-only analysis. At T2, the completers-only analysis showed significant effects of the CI and the PI. The intraclass correlations were 0.036 and 0.062. Therefore, the combined intervention can delay effectively the onset of weekly drinking in the short term as well as the long term.

Table 2.2 *Alcohol Use at Follow-Up (Ten and 22 Months)*

Variable	Total	PI	SI	CI	CC
	n = 2,937	*n* = 689	*n* = 771	*n* = 698	*n* = 779
T1					
Heavy weekly drinking = 1, *n* (%)	83 (2.8)	24 (3.5)	26 (3.4)	8 (1.2)	25 (3.2)
Weekly drinking = 1, *n* (%)	422 (14.4)	87 (12.6)	124 (16.1)	82 (11.8)	129 (16.6)
T2					
Heavy weekly drinking = 1, *n* (%)	265 (9.0)	72 (10.5)	63 (8.2)	53 (7.6)	77 (9.9)
Weekly drinking = 1, *n* (%)	1,050 (35.8)	229 (33.2)	278 (36.1)	220 (31.5)	323 (41.5)

PI = parent intervention, SI = student intervention, CI = combined intervention, CC = control condition.

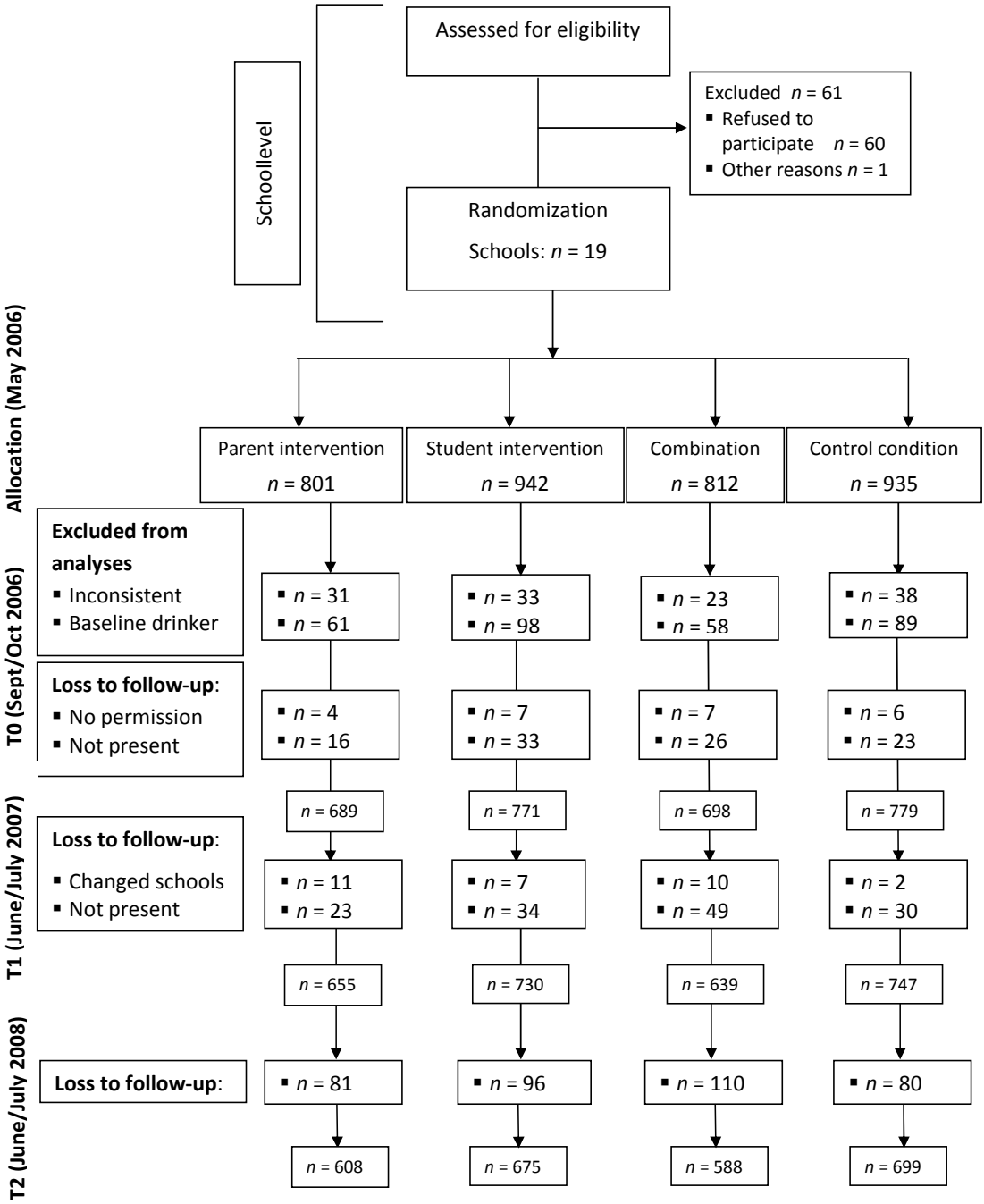
Assessed for eligibility
Excluded n = 61
Refused to participate n = 60
Other reasons n = 1
Schoollevel
Randomization
Schools: n = 19
Allocation (May 2006)
Parent intervention n = 801
Student intervention n = 942
Combination n = 812
Control condition n = 935
T0 (Sept/Oct 2006)
Excluded from analyses
Inconsistent
Baseline drinker
n = 31
n = 61
n = 33
n = 98
n = 23
n = 58
n = 38
n = 89
Loss to follow-up:
No permission
Not present
n = 4
n = 16
n = 7
n = 33
n = 7
n = 26
n = 6
n = 23
n = 689
n = 771
n = 698
n = 779
T1 (June/July 2007)
Loss to follow-up:
Changed schools
Not present
n = 11
n = 23
n = 7
n = 34
n = 10
n = 49
n = 2
n = 30
n = 655
n = 730
n = 639
n = 747
T2 (June/July 2008)
Loss to follow-up:
n = 81
n = 96
n = 110
n = 80
n = 608
n = 675
n = 588
n = 699

Figure 2.1. Flow of participants through the trial. Students not participating in one follow-up may have participated in the next follow-up. Therefore, the final n's are not calculated by the T1/T2 n's minus loss to follow-up.

Table 2.3 *Logistic Multiple Regression of Heavy Weekly Drinking at Follow-Up on Conditions*

	T1					T2				
Condition	ICC	OR	P	95% CI	NNT	ICC	OR	P	95% CI	NNT
Intention-to-treat	0.03					0.03				
Parent intervention		1.41	0.89	0.69 – 2.90	116.4		1.13	0.58	0.73 – 1.73	48.9
Student intervention		1.22	0.94	0.68 – 2.19	135.0		0.85	0.44	0.56 – 1.29	84.4
Combined intervention		0.36	0.02	0.15 – 0.86	45.3		0.80	0.39	0.48 – 1.32	58.7
Completers only	0.03					0.03				
Parent intervention		1.46	0.30	0.71 – 3.01	114.4		1.19	0.40	0.79 – 1.83	41.5
Student intervention		1.24	0.47	0.69 – 2.24	130.3		0.89	0.58	0.59 – 1.34	74.8
Combined intervention		0.39	0.03	0.16 – 0.91	44.1		0.88	0.61	0.53 – 1.45	71.3

Note: reference group = control condition. Adjusted for confounders (age, level of education and gender) and cluster effect. ICC = Intra-Class Correlation, OR = Odds Ratio, NNT = Numbers Needed to Treat.

Table 2.4 *Logistic Multiple Regression of Weekly Drinking at Follow-Up on Conditions*

	T1					T2				
Condition	ICC	OR	P	95% CI	NNT	ICC	OR	P	95% CI	NNT
Intention-to-treat	0.03					0.06				
Parent intervention		0.86	0.37	0.62 – 1.20	43.9		0.86	0.32	0.63 – 1.16	181.8
Student intervention		1.06	0.66	0.81 – 1.40	43.0		0.92	0.51	0.71 – 1.19	67.9
Combined intervention		0.67	0.04	0.45 – 0.99	39.1		0.71	0.02	0.53 – 0.94	17.2
Completers only	0.04					0.08				
Parent intervention		0.87	0.52	0.55 – 1.34	261.7		0.64	0.03	0.43 – 0.95	40.6
Student intervention		0.92	0.67	0.64 – 1.32	74.9		0.74	0.12	0.51 – 1.08	178.8
Combined intervention		0.43	0.00	0.28 – 0.66	17.6		0.49	0.00	0.33 – 0.75	13.6

Note: reference group = control condition. Adjusted for confounders (age, level of education and gender) and cluster effect. ICC = Intra-Class Correlation, OR = Odds Ratio, NNT = Numbers Needed to Treat.

Effects on frequency of drinking

Analyses on the frequency of drinking (Table 2.5) showed that students in the CI drank significantly less frequently than students in the CC at T1 and T2. These results were replicated in the completers-only analysis.

Table 2.5 *Multiple Regression of Monthly Frequency of Drinking at Follow-Up on Conditions*

	T1			T2		
Condition	Beta	*P*	95% CI	Beta	*P*	95% CI
Intention-to-treat						
Parent intervention	0.15	0.22	-0.09 – 0.38	-0.09	0.62	-0.44 – 0.27
Student intervention	0.10	0.22	-0.06 – 0.27	-0.22	0.17	-0.54 – 0.09
Combined intervention	-0.26	0.00	-0.40 – -0.11	-0.40	0.04	-0.75 – -0.03
Completers only						
Parent intervention	0.17	0.16	-0.06 – 0.41	-0.06	0.76	-0.45 – 0.33
Student intervention	0.12	0.16	-0.05 – 0.29	-0.22	0.21	-0.56 – 0.13
Combined intervention	-0.25	0.00	-0.40 – -0.11	-0.40	0.04	-0.82 – -0.99

2.4 Discussion

In a cluster-randomized trial involving 3490 adolescents and their parents, a parent intervention and a student intervention were offered separately and jointly. It was hypothesized that the active interventions would be superior to the control condition in reducing the onset of adolescent (heavy) weekly alcohol use and the frequency of drinking on the first and second follow-ups. Superiority was expected, in particular, for the combined student–parent intervention. The results partly confirmed these expectations: the combined intervention reduced the likelihood of onset of heavy weekly

drinking at T1, but not at T2. The combined intervention did delay the onset of weekly alcohol use and reduced the frequency of drinking at the first and second follow-ups. However, no effects were found for the interventions directed at either the parents or the students when carried out separately.

2.4.1 Limitations and strengths

Some limitations of the study should be mentioned. Imbalances between the conditions at baseline were observed with regard to sex, age and educational level. Therefore, all analyses were adjusted for these potentially confounding variables. Secondly, we should consider the potential for selection biases based on the exclusion of schools with >25% migrant populations. To examine the impact of the interventions on the incidences of (heavy) weekly drinking, an at-risk sample was required. Therefore, schools with a relatively high percentage of ethnic minorities, who have a lower risk of heavy episodic drinking (Monshouwer, Van Dorsselaer, Van Os, et al., 2007), were excluded in the current study. Thirdly, outcomes are based on self-report questionnaires. Although self-reports have been found to be a reliable method to measure alcohol use if confidentiality is assured (Del Boca & Darkes, 2003; Wagenaar et al., 1993; Koning, Harakeh, Engels, & Vollebergh, 2010) objective measures are clearly superior, but not feasible, in a large study. Fourthly, the first follow-up was conducted shortly after the student intervention was executed. It is possible that a proportion of the students who reported drinking at the follow-up had begun drinking prior to delivery of the student intervention. The results of the second follow-up cover this limitation, and are therefore of significant importance. Fifthly, we used a limited number of elements in the parent intervention that were directed at all parents, and we did not vary these systematically for different groups of parents. As a result, we are not able to analyze a dose–response relationship. It might be an interesting option for future studies to detect possible dose–response effects. Finally, some dropout occurred, specifically among older students and those in lower types of education. On the whole, attrition was limited, unrelated to conditions, and was therefore unlikely to affect our conclusions.

Despite these limitations, the study has a number of strengths that might be noteworthy. First, the study evaluated school-based interventions that are relatively

simple to implement in a setting where many young people can be reached. The number of absent students at T1 averaged 0.08 (in classes with mean = 19.3 students). The attendance of parents at the parents' meetings was consistently high, more than 80%. The low number of parents who did not participate (18) or refused consent for their child's participation (24) can be interpreted as a generally positive attitude towards the intervention. Both parent and student interventions can be administered easily in classrooms or through parent–teacher meetings, without extensive training of project workers. Secondly, it assessed outcomes that are important given the detrimental health effects of (heavy) weekly drinking at a young age. Thirdly, it was a pragmatic trial, mimicking real-life situations as encountered in the Dutch school system. This helps to guarantee that our findings have practical value and can be generalized more safely.

Fourthly, it was a randomized trial, thus providing rigorous tests of the hypotheses. This enhanced aetiological inference and indicated the potential cross-cultural validity of the parent intervention. Fifthly, this test was conducted in a cultural context other than the Swedish example, in a particular context where drinking among adolescents is far more prevalent than in Sweden. Sixthly, loss to follow-up was very limited, and intention-to-treat and completion-only analyses produced virtually identical results, supporting the robustness of our findings.

2.4.2 Conclusions

Although the renewed alcohol module of the widely used HSD programme was tested, no effects of this stand-alone preventive strategy were found (Foxcroft et al., 2003; Lopez et al., 2008; Perry, et al., 1996; Williams, Perry, Farbakhsh, & Veblen-Mortenson, 1999). Contrary to the promising results of the ÖPP in Sweden (Koutakis et al., 2008), we did not find any decrease in the onset of drinking. Koutakis and colleagues (2008) suggested that parents may be less effective in deferring the onset of adolescent alcohol use in countries with a lower legal drinking age and a more lenient alcohol policy than in Sweden. With a legal age of 16 years for buying and consuming alcohol, and a somewhat weak enforcement of laws prohibiting selling alcohol to underage youths (Gosselt, 2006), the Dutch cultural context promotes drinking at an early age. Thus, even if Dutch parents impose strict drinking rules, the wider social context may promote drinking and may

render these individual efforts ineffectual. This may cause the lack of replication of the effects of the ÖPP to reduce heavy drinking in the Netherlands.

A substantial effect was found for the combined student—parent intervention, corroborating other findings that multi-target interventions may be superior to single ones (Foxcroft et al., 2003; Lopez et al., 2008; Wu et al., 2003). Our results suggest that parental rule-setting may be best understood and taken seriously by adolescents if similar messages were voiced in other relevant social contexts, such as the school. However, in the longer term, the effect of the combined intervention on delaying the onset of heavy weekly drinking disappeared. Although this finding was unexpected, it has some implications. It is likely that students who started to drink on a weekly basis in the second year of high school cannot be discouraged by these interventions to drink heavily. This is in line with a previous study (Van der Vorst et al., 2006) which demonstrated that once adolescents have started to drink, parental influence decreases. This would indicate that interventions should be delivered at an early age, at least prior to the onset of weekly drinking.

The current findings have implications for research and practice. First, findings indicate the relevance of restrictive parental rules in combination with targeting adolescents' attitudes and self-efficacy. Secondly, we suggest including parents as well as students in alcohol prevention programs and implement programs at the beginning of high school. Thirdly, the PAS intervention is a universal program targeted at the general population. However, interventions may be particularly effective among a specific subgroup (Kreamer et al., 2002). Therefore, differential effects should be examined to determine whether there is variation in impact within subgroups.

Overall, this study strengthens the evidence that both adolescents and their parents should be targeted in a multi-component intervention. A combined intervention is more effective in delaying the onset of alcohol use among young adolescents than single-target attempts. It seems that, in particular in cultural contexts where alcohol is readily available to young people and peer pressure to drink is strong, both preventive efforts have to be offered simultaneously.

3. Why target early adolescents and parents in alcohol prevention? The mediating effects of self-control, rules and attitudes about alcohol use

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The aim of this study is to examine the effects of a parent and student intervention offered separately and simultaneously (PAS) on onset of weekly drinking via its putative mediators. *Design:* A randomized trial with four conditions; 1. Parent intervention, 2. Student intervention, 3. Combined parent-student intervention and 4. Control group. *Setting:* High schools randomly selected, located in different areas. *Participants:* 2,937 early adolescents (M age=12.68, SD=0.51) and their parents. *Measurements:* Mediation effects were analyzed using pretest data and two follow-up measurements (ten and 22 months after baseline). A path model was estimated (Mplus) to examine the effect of the interventions on adolescent-reported mediators (self-control, perceived parental rules, and attitudes about alcohol) and parent-reported mediators (parental rules and attitudes about alcohol). Outcome was onset of weekly drinking. *Findings:* The parent intervention modified rules and attitudes about alcohol as reported by parents. An indirect effect of the parent intervention via parental rules was found. The combined intervention affected both adolescent reported and parent reported rules and attitudes about alcohol and adolescents' perceived self-control, yet only perceived rules and self-efficacy, as reported by adolescents, and parental attitudes mediated the association between the combined intervention and onset of weekly drinking. No significant effects of the separate student intervention on the mediating factors were found. *Conclusions:* The PAS-program proved to be effective as predicted by the theoretical assumptions underlying the interventions. The combined intervention modified the targeted factors; alcohol-related perceptions and behaviors of both parents and adolescents. These modifications accounted for the delay in onset of drinking among adolescents.

3.1 Introduction

Given the risks involved in drinking alcohol at an early age (Dewit, et al., 2000), researchers, prevention workers, and parents question how they can prevent early adolescents from starting to drink alcohol. A potentially effective strategy for delaying the onset of drinking is to carry out alcohol prevention programs in which adolescents as well as their parents are targeted. Reviews on the effectiveness of alcohol interventions show preventive interventions for young adolescents to be most effective when both adolescents and their parents are targeted simultaneously (Smit, et al., 2008; Wu et al., 2003). In agreement with this finding, a recent study demonstrated that a Dutch prevention program was effective in delaying the onset of weekly drinking, especially when adolescents and their parents were targeted simultaneously, whereas targeting adolescents or their parents separately revealed no effects (Chapter 2). In extension to this finding, it is imperative to understand the effect of the interventions on the putative mediators and to analyze *how* such an alcohol intervention achieves its impact.

Insight into what processes an intervention achieves its effects is usually generated by detecting factors that are changed by the intervention and that subsequently cause the change in outcome, the so called mediators (MacKinnon, 2008). Identifying mediating processes that underlie the effectiveness of an intervention is important for the following reasons. First of all, mediating analyses test whether the intervention modifies the theory-based determinants as hypothesized. Second, mediation analyses may provide insight into how the intervention achieves its effects, i.e., which psychosocial determinants are modified by the intervention that are related to the pertinent outcomes (in this case drinking onset). Third, it reveals which mediating factors are the most important for realizing change in outcome. Fourth, particularly in a combined adolescent-parent intervention versus separate adolescent and separate parent interventions, mediation analyses may manifest how the intervention affects either adolescents and/or parents, which may be relevant for implementation purposes (Spoth et al., 2008a).

Prevention of Alcohol use in Students (PAS-program)

A recent study revealed that a new Dutch alcohol intervention program (PAS), in which both parents and adolescents were targeted, was effective in postponing adolescents' weekly alcohol use at follow-up measurements one and two years later (Chapter 2). At the two-year follow-up measurements, the PAS intervention lowered the onset of weekly drinking in adolescents significantly by 10%. Targeting parents or adolescents separately did not reveal any significant effects on the onset of weekly drinking. The student part of the intervention was based on the Healthy School and Drugs program (HSD; Cuijpers et al., 2002). The HSD program demonstrated significant effects on the proportion of weekly drinkers three years past baseline (Cuijpers et al., 2002). In accordance with the principles of the theory of planned behavior (Ajzen & Fishben, 1980) and social cognitive theory (Bandura, 1986), students were trained to develop a higher degree of self-control and more healthy attitudes about alcohol use, both strong predictors of alcohol use (e.g. Kam et al., 2009) and often targeted in alcohol interventions (Foxcroft et al., 2003; Tobler et al., 1998). In the parent intervention, a renewed Dutch version of the Swedish Örebro Prevention Program (ÖPP; Koutakis et al., 2008), parents were informed about the negative consequences of alcohol use at an early age and they were encouraged to develop restrictive attitudes and to set strict rules toward their offspring's drinking. This intervention was based on previous research showing that a lack of rule-setting in parents is one of the best predictors of early adolescent drinking (e.g. Van der Vorst et al., 2006, Spijkerman et al., 2008; Yu, 2003). In addition, interventions targeting parenting behavior in order to facilitate change in their offspring's drinking have gained increased attention and showed very promising results (e.g. Smit et al., 2008; Spoth et al., 2008a).The main aim of the present study was to examine whether the separate and combined interventions succeeded in modifying the intervention-induced factors, and whether these factors were accountable for the delay in onset of drinking in the effective combined intervention.

3.1.1 Empirical evidence of prior studies

Most review studies showed that adolescent-targeted alcohol interventions did change their attitudes toward alcohol use, but not, or not consistently, their perceived self-control (Cuijpers et al., 2002, Faggiano, Vigna-Taglianti, Versino, et al., 2008; Tobler et al., 2000). On the other hand, two recent reviews on the effectiveness of alcohol interventions showed positive effects of interventions targeting attitude as well as self-control in adolescents on these intermediate factors (Faggiano et al., 2008) as well as on alcohol use (Spoth et al., 2008a). In addition, Komro et al. (2001) found that the effect of Project Northland was mediated by self-control in non-using adolescents at baseline, whereas the change in attitude did not account for the effects. The Dutch prevention program HSD, on which the present adolescent intervention was based, showed that only self-control, but not attitude, was significantly changed by the intervention (Cuijpers et al., 2002). Thus, based on these findings, it is expected that the adolescent intervention modified the self-control, but not adolescents' attitudes regarding alcohol use.

Research showed that alcohol interventions targeting parents did change parental attitudes (Ennett et al., 2001b; Park et al., 2000) and rule-setting (Ennett et al., 2001b) about alcohol use, but these changes could not account for changes in alcohol use. In addition, Perry et al. (1996) revealed that their effective multi-component intervention resulted in a significant increase in parental rule-setting reported by adolescents after two years. Finally, Koutakis et al. (2008) demonstrated an increase in restrictive attitudes in parents, but without testing actual mediation. Thus, former studies lead to the expectation that interventions targeting parents can change parental rule-setting and attitudes, but it remains to be proven that this effect also contributes to postponing alcohol use in their children.

3.1.2 The current study

The current study is an extension of a previous report on the effects of the PAS intervention (Chapter 2). In the current study, we investigated whether the PAS alcohol intervention (targeting both parents and students) and the separate aspects of PAS (targeting only parents and only students) modified the hypothesized determinants of

onset of drinking. In addition, we examined to what extent these modifications could explain the effect on onset of weekly drinking in adolescents. To address this issue, we examined specific theory-based factors in adolescents (adolescents' self-control and attitudes towards drinking, and parental rules) as well as in parents (attitudes on juvenile drinking and rules about alcohol use of their child) within a randomized trial including 2,937 early adolescents and their parents. We expect that PAS modified the intervention-induced psychosocial determinants, which in turn account for the significant effect of the combined intervention.

3.2 Method

The design, procedure and sample used in this study is in accord with the study as described in Chapter 2.

3.2.1 Design and procedure

From a list of Dutch high schools, 80 schools were randomly selected. An independent statistician assigned nineteen schools randomly to one of the four conditions: (1) parent intervention, (2) student intervention, (3) combined student-parent intervention, and (4) control condition (business as usual). More detailed information on the randomization and power calculations can be found in Chapter 2.

The baseline data were collected at the beginning of the first year in high school (September/October 2006), before any intervention was carried out. The first (T1) follow-up was 10 months later in May/June 2007, and again in May/June 2008 (T2). Adolescent digital questionnaires were administered in the classroom by trained research assistants. Questionnaires for parents and letters for consent were sent to their home addresses. Non-responding parents were reminded after three weeks by a letter and after another two weeks by phone.

3.2.2 Participants

Nineteen schools, including 3,490 adolescents were selected to participate in the study. Due to initial non-response (n = 122) and exclusion of adolescents who already drank

weekly at baseline or responded inconsistently to the alcohol measure, 2,937 adolescents and 2,381 parents were eligible for analyses.

The sample is characterized by an average age of 12.6 (SD=0.49) at baseline, consisting of 51% boys and 40% in lower secondary education. At baseline, the intervention conditions differed significantly from the control condition with respect to the number of males and low educated adolescents (Table 3.1). Most of the responding parents were female (80.9%). More than half of the mothers (61.9%) and fathers (55.5%) had low educational levels (only vocational training).

3.2.3 Loss to follow-up

A total of 2,771 adolescents (94.3%) at T1 and 2,570 adolescents (87.5%) at T2 stayed in the program and completed the follow-up assessments after ten and 22 months respectively. At T1, 2,051 parents (86.1%) and at T2, 1,729 parents (72.6%) participated in the study.

Attrition rates were unrelated to intervention conditions. Attrition analyses on demographic variables and alcohol use indicated that participating adolescents were more likely to be younger, more often in lower education and drank a lower average number of alcohol beverages per week at baseline (for more detailed information see Chapter 2). No differences were found between responding and non-responding parents at the follow-up, with respect to their levels of education, rules and attitudes about alcohol and own alcohol use.

3.2.4 Interventions

Adolescents and/or parents were targeted separately and simultaneously while attending high school.

Parent intervention (PI). This intervention targets restrictive parenting rules and attitudes about alcohol) with respect to their children's alcohol use. A brief presentation was given at the first parents meeting at the beginning of each school year, where after parents of children from the same class got together to agree about a shared set of rules about alcohol use. Three weeks after the parents meeting a folder with a summary of the

presentation and the result of the classroom discussion was sent to parents' home address.

Student intervention (SI). The SI is a digital alcohol program. The students were trained to increase their self-control and healthy attitudes towards alcohol use. After receiving training, the teachers conducted the intervention (four lessons) in all first year classes in March/April 2007. A hardcopy booster session was provided one year later in March/April 2008.

Combined intervention (CI). Schools in this condition carried out both the PI and SI.

Control condition (CC). Schools in the control condition were contracted not to start any alcohol-related interventions throughout the study period. However, because basic information about alcohol use is part of the standard curriculum in the Netherlands, schools were allowed to continue this practice (business-as-usual).

For a more detailed description of the interventions we refer to Chapter 2.

3.2.5 Measures

Outcome measure

Weekly alcohol use was defined by the Quantity-Frequency measure (Engels et al., 1999; Engels & Knibbe, 2000). The scale was recoded into 0 = 'no weekly user' and 1 = 'weekly user', if at least one glass of alcohol was consumed on a weekly basis. Onset of weekly alcohol use was defined if students who were not weekly drinkers at baseline became weekly drinkers at the follow-up (T2).

Dichotomous measures are clinically useful and allow for the calculation of important outcome measures, such as Number Needed to Treat (Pinson & Gray, 2003; reported in Chapter 2), that should be reported according to the CONSORT guidelines (Altman et al., 2001). As this study is an extension of a previous report on the effectiveness of the interventions on the incidence of weekly drinking, the same outcome measures were included.

Adolescent measures

Self-control reflects the ability to control responses, to interrupt undesired behavioral tendencies and refrain from acting on them. The measure is the shorter version of the original measure developed and tested by Tangney, Baumeister, and Boone (2004). It consists of 13 items (Cronbach's alpha = .74) that were rated on a 5-point scale, ranging from 1 *'not at all like me'* to 5 *'very much like me.'* Example items are "I have trouble saying no" and "I do certain things that are bad for me, if they are fun." Items were reversely scored; higher scores indicated higher self-control.

Rules about alcohol use reflect the degree of rule-setting behavior by the parents experienced by the adolescents (Van der Vorst et al., 2005). Items included "I am allowed to have one glass of alcohol when my parents are at home", "I am allowed to drink several glasses of alcohol when my parents are not home" and "I am allowed to drink alcohol on a party with my friends." It consisted of the mean of ten items (alpha = .90) rated on a 5-point scale from 1 *'never'* to 5 *'always'* reversely scored, i.e. higher scores indicated more rule-setting behavior.

Attitudes about alcohol use reflect the degree to which adolescents think a person of their age should be able to drink alcohol in various situations. These ten items corresponded to the items (alpha = .90) assessing rules about alcohol use (for example, "a person of my age should be allowed to have one glass of alcohol when the parents are at home" and "a person of my age should be allowed to drink alcohol on a party with friends"). Higher scores indicate more restrictive attitudes about alcohol.

Parental measures

Rules about alcohol use indicate the degree of rule-setting behavior reported by the parent. These ten items correspond to the items measuring rules in adolescents, except for some alterations in the phrasing, e.g. "My child is allowed to drink alcohol on a party with friends." Alpha was .81.

Attitudes about alcohol use measure the degree to which the parent finds it acceptable (1 = not at all acceptable to 5 = very acceptable) for a 13/14-year-old adolescent to drink alcohol in various situations (Brody, Flor, Hollett-Wright, McCoy, &

Donovan, 1999; Van der Vorst et al., 2006). For example, “I find it acceptable for a 13/14-year old to drink alcohol at a family party” and “I find it acceptable for a 13/14-year old to drink alcohol at a friend’s place”. The age mentioned in the questions is in accord with the age of their child at time of responding. Originally it contained seven items. However, in this study, we added one item (drink alcohol on a Saturday evening with parents). Responses were rescaled, so that higher scores indicate more restrictive attitudes. Alpha was .79.

3.2.6 Strategy for Analyses

Table 3.1 reports on descriptive analyses of demographic variables and alcohol use at baseline across conditions. It appears that the randomization resulted in a slightly uneven distribution in the intervention conditions and the control condition with respect to sex, and levels of education of adolescents and parents. Therefore, all subsequent analyses were conducted with sex and level of education as covariates. Correlations between all variables are reported in Table 2. Missing observations on alcohol use were imputed using regression imputation with best predictors of both the clinical endpoint and drop-out. The first set of predictors is needed to replace missing observations with the most likely values; the second is needed to correct for bias that may have been caused by differential loss-to-follow-up (cf. Demirtas, 2004).

The mediating effects of the intervention-induced adolescent and parent factors were analyzed according to the steps suggested by MacKinnon, Taborga, Morgan-Lopez (2002). First, it was tested whether the interventions have an effect on the mediating variable. Since meditational processes may cancel each other out, a direct effect of the intervention on onset of alcohol use is not required for mediation to occur (Bryan, Schmiege, & Broaddus, 2007). For this reason also the non-effective intervention conditions were included in the models. Second, the effect of the mediating variable on the onset of drinking was analyzed, while controlling for the effects of the prevention programs. And finally, it was tested whether the size of the mediated effects are statistically significant (Bryan et al., 2007; MacKinnon et al., 2002).

To test the hypothesis that adolescent and parent factors mediate the effects of the interventions on alcohol use, path modeling was carried out in Mplus5.0 (Muthen &

Muthen, 2007). Calculating bootstrap confidence limits of the mediated effects, as computed in Mplus, are favorable as this resampling method provides a test of significance and does not require as many assumptions as other tests (MacKinnon, Fairlchild, & Fritz, 2007). The (mediating) effects of the intervention programs on the adolescent reported factors (self-control, and parental rules and attitudes about alcohol) and parent reported factors (parental rules and attitudes about alcohol) were analyzed.

The mediators were measured at T1, whereas the outcome measure (onset of weekly drinking) was measured at T2, so that actual change over time and mediation could be measured. Pretreatment scores for the putative mediators were included in the model as control variables so that posttest scores result in a residual change variable (Cole & Maxwell, 2003). Due to the categorical outcome variable (did or did not start to drink weekly), logit estimations using robust weighted least squares (WLSMV) were obtained (Muthen & Muthen, 2007). In Mplus it is not possible to control for cluster-effects and carry out bootstrap analyses simultaneously. The bootstrap method, with bias-corrected bootstrap confidence intervals, was preferred because (1) better statistical tests are obtained (MackKinnon et al., 2007), (2) a low intra-class correlation was observed (ICC = 0.04), and (3) all predictors were measured at the individual level. Missing data on the mediating variables were handled by using full estimation maximum likelihood (Muthen & Muthen, 2007).

3.3 Results

3.3.1 Alcohol use at follow-up (T2) and inter-correlations

In the total group, 36% of the adolescents had started to drink alcohol at T2. As previously reported in Chapter 2, the onset of weekly drinking at T2 was higher for adolescents in the control condition (41.5%) compared to adolescents in the intervention conditions, with only a significant difference between control and combined conditions (31.5%) (F = 15.65, p < .001).

Table 3.2 depicts the inter-correlations among the mediating variables. High positive correlations were found between rules and attitudes about alcohol reported by parents (r=.54, p<.000) as well as adolescents (r=.59, p<.000). Self-control is positively related to

attitudes and rules about alcohol moderately when reported by adolescents (r=.59, p<.000 / r=.59, p<.000) and weakly when reported by parents. Alcohol use is negatively related to all mediating variables.

Table 3.1 *Baseline Characteristics of Adolescents and Parents*

	Conditions			
Variable	Parent intervention	Student intervention	Combined intervention	Control condition
Adolescents				
Male, *n* (%)	302 (46.1)	348 (47.7)	380 (59.5)	378 (50.6)ª
Age, years: mean (SD)	12.6 (0.46)	12.7 (0.49)	12.7 (0.50)	12.7 (0.50)ª
Low level of education, *n* (%)	198 (28.7)	307 (39.9)	230 (32.9)	443 (56.9)ª
Parents				
Female (%)	81.9	79.0	80.7	81.8
Level of education: mean (SD)	3.76 (1.07)	3.67 (1.08)	3.82 (1.13)	3.49 (1.07)ª

ª Significantly different from the active interventions at p < .05. SD: standard deviation.

Table 3.2 *Correlations between Adolescent Factors, Parent Factors and Alcohol Use Based on Adolescent and Parent Reports*

Variables	1	2	3	4	5
1. Rules A	-				
2. Attitude A	.59***	-			
3. Self-control A	.25***	.31***	-		
4. Rules P	.29***	.20***	.06**	-	
5. Attitude P	.25***	.16***	.09***	.54***	-
6. Alcohol use A	-.30***	-.29***	-.22***	-.20***	-.17***

Note. A = adolescent report, P = parent report.
*** p < .001, ** p < .01.

3.3.2 Parent intervention

The results of the intervention conditions on both parent and adolescent factors, as well as their effects on the onset of weekly drinking of adolescents revealed that the parent only intervention significantly predicted changes in restrictive rules (*b*=.07, *SE*=.02, *p*< .001) and strict attitudes (*b*=.06, *SE*=.03, *p*= .014) at T1 in parents (Figure 1). That is, parents in the parent intervention reported to have stricter attitudes and rules about alcohol use compared to parents in the control condition. Strict rules (*b*=-.37, *SE*=.16, *p*=.029) and attitudes (*b*=-.34, *SE*=.10, *p*=.001) significantly predicted the onset of weekly drinking. Whereas no direct effect of the parent intervention on the onset of weekly drinking was found (in line with Chapter 2), the indirect effect of the parent intervention via parental rule-setting was statistically significant (indirect effect = -.03, *SE*=.01, *p*=.04). No effects of the parent intervention on adolescent reported factors were found.

3.3.3 Student intervention

The student intervention did neither change the intervention-induced factors reported by adolescents nor reported by parents. No direct (replicating previous findings described in Chapter 2) and indirect effects were found.

3.3.4 Combined intervention: parent and student intervention

Figure 3.1 shows that the combined intervention significantly predicted parents' restrictive rule setting (*b*=.07, *SE*=.02, *p*< .001) and parents' attitudes (*b*=.07, *SE*=.02, *p*=.01) at T1. That is, parents in the combined intervention reported to have stricter attitudes and rules about alcohol use, compared to parents in the control condition. In turn, parents' rule setting (*b*=-.37, *SE*=.16, *p*=.029) and attitudes about alcohol (*b*=-.34, *SE*=.10, *p*=.001) predicted the onset of weekly drinking. The indirect effect of the combined intervention through parents' attitudes (indirect effect = -.02, *SE*=.01, *p*=.03) was statistically significant.

The combined intervention significantly predicted the perceived rules (*b*=.20, *SE*=.03, *p*< .001), attitudes (*b*=.16, *SE*=.03, *p*< .000) and self-control (*b*=.07, *SE*=.03, *p*=.02) reported by adolescents. Adolescents in the combined intervention reported to perceive

more restrictive rules, to have stricter attitudes and a higher degree of self-control than adolescents in the control condition. Only adolescents' perceived rules (*b*=-.42, *SE*=.09, *p*< .000) and their self-control (*b*=-.46, *SE*=.09, *p*< .001) significantly predicted the onset of weekly drinking. Significant indirect effects of the combined intervention through restrictive rules (indirect effect = -.08, *SE*=.01, *p*< .001) and self-control (indirect effect = -.03, *SE*=.01, *p*=.02) in adolescents were found.

Thus, the combined intervention significantly changed the perceived parental rules about alcohol and self-control in adolescents, and parents' attitudes, which accounted for the delay in onset of weekly drinking in the combined intervention.

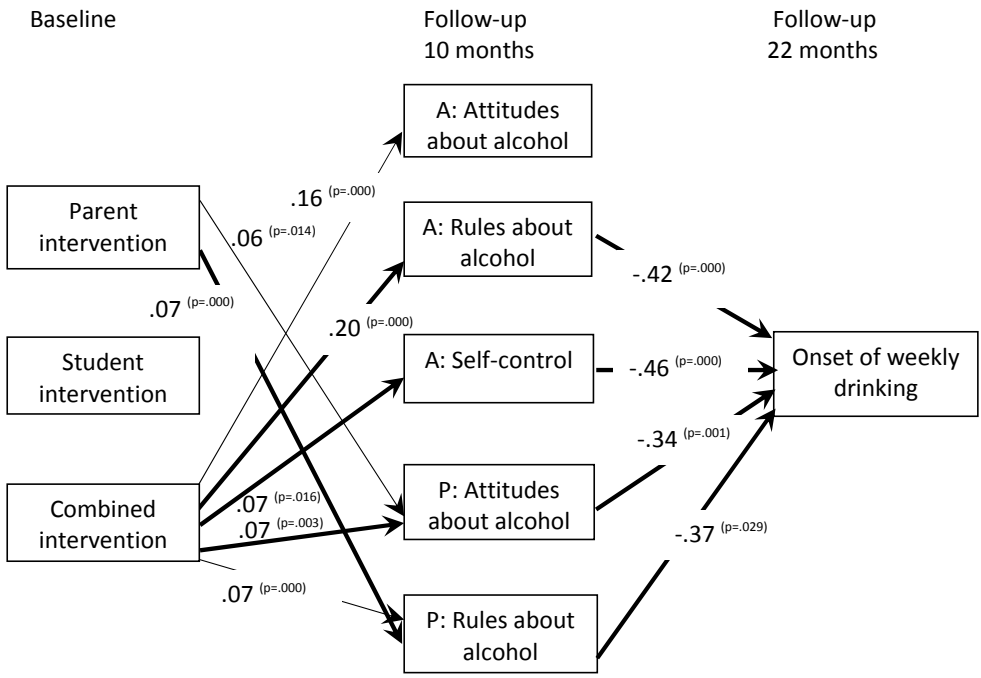

Figure 3.1. Results of the mediation analyses of the intervention-targeted parent and adolescent.
Model fit: Chi=52(8), CFI=.99, RMSEA=.04.
Note. Only significant paths are depicted. Bold arrows indicate significant mediation.

3.4 Discussion

In extension of our previous findings on the effects of the PAS intervention, our study demonstrated that the combined intervention effectively delayed the onset of weekly drinking in Dutch early adolescents by changing the intervention-induced factors, as hypothesized. Based on former research indicating the major importance of strict parenting for adolescent drinking, and theoretical perspectives stressing the importance of adolescent self-control, a multi-component intervention was developed to target exactly these two factors simultaneously in a multi-component design as well as separately. Mediation analyses reveal the importance of both components in the intervention.

In line with the findings of Cuijpers et al. (2002; HSD-program), the combined intervention was effective in delaying the onset of drinking via adolescents' self-control, but not via their attitudes toward alcohol use once their perceived parental rules were taken into account. This result suggests that changing adolescents' attitudes about alcohol use may not be sufficient to delay the onset of drinking. In contrast, parental restrictive rule-setting (reported by the adolescent) was of major importance. Therefore, alcohol interventions targeting early adolescents should involve components that focus at least on the development of self-control in adolescents as well as on the rule setting by parents.

This finding is supported by the change in the intermediate factors by the separate interventions. Whereas the parent intervention did change the intervention-induced factors (in parents), the student intervention did not. This seems to indicate that, in order to increase the self-control in adolescents, parents should be targeted as well. As the student intervention followed the parent intervention, targeting restrictive parenting first may be essential to enhance self-control in adolescents. More research is needed to test the importance of the sequence of carrying out the interventions.

Following this result, it is interesting that the combined intervention increased the (perceived) restrictive rule-setting in both adolescents and their parents, but that only the rules as perceived by adolescents caused the delay in onset of drinking, while the increase in restrictive attitudes in parents (Ennett et al., 2001b; Koutakis et al., 2008; Park et al., 2000) accounted for the delay in onset of drinking. The indirect effects of the combined

intervention via parental attitudes, but not rules, may seem contradictory when considering the opposite finding in adolescents. A possible explanation is that parental attitudes can be experienced by the adolescent as rules being set. In addition, it is interesting that the perceptions of parental behaviors by adolescents seem to be more relevant than the actual parental behavior as reported by parents. This can be exemplified by the absence of the relations between rules reported by parents and adolescents' onset of weekly alcohol use, as opposed to the strong relations with parental rules reported by the adolescents. This is also supported by the high discrepancy in reporting rules about alcohol by parents and adolescents, found in previous research, i.e. parents reporting more restrictive rule-setting behavior than their offspring (Van der Vorst et al., 2006). In addition, parent and child reports on rule-setting correlate only moderately. More research is needed to examine how restrictive alcohol-specific socialization should be accomplished effectively.

Since no direct effect of the parent intervention of PAS on onset of drinking was found in Chapter 2, it is noteworthy that an indirect effect via parental rules was revealed in the present study. It has been suggested that it is possible that in a multiple mediator model an indirect effect can occur even when lacking a direct effect (Bryan et al., 2007; Kreamer et al., 2002). The rationale for this assumption is that in a multiple mediator model, mediators may cancel each other out. In the present study, parental attitudes and rule setting may act as suppressing confounders; that is, when parents' attitudes are included in the model, the magnitude of the association between the intervention and rules reported by parents on the one hand, and parental rules with onset of drinking may become stronger. Attitudes may explain the variability in rules set by parents, causing the significant indirect relation of the parent intervention via rules set by parents (MacKinnon, Krull, & Lockwood, 2000). This assumption is supported by the relatively high correlation between rules and attitudes about alcohol.

Notwithstanding the strengths of the current study, such as the study design, sample size, and sophisticated analytic strategy, some limitations have to be mentioned. First, the outcome measures are based on self-reports. Self-report questionnaires are found to be a reliable method to measure alcohol use in adolescents (Del Boca & Darkes, 2003; Koning, et al., 2010; Wagenaar, et al., 1993), however, objective measures are clearly superior, but not feasible in a large study. Second, a dichotomous and not a continuous outcome

measure were used. Although continuous measures may have some statistical advantages over dichotomous measures, and may also yield meaningful effect size measures, a dichotomous outcome measure is needed for the calculation of Number Needed to Treat that is requested by the CONSORT guidelines (Altman et al., 2001). Third, although a multiple-mediator model provides a more accurate assessment of mediation effects than single-mediator models MacKinnon et al., 2007), it also increases the complexity of the model as multiple mediators are adjusted for. Fourth, some differences were found between de intervention and control conditions with regard to sex and educational levels. Therefore, all analyses were adjusted for these potentially confounding variables. Fifth, the relatively high correlation between rules and attitudes should be taken into account when interpreting the importance of both determinants. Sixth, one should be careful in generalizing our results to countries with other drinking cultures. The Netherlands is known for its lenient drinking culture and Dutch adolescents at this age (12–14) drink more frequently than adolescents in most other European countries (Hibell, Guttornsson, Ahlström, et al., 2009). It is difficult to predict whether the same mechanisms will explain the potential effects of alcohol interventions implemented in countries with more restrictive drinking cultures. Therefore, replication of this study in other countries is warranted to inform us about the generalisability of the present results to countries with different alcohol attitudes.

In this study, it was tested through which intermediate processes a multi-component alcohol intervention, targeted at adolescents and their parents, was effective in delaying the onset of weekly alcohol use in adolescents, by considering adolescent as well as parental psychosocial determinants. We put this to the test in a large randomized trial, by actually examining possible mediation effects of the intervention on the onset of weekly drinking through adolescent and parental factors. This is one of the few studies that tested whether the hypothesized mediators, targeted in a multi-component intervention could explain the achieved outcomes. The results support the potential of this type of intervention for the postponement of alcohol use among adolescents in the Netherlands, and indicate that interventions should involve the improvement of self-control in adolescents, preceded by the encouragement of restrictive rules and attitudes in parents.

4. Risk moderation of adolescent and family factors in a preventive alcohol intervention: A cluster randomized trial

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The objective of this study is to examine the risk moderation effects of an alcohol intervention targeting parents and adolescents. *Design.* A cluster randomized trial including 2,937 Dutch early adolescents (M age = 12.66, SD = 0.49) and their parents randomized over four conditions; 1) parent intervention, 2) student intervention, 3) combined parent and student intervention, and 4) control group. *Method.* Moderators at baseline (gender of the child, educational level of parent and child, externalizing behavior of the child, and heavy alcohol use of the parent) were used to examine the differential effects of the interventions on onset of (heavy) weekly drinking at 22-month follow-up. *Results.* The combined intervention was found to be effective in delaying the onset of heavy weekly drinking among adolescents attending lower levels of education and those reporting higher levels of externalizing behavior. In addition, the student intervention was found to be effective in delaying the onset of heavy weekly drinking among adolescents reporting higher levels of externalizing behavior. No differential effects were found of the separate parent intervention or on the outcome measure onset of weekly drinking. *Conclusion.* The combined intervention was found to be universally effective in delaying the onset of weekly drinking in the general population of adolescents, but only effective in delaying heavy weekly alcohol use in a higher-risk subsample of adolescents.

4.1 Introduction

In the last decades, various programs have been developed in order to prevent early drinking in adolescents. These programs mainly focused on the adolescents themselves (i.e. school interventions), their parents or a combined parent and adolescent approach (i.e. family interventions, Spoth et al., 2008a). Many of these programs showed actual effects on early adolescent alcohol consumption, whereby these findings apply to the targeted general population of adolescents and their parents (Smit et al., 2008; Spoth et al., 2008a). Relatively little attention, however, has been paid to the question whether all adolescents benefit from these interventions to the same extent. Interventions may have differential effects on different groups of adolescents, and may be particularly effective or ineffective among specific subgroups (Kraemer et al., 2002). Especially, investigation of risk-related moderator effects is important as it can establish whether groups at higher risk may be more likely to benefit from the intervention than groups at lower risk, as they are more inclined to develop the targeted behavior (Spoth et al., 2006; Stice et al., 2009). Therefore, testing of the risk moderation of universal prevention programs is required to confirm that interventions designed for general populations indeed have positive effects across both high and low risk subgroups (Kraemer et al., 2006; Spoth et al., 2006). In addition, investigating the moderation factors of intervention outcomes is critically important for theoretical as well as practical implementation purposes (Brown, McGue, Maggs, et al., 2008). Insight into differential effects across subgroups might contribute to the development of group-specific programs in order to increase the effects of interventions in specific subgroups which the general interventions do not seem to address effectively.

Recently, a Dutch school-based multi-component prevention program (PAS) demonstrated to effectively postpone the onset of drinking in early adolescents when adolescents as well as their parents were targeted (Chapter 2). However, no effects were found for the interventions directed at either the parents or the students when carried out separately. The purpose of the current study is to examine the role of different potential risk moderators of this universal prevention program. Various types of risk moderators can be identified, such as demographic variables (gender and level of

education), adolescent behavioral characteristics (externalizing behavior) and characteristics of the environment (parental alcohol use). Gender is a potential risk moderator, as boys are at a higher risk for (heavy) weekly drinking than girls (Gruber et al., 1996; Monshouwer et al., 2008). However, previous studies that have examined the effectiveness of alcohol interventions across genders showed contradictory results, varying from more benefits among boys (Vigla-Taglianti et al., 2009), comparable effects for both genders (Jones et al., 2005; Koutakis et al., 2008; Kulis et al., 2007; Trudeau et al., 2003) and even more benefits among girls (Lillehoj, Trudeau, Spoth, & Wickrama, 2004; Trudeau et al., 2007). Another known risk factor for adolescent (heavy) weekly drinking is a low educational level. Adolescents with a lower educational level tend to drink more alcohol than higher educated adolescents (Crum et al, 1998; Van Dorsselaer et al., 2007; Vereecken et al., 2004). This difference in alcohol use between educational levels may be (partly) explained by the finding that lower educated parents are more likely to approve of the use of alcohol by their offspring (Bogenschneider et al., 1998a; Verdurmen et al., 2008) and tend to set less restrictive rules (Spijkerman et al., 2008), factors that have been found to be related to higher adolescent alcohol use (Van der Vorst et al., 2006). However, to our knowledge, no studies are available that have examined the level of education of adolescents and/or parents as a moderator for alcohol prevention outcomes.

A third possible risk moderator is adolescent externalizing behavior. Externalizing behavior and alcohol use often co-occur among adolescents, in which externalizing behavior mostly precedes the use of alcohol (Bui et al., 2000; Mason et al., 2003). A study among adolescents in treatment for substance use disorders found worse treatment outcomes among adolescents exhibiting externalizing behavior at baseline compared to adolescents not exhibiting this behavior (Winters, Stinchfield, Larimer, & Stone, 2008). However, no studies examining moderation effects of externalizing behavior in alcohol prevention programs were found.

Finally, parental alcohol use may be considered a potential risk moderator, as previous studies have shown parental alcohol use to be related to the alcohol use of their children, even after controlling for alcohol-specific parenting practices (van der Zwaluw et al., 2008; Latendresse et al., 2008).

4.1.1 The current study

In the present study, we examined the risk moderation effects of an alcohol intervention targeting parents and adolescents. In a cluster randomized trial, the effects were measured for onset of weekly and heavy weekly drinking at the 22 month follow-up in a sample of 2,937 adolescents and their parents. Based on previous studies showing larger effects of preventive interventions in groups at higher risk of exhibiting the targeted behavior (i.e.Stice et al., 2009), we expected the effects of the PAS intervention to be larger for boys, adolescents with a lower educational level, adolescents with a higher level of externalizing behavior, and adolescents with heavy drinking parents.

4.2 Method

4.2.1 Procedure and participants

In April 2006, 80 schools were randomly selected from the list of all public secondary schools in the Netherlands, and were requested to participate in the study if the following inclusion criteria were met: 1) at least 100 first year students, 2) less than 25% students from migrant populations, and 3) not offering special education. A total of 20 schools were willing to participate.

Both the students and their parents were involved in this study. Parents and their children were matched by an identification code. Student data were collected in their classrooms by online questionnaires, available on a secured website. Research assistants were trained to administer the survey. Questionnaires for parents were sent to their home address, along with a letter of consent. In this letter, parents were informed about participation of the school in the project and were given the opportunity to refuse participation of their child. Non-responding parents received a written reminder after three weeks. Another two weeks later, non-responding parents were called by phone. Both parental and student data were gathered in September/October 2006, before any intervention was carried out, and again 22 months later in June/July 2008.

4.2.2 Randomization

The participating schools were randomly assigned by an independent statistician to one of the following conditions: 1) parent intervention, 2) student intervention, 3) parent and student intervention (combined intervention), 4) control condition consisting of the regular curriculum. Randomization was carried out centrally, using a blocked randomization scheme (block size 5) stratified by level of education, with the schools as the unit of randomization. Within each participating school, all first year students participated in the intervention. After randomization, one school refused further participation because of reasons not related to the study. This school was originally randomized to the control condition.

4.2.3 Interventions

Parent intervention (PI). This intervention targets parental rules for their children's alcohol use. The intervention was modelled after a Swedish intervention, The Örebro Prevention program (for details, see Koutakis et al., 2008). The intervention was carried out at the first parents' meeting at the beginning of each school year (September/October 2006 and 2007), in which also other school-related topics were discussed. The intervention was designed to encompass three elements. First, during a plenary parents' meeting, information was given on the adverse effects of alcohol use at a young age, and on the effects of permissive parental attitudes toward children's alcohol use. Second, after the plenary meeting, the parents of students in the same class joined the mentor of that class in a class meeting to discuss rules and to reach consensus on a set of shared rules. Third, an information leaflet with a summary of the presentation and a report of the outcome of the class meeting was prepared and sent to parents' home addresses.

Student intervention (SI). The SI targets adolescents' self-control and attitude towards alcohol use and consists of the renewed digital alcohol module of the Dutch prevention program 'The Healthy School and Drugs (HSD). The alcohol module is based on principles of the theory of planned behavior (Ajzen & Fishbein, 1980) and social cognitive theory (Bandura, 1986). After receiving training, the teachers conducted the intervention (four lessons) in all first year classes in March/April 2007. A booster session was provided

one year later in March/April 2008. The booster session included one lesson on paper in continuation of the digital lessons based on the same principles.

Combined intervention. Schools in this condition carried out both the PI and SI.

Control condition (CC). Schools in the control condition were contracted not to start any alcohol related interventions throughout the study period. However, as basic information about alcohol use is part of the standard curriculum in the Netherlands, they were allowed to continue this practice.

4.2.4 Outcome measures

The outcomes of interest for the proposed study were equal to the outcome measures used in the previous study in which the effectiveness of the intervention was described (Chapter 2). The onset of weekly alcohol use was defined by the Quantity-Frequency measure (Engels & Knibbe, 2000; Engels et al., 1999). To detect the incidence rate of onset of weekly drinking, the scale was recoded into 0 = 'no weekly user' and 1 = 'weekly user', if at least one glass of alcohol was consumed on a weekly basis. Onset of heavy weekly drinking was measured by asking how many glasses of alcohol the student usually drank on a weekend day (Engels et al., 1999). Boys drinking an excess of 4 glasses and girls drinking an excess of 3 glasses per week were considered to be heavy drinkers. The scale was recoded into a dichotomous variable with 0 = 'no heavy weekly drinking' and 1 = 'heavy weekly drinking'. Self-report measures of adolescents on alcohol use have demonstrated to be reliable and valid methods to measure alcohol use (Del Boca & Darkes, 2003; Koning et al., 2010).

4.2.5 Moderators

Demographic factors (gender and level of education), externalizing behavior and parental heavy drinking were moderators investigated in this study. All moderators were transformed into dummies (0/1 variables), so that interaction variables could be computed. Level of education of the adolescent and the parent was divided into low-level education (lower secondary education) and high-level education (general and pre-university secondary education).

Externalizing behavior was measured by using the conduct problems subscale of the Strength and Difficulties Questionnaire (SDQ; Goodman, Meltzer, & Bailey, 1998), translated by Van Widenfelt, Goedhart, Treffers, & Goodman (2003). The scale consisted of the sum of five items rated on a 3-point scale from 0 '*not true'* to 2 '*certainly true'*. No standardized cut-off points are available in the Netherlands. Therefore, in accordance with results of two national Dutch studies (Van Dorsselaer et al., 2007, 2010), a cut-off point of > 3 was used to indicate adolescents exhibiting externalizing behavior (scored as '1'; prevalence 15%). Although in most cases no high reliability is found, this scale is widely used in scientific research (i.e. Stadler, Feifel, Rohrmann, Vermeiren, & Poustka, 2010; Havas, Bosma, Spreeuwenberg, & Feron, 2010).

Parental heavy drinking was measured by using the Quantity-Frequency measures. Items were identical to the outcome measure as described previously for tapping adolescent drinking. Parents drinking an excess of 14 glasses were considered to be heavy drinkers (scored as '1'). As mainly mothers filled in the parent questionnaire (82%), the parental heavy drinking variable was based on the Dutch norm regarding acceptable weekly alcohol use by women.

4.2.6 Analyses

Data were analyzed in accordance with the intent-to-treat principle. All analyses were conducted with Stata/SE version 9.2. At follow-up, 12.5% of the data were missing, mainly due to students changing schools. Missing data were handled by regressing imputation as implemented in Stata while using rules and attitude about alcohol, alcohol use of both the students and their parents at baseline and age, gender, and level of education (lower *vs* higher secondary education) as predictors of outcome and dropout (Demirtas, 2004).

The randomization had resulted in a slightly uneven distribution across the active conditions compared with the control condition in terms of age (OR = 1.41, 95% CI 1.18 – 1.68, p = 0.00), gender (OR = .68, 95% CI 0.55 – 0.84, p = 0.00), and level of education (OR = 1.29, 95% CI 1.23 – 1.35, p = 0.00). Therefore, all subsequent analyses were conducted with these variables as covariates to control for any possible bias stemming from the imbalance.

The cluster effect (introduced in the data since students were 'nested' in classes) was handled data-analytically by getting robust variance-related estimates based on the first-order Taylor-series linearization method, using Stata's procedures for design-based analyses. We corrected for the cluster effects at class-level, as the interventions were carried out in classes. To test moderation effects, interaction variables were computed between the moderator and the intervention dummies (did not *vs* did receive the intervention). Logistic regression analyses were used to test the significance of the interaction of each moderator with the intervention dummies, taking the covariates and cluster effect into account. Post estimation linear combination calculations, as implemented in Stata, were used to be able to interpret the significant moderation effects.

4.3 Results

4.3.1 Participants

A total of 3,490 students were asked to participate in the study. Of these, 122 students did not participate due to the refusal of their parents or because they happened to be absent from school the day the questionnaire was administered. This resulted in a response rate of 97% (N = 3,368) at baseline. To measure the onset of (heavy) weekly drinking, we needed to exclude the 431 students (12.7%) who already were weekly drinkers at baseline (*n* = 306), or who responded inconsistently on the quantity and frequency items measuring weekly drinking (*n* = 125). This resulted in a total of 2,937 students eligible for analyses.

Of this group, a total of 2,570 students (87.5%) stayed in the program and completed the follow-up assessment after 22 months. Intention-to-treat analyses were based on 2,937 students not manifesting weekly drinking at baseline.

4.3.2 Characteristics of the sample at baseline

The total student sample had a mean age of 12.66 (SD = 0.49) at the pre-test, consisting of 51% boys, 40% in lower secondary education, 9% with externalizing problem behavior,

and 6% with parental heavy drinking. An extensive description of the sample at baseline for each condition can be found in Chapter 2.

4.3.3 Moderation of demographic factors

Gender did neither moderate the effect of the interventions on onset of weekly drinking, nor on onset of heavy weekly drinking.

Level of education (low *vs* high) of the adolescent did not moderate the effects of the interventions on incidence of weekly drinking. However, with respect to the incidence of heavy weekly drinking, the level of education moderated the effect of the combined intervention ($OR_{interaction}$ = 5.59; 95% CI 1.78 – 17.58, p < 0.00). Post estimation calculations showed that the effect of the combined intervention on heavy weekly drinking was significant among low-educated adolescents (OR = 0.29; 95% CI 0.12 – 0.71, p = 0.01), and not among high-educated adolescents (OR = 1.66; 95% CI 0.80 – 3.42, p = 0.22). This finding indicates that only lower educated adolescents benefit from the combined intervention, but adolescents in higher education do not (see also Table 4.1). No moderation effects of the separate parent and student intervention were found.

Level of education of the parent neither moderated the intervention effects on the incidence of weekly drinking, nor the incidence of heavy weekly drinking. This indicates that the intervention effects did not differ according to the level of education of the parent.

4.3.4 Moderation of adolescent and parent factors

Externalizing problem behavior did not moderate the intervention effects on the incidence of weekly drinking. However, externalizing problem behavior moderated the effects of the student intervention ($OR_{interaction}$ = 0.27; 95% CI 0.09 – 0.88, p = 0.03) and the combined intervention ($OR_{interaction}$ = 0.30; 95% CI 0.11 – 0.83, p = 0.02) on the onset of heavy weekly drinking. Post estimation calculations showed that the effect of the student intervention and the combined intervention on heavy weekly drinking was significant among adolescents exhibiting externalizing behavior (student intervention: OR = 0.24; 95% CI 0.07 – 0.77, p = 0.03; combined intervention: OR = 0.29; 95% CI 0.11 – 0.78,

p = 0.03), and not significant among adolescents without externalizing behavior (student intervention: OR = 0.89; 95% CI 0.53 – 1.47, p = 0.68; combined intervention: OR = 0.98; 95% CI 0.56 – 1.71, p = 0.95). That is, both interventions are effective in postponing the onset of heavy weekly drinking in adolescents with externalizing problem behavior, but not in adolescents without externalizing problem behavior (Table 4.2). No moderation effect of the parent intervention was found.

Parental heavy alcohol use did not moderate the intervention effects on the onset of weekly and heavy weekly drinking. That is, the intervention effects did not differ according to the level of alcohol use of the parent.

Table 4.1 *Interaction Effects between Intervention Conditions and Level of Education for the Onset of Heavy Weekly Drinking while Controlling for Age and Gender*

	OR	95% CI
Main effects		
Age	1.22	0.93-1.61
Gender	1.14	0.82-1.59
Parent intervention	0.72	0.36-1.42
Student intervention	0.87	0.49-1.55
Combined intervention	0.30	0.12-0.71
Level of education	0.50	0.25-0.99
Interaction effects		
Parent intervention x level of education	2.44	0.93-6.39
Student intervention x level of education	0.87	0.34-2.23
Combined intervention x level of education	5.59	1.78-17.58

OR = Odds Ratio, CI = Confidence Interval.

Table 4.2 *Interaction Effects between Intervention Conditions and Externalizing Behavior for the Onset of Heavy Weekly Drinking while Controlling for Age and Gender.*

	OR	95% CI
Main effects		
Age	1.18	0.89-1.56
Gender	1.17	0.84-1.63
Level of education	0.94	0.86-1.03
Parent intervention	1.31	0.80-2.15
Student intervention	0.89	0.53-1.47
Combined intervention	0.98	0.57-1.71
Externalizing behavior	2.79	1.54-5.07
Interaction effects		
Parent intervention x externalizing behavior	0.26	0.06-1.21
Student intervention x externalizing behavior	0.27	0.09-0.88
Combined intervention x externalizing behavior	0.30	0.11-0.83

OR = Odds Ratio, CI = Confidence Interval.

4.4 Discussion

In the present study, factors moderating the effectiveness of an alcohol intervention targeting parents and adolescents were examined. Of the moderators investigated in this study - gender, level of education, externalizing behavior and parental drinking - the level of education and externalizing behavior of the adolescents led to differential effects of the interventions. The present study revealed that, in addition to the previous finding that the combined student and parent intervention helps to prevent the onset of weekly alcohol use in the general population (Chapter 2), the combined intervention is exclusively effective in delaying the onset of heavy weekly drinking among adolescents attending lower levels of education and adolescents reporting higher levels of externalizing behavior. In addition, the student intervention, which was not found to be effective in the general population (Chapter 2), appeared to show to be effective among adolescents reporting higher levels of externalizing behavior. No differential effects were found of the separate parent intervention.

Contrary to an earlier study on adolescents in treatment for substance use, showing that the high-risk externalizing group had worse outcomes (Winters et al., 2008), the

findings from our study indicate a compensatory effect of the combined (and student) intervention on heavy weekly alcohol use. That is, regarding heavy weekly alcohol use the combined (and student) intervention provided benefits only to the higher risk groups of adolescents exhibiting higher levels of externalizing behavior and lower levels of education (which are often related). Similar significant intervention effects among high-risk groups with externalizing behavior have been reported in other school-based intervention studies targeting aggressive behavior (August, Realmuto, Hektner, & Bloomquist, 2001; Kellam, Ling, Merisca, Brown, & Ialongo, 1998; Stoolmiller, Eddy, & Reid, 2000), but to our knowledge not in alcohol interventions. Spoth, Randall, Trudeau, Shin, & Redmond (2008b), however, recently reported positive outcomes of a substance use intervention in a higher risk subsample of adolescents who had already initiated substance use. As a possible reason for these differential effects the authors propose that adolescents at higher-risk of more serious substance use outcomes may be more predisposed to respond to the intervention. That is, the intervention's positive effects may be experienced relatively more by these adolescents because the prevention messages and activities had more salience for them, as well as for their parents (Spoth et al. 2008b), as these adolescents are more inclined to develop heavy alcohol use (Stice et al., 2009). This could also offer an explanation for the compensatory effects found among externalizing and lower level of education subgroups in the present study.

As the moderation effects were only found for heavy weekly alcohol use, but not for weekly alcohol use, we may conclude that the PAS intervention was found to be universally effective in delaying the onset of weekly drinking in the general population of early adolescents, but only effective in delaying more serious alcohol use in a higher-risk subsample of adolescents. Again, this is in line with the recent findings of Spoth et al (2008b). However, as adolescents were only 14 years old at the time of the outcome measurement, an age at which heavy alcohol use is still relatively rare, it is possible that a universal effect on heavy alcohol use will appear at a later age when heavy alcohol use is also more prevalent among adolescents with lower levels of externalizing behavior and a higher level of education. The combination of effectiveness in postponing early alcohol use in the general population and postponing heavy alcohol use in risk groups supports the importance of universal implementation of the intervention, as both low and high-risk adolescents were found to benefit from the intervention.

The lack of a moderation effect for gender is in line with a previous study by Jones et al. (2005) who did find a moderating effect of gender on externalizing behavior, but not on alcohol or substance use. However, it is contrary to Vigna-Taglianti et al (2009) who found a greater effect of a school-based prevention program on substance use among boys in a large European drug abuse prevention trial. A possible explanation for these contradictory findings might lie in the different ages of the students in the studies; the average age of the sample in the study of Jones et al. and the present study being much younger at follow-up than in the study by Vigna-Taglianti et al. At a young age, little difference exists in both the prevalence and extent of alcohol used by boys and girls (Monshouwer et al., 2008). It would therefore be of interest to repeat the moderation analyses in a follow-up to investigate whether gender effects do appear at a later age when the alcohol use of boys increases more strongly compared to girls.

Finally, in our study we only found moderating effects of adolescent characteristics, not of parent characteristics. This lack of differential effects of parent factors is in line with earlier findings of Spoth et al. (2006) concluding that studies on risk moderation of family-focused interventions tend to confirm the universality of the interventions among general population families.

4.4.1 Limitations

The results of this study should be considered in light of some limitations. First, the results are based on self-reported questionnaires. However, although susceptible to social desirability biases, the literature suggests self-reports to be a valid method to assess alcohol use in adolescents (Del Boca & Darkes, 2003; Koning et al., 2010). Second, one should be careful in generalizing the findings to other countries. Since the Netherlands is considered to have a fairly lenient drinking culture, in which adolescents drink more frequently relative to other European countries (Hibell et al., 2009), our findings may not reflect the situation in other drinking cultures. Therefore, replication of this study in other countries is necessary.

4.4.2 Implications

The present and previous results on the PAS intervention have established PAS to be an effective intervention for preventing (heavy) alcohol use among Dutch adolescents in the general population with an added effect in certain high-risk groups. These results support the initiation of implementation of the intervention in the general population of schools in the Netherlands. Replication of this study in other countries would inform us about the generalizability of the effects of this intervention to other countries with different attitudes towards adolescent drinking.

5. Long-Term Effects of a Parent and Student Intervention on Alcohol Use in Adolescents

A Cluster Randomized Controlled Trial

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Early onset of drinking among Dutch adolescents is highly prevalent. A lower age of onset is associated with several developmental and social risks. *Purpose:* To evaluate the long-term effectiveness of two preventive interventions targeting heavy drinking in third year high school students. *Design:* Cluster randomized controlled trial using four conditions for comparing two active interventions (separately and simultaneously) with a control group. *Setting:* 152 classes of 19 high schools in the Netherlands. *Participants:* 3490 first year high school students (m = 12.6 years, SD = 0.49) and their parents. *Intervention conditions:* (1) parent intervention aimed at encouraging restrictive parental rule-setting concerning their children's alcohol consumption, (2) student intervention aimed at increasing self-control and healthy attitudes towards alcohol, consisting of four digital lessons based on the principles of the theory of planned behavior and social cognitive theory, (3) interventions 1 and 2 combined, (4) the regular curriculum as control condition. *Main outcome measures:* Incidence of (heavy) weekly alcohol use at 34 months (2009) after baseline measurement (2006). *Results:* 2937 students were eligible for analyses in this study. At follow-up, only the combined student–parent intervention showed substantial and statistically significant effects on heavy weekly and weekly drinking. *Conclusions:* Following the effects on the short-term, these results further support that adolescents as well as their parents should be targeted in order to delay the onset of (heavy) drinking.

5.1 Introduction

Prevention programs that involve parents as well as their children appear to be fairly successful in preventing the onset of drinking in adolescents under the age of 16 (Smit et al., 2008; Spoth et al., 2008a). The magnitude of effects of prevention programs curbing alcohol use in adolescents also depends on the interval between baseline measurement and follow-up. In some cases, the effectiveness of family interventions become stronger over time, with stronger and more robust effects of the interventions after a larger interval between baseline and follow-up (Smit et al., 2008). For example, the family-based intervention (PDFY) of Park et al. (2000) showed stronger effects of the intervention over a period of 3,5 years. On the other hand, several studies showed that the effectiveness of interventions with respect to alcohol initiation decayed (Bauman et al., 2002; Perry et al., 2002) or diminished (Spoth et al., 2001) over time. In general, relatively little data on longer-term effects (≥ 3 years) of parents and adolescent-based prevention regarding juvenile alcohol use have been reported (Faggiano et al., 2008; Foxcroft et al., 2003; Petrie, Bunn, & Byrne, 2007; Spoth et al., 2008a).

Spoth et al. (2008b) argue that former studies also suffer from methodological flaws, such as a lack of robust designs (e.g. weak experimental design), statistical power, representative samples, and theoretically founded interventions. A Dutch alcohol prevention program (PAS) dealt with these issues. In a cluster randomized trial among a representative sample of 3,490 Dutch early adolescents and their parents, the effects a parent intervention and a student intervention were examined simultaneously as well as separately. Only when parents and their children were targeted simultaneously, the onset of (heavy) weekly drinking and the frequency of drinking were effectively postponed 10 and 22 months later (Chapter 2). Targeting parents or adolescents separately did not reveal any significant effects. The PAS intervention was grounded on theoretical and empirical literature. The student part of the intervention was based on the Healthy School and Drugs program (HSD; Cuijpers et al., 2002). In accordance with the principles of the theory of planned behavior (Ajzen & Fishbein, 1980) and social cognitive theory (Bandura, 1986), students were trained to develop a higher degree of self-control and more healthy attitudes about alcohol use, both strong predictors of alcohol use (Kam et al., 2009). The

parent intervention consisted of a renewed Dutch version of the Swedish Örebro Prevention Program (ÖPP; Koutakis et al., 2008): based on research showing that a lack of rule-setting in parents is one of the best predictors of early adolescent drinking (Van der Vorst et al., 2006). Parents were informed about the negative consequences of alcohol use at an early age and they were encouraged to develop restrictive attitudes and to set strict rules toward their offspring's drinking. Mediation analyses revealed that the PAS intervention indeed modified these theory-based factors, which accounted for the delay in onset of drinking (Chapter 3). The next step is to examine whether the effects of the PAS intervention also apply to the long-term follow-up, three years after baseline measurement.

Examining the effects of interventions on the long-term is important for the following reasons. It gives insight into (1) the decay or growth of effects, (2) the public health significance of the findings, and (3) various alcohol patterns over time due to the intervention (Spoth et al., 2008a). In addition, in this particular study, the long-term effectiveness provides insight into the strength of a brief universal multi-target prevention program on drinking of youngsters at the age of 15, which is one year prior to the legal buying age in the Netherlands, while at the age of 15, 65% of Dutch adolescents already drink on a weekly basis (Monshouwer et al., 2008). Thus, examining the long-term effects of alcohol prevention programs is an imperative step following the short-term results.

In sum, this study addressed whether the PAS intervention is effective in delaying the onset of (heavy) weekly drinking in early adolescents on the long-term (34 months). In a cluster randomized trial, including 3490 early adolescents, the effects of a parent and student intervention are examined simultaneously as well as separately. Relevant outcomes are onset of heavy weekly drinking and onset of weekly drinking.

5.2 Method

5.2.1 Design and Procedure

From a list of Dutch high schools, 80 schools were randomly selected. Five schools, including 696 students per condition, were needed to power the trial to detect a

reduction of 10% in weekly heavy drinking and weekly drinking relative to the control condition in a one-tailed test with a = 0.05 at a power of (1b) = 0.80, while accounting for 20% initial non-response, 30% loss to follow-up and the loss of power due to the fact that schools (not students) were randomized (an intra-class correlation of 0.30 is assumed). An independent statistician assigned nineteen schools randomly to one of the four conditions: (1) parent intervention, (2) student intervention, (3) combined student-parent intervention, and (4) control condition (business as usual). Randomization was carried out centrally, using a blocked randomization scheme (block size 5) stratified by level of education, with the schools as units of randomization. Within each participating school, all first-year students participated in the intervention.

The baseline data were collected immediately after allocation at the beginning of the first year in high school (September/October 2006), before any intervention was carried out, and again 34 months later in May/June 2009. Adolescent digital questionnaires were administered in the classroom by trained research assistants. Students who were not willing to participate were free to refuse participation on the day the questionnaires were administered. Parental questionnaires were sent to parents' home address along with a letter of consent at baseline. This letter informed parents about the participation of the school in the project and parents were given the opportunity to refuse participation of their child (0.01% refusal). Non-responding parents were reminded after three weeks by a letter and after another two weeks by phone. The trial protocol (NTR649) was approved by the Medical Ethical Committee.

5.2.2 Participants

Nineteen schools, including 3490 adolescents were selected to participate in the study. Due to initial non-response (n = 122) and exclusion of adolescents who already drank weekly at baseline (n = 306) or who responded inconsistently on the quantity-frequency items (indicated 1 or higher drinks and zero on the number of days or vice versa) measuring weekly drinking (n = 125), 2937 adolescents were eligible for analyses. Intention-to-treat analyses were based on 2937 students not manifesting (heavy) weekly drinking at baseline.

The final sample (N = 2937) is characterized by an average age of 12.6 (SD = 0.49) at baseline, consisting of 51% boys and 40% in lower secondary vocational education. At baseline, the intervention conditions differed significantly from the control condition with respect to the number of males and low educated adolescents (Table 5.1).

Table 5.1. *Characteristics of the Students at Baseline*

	Conditions			
Variable	PI	SI	CI	CC
	n = 689	*n* = 771	*n* = 698	*n* = 779
Male, *n* (%)	302 (46.1)	348 (47.7)	380 (59.5)	378 (50.6) [a]
Age, years: mean (s.d.)	12.6 (0.46)	12.7 (0.49)	12.7 (0.50)	12.7 (0.50) [a]
Low level of education[b], *n* (%)	198 (28.7)	307 (39.9)	230 (32.9)	443 (56.9) [a]

[a] Significantly different from the active interventions at $p<0.05$ [b] Lower secondary vocational education. PI = parent intervention, SI = student intervention, CI = combined intervention, CC = control condition.

5.2.3 Loss to Follow-Up

A total of 2533 adolescents (86.2%) stayed in the program and completed the follow-up assessment after 34 months (see Figure 1). Attrition analyses on demographic variables and alcohol use indicated that participating adolescents were more likely to be younger (t = 4.32, p = 0.00), more often in lower education (*Chi-square*=33.95(*df*=1), p = 0.00) and drank a lower average number of alcohol beverages per week at baseline (t = 3.32, p = 0.00). Attrition was unrelated to conditions (*Chi-square*=6.45(*df*=3), p = 0.79).

5.2.4 Interventions

Parent intervention. This intervention targets parental rules for their children's alcohol use. The intervention was modelled after a Swedish intervention, The Örebro Prevention program (for details, see Koutakis et al., 2008). The intervention was carried out at the first parents meeting at the beginning of each school year (September/October 2006 and 2007), in which also other school-related topics were discussed. The intervention consisted of three elements: 1) a brief presentation (20 minutes), 2) consensus building

among a shared set of rules among parents of children of the same class, and 3) an information leaflet with a summary of the presentation and the outcome of the class meeting was sent to the parents' home addresses.

Student intervention. The student intervention is the renewed digital alcohol module of the Dutch prevention program ´The Healthy School and Drugs´ (HSD). The alcohol module targets the students' abilities to develop a healthy attitude towards alcohol use and to train their refusal-skills. After receiving training, the teachers conducted the intervention (four lessons) in all first year classes in March/April 2007. A booster session was provided one year later in March/April 2008.

Combined intervention. Schools in this condition carried out both the parent and student intervention.

Control condition. Schools in the control condition were contracted not to start any alcohol-related interventions throughout the study period. However, because basic information about alcohol use is part of the standard curriculum in the Netherlands, schools were allowed to continue this practice (business-as-usual).

For a more detailed description of the interventions see Chapter 2.

5.2.5 Measures

The outcomes of interest for the proposed study were equal to the outcome measures used in the previous study in which the effectiveness of the intervention was described for a shorter follow-up period (Chapter 2). In accordance with the registration of this study in the Trial register (NTR649), the interest of the study was to examine the effect of the intervention on the incidence rate of onset of drinking over a three year period. Therefore, dichotomous variables were computed indicative of the onset of (heavy) weekly drinking in those who did not report drinking weekly at baseline. The primary and secondary outcomes of interest were onset of heavy weekly and weekly alcohol use, respectively.

Heavy weekly drinking was measured by asking how many glasses of alcohol the student usually drank on a weekend day (Engels et al., 1999). In accordance with the definition of heavy drinking in adults, separate outcome variables for boys and girls were used. Boys drinking at least 5 glasses and girls drinking at least 4 glasses every week were

considered to be heavy drinkers. The scale was recoded into a dichotomous variable with 0 = 'no heavy weekly drinking' and 1 = 'heavy weekly drinking.'

Weekly alcohol use was defined by the Quantity-Frequency measure (Engels et al., 1999; Engels & Knibbe, 2000). The scale was recoded into 0 = 'no weekly user' and 1 = 'weekly user', if at least one glass of alcohol was consumed on a weekly basis. In addition, the quantity-frequency was set to zero if adolescents reported not to have drunk alcohol in the previous month (n.b. analysis where the quantity-frequency measure was left unchanged revealed the same results). Onset of (heavy) weekly alcohol use was defined if students who were not weekly drinkers at baseline became (heavy) weekly drinkers at follow-up. Self-report measures of adolescents on alcohol use have proven to be reliable and valid methods to measure alcohol use (Del Boca & Darkes, 2003; Koning et al., 2010; Wagenaar et al., 1993).

Dichotomous measures are clinically useful and allow for the calculation of important outcome measures, such as Number Needed to Treat (Pinson & Gray, 2003), that should be reported according to the CONSORT guidelines (Altman et al., 2001).

5.2.6 Analyses

Data were analyzed (Mplus 6.0) in accordance with the intent-to-treat principle. Intention-to-treat analysis requires that all participants are analyzed in the condition to which they were randomized. No missing data appeared on confounders due to zero non-response on item-level for the adolescents. Missing data on the dependent variables were handled by using full information maximum likelihood (FIML: Muthen & Muthen, 2007). FIML has been recommended as a state of the art technique for analyzing datasets that include missing data (Schafer & Graham, 2002). An earlier report showed that the randomization resulted in a slightly uneven distribution across the active conditions compared to the control condition in terms of age, sex, and level of education (Chapter 2). Therefore, all subsequent analyses were conducted with these variables as covariates to control for any possible bias stemming from the imbalance.

Non-independence of observations due to cluster sampling —students were 'nested' in classes—was taken into account by obtaining standard errors as implemented in Mplus. The cluster effect was corrected for at class-level, as the interventions were

carried out in classes and higher intra-class correlations were found at the class level (ICC: weekly drinking = .06, heavy weekly drinking = 0.07) compared to the school level (ICC: weekly drinking = .02, heavy weekly drinking = 0.03). The intra-class correlations were calculated without adjustment for confounders in an intercept-only model. To examine the effect of the interventions on the incidence rates of heavy weekly and weekly drinking two models were tested. In the first model, each of the experimental conditions was compared with the control condition. Odds ratios of weekly (heavy) drinking were obtained using logistic regression of the binary outcome on the treatment dummies (experimental versus control), while adjusting for the confounders and the nested data. This model informs us about the incidence of alcohol use at wave 3 compared to baseline. In the second model, alcohol use at previous time points was added to the first model so that an autoregressive logistic model was tested. This model shows the stability or additional effect at wave 3 compared to the previous waves. Number-needed-to-treat (NNT) represents the number of students who need to receive the intervention rather than its alternative in order to avoid one adverse outcome (Pinson & Gray, 2003). NNT was obtained as the inverse of the risk difference.

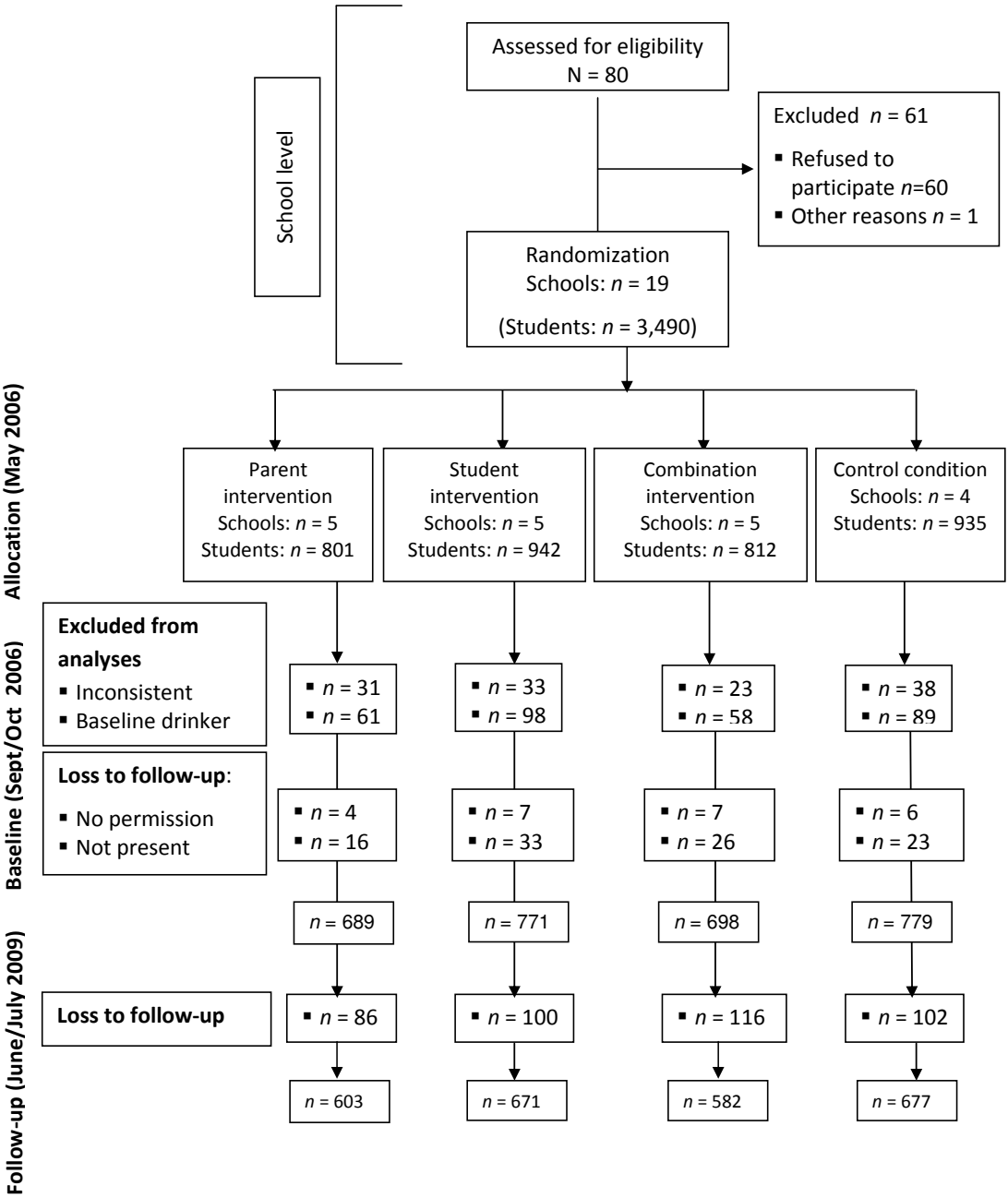

Figure 5.1. Flow of participants through the trial.

Table 5.2. *The Effect of the Intervention Conditions on the Incidence of Heavy Weekly and Weekly Drinking (incidence rates between brackets)*

	ICC	OR	*P*	NNT
Heavy weekly drinking	0.059			
Model 1[1]:				
Parent intervention (20.3%)		0.83	0.14	62.5
Student intervention (21.4%)		0.85	0.17	38.5
Combined intervention (14.9%)		0.69	0.00	3.9
Reference = control condition (27.3%)				
Model 2[2]:				
Parent intervention		0.78	0.14	45.5
Student intervention		0.80	0.17	21.7
Combined intervention		0.61	0.00	2.9
Reference = control condition				
Weekly drinking	0.066			
Model 1[1]:				
Parent intervention (52.7%)		0.86	0.22	83.3
Student intervention (54.4%)		0.88	0.26	35.7
Combined intervention (48.6%)		0.69	0.00	3.8
Reference = control condition (59.1%)				
Model 2[2]:				
Parent intervention		0.81	0.22	52.6
Student intervention		0.82	0.27	23.8
Combined intervention		0.59	0.00	2.6
Reference = control condition				

[1] Model 1: Logistic multiple regression, adjusted for confounders (age, level of education and sex) and cluster effect.
[2] Model 2: Autoregressive logistic regression analyses, adjusted for confounders (age, level of education and sex), cluster effect and outcome at *t* - 1.
ICC = intra-class correlation; NNT = numbers needed to treat.

5.3 Results

5.3.1 Effects on onset of heavy weekly drinking

Table 5.2 presents the results of the interventions on the incidence of heavy weekly alcohol use at follow-up. At follow-up, significantly fewer students in the combined intervention had started to drink heavily on a weekly basis compared to the control condition (OR = 0.69, p = 0.00). No significant effects of either the parent intervention or student intervention were found on the incidences of heavy weekly drinking. This finding is replicated when previous alcohol use was included in the analysis (model 2). So, when parents and adolescents are targeted simultaneously, the proportion of heavy weekly drinking adolescents is reduced.

5.3.2 Effects on onset of weekly drinking

Table 5.2 presents the percentages of (heavy) weekly alcohol use at follow-up across conditions. Significantly fewer students in the combined intervention had started to drink on a weekly basis relative to the control condition at follow-up (OR = 0.69, p = 0.02). No significant effects of either the parent intervention or student intervention were found. Again, these findings are in line with the autoregressive analysis. So, the combined intervention can effectively reduce the proportion of weekly drinking adolescents.

5.3.3 Treatment integrity

All schools implemented the interventions as stipulated in the protocol; the integrity of the program was checked by the intervention coordinator of the National Institute of Mental Health and Addiction. Only some small differences were found in the way consensus among parents was strived for five schools (out of ten) did not try to reach consensus among the parents about the rules for adolescent drinking while being in the meeting with the mentor, but instead distributed copies of a pre-printed list of plausible rules, for the parents to take home. Parents returned the lists to the mentor after having chosen the rules they complied with. A summary of these lists was used to compose the leaflet sent to parents afterwards, in order to notify all parents about the chosen set of

rules. No other differences with respect to the parent intervention were found. No differences in the implementation of the student intervention were found. This was verified by using a remote digital system underlying the student intervention.

5.4 Discussion

In the present study the long-term effects of a theory-based parent and student intervention were examined separately and simultaneously in a cluster randomized trial including 3490 adolescents. At 34-months follow-up, significant effects of the combined PAS intervention (parent and student) were found on both outcome measures. The onset of heavy weekly drinking and weekly drinking was significantly reduced by respectively 12.4% and 10.5% in adolescents who were targeted themselves as well as their parents. No effects of the separate interventions were found. So, following the short-term effects, parents and adolescents should be targeted to effectively delay the onset and to reduce the quantity of drinking among adolescents later in teenage years.

The prevalence of drinking among early adolescents allowed us to examine the long-term effects of the PAS intervention at the pivotal age of 15 years. At this age, one year before the legal buying age in the Netherlands, most adolescents have started to drink already on a weekly basis (Monshouwer et al., 2008). As has been observed in our previous report, the current long-term findings are consistent with the short-term findings (Chapter 2). The short-term results are not only replicated in the sense that the combined intervention was effective in delaying the onset of drinking, whereas the separate parent and student intervention were not. The effects of the combined PAS intervention also became more powerful over time, as exemplified by the lower NNT's at the long-term for onset of weekly drinking (10-months follow-up: NNT=39, 22-months follow-up: NNT=17, 34-months follow-up: NNT=4) as well as heavy weekly drinking (10-months follow-up: NNT=44, 22-months follow-up: NNT=57, 34-months follow-up: NNT=4). This finding is in line with a meta-analysis on the effectiveness of family interventions of Smit et al. (2008) and a recent study on the long-term effects of the PROSPER study (Spoth et al., 2011), which both demonstrated that the effects became stronger over time.

The stronger effects of the PAS intervention over time are considerable, taking into account that the adolescents were 15 years old; one year before the legal buying age in the Netherlands. The delay in onset of drinking due to the PAS intervention may therefore be an imperative step towards changing the drinking pattern in these adolescents later on.

In sum, when adolescents and their parents are targeted simultaneously in the PAS intervention, after 34 months, the onset of (heavy) weekly drinking is effectively postponed. No effects of the separate parent or student intervention were found.

5.4.1 Limitations and strengths

Despite the clear and robust findings and the strengths of the study, such as its large sample size, the study design and the large time interval, the current study is limited by some factors. First, one should be careful in generalizing the effects of the PAS intervention to other countries, since our findings may not reflect the situation in other drinking cultures. Therefore, evidence-based interventions in one culture should always be re-examined in another. Second, due to the exclusion of weekly drinking adolescents at baseline, necessary for analyzing incidence rates, the current findings only apply to adolescents who were not involved in weekly drinking at age 12. As this percentage was rather small (12.7%), we feel confident that our results apply to the large majority of students at this age. Third, although it was accomplished to include the number of schools and participants that were needed according to the power calculation, only 25% of all schools that were approached actually participated. No data are available on whether the participating schools differ from the non-participating schools. This may limit the generalizability of our findings. However, as most schools declined participation due to other research going on in the school (in a highly populated country with a large number of universities, the pressure on schools to participate in research is rather high) we feel confident that the participating schools are not very different from other schools in the Netherlands.

Fourth, outcome measures were based on self-reported data. Although self-reports have been found to be a reliable method to measure alcohol use if confidentiality is assured (Koning et al., 2010; Del Boca & Darkes, 2003) objective measures are clearly

superior, but not feasible, in a large study. Fifth, baseline data was collected after allocation of the schools to conditions. This may have resulted in response bias, although this is not very likely as schools and not students were randomized over conditions and students were not aware of the different (experimental) conditions present in this study. Sixth, some drop-out occurred, specifically among older students and those in lower types of education. On the whole, however, attrition was limited, unrelated to conditions, and was therefore unlikely to affect our conclusions.

5.4.2 Implications

There are some practical implications of the present findings. Firstly, the findings underline the need to target early adolescents as well as their parents. Neither on the short- nor on the long-term were the separate student and parent interventions effective. Secondly, results indicate the importance of targeting adolescents at an early age, before they start to drink regularly. This universal brief parent-student intervention was efficient in delaying the onset of (heavy) weekly drinking even 34-months after baseline, when adolescents were 15 years old. In early adolescence, family factors (e.g. parental attitudes and rule-setting) have demonstrated to be more salient in explaining juvenile drinking than peer factors (Cleveland, Feinbergh, Bontempo, & Greenberg, 2008). In addition, parent interventions targeting older adolescents seem to be less effective (Spoth et al., 2008). Therefore, it is recommended to intervene at an early age on multiple domains (Pasch et al., 2009). Thirdly, even when adolescents in the combined intervention condition have started to drink alcohol on a weekly basis, they still drink significantly less compared to adolescents who did not follow the intervention. All together, the findings emphasize the strength of the combined PAS intervention and therefore the public health importance of its implementation.

6. Differential impact of a Dutch alcohol prevention program targeting adolescents and parents separately and simultaneously: low score on moderating factors at baseline a predictor of effectiveness

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The objective of this study is to test whether baseline levels of the factors accountable for the effect of the Prevention of Alcohol use in Students (PAS) intervention (self-control, perceived rules about alcohol and parental attitudes about alcohol), moderate the effect of the intervention. *Design.* A cluster randomized trial including 3,490 Dutch early adolescents (M age = 12.66, SD = 0.49) and their parents randomized over four conditions; 1) parent intervention, 2) student intervention, 3) combined intervention and 4) control group. *Method.* Moderators at baseline were used to examine the differential effects of the interventions on onset of (heavy) weekly drinking at 34-month follow-up. *Results.* The combined intervention was only effective in preventing weekly drinking among those adolescents who reported to have lower self-control and more lenient parents at baseline. No differential effect was found for the onset of heavy weekly drinking. No moderating roles of self-control and lenient parenting were found for the separate student and parent interventions regarding the onset of drinking. *Conclusion.* The combined intervention is more effective among adolescents with low self-control and lenient parents at baseline, both factors that were a specific target of the intervention. The relevance of targeting self-control in adolescents and restrictive parenting is underlined.

6.1 Introduction

In recent years, the number of Dutch adolescents drinking at a young age has increased (Monshouwer et al., 2008). At the same time more knowledge of the risks involved in underage drinking has become available (Behrendt et al., 2009a; Brown et al., 2008). Although the literature shows mixed findings on the effectiveness of preventive alcohol interventions (Foxcroft, Ireland, Lowe, & Breen, 2002; Spoth et al., 2008a), some interventions have proved to significantly affect the drinking behavior of adolescents. However, interventions may have different effects on different subgroups of adolescents. Thus, a relevant question is whether these effects apply to adolescents in general.

So far, most studies examining moderation effects focused on demographic moderators, such as gender, level of education and ethnicity, or on the initial level of outcome of interest (e.g. Brown, Anderson, Schulte, Sintov, & Frissell, 2005; Sloboda, Stephens, Stephens, et al., 2009; Spoth et al., 2006). For example, although most studies find more favorable effects of alcohol interventions in adolescents who drink more frequently at baseline (Brown et al., 2005; Spoth et al., 2008b), not much support for beneficial effects in other higher risk groups (e.g. boys and adolescents in lower education) has been found (e.g. Spoth et al., 2006; Trudeau et al., 2003). However, it is particularly relevant to analyze whether the theoretically relevant factors that are targeted in the intervention, also act as potential moderator variables.

Examination of the moderation effects of intervention-induced factors is important for two reasons. First, it provides theoretical evidence for the justification of targeting these specific factors in interventions. Second, insight into subgroups who have more favorable effects from an intervention helps in finding the best target groups for implementing this intervention (Kraemer et al., 2002), especially when these subgroups can be identified by demographic variables. Thus, it is relevant to examine the moderating role of the intervention-induced factors on the effect of the intervention condition on outcome of interest.

Recently, a Dutch school-based multi-component prevention program (PAS) was shown to effectively postpone the onset of drinking by 10% when early adolescents as well as their parents were targeted (Chapter 2), whereas targeting adolescents or parents

separately revealed no significant effects. The adolescent part of the intervention was developed with a view to increasing self-control and fostering healthy attitudes in adolescents. This target behavior was chosen because the inability to refuse alcohol (low self-control) in adolescents appears to be a powerful predictor of (onset of) alcohol use in adolescents (e.g. Wills, Cleary, Filer, et al., 2001). Therefore, increasing the level of self-control in adolescents is often targeted in alcohol interventions (Foxcroft et al., 2002; Tobler et al., 2000), in many cases successfully (Foxcroft et al., 2002; Tobler et al., 2000). In the parent intervention, parents were encouraged to maintain restrictive rule setting and attitudes about alcohol use. This target behavior was chosen on the basis of a number of studies that consistently revealed strong effects of restrictive parenting (rules and attitudes about alcohol) on adolescent drinking (Spijkerman et al., 2008; Van der Vorst et al., 2006; Van der Vorst, Engels, Dekovic, Meeus, & Vermulst, 2007; Yu, 2003). That is, adolescents with stricter parents (e.g. who prohibit drinking) are less likely to drink alcohol (heavily). In addition, interventions targeting parenting behavior in order to induce change in their offspring's drinking have shown very promising results (Smit et al., 2008; Spoth et al., 2008a).

The combined intervention considered in this study revealed that this intervention indeed modified the theory-based factors as hypothesized. By increasing self-control among adolescents and by enhancing strict rule enforcement and negative attitudes in parents about adolescent alcohol use, the onset of weekly drinking was postponed (Chapter 3). In Chapter 2 it is described that only when both adolescents and their parents were targeted, the onset of drinking was postponed, whereas the separate parent or adolescent interventions were not effective. This makes us wonder if these separate interventions may become effective if a high level of self-control in adolescents and perceived strict parenting at present at baseline. That is, the adolescent intervention may become effective when parents set restrictive rules and have strict attitudes, while the parent intervention may become effective among those adolescents with a high level of self-control.

According to the risk moderation hypothesis, an intervention should be more effective among high risk groups than among moderate and low risk groups. Although this does not seem to account for moderation of demographic factors, it may account for intervention-induced factors. Adolescents who lack the intervention-targeted protective

behaviors can be considered among the high risk groups. With respect to the PAS intervention this involves adolescents with low self-control and low restrictive parents at baseline. Therefore, it can be expected that specifically those higher risk groups of adolescents benefit more from the intervention.

As the student and parent interventions specifically target adolescent self-control and restrictive parenting respectively, more change can be induced in groups that are low the start of the intervention in comparison to adolescents with high levels of these behaviors at baseline. Increasing self-control in adolescents is often a target of alcohol interventions, in many cases successfully (Foxcroft et al., 2002; Tobler et al., 2000). Moreover, several studies point to the importance of testing self-control among adolescents as a moderator in intervention trials (e.g. Brown et al., 1998; Demmel et al., 2004). Earlier studies have confirmed that a lower level of self-control at baseline indeed appeared to be related to a higher degree of change in the desired direction during the intervention (Brown et al., 1998; Demmel et al., 2004). In addition, Brody, Kogan, Yi-fu, & McBridy Murry (2008) showed that the effect of their parenting program on conduct problems in adolescents was greater for youth with lower levels of self-control. Yet, to our knowledge, no data is available with respect to the moderation of restrictive parenting. Thus, a relevant question is to investigate whether the combined intervention is indeed most effective in the adolescent groups that are low in self-control and perceived rule setting at baseline and in parents with a tolerant attitude with respect to adolescent drinking.

6.1.1 Current study

In this study, we examine whether the degree to which baseline levels of factors accountable for the effect of the combined PAS intervention, i.e. self-control, perceived parental rules and parental attitudes about alcohol use, moderate the effects of the different intervention conditions (parent and student intervention separately and simultaneously). In addition, in order to detect the subgroups on whom the intervention has more favorable effects, the characteristics of these subgroups have to be identified. Demographic factors that have been found to relate to low self-control in adolescents or permissive parenting are gender (Sumter, Bokhorst, Steinberg, & Westenberg, 2009), age

(Sumter et al., 2009; Van der Vorst et al., 2005), level of education (Spijkerman et al., 2008) and religion (Spijkerman et al., 2008). In a cluster randomized trial, the effects were measured for onset of both heavy weekly and weekly drinking at the 34 month follow-up in a sample of 3,417 adolescents and their parents.

6.2 Method

6.2.1 Procedure and participants

In April 2006, 80 schools were randomly selected from the list of all public secondary schools in the Netherlands, and were requested to participate in the study. A total of 20 schools were willing to participate.

Both the students and their parents were involved in this study. Student data were collected in classrooms by online questionnaires, available from a secured website. Research assistants were trained to administer the survey. Questionnaires for parents were sent to their home address, along with a letter of consent. Non-responding parents were encouraged to participate by a written reminder and phone-call. The parent who completed the first questionnaire was asked to complete the subsequent questionnaires as well. In most cases (83%) the responding parent was female. Both parental and student data were gathered in September/October 2006, before any intervention was carried out, and again 34 months later in June/July 2009. For a more detailed description of the procedure, see Chapter 2.

6.2.2 Randomization

The participating schools were randomly assigned by an independent statistician to one of the following conditions: 1) parent intervention, 2) student intervention, 3) both parent and student intervention (combined intervention), 4) control condition consisting of the regular curriculum. Randomization was carried out centrally, using a blocked randomization scheme (block size 5) stratified by level of education, with the schools as the unit of randomization. Within each participating school, all first year students participated in the intervention. After randomization, one school refused further

participation for reasons unrelated to the study. This school was originally randomized to the control condition.

6.2.3 Interventions

Parent intervention (PI). This intervention targets parental rules for their children's alcohol use. The intervention was modelled after a Swedish intervention, The Örebro Prevention program (for details, see Koutakis et al., 2008). The intervention was carried out at the first parents meeting at the beginning of each school year (September/October 2006 and 2007), in which also other school-related topics were discussed. A brief presentation was given at the plenary meeting by a social worker who was trained by the National Institute of Mental Health and Addiction. Thereafter, parents of children from the same class got together to reach consensus on a shared set of rules about alcohol use. Three weeks later an information leaflet with a summary of the presentation and a report of the outcome of the class meeting was sent to parents' home addresses.

Student intervention (SI). The SI is the renewed digital alcohol module of the Dutch prevention program ´The Healthy School and Drugs´ (HSD). The alcohol module makes use of e-learning and is based on principles of the theory of planned behavior (Ajzen & Fishbein, 1990) and social cognitive theory (Bandura, 1986). In the interactive lessons students were provided with information about alcohol and the risks involved in drinking. Students were trained to increase their self-control and healthy attitudes towards alcohol use by means of exercises such as short movies, texts following questions, animations and a chat room to exchange opinions. Each lesson ends with a summary task, such as creating a flyer or poster. The teachers received training in advance on how they could guide students in completing the lessons. In addition, information was given about how teacher could track the students while carrying out the intervention. The teachers conducted the intervention (four lessons) in all first year classes in March/April 2007. A hardcopy booster session was provided by the teachers one year later in March/April 2008. This booster lesson involved a repetition of the digital alcohol program on paper. For example, propositions were used to encourage discussion and recall knowledge obtained from the digital program.

Control condition (CC). Schools in the control condition were contracted not to start any alcohol related interventions throughout the study period. However, as basic information about alcohol use is part of the standard curriculum in the Netherlands, which involves the previously supported message of learning to drink alcohol safely instead of prohibit it, they were allowed to continue this practice. The interventions are implemented and supervised by the National Institute of Mental Health and Addiction.

6.2.4 Demographic variables

Age (in years), gender, level of education and religion were demographic variables taken into account as covariates and/or predictors. Age was measured by subtracting date of response from the date of birth of the respondent. The level of education reflects the type of education the adolescent engaged in. In the Netherlands, from the first year of secondary school, the educational system consists of different types of secondary education ranging from pre-vocational to pre-university education. This variable was dichotomized into lower (pre-vocational and lower secondary education) versus higher (higher general secondary and pre-university education) level of education. Religion is measured by asking if the adolescent was brought up religiously ('Catholic', 'Protestant', 'Islamic', 'Other, namely' and 'No religion'). In the current analyses, adolescents indicating to have an 'other religion' were recoded as missing (3.6%). Dummy variables were computed with 'no religion' as reference category.

6.2.5 Outcome measures

The outcomes of interest for the proposed study were equal to the outcome measures used in the previous study in which the effectiveness of the intervention was described (Chapter 2). In accordance with the registration of this study in the Trial register (NTR649), we were interested in the effect of the intervention on the incidence rate of onset of drinking. Therefore, dichotomous variables were computed.

The onset of weekly alcohol use was defined by a Quantity-Frequency measure (Engels & Knibbe, 2000; Engels et al., 1999). To detect the incidence rate of onset of weekly drinking, the scale was recoded into 0 = 'no weekly user' and 1 = 'weekly user', if

at least one glass of alcohol was consumed on a weekly basis. This was only calculated for those adolescents indicating to have also a monthly prevalence of drinking. Onset of heavy weekly drinking was measured by asking how many glasses of alcohol the student usually drank on a weekend day (Engels et al., 1999). Boys drinking 5 or more glasses and girls drinking 4 glasses or more per week were considered to be heavy drinkers. The scale was recoded into a dichotomous variable with 0 = 'no heavy weekly drinking' and 1 = 'heavy weekly drinking'.

6.2.6 Moderators

Self-control and restrictive parenting factors (rules and attitudes about alcohol) were moderators investigated in this study. All moderators, except parental attitudes, were reported by the adolescent. Due to skewness of the data (see Table 6.1), all moderators were transformed into dummies (0/1 variables) on basis of median split and were used to compute interaction variables (cf. Spoth et al., 2006).

Self-control measures the ability to control responses, to interrupt undesired behavioral tendencies and refrain from acting on them. The measure is the shorter version of the original measure developed by Tangney et al. (2004). It consists of 13 items (alpha = .74) that were rated on a 5-point scale, ranging from 1 '*not at all like me*' to 5 '*very much like me'*. For example, "I have trouble saying no" and "I do certain things that are bad for me, if they are fun". Items were reversely scored, higher scores indicate more self-control. The sample was divided into 0 = 'high self-control' and 1 = 'low self-control' based on the median score.

Rules about alcohol use reflect the degree of rule-setting behavior by the parents experienced by the adolescent (Van der Vorst et al., 2005). Items included "I am allowed to have one glass of alcohol when my parents are at home", "I am allowed to drink several glasses of alcohol when my parents are not home" and "I am allowed to drink alcohol when I am at a party with my friends." It consisted of the mean of ten items (alpha = .90) rated on a 5-point scale from 1 *'never'* to 5 *'always'* reversely scored, i.e. higher scores indicate more rule-setting behavior. The median split was used to distinct strict parents and lenient parents (scored as '0' and '1' respectively) as perceived by the adolescent.

Attitudes about alcohol use measure the degree to which the parent finds it acceptable (1 = not at all acceptable to 5 = very acceptable) for a 12/13-year old adolescent to drink alcohol in various situations (Brody et al., 1999; Van der Vorst et al., 2006). Originally it contained seven items, in this study we added one item (drink alcohol on a Saturday evening with parents; alpha = .79). Responses were dichotomized, so that parents with strict and lenient attitudes (scored as '0' and '1' respectively) could be distinguished.

6.2.7 Statistical analyses

Data were analyzed in accordance with the intent-to-treat principle. All analyses were conducted with Stata/SE version 9.2. At follow-up, 13.8% of the data were missing, mainly due to students changing schools. Missing data were handled by regressing imputation as implemented in Stata while using rules and attitudes about alcohol, alcohol use of both the students and their parents at baseline and age, gender, and level of education (lower *vs* higher secondary education) as predictors of outcome.

The randomization had resulted in a slightly uneven distribution across the active conditions compared with the control condition in terms of age, gender, and level of education. Therefore, all subsequent analyses were conducted with these variables as covariates to control for any possible bias stemming from the imbalance.

The cluster effect (introduced in the data since students were 'nested' in classes) was handled data-analytically by getting robust variance-related estimates based on the first-order Taylor-series linearization method, using Stata's procedures for design-based analyses. We corrected for the cluster effects at class-level, for the interventions were carried out in classes. To test moderation effects, interaction variables were computed between the moderator and the intervention dummies (did not vs did receive the intervention). Furthermore, multiple logistic regression was used to analyze the main and moderation effects. Post estimation linear combination calculations, as implemented in Stata, were used to be able to interpret the significant moderation effects.

6.2.8 Participants

A total of 3,490 students were asked to participate in the study. Of these, 122 students did not participate due to the refusal of their parents, or because they were absent from school the day the questionnaire was administered. This resulted in a response rate of 97% (N = 3,368) at baseline. It was required to include students who did not meet the criteria for weekly drinking at baseline, and were therefore 'at risk' to become manifest as new cases of (heavy) drinking at follow-up. Therefore we excluded 431 students (12.7%) who already were weekly drinkers at baseline (n = 306), or who responded inconsistently on the quantity and frequency items measuring weekly drinking (n = 125). This resulted in a total of 2,937 students and 81% of their parents eligible for analyses. Of this group, a total of 2,533 students (86.2%) and 63.3% of their parents stayed in the program and completed the follow-up assessment after 34 months. Intention-to-treat analyses were based on 2,937 students not manifesting weekly drinking at baseline and 2,381 parents.

6.2.9 Characteristics of the sample at baseline

The total student sample had a mean age of 12.66 (SD = 0.49), consisting of 51% boys, and 40% in lower secondary education (Table 6.1). Most students reported not having any religion (59.5%). An extensive description of the sample at baseline for each condition can be found in Chapter 2. Of all participating parents, most were female (81%) and between the age of 35 and 49 (90%). More than one third of the parents had been into secondary education (38%), 34% in vocational education and 27% in pre-university or university.

Table 6.1 *Descriptive Statistics of Demographic and Moderating Variables and Alcohol Use*

	%			
Demographic variables				
Religion				
No religion	59.5			
Catholic	22.5			
Protestant	13.6			
Islamic	4.4			
Gender				
Boy	51.0			
Level of education				
Low	40.1			
Alcohol use				
Weekly drinkers	53.8			
Heavy weekly drinkers	21.2			
Moderating variables	Mean	SD	Skewness	Kurtosis
Self-control (1-5)	3.65	0.50	-0.28	0.15
Rules about alcohol (1-5)	4.64	0.46	-2.04	6.06
Attitude about alcohol (1-5)	4.59	0.50	-2.48	10.77

SD = standard deviation.

6.3 Results

6.3.1 Onset of weekly drinking

Tables 6.2, 6.3 and 6.4 depict the main and interaction effects of intervention conditions with self-control and rules and attitudes about alcohol use respectively on the onset of weekly drinking.

Self-control in adolescents moderated the effect of the combined intervention on onset of weekly drinking ($OR_{interaction}$ =0.62; 95% CI 0.40 – 0.96, p=0.04). Post estimation calculations showed that the effect of the combined intervention on weekly drinking was significant among adolescents with low self-control (OR=0.52; 95% CI 0.36 – 0.75, p=0.00),

and not significant among adolescents with high self-control (OR=0.84; 95% CI 0.56 – 1.27, p=0.42). Thus, the combined intervention is only effective in adolescents with low self-control and not in adolescents with high self-control at baseline (Figure 6.1). No moderation effects of the student and parent interventions separately were found.

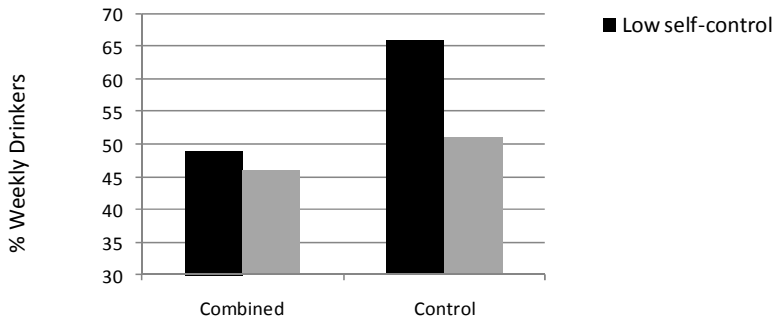

Figure 6.1. Percentages (unadjusted) of Weekly Drinkers with Low and High Self-control in the Combined and Control Condition

Rules about alcohol moderated the effect of the combined intervention on the onset of weekly drinking ($OR_{interaction}$ =0.63; 95% CI 0.41 – 0.98, p=0.04). Post estimation calculations showed that the effect of the combined intervention on weekly drinking was significant among adolescents reporting that their parents had lenient rules about alcohol use (OR=0.63; 95% CI 0.41 – 0.98, p=0.00), and not significant among adolescents reporting to have strict parents (OR=0.84; 95% CI 0.59 – 1.19, p=0.32). Thus, the combined intervention is effective in adolescents with lenient parents and not in adolescents with strict parents regarding alcohol use (Figure 6.2). No moderation effects of the student and parent interventions separately were found.

Parental attitudes did not moderate the effect of any of the intervention conditions on the onset of weekly drinking.

Table 6.2 *Interaction Effects between Intervention Conditions and Self-control on the Onset of Weekly Drinking while controlling for Age, Gender and Level of Education*

	OR	95% CI
Main effects		
Age	1.33	1.13-1.55
Gender (1=boy)	0.93	0.78-1.11
Level of education (1=low)	1.17	0.95-1.45
Parent intervention	1.00	0.65-1.54
Student intervention	1.02	0.69-1.51
Combined intervention	0.84	0.56-1.27
Self-control (1=low)	1.77	1.30-2.43
Interaction effects		
Parent intervention x self-control	0.70	0.42-1.17
Student intervention x self-control	0.69	0.46-1.05
Combined intervention x self-control	0.62	0.40-0.96

OR = Odds Ratio, CI = Confidence Interval.

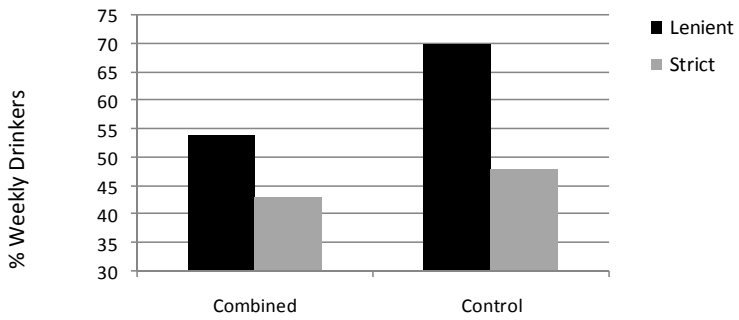

Figure 6.2. Percentages (unadjusted) of Weekly Drinkers with Lenient and Strict Parents in the Combined and Control Condition

Table 6.3 *Interaction Effects between Intervention Conditions and Rules about Alcohol on the Onset of Weekly Drinking while controlling for Age, Gender and Level of Education*

	OR	95% CI
Main effects		
Age	1.37	1.17-1.61
Gender (1=boy)	0.93	0.78-1.11
Level of education (1=low)	1.20	0.97-1.48
Parent intervention	1.00	0.65-1.54
Student intervention	1.01	0.72-1.44
Combined intervention	1.01	0.71-1.44
Rules about alcohol (1=lenient)	2.50	1.79-3.48
Interaction effects		
Parent intervention x rules	0.67	0.44-1.01
Student intervention x rules	0.72	0.46-1.13
Combined intervention x rules	0.63	0.41-0.98

OR = Odds Ratio, CI = Confidence Interval.

Table 6.4 *Interaction Effects between Intervention Conditions and Attitude about Alcohol on the Onset of Weekly Drinking while controlling for Age, Gender and Level of Education*

	OR	95% CI
Main effects		
Age	1.38	1.16-1.64
Gender (1=boy)	0.95	0.79-1.15
Level of education (1=low)	1.18	0.94-1.47
Parent intervention	0.76	0.57-1.41
Student intervention	0.74	0.59-1.34
Combined intervention	0.57	0.52-1.19
Attitude about alcohol (1=lenient)	1.20	0.56-1.23
Interaction effects		
Parent intervention x attitude	1.18	0.68-2.06
Student intervention x attitude	1.19	0.71-2.02
Combined intervention x attitude	1.37	0.83-2.26

OR = Odds Ratio, CI = Confidence Interval.

6.3.2 Onset of heavy weekly drinking

In addition to the direct effect of the combined intervention on the onset of heavy weekly drinking, no moderation effect of any of the intervention conditions were found. Thus, the effects of the interventions on the onset of heavy weekly drinking did not differ according to the level of self-control, perceived rule-setting and parental attitudes at baseline.

6.3.3 Additional analysis

In order to be able to detect those subgroups of adolescents that respond most favorably to the combined intervention (a low level of self-control and low restrictive rules about alcohol), we performed logistic regression analyses with level of education, age, gender and religion (religion vs. no religion) at baseline as predictors, and level of self-control (low vs. high) and rules about alcohol (low vs. high) as measures of outcome while controlling for the cluster effect.

Being Islamic religion as opposed to having no religion reduced the chance of having a low self-control (OR=0.47; 95% CI 0.31-0.69, p=.000), while being at a lower level of education (OR=1.99; 95% CI 1.64-2.43, p=.000) significantly increased the likelihood of having low self-control (Table 6.5).

Being Islamic had the only significant correlation with the level of rule setting in parents. Adolescents of Islamic religion (as opposed to no religion) have a lower risk of reporting low levels of restrictive parenting than adolescents reporting to have no religion (OR=0.17; 95% CI 0.09-0.30, p=.000).

Logistic regression analysis performed on adolescents reporting both low self-control and low restrictive rule setting (25% of the total sample) showed that, again, level of education and religion were significant correlates of having low self-control and low restrictive parents. That is, adolescents in low education (OR=1.61; 95% CI 1.31-1.97, p=.000) are more likely and those of Islamic religion (OR=0.16; 95% CI 0.08-0.35, p=.000) are less likely to have low self-control and to live with low restrictive parents.

Table 6.5 *Logistic Regression of Self-Control and Rules about Alcohol predicted by Demographic Factors at Baseline (Gender, Level of Education and Religion)*

	Self-control (1=low)		Rules about alcohol (1=low)		Self-control and rules about alcohol (1=low on both)	
	OR	p-value	OR	p-value	OR	p-value
Gender (1=boy)	1.16	.06	0.96	.64	1.12	.18
Age	1.05	.54	0.89	.18	0.93	.45
Level of education (1=low)	1.99	.00	1.15	.14	1.61	.00
Religion (reference = no religion)						
Catholic	0.89	.32	1.00	.99	0.91	.41
Protestant	.98	.91	0.83	.15	0.94	.69
Islamic	.47	.00	0.17	.00	0.16	.00

OR = Odds Ratio.

6.4 Discussion

In the present study, we examined the moderating effects of factors causing the effectiveness of an alcohol intervention targeting parents and adolescents simultaneously (PAS). Of all moderators investigated in this study (i.e. self-control, perceived rule-setting and parental attitudes about alcohol), both the initial level of self-control among adolescents and perceived rule-setting by parents moderated the effects of the combined intervention on the onset of weekly drinking. The present findings revealed that the combined intervention is most effective in delaying the onset of weekly drinking among those adolescents who reported to have low self-control and lenient parents at baseline. This underscores the relevance of targeting self-control in adolescents and restrictive parenting in their parents. No differential effects of the separate parent and student intervention on delaying the onset of (heavy) weekly drinking were found.

The finding that adolescents who perceive their parents to be more lenient towards alcohol use and who experience little behavioral control over their alcohol use benefit more from the combined intervention is in line with the risk moderation theory. According to the risk moderation hypothesis, high risk groups should benefit more from preventive alcohol interventions than moderate and low risk groups. We defined high risk groups in terms of the theoretically relevant target behaviors of the intervention, i.e. as

those scoring low on the target behaviors at baseline. As PAS targeted self-control and restrictive parenting, adolescents with low level of self-control and low restrictive parents were considered to be a high risk group. As expected, lower levels of the behaviors targeted by PAS, resulted in more favorable effects of the intervention. The importance of the moderating role of self-control has already been demonstrated by Brown et al. (1998) in a sample of adults participating in an abstinence-focused inpatient alcohol treatment program. As far as we know, no studies are available that tested the moderating role of rules parents set about alcohol, that were also a target of the alcohol intervention. This study is one of the first showing the relevance of testing moderation of intervention-induced factors of alcohol interventions targeting early adolescents and their parents. In addition to the effects of PAS in the general population (Chapter 2), the fact that the effects were more favorable among the groups scoring low on the intervention-induced behaviors at baseline underlines the appropriateness of choosing self-control and restrictive parenting as targets for the intervention.

We can only speculate about the lack of significance of moderation in respect of parental attitudes. Attitudes of parents about alcohol use, as opposed to specific rules about alcohol, represent not so much concrete behavior but a state of mind. It is possible that the moderating effect of the combined intervention on the onset of (heavy) weekly drinking was not found due to the, sometimes subconscious, cognitive acceptance of parents not to agree with early drinking. On the other hand, changing of their behavior by setting rules requires more effort from parents and results in those parents who were lenient showing the highest rates of change.

The separate parent and student intervention parts did not become effective in subgroups of adolescents, based on their initial level of self-control and restrictive parenting. This may indicate that the effects of the separate interventions were not strong enough to foster change in onset of drinking even when the pertinent behaviors were low at baseline. However, the results do suggest that the separate interventions tend to be more beneficial for adolescents with low self-control and those experiencing lenient parenting. But in order to significantly impact the onset of drinking in early adolescents, behaviors in both parents and adolescents should be targeted. These findings underscore the additional effect of the combined intervention over and above the separate interventions.

While a differential effect of the combined intervention was found for the onset of weekly drinking, this was not the case for the onset of heavy weekly drinking. That is, the effect of the combined intervention on the onset of heavy weekly drinking did not differ across the level of self-control and strict parenting. We can only speculate as to why the results are different for weekly and heavy weekly drinking. It is possible that self-control and parenting are mostly related to the onset of less severe drinking behavior, due to the high variance within adolescents and parents. In this way the intervention can induce high rates of change in a large number of adolescents scoring low on these behaviors. However, once adolescents drink heavily on a weekly basis, the lower variance of self-control and strictness of parents may explain the lack of differential effect in these subgroups. More research on the role of self-control and parenting in diverse drinking intensities could provide more insight into this issue.

Additional analyses showed that those at risk for having low self-control and low restrictive parents are particularly found among the lower educated and non-Islamic adolescents. This finding is in support of a previous study that demonstrated that adolescents from families with a lower socio-economic-status were more likely to have more lenient parents (Spijkerman et al., 2008). In addition, as drinking alcohol is not accepted in Islamic cultures and therefore alcohol use is not very common among immigrant groups (Monshouwer, Van Dorsselaer, Van Os, et al., 2003), parents of migrant youth are expected to be more strict about alcohol. On the other hand, adolescents in lower education are at higher risk for alcohol use (Salonna, Van Dijk, Geckova, et al., 2008). Thus, the level of education and religion of the adolescent are significant indicators for identifying the subgroups of adolescents who benefit most from the combined intervention.

6.4.1 Study limitations

The results of this study should be considered in the light of some limitations. First, the results are based on self-reported questionnaires. Although susceptible to social desirability biases, self-reports on alcohol use are found to be a valid method to assess alcohol use in adolescents (Del Boca and Darkes, 2003; Koning et al., 2010). Second, the findings are based on one follow-up measurement only. Examining differential effects of

the PAS intervention on alcohol use at later follow-ups may demonstrate the strength of the current results. Third, one should be careful in generalizing the findings to other countries with other drinking cultures. The Netherlands is considered to have a fairly lenient drinking culture, in which adolescents drink more frequently relative to other European countries (Hibell et al., 2009). Therefore, replication of this study in other countries is necessary in order to generalize these findings to counties with a stricter drinking culture. Fourth, although we managed to include the number of schools and participants that were needed to power the trial (see Chapter 2), only 25% of all schools that were approached actually participated. No data is available on whether the participating schools differ from the non-participating schools. This may affect the generalizability of our findings. Last, in this study we included education, age, gender and religion as predictors to detect the specific subgroups which the intervention may benefit the most. It should be noted however that, apart from these characteristics, other predictors could have been useful to include in the analyses, such as family situation and problematic behavior.

6.4.2 Implications

The present and previous results of the PAS intervention indicate the need for targeting adolescents as well as parents, over and above targeting either of them separately in a school-setting. It is suggested that the concurrent increase of self-control in adolescents and restrictive parenting in parents are behaviors that can be targeted effectively by alcohol interventions. Prevention workers and schools wanting to delay the onset of weekly drinking should be informed by the Netherlands Institute of Mental Health and Addiction about the importance of implementing the combined PAS intervention aimed at both students and their parents. Adolescents in lower levels of education and in non-Islamic school should be a specific target when implementing the PAS intervention. However, since no adverse effects were found in other groups of adolescents, PAS can be implemented in schools with adolescents from different religious and educational backgrounds. The present findings highlight the conclusion that the separate interventions should not be implemented. Even in cases where adolescents have high self-control and/ or parents have strict rules, the separate interventions are not shown to

be effective, thereby indicating that an increase in these behaviors only is not sufficient to foster change. Prevention workers should be kept updated about new insights and knowledge that are obtained in future.

7. Effects of a Parent and Student Intervention on Alcohol Use in Adolescents Four Years after Baseline; no evidence of catching up behavior

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Submitted for publication.

It is questioned whether the PAS prevention program is not only effective in delaying the onset of drinking in adolescents, but also the level of alcohol at the age adolescents' are allowed to buy alcohol in the Netherlands (16 years). In a cluster randomized trial, including 2,937 adolescents, the separate as well as the combined effects are investigated in comparison with a control group. In addition, it is questioned whether these effects are attributed to the delay in onset earlier in adolescence or to the development of skills (adolescents' self-control and parental rules about alcohol) due to the PAS intervention. Last, moderation analyses are carried out to test for differential effects among high risk groups. Outcome measures were the onset of heavy and the growth (slope) of weekend drinking measured at age 12 to 16 (5 waves). Results showed that only when parents and students are targeted simultaneously, the onset of heavy weekly drinking could be postponed and the growth of alcohol intensity could be attenuated. No effects of the separate parent and student intervention were found. In addition, with respect to the level of drinking at age 16, the combined intervention was effective in non-using adolescents at age thirteen and fourteen, whereas no effects were found on the intervention-induced factors. These findings implicate that the combined PAS intervention remained effective in delaying the onset of heavy weekly drinking in 16-year old students. In addition, the combined intervention also effectively attenuated the growth of alcohol use in adolescents up to age 16, most likely as a result of the delayed initiation earlier in adolescence. Implementation of the PAS intervention is suggested.

7.1 Introduction

Although declining, the rate of alcohol use among early adolescents in the Netherlands remains high. In 2010, 39% of the 14-year old adolescents drink on a monthly basis and this percentage increases to 71% at the age of 16 (Van Dorsselaer et al., 2010). Moreover, once adolescents have started to drink, they tend to drink high amounts of alcohol. The use of alcohol at an early age is associated with several (health) risks later in life (e.g. substance abuse; DeWit et al., 2000). Therefore, several attempts have been undertaken to postpone the onset of drinking until the age of 16, the legal buying age in the Netherlands. Studies have shown that prevention programs targeting adolescents as well as their parents demonstrate most promising findings (Smit et al., 2008; Spoth et al., 2008a; Turissi et al., 2009).

7.1.1 Prevention of Alcohol use in Students (PAS)

The present study reports findings from a randomized clinical trial of Prevention of Alcohol use in Students (PAS), a universal prevention program for adolescents (aged 12-15) and their parents. Previous reports showed that only when adolescents as well as their parents were targeted, the PAS program effectively postponed the onset of (heavy) weekly drinking at ten, 22 and 34 months after baseline (Chapter 2 and 5). The parent intervention motivated parents to set restrictive rules about alcohol (Van der Vorst et al., 2005; Yu, 2003), whereas the student intervention encouraged the development of healthy attitudes about alcohol and self-control (Kam et al., 2009; Pasch et al., 2009) in adolescents. Mediation analyses showed that the change in these theory-based factors indeed accounted for the effect of the PAS intervention (Chapter 3). Targeting parents or adolescents separately did not reveal any significant effects.

Moderation analyses revealed that these findings mostly apply to adolescents scoring low on the intervention-induced factors, i.e. self-control and rules about alcohol (Chapter 6), as well as to adolescents in a lower education level and those reporting more externalizing behavior (Chapter 4). Following these findings on the short- and long-term effectiveness and on mediation and moderation effects, it is important to examine the effect of PAS on the alcohol use of adolescents who have reached the legal buying age of 16, four years after baseline.

7.1.2 Long-term effects

Only until recently, Dutch parents were advised to learn their child to drink moderately by providing their child with alcohol at home under their supervision. In this way, it was believed that at the age of 16, these adolescents are more capable of dealing with alcohol responsibly. From this perspective, the PAS program in which parents were advised to prohibit the use of alcohol until at least 16 years may have the possible side effect that adolescents who turn 16 will catch up their drinking behavior. That is, according to this assumption, adolescents have not learned to drink responsibly and are therefore more likely to rapidly develop a pattern of irresponsible (excessive) drinking. The possibility of adolescents catching up their drinking behavior as a result of the PAS intervention makes it imperative to examine the effects of PAS in 16 year old adolescents.

On the other hand, there are reasons to believe that the previously obtained effects of the combined intervention sustain at the 4 year follow-up. First, fewer adolescents have started drinking before the age of 16 in the combined intervention compared to the control condition. Since an early age of onset is associated with stronger increases and higher amounts of alcohol use during middle and late adolescence (Behrendt et al., 2009b), it can be assumed that students in the combined intervention are likely to drink less alcohol at the age of 16, when they are allowed to drink alcohol by their parents. Second, adolescents in the combined intervention have developed a higher level of self-control, an important skill to resist peer pressure (Kam et al., 2009). In addition, the parents of these adolescents are more restrictive regarding alcohol use, a parenting practice that proves to be effective along the adolescent development (Koning et al., submitted). Therefore, it is likely that adolescents in the combined PAS intervention are more equipped to restrain their drinking, even when they are allowed to drink. The delay in onset as well as the development of relevant skills (self-control and strict parenting) may both increase the likelihood of finding long-term effects (Spoth et al., 2001) of the PAS intervention. In case long-term effects are found, it is interesting to see which one of these (delayed initiation or development of skills) is actually related to the effectiveness of PAS in 16 year old adolescents.

7.1.3 Differential effects

A previous study demonstrated more favorable effects of PAS for delaying the onset of heavy weekly drinking in high risk groups; adolescents in lower levels of education and those exhibiting externalizing behavior (Chapter 4). This finding was based on the second follow-up measurement, 22 months after baseline, when adolescents were 14 years of age. The differential effect of alcohol prevention programs may vary according to the time-interval between baseline and post-test. For example, Spoth et al. (2006) showed that the differential effects of a family-focused alcohol prevention program (ISFP) was more apparent on the short-term compared to the long-term. Therefore, it is likely that the previously obtained moderation effects of the PAS intervention, favoring adolescents in lower levels of education and those with externalizing behavior, may diminish over time. Insight into differential effects across subgroups might contribute to the development of group-specific programs so that the effectiveness of the intervention can be increased.

7.1.4 Outcomes of interest

Nearly all adolescents in the Netherlands have initiated drinking before the age of 16 (85%; Van Dorsselaer et al., 2010). Among these early adolescents (12 to 16 years), a small percentage (9.4%) is involved in high-risk drinking; using 10 or more glasses on a weekend day. Drinking a high quantity of alcohol is related to major health risks, mainly in adolescents who are young of age (Bava & Tapert, 2010). In previous reports we only examined the effects of PAS on the onset of (heavy) weekly drinking. Due to the high prevalence of drinking among Dutch adolescents aged 16, and the fact that PAS promoted the delay in onset until at least 16, we are now interested in the effects of PAS on heavy drinking outcome measures. Hence, in the current study the effects of the PAS intervention on the onset of heavy weekly drinking and the development of drinking intensity are taken into account.

7.1.5 The current study

The research questions in the current study are threefold. First, we tested whether the favorable effects of the PAS intervention on adolescents under the legal drinking age sustain at age 16. Second, it is investigated whether the effects of the PAS intervention differ across subgroups of adolescents groups (adolescents in lower levels of education and with externalizing behavior). Third, we examined whether the long term effects are a result of the delayed initiation of drinking or of the skills adolescents are equipped with due to the PAS intervention.

7.2 Method

7.2.1 Design and Procedure

From a list of Dutch high schools, 80 schools were randomly selected. An independent statistician assigned nineteen schools randomly to one of the four conditions: (1) parent intervention, (2) student intervention, (3) combined student-parent intervention, and (4) control condition (business as usual). Randomization was carried out centrally, using a blocked randomization scheme (block size 5) stratified by level of education, with the schools as units of randomization. Within each participating school, all first-year students participated in the intervention.

The baseline data were collected at the beginning of the first year in high school (September/October 2006), before any intervention was carried out, and again 10 (T1: 2007), 22 (T2: 2008), 34 (T3: 2009) and 50 (T4: 2010) months later. Adolescent data at T0 to T3 was collected by means of digital questionnaires administrated in the classroom by trained research assistants. Collection of the T4 data was originally not planned, and as most adolescents had left school by then, adolescents were asked at T3 whether they agreed to be contacted to participate in one more wave. Almost three quarter (70%) of the participating adolescents or their parents at T3 indicated to be willing to participate one more time and noted a telephone number. At T4, data was collected by means of interviews over the telephone administered by trained interviewers. Parents were sent a letter of consent at baseline and a letter that informed parents about the participation of

the school in the project and they were given the opportunity to refuse participation of their child (0.01% refusal). The trial protocol (NTR649) was approved by the Medical Ethical Committee.

7.2.2 Participants

Nineteen schools, including 3,490 adolescents were selected to participate in the study. Due to initial non-response (n = 122) and exclusion of adolescents who already drank weekly at baseline (n = 306) or who responded inconsistently on the quantity-frequency items (indicated 1 or higher drinks and zero on the number of days or vice versa) measuring weekly drinking (n = 125), 2,937 adolescents were eligible for analyses.

The final sample (N = 2,937) is characterized by an average age of 12.6 (SD = 0.49) at baseline, consisting of 51% boys and 40% in lower secondary vocational education. At baseline, the intervention conditions differed significantly from the control condition with respect to the number of males and low educated adolescents (Table 7.1).

Table 7.1. *Characteristics of the Students at Baseline and Follow-up*

	Conditions							
Variable	Parent intervention *n* = 689		Student intervention *n* = 771		Combined intervention *n* = 698		Control condition *n* = 779	
	T0	*T4*	*T0*	*T4*	*T0*	*T4*	*T0*	*T4*
Male (%)	46.1	47.5	47.7	47.3	59.5	47.4	50.6 [a]	48.7
Age, years: mean (s.d.)	12.6 (0.46)	16.2 (0.46)	12.7 (0.49)	16.2 (0.46)	12.7 (0.50)	16.2 (0.44)	12.7 (0.50) [a]	16.2 (0.45)
Low level of education[b], *n* (%)	198 (28.7)	NA	307 (39.9)	NA	230 (32.9)	NA	443 (56.9) [a]	NA

[a] Significantly different from the active interventions at $p<0.05$
[b] Lower secondary vocational education
NA: information about the level of education at T4 is not available, as many students had left school.

Loss to Follow-Up

A total of 2,771 students (94.3%) at T1, 2,570 students (87.5%) at T2, 2,533 students (86.2%) at T3 and 1064 students (36%) at T4 stayed in the program and completed the follow-up assessment after ten, 22, 34 and 50 months respectively. The different

approach at T4 resulted in the relatively low response rate as only participating students at T3 were asked for further participation. Although 70% of the students at T3 agreed upon participation, only 36% of them also participated at baseline.

Attrition analyses on demographic variables and alcohol use indicated that participating adolescents at T4 were more likely to be younger (t = 5.81, p = 0.00) and more often in higher education (*Chi-square*=43.99(*df*=1), p = 0.00). No differences between non-responding and responding adolescents at T4 were found with respect to the average number of alcohol beverages per week at baseline (t = 0.96, p = 0.34). In addition, attrition was related to conditions (*Chi-square*=41.48(*df*=3), p = 0.00). Participating adolescents at T4 most likely belonged to the student intervention or control condition (30.1 and 30.0% respectively), whereas only 21.8% belonged to the parent intervention and 18.1% to the combined intervention conditions.

7.2.3 Interventions

Parent intervention. This intervention targets parental rules for their children's alcohol use. The intervention was modelled after a Swedish intervention, The Örebro Prevention program (for details, see Koutakis et al., 2008). The intervention was carried out at the first parents meeting at the beginning of each school year (September/October 2006 and 2007), in which also other school-related topics were discussed. The intervention consisted of three elements: 1) a brief presentation (20 minutes), 2) consensus building among a shared set of rules among parents of children of the same class, and 3) an information leaflet with a summary of the presentation and the outcome of the class meeting was sent to the parents' home addresses.

Student intervention. The student intervention is the renewed digital alcohol module of the Dutch prevention program ´The Healthy School and Drugs´ (HSD). The alcohol module targets the students' abilities to develop a healthy attitude towards alcohol use and to train their refusal-skills. After receiving training, the teachers conducted the intervention (four lessons) in all first year classes in March/April 2007. A booster session was provided one year later in March/April 2008.

Combined intervention. Schools in this condition carried out both the parent and student intervention.

Control condition. Schools in the control condition were contracted not to start any alcohol-related interventions throughout the study period. However, because basic information about alcohol use is part of the standard curriculum in the Netherlands, schools were allowed to continue this practice (business-as-usual).

For a more detailed description of the interventions see Chapter 2.

7.2.4 Outcome measures

Different from previous papers, in the current study we are mainly interested in heavy drinking in adolescents, as these youngsters have reached the accepted drinking age in the Netherlands. The primary and secondary outcomes of interest were the onset of heavy drinking and the development of drinking intensity, respectively.

Drinking intensity in adolescents was measured by asking how many glasses of alcohol the student usually drank on a weekend day (Engels, Knibbe & Drop, 1999). In accordance with the definition of heavy drinking in adults, separate outcome variables for boys and girls were used to define heavy drinking. Boys drinking at least 6 glasses and girls drinking at least 5 glasses every week were considered to be heavy drinkers. The scale was recoded into a dichotomous variable with 0 = 'no heavy weekly drinking' and 1 = 'heavy weekly drinking.'

Self-report measures of adolescents on alcohol use have proven to be reliable and valid methods to measure alcohol use (DelBoca & Darkes, 2003; Koning et al., 2010).

7.2.5 Moderators and mechanisms

Level of education and externalizing behavior were moderators investigated in this study. Both moderators were transformed into dummies (0/1 variables), so that interaction variables could be computed. Level of education of the adolescent was divided into low-level education (lower secondary education) and high-level education (general and pre-university secondary education).

Externalizing behavior was measured by using the conduct problems subscale of the Strength and Difficulties Questionnaire (SDQ; Goodman et al., 1998), translated by Van Widenfelt et al., (2003). The scale consisted of the sum of five items rated on a 3-point

scale from 0 '*not true'* to 2 '*certainly true'*. No standardized cut-off points are available in the Netherlands. Therefore, in accordance with results of two national Dutch studies (Van Dorsseleaer et al., 2007; 2010), a cut-off point of > 3 was used to indicate adolescents exhibiting externalizing behavior (scored as '1'; prevalence 15%). Although in most cases no high reliability is found, this scale is widely used in scientific research (i.e. Stadler et al., 2010; Havas et al., 2010).

The mechanisms that were changed by the intervention and mediated the effect on the onset of weekly drinking are self-control and rules about alcohol use reported by the adolescent, and attitudes about alcohol reported by parents. (Chapter 3). At the fourth follow-up no parental data was collected so parental attitudes about alcohol could not be included in the current analysis. Self-control and rules about alcohol in adolescents were measured at baseline (control variable) and T4 (outcome measure).

Self-control reflects the ability to control responses, to interrupt undesired behavioral tendencies and refrain from acting on them. The measure is the shorter version of the original measure developed and tested by Tangney et al., (2004). It consists of 13 items (Cronbach's alpha = .74) that were rated on a 5-point scale, ranging from 1 '*not at all like me*' to 5 '*very much like me.'* Example items are "I have trouble saying no" and "I do certain things that are bad for me, if they are fun." Items were reversely scored; higher scores indicated higher self-control.

Rules about alcohol use reflect the degree of rule-setting behavior by the parents experienced by the adolescents (Van der Vorst et al., 2005). Items included "I am allowed to have one glass of alcohol when my parents are at home", "I am allowed to drink several glasses of alcohol when my parents are not home" and "I am allowed to drink alcohol on a party with my friends." It consisted of the mean of ten items (alpha = .90) rated on a 5-point scale from 1 '*never'* to 5 *'always'* reversely scored, i.e. higher scores indicated more rule-setting behavior.

7.2.6 Analyses

Data were analyzed (Mplus 6.0) in accordance with the intent-to-treat principle. Intention-to-treat analysis requires that all participants are analyzed in the condition to which they were randomized. No missing data appeared on confounders due to zero non-

response on item-level for the adolescents. Missing data on the dependent variables were handled by using full information maximum likelihood (FIML: Muthen & Muthen, 2007). FIML has been recommended as a state of the art technique for analyzing datasets that include missing data (Schafer & Graham, 2002). The randomization resulted in a slightly uneven distribution across the active conditions compared to the control condition in terms of gender and level of education. Therefore, all subsequent analyses were conducted with these variables as covariates to control for any possible bias stemming from the imbalance.

Non-independence of observations due to cluster sampling —students were 'nested' in classes—was taken into account by obtaining standard errors as implemented in Mplus. The cluster effect was corrected for at class-level, as the interventions were carried out in classes and previous reports demonstrated higher intra-class correlations at the class level compared to the school level (Chapter 3).

First, to examine the effect of the interventions on the onset of heavy drinking we compared each of the experimental conditions with the control condition. Odds ratios of heavy drinking were obtained using logistic regression of the binary outcome on the treatment dummies (experimental versus control), while adjusting for the confounders and the nested data. This model informs us about the incidence of heavy alcohol use at wave 4 compared to baseline. To examine the effect of the interventions on the development of drinking intensity first, a two-factor latent growth model was used, including intercept and slope. The intercept represents information in the sample concerning the mean and variance of the adolescent alcohol level at T0. Factor loading for the intercept was fixed at zero as only adolescents who did not drink on a weekly basis at baseline were selected. The second factor, the slope has a mean and variance of the total sample, and describes the individuals' change of alcohol use over time. The residual variances of the outcome variables were estimated and allowed to be different across time. Next, path modeling was used to estimate the influence of the intervention conditions on adolescents' growth trajectories, with the control condition as reference group. This model was tested among adolescents in lower versus higher levels of education and those with and without externalizing problem behavior so differential effects among subgroups of adolescents could be tested. Model fit was assessed using

the Chi-square goodness of fit test, comparative fit index (CFI; Bentler, 1990) and root mean square error of approximation (RMSEA; Browne and Cudeck, 1993).

Second, it was investigated whether the effect of the intervention was a result of a delayed initiation or of the development of better skills (strict parents and higher self-control). Linear regression analyses was carried out to examine the effect of the intervention conditions on drinking intensity at T4 for adolescents who reported to drink at least one glass on average on a weekly basis and those how reported to drink no alcohol on a weekly basis at T1, T2 and T3, while controlling for alcohol use at the previous time point and covariates. In addition, the parent and adolescent behaviors (rules about alcohol and self-control at T4) that were changed by the intervention were regressed on the intervention conditions, while controlling for these behaviors at baseline.

7.3 Results

7.3.1 Effects on onset of heavy drinking

Table 7.2 presents the results of the effects of the interventions on the onset of heavy alcohol use at follow-up (T4). At follow-up, significantly fewer students in the combined intervention had started to drink heavily compared to the control condition (OR = 0.48, p = 0.02). No significant effects of either the parent intervention or student intervention were found on the onset of heavy weekly drinking. So, when parents and adolescents are targeted simultaneously, the proportion of heavy drinking adolescents is reduced.

Table 7.2. *The Effect of the Intervention Conditions on the Onset of Heavy Weekly Drinking (incidence rates between brackets)*

Intervention conditions	ICC	OR	P
	0.092		
Parent intervention (19.1%)		1.05	0.87
Student intervention (15.2%)		0.79	0.42
Combined intervention (9.7%)		0.48	0.02
Reference = control condition (19.6%)			

Note: ICC = intra class correlation, OR = Odds Ratio. Adjusted for confounders (age, level of education and sex) and cluster effect.

7.3.2 Effects on drinking intensity

Table 7.3 depicts the effects of the intervention dummies (reference = control condition) on the development of drinking intensity. With respect to the effect of the active intervention conditions on the growth of drinking intensity, the model showed a moderate model fit ($\chi^2(22) = 91$, $p < .001$; CFI= .84; RMSEA= .03). The combined intervention was significantly predicting the slope of drinking intensity ($\beta = -.14$, $p = .01$). That is, among adolescents in the combined intervention, the intensity of drinking increased less strongly compared to adolescents in the control condition. No effects of the separate parent and student intervention on the development of drinking intensity were found. Only when parents and adolescents are targeted simultaneously, the growth in the drinking intensity among adolescents can be reduced.

Table 7.3. *The Effect of the Intervention Conditions on the Development (slope) of Drinking Intensity*

	Drinking intensity	
Intervention conditions	β	p-value
Parent intervention	-.02	0.70
Student intervention	-.08	0.17
Combined intervention	-.14	0.01

β = standardized regression coefficient.

7.3.3 Moderation of level of education and externalizing behavior

The differential effect of the PAS intervention on the drinking intensity was analyzed. Level of education (low *vs* high) of the adolescent moderated the effect of the combined intervention on the slope of the drinking intensity. Multi-group analysis showed that the effect of the combined intervention on the level of alcohol use was significant among low-educated adolescents (β = -.26, p < .00), and not among high-educated adolescents (β = -.08, p = .24). This finding indicates that only lower educated adolescents benefit from the combined intervention, but adolescents in higher education do not. No moderation effects of the parent and student intervention were found.

Externalizing behavior moderated the effect of the parent and student intervention on the slope of alcohol use, with favorable effects in adolescents with externalizing behavior (parent intervention: β = -.28, p = .02; student intervention: β = -.28, p = .04) and a lack of effect among adolescents without externalizing behavior (parent intervention: β = .02, p = .81; student intervention: β = -.04, p = .51). The combined intervention was more effective among adolescents exhibiting externalizing behavior (β = -.35, p = .01) compared to those without externalizing behavior (β = -.14, p = .02).

7.3.4 Effects among non-drinking and drinking adolescents

Table 7.4 depicts the results of the effects of the intervention conditions among adolescents who drink and who do not drink alcohol in weekends. Adolescents in the combined intervention who did not drink alcohol at T2 and T3 had a significant lower drinking intensity at T4 compared to non-drinking adolescents in the control condition (T2: β = -0.10, p = .02; T3: β = -0.11, p = .01). In addition, the parent intervention significantly predicted a lower level of alcohol use at T4 in drinking adolescents at T2 (β = -0.15, p = 0.02). No effect of the student intervention was found.

Table 7.4 *Predicting Drinking Intensity at T4 for Non-Weekend Drinkers and Weekend Drinkers at T1, T2 and T3 (ß's and p-values)*

	T1		T2		T3	
	Non-weekend drinkers	Weekend drinkers (10%)	Non-weekend drinkers	Weekend drinkers (22%)	Non-weekend drinkers	Weekend drinkers (42%)
Parent intervention	-0.03 (.55)	-0.13 (.18)	-0.01 (.82)	-0.15 (.02)	0.05 (.36)	-0.06 (.30)
Student intervention	-0.06 (.17)	0.13 (.29)	-0.08 (.08)	0.05 (.51)	-0.02 (.69)	-0.03 (.69)
Combined intervention	-0.09 (.02)	-0.09 (.25)	-0.11 (.01)	-0.03 (.81)	-0.03 (.59)	-0.08 (.15)

Note. Gender, level of education and alcohol use at previous time points were included as control variables.

7.3.5 Effects on mechanisms

No significant effects of the intervention conditions on either the level of rule setting by parents, or the level of self-control in adolescents at T4 were found.

7.4 Discussion

This study showed that the combined PAS intervention, targeting students as well as t heir parents, effectively delayed heavy drinking and attenuated the increase in alcohol use among adolescents up to 16 years, 50 months past baseline. In line with previous reports on the effectiveness of PAS, no effects of the separate parent or student intervention were found. Thus, this brief universal prevention program that targets adolescents and their parents effectively delayed and diminished heavy drinking among Dutch adolescents who have reached the legal buying age. Findings suggest that the PAS program achieved its effectiveness on the drinking intensity due to the delayed initiation earlier in adolescence. In addition, the intervention showed to be more effective among high risk groups.

The current findings elaborate on former studies on the effectiveness of PAS by showing that PAS was able to delay the onset of heavy drinking and to decrease the growth in alcohol use in adolescents when these youngsters as well as their parents were targeted. The previous studies already showed that adolescents, who themselves as well

as their parents received the intervention, were less likely to start drinking heavily on a weekly basis compared to their peers who received no intervention (Chapter 2 and 5). The sustained effects of the combined intervention only, demonstrate the coherence of the combined PAS intervention throughout adolescence.

The current study rules out the 'catching up' hypothesis that assumes that by prohibiting the use of alcohol under the age of 16, adolescents will drink even more once they have reached this age. On the contrary, the findings imply that it is due to this delayed initiation that adolescents drink less alcohol when they have reached the accepted age for drinking in the Netherlands. By delaying the onset of drinking up to age fifteen, the combined PAS intervention promotes drinking in a responsible manner once adolescents start drinking alcohol at age 16. It is important to not that no effect of the intervention program on the mechanisms that were induced by PAS were found. Taking together, these findings indicate that with respect to the level of drinking at age 16, the postponement of alcohol initiation seems of more importance than the skills that students and parents developed due to the PAS program. Interventions aiming at curbing adolescents' alcohol use, should therefore, for the benefit of public health, focus on delaying the onset of alcohol use until at least fifteen years (McGue & Iacono, 2008). Yet, in order to delay alcohol initiation among early adolescents, previous studies have shown that adolescents' self-control and parental rules about alcohol are imperative factors to take into consideration (e.g. Chapter 3; Pasch et al., 2009; Van der Vorst et al., 2005). Thus, increase of self-control among adolescents and restrictive rule setting in parents are relevant factors for interventions to target in order to delay the onset of drinking. Not only is postponing the onset of drinking beneficial for adolescents' health and development (Behrendt, Wittchen, Hofler, Lieb, & Beesdo, 2009b; Dewit et al., 2000), it also seems to decrease the likelihood of irresponsible drinking later on.

The current findings underscore the presence of risk moderation; high risk groups, i.e. adolescents in lower education and those with externalized behavior, have more favorable effects of the PAS intervention. This finding is in line with the moderation effects that were reported for the second wave (Chapter 4). Most likely, adolescents at higher risk for using high rates of alcohol and their parents respond more positive to the prevention program as this had more salience for them (Spoth et al., 2008b). Interestingly, all intervention conditions are effective in curbing adolescents' drinking

when adolescents exhibit externalized behavior at baseline. At the second wave, this effect was not reported by Verdurmen et al. (Chapter 4). As no other significant effects are found for the separate parts of the PAS intervention, implementation of the combined PAS intervention is recommended.

In sum, the combined PAS intervention is effective in delaying and curbing heavy alcohol use in adolescents up to age 16, most likely due to the delayed initiation as a result of the combined PAS intervention earlier in adolescence. High risk adolescents, i.e. those in lower levels of education and with externalizing behavior, benefit the most from the PAS intervention.

7.4.1 Limitations

The current findings should be considered in light of some limitations. First, the results are based on self-reported data by adolescents. Although multiple informant data is preferred, self-reported measures have found to be a reliable method (DelBoca & Darkes, 2003; Koning et al., 2010), and often used in studies including large sample sizes. Second, attrition rate at the fifth wave was relatively high; more than half of the initial participants did not complete the fourth post-test data collection. A high attrition rate may result in certain types of individuals remaining in the study; thereby limiting the generalizability of study findings. Third, different survey methods were used; digital questionnaires at waves 1 to 4 and interview by telephone at wave 5. Data obtained by these methods may not be similar; in an adult sample the use of alcohol was more easily reported in the self-reported questionnaires compared to telephone interviews (Kraus and Augustin, 2001). Yet, as the whole sample was exposed to the same method, we can still run within-sample difference analysis and therefore draw valid conclusions about the effectiveness of the PAS intervention.

7.4.2 Implications

The current study underlines the importance of delaying the onset of drinking in early adolescents. By delaying the onset of drinking until 15 years, the rate of alcohol use two years later can be reduced, and therefore lowers the risk of developing a substance abuse

pattern later in life (e.g. Behrendt et al., 2009a). It is suggested that the Dutch government encourages the implementation of evidence-based prevention programs, where the PAS program has proven to be an effective tool to accomplish this.

Part II

Alcohol-specific parenting: a closer look

8. Alcohol-specific socialization practices and alcohol use in Dutch early adolescents.

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The present study examined the associations of alcohol-specific socialization practices and heavy parental drinking with alcohol use in early adolescents. Cross-sectional nationwide survey data from 2 725 parent-adolescent (mean age = 12.16) dyads were used to conduct logistic regression analyses. Onset of alcohol use as well as infrequent and regular drinking were associated with tolerant rules and attitudes as reported by adolescents, and by tolerant attitudes as reported by parents. In contrast to former studies including middle and late adolescents, parental alcohol use was not found to be associated with early adolescent alcohol use, nor did parental alcohol use influence the impact of parental rules. Restrictive alcohol-specific socialization was, independent of parental alcohol use, related to absence of (regular) early adolescent drinking. Thus, this study demonstrated that in early adolescence alcohol-specific parenting is more important for adolescent drinking than parental alcohol use.

8.1 Introduction

The early onset of alcohol use and the increase in the amount of drinking in young Dutch adolescents have led to an increasing interest in the role of parents in drinking behavior of early adolescents, as parents are among the most important socializing agents in the early adolescents' lives (Duncan et al., 2006; Marshal & Chassin, 2000; Wood, Read, Mitchell, & Brand, 2004). In addition to that, in the Netherlands parents appear to be the ones who, in most cases, provide their offspring with their first drink, thus underlining the importance of parents for early adolescent drinking (Monshouwer et al., 2004). Understanding better parents' importance for adolescent drinking is thus warranted, as initiation at a young age is not only eliciting progress into more regular drinking (Monshouwer, Smit, De Zwart, Spruit, & Van Ameijden, 2003; Takakura & Wake, 2003), it also is a strong predictor of alcohol abuse and alcohol-related problems later in life (DeWit et al., 2000; Hingson et al., 2006). The current study examines the relation between parental alcohol-specific socialization practices (rules and attitudes about alcohol) and parental drinking on the one hand, and alcohol use in their children on the other. Most earlier research on the relation of parental behavior with juvenile drinking focused on middle and late adolescents. However, almost half of the Dutch adolescents have already drunk alcohol at age 12 or younger (Monshouwer et al., 2004; Poelen, Scholte, Engels, Boomsma, & Willemsen, 2005). Due to their young age, the early drinking phase they find themselves in, and the larger influence of parents at that age, it is possible that different parental factors are related with the (onset of) alcohol use of early adolescents compared to middle and late adolescents. Thus, in contrast to earlier studies who analysed this relationship primarily in middle and late adolescents, in the present study we will focus on drinking in early adolescents.

8.1.1 Parental alcohol use and alcohol-specific socialization

Previous research on the impact of parents on drinking behavior of their offspring reveals the importance of two main mechanisms; first, parental alcohol use as modelling behavior for their offspring (Duncan et al., 2006; Hellandsjo Bu, Watten, Foxcroft,

Ingebrigtsen, & Relling, 2002; Jackson et al., 1997) and second, the way parents raise their children with respect to alcohol – i.e. alcohol-specific socialization - (Engels & Van der Vorst, 2003; Spijkerman, van den Eijnden, & Huiberts, 2008; Van der Vorst, et al., 2006; Yu, 2003).

Parental alcohol use is shown to be related to the onset of early drinking (Jackson et al., 1997; Duncan et al. (2006). Parental drinking is also related to less engagement in alcohol-specific socialization practices (Ennett, et al., 2001; Van der Vorst et al., 2006) and thus may influence the alcohol consumption in their offspring both directly and indirectly. Moreover, parental drinking might moderate the relation between alcohol-specific socialization practices and adolescents' drinking: (heavy) parental drinking might reduce the effect of parental alcohol-specific socialization. Although Van der Vorst et al. (2005) did not find such a moderation effect in a sample of middle and late adolescents, for early adolescents it may be different since the impact of parental behavior might be stronger when their offspring is younger. Therefore, it is important to examine how parental drinking moderates the relations between alcohol-specific socialization and early adolescents' drinking.

In studying the role of parents in early adolescents' drinking by alcohol-specific parenting (rules and attitudes about alcohol) and parental alcohol use, it is important to take the following two aspects into account. First, results of studies that did report on the influence of parenting behavior on early adolescents were based on adolescent reports only. Research has shown that it is essential to include both adolescent and parent reports when assessing alcohol use and alcohol-specific socialization practices for two reasons; (1) by including multiple informants a more complete picture of alcohol use and its related factors can be constructed and (2) cross-reports of parents and adolescents on alcohol use and alcohol-specific socialization practices do not correspond completely (Engels et al., 2007; Smith, Miller, Kroll, Simmons, & Gallen, 1999; Van der Vorst et al., 2005; Williams, McDermitt, Bertrand, & Davis, 2003). Second, to our knowledge no studies that involved early adolescents have included rule setting, attitudes about alcohol and parental alcohol use concurrently. For instance, studies looked at either parental alcohol use (Duncan et al., 2006), rules (Van der Vorst et al., 2007) or attitudes about alcohol (Ary, Tildesley, Hops, & Andrews, 1993; Brody, Ge, Katz, & Arias, 2000), or involved a combination of two (Johnson, Greenlund, Webber, & Berenson, 1997; Van der

Vorst et al., 2005, Yu, 2003). As all three parental behaviors have independently shown their significant associations with adolescent alcohol use, it is relevant to examine the comparative roles of these behaviors in early adolescents' drinking. Only Van der Vorst et al. (2006) included all three parental behaviors, but in this study a relatively small sample was used, with middle and late adolescents only. They demonstrated that rules and attitudes about alcohol were related to less drinking in middle and late adolescents, whereas parental drinking was not found to be significantly related. It is interesting to examine what the comparative influence of these variables is in a sample of early adolescents.

8.1.2 The current study

The aim of the current study is to examine the association of alcohol-specific socialization practices and parental alcohol use with onset of alcohol use in their early adolescent children, using a representative sample of 2 725 parent-adolescent dyads. By doing so, we will take parental alcohol use into account, both as a correlate and as a moderator of alcohol-specific socialization of their children. Based on findings concerning middle and late adolescents, we expect to find that restrictive alcohol-specific socialization (restrictive rules and attitudes) lowers the risk of being engaged in drinking alcohol of their children. We furthermore assume that heavy parental alcohol use is associated with higher alcohol use in their offspring. In addition, we hypothesize that restrictive alcohol-specific socialization has stronger effects on alcohol use among adolescents if heavy parental alcohol use is absent. This study is one of the first involving a large representative sample of early adolescents and their parents to test hypotheses on the role of alcohol-specific socialization and parental alcohol use in early adolescent drinking.

8.2 Method

8.2.1 Procedure

The current study is part of a longitudinal randomized clinical trial called 'Prevention of Alcohol Use in Students'. Current analyses are based on results from the baseline-

measurement, before any interventions have been carried out. A randomly selected sample of 80 secondary schools in the Netherlands were invited (by letter) to participate in the study. A total of 19 secondary schools from different regions in the Netherlands were willing to participate with a total of 3 490 first year adolescents. Participating schools did not differ from non-participating schools. The study both involved the adolescents and one of their parents. Home addresses and phone numbers were obtained through the schools.

Adolescent data were collected in their classrooms in September/October 2006 through questionnaires, available on a secured web site. Research assistants were trained to administer the survey. Non-response was low, only 3% of the adolescents were not included due to illness, change of schools or refusal of parents. This resulted in a sample of 3 368 adolescents.

Parental data were collected by written questionnaires, also in September/October 2006. Questionnaires for parents were sent to their home address in a school envelope along with a letter of consent. Parents could decide themselves who filled in and returned the questionnaire. In this letter, parents were informed about the project and were given the opportunity to refuse participation of their child (0.01% actual refusal). The questionnaire was followed by a written reminder three weeks later to parents who had not yet responded. Another two weeks later, non-responding parents were called by phone. These procedures resulted in an 80% response rate.

8.2.2 Participants

Adolescents (N = 3 368) from 19 secondary schools and 2 840 parents completed the questionnaires. Parents who returned the questionnaire had adolescents who have drunk less often alcohol in their life ($t = 2.79$, $p < .01$), were more often into higher education ($t = -3.14$, $p < .01$) and were older of age ($t = 4.14$, $p < .001$) than adolescents of non-responding parents. In addition, adolescents of non-responding parents more often reported to come from a single-parent family (27.2% versus 18.0%, Chi=27.9, df=1, p=0.00) and from families wherein the parents had a non-paid job (mother: 33.7% versus 22.1%, Chi=38.62, df=1, p=0.00; father: 13.8% versus 8.1%, Chi=20.77, df=1, p=0.00). With

respect to rules and attitudes about alcohol no differences between adolescents of non-responding and responding parents were found.

This study focused on those families with both adolescent and parent reports; analyses were conducted on 2 725 parent-child dyads. The adolescent sample had a mean age of 12.16 (SD = 0.5; range = 11 to 14), including 48% girls and 52% boys, 41% in lower secondary vocational education (low education) and 59% in higher general secondary and pre-university education (high education). Almost one fifth of the adolescents (18%) reported to live in a single-parent family, which is in accordance with the national percentage of 16%. (CBS, 2008). Of all parents (81% mothers) 90% were in the age range of 35-49 years and 15% were defined as heavy drinkers. Almost a quarter of their partners (23.7%) were considered to be a heavy drinker. Parents and their offspring were matched by an identification code which was printed on the parent questionnaire and was used as log-in for the digital questionnaire of the adolescent.

8.2.3 Measures

Alcohol use

Alcohol use in adolescents was measured by asking the adolescent how often they had drunk alcohol (minimum of one glass) in their life (life-time prevalence), indicated from zero to 40 or more on a 14-point scale (O'Malley, Bachman, & Johnston, 1983). In order to select the adolescents who had drunk alcohol at least once in their life, we recoded their responses as 0 = ‘non-user’ and 1 = ‘user’.

Drinking patterns were measured by using the Quantity-Frequency measure. The Quantity-Frequency measure represented the average weekly alcohol use. Frequency was measured by asking the number of days the adolescent usually drank on weekdays (Monday to Thursday) and weekend days (Friday to Sunday) (Engels & Knibbe, 2000). Quantity was measured by asking how many glasses of alcohol the adolescent usually drinks on a weekday and weekend day (Engels et al., 1999). Quantity-Frequency was computed by calculating the products of the number of days and the number of glasses and then summing the two products for weekdays and weekend days. The quantity-frequency of 1 or more indicated that the respondent drinks at least one day a week, one

glass of alcohol. Since this measure represents weekly drinking, we used this measure to divide the group of adolescents being defined as users into two drinking patterns: infrequent and regular users. Infrequent users were adolescents defined as users who do not drink weekly (i.e. a quantity-frequency of 0). Regular drinkers were adolescents with a life-time prevalence and a quantity-frequency of one (i.e. drinking one glass each week) or higher. Ninety-eight adolescents responded inconsistently on the two items assessing number of days and consumed glasses of alcohol (in week or weekend). Therefore they are omitted in analyses concerning drinking patterns.

Best friends' use was measured by the same Quantity-Frequency measure, which was answered by the adolescent.

Parental alcohol use was also measured using the quantity-frequency scale. Heavy parental drinking was defined as drinking more than 11 glasses per week. This variable was dummy coded with 0 = 'no heavy drinker' and 1 = 'heavy drinker'. As proxy reports of partners on their alcohol use appeared to be quite reliable (Connors & Maisto, 2003; Graham & Jackson, 1993), the respondents (81% mothers) answered the questions about her/himself as well as their partners.

Alcohol-specific socialization practices

All items about alcohol-specific socialization practices are based on self reports of adolescents and their parents. The parents had to answer the same questions as their children, with minor alterations in sentence structure. The measures are described below.

Rules about alcohol measured the degree of rule-setting regarding alcohol use of the adolescent. This scale was developed by Van der Vorst et al. (2005). Items included "I am allowed to have one glass of alcohol when my parents are at home", "I am allowed to drink several glasses of alcohol when my parents are not home" and "I am allowed to drink alcohol at a party with my friends." It consisted of the mean of ten items rated on a 5-point scale from 1 '*never*' to 5 '*always*' reversely scored, i.e. higher scores indicate more rule-setting behavior. Cronbach´s alphas were .90 for adolescents and .81 for parents.

Attitudes about alcohol reflect the degree of acceptability of 12-year old adolescents consuming alcohol in various situations. This is measured differently in adolescents and

parents. Adolescents were asked to what degree they thought a person of the same age should be able to drink alcohol in various situations. These ten items correspond to the items assessing rules about alcohol, so it was possible to compare what they thought, with what they were actually allowed to drink. Cronbach's alpha was .90. Attitudes about alcohol of parents was measured by the degree to which the parent found it acceptable (1 = *not at all acceptable* to 5 = *very acceptable*) for a 12 to 13-year-old to drink alcohol in various situations (for example a family party, at home, and at a friend's place). The instrument is based on a Dutch translation of the 'Alcohol Use Norms Scale' of (Brody et al., 1999) which was used in earlier research in the Netherlands (Van der Vorst et al., 2006). Originally it contained seven items, in this study we added one item (drink alcohol on a Saturday evening with parents). Responses were rescaled, so that higher scores indicated more restrictive attitudes. Cronbach's alpha was .79.

8.2.4 Strategy for Analyses

Descriptive analyses were conducted on control variables (gender, level of education and age) to describe the non-users versus users, and the infrequent and the regular users. Subsequently, independent t-tests were carried out to examine whether these variables were significantly different between the groups. Pearson correlations were used to calculate associations between alcohol use (adolescent and parents), and rules and attitudes based on adolescent and parent reports.

Further, multiple logistic regression analyses of rules and attitudes and parental alcohol use on using versus non-using adolescents were performed for adolescent and parent reports. Similar analyses were done for the infrequent and regular users in comparison with non-users. Adolescents who are at higher risk for alcohol use are, amongst others, boys (Epstein, Botvin, & Diaz, 1998), lower educated (Kostelecky, 2005), older of age (Van der Vorst et al., 2005), from single parent families (Ledoux, Miller, Choquet, & Plant, 2002) and have drinking peers (Scholte et al., 2008). Therefore, we controlled for gender, educational level, family situation (single- or two-parent family), age and best friends' drinking.

We tested whether there were interaction effects between heavy parental drinking (Passaro, Noss, Savitz, & Little, 1997) and rules and attitudes on adolescent alcohol use

(life time prevalence, infrequent and regular use). All variables were centred before the interaction terms of rules and attitudes were computed (Aiken & West, 1991). The previously described set of control variables was also included in the model. Because of the large sample size, a 99% confidence-interval was used in order to increase the reliability of our findings.

8.3 Results

8.3.1 Alcohol use in early adolescents

Descriptive analyses showed that 1 157 adolescents (42.5%) had never drunk alcohol and 1 567 adolescents (57.5%) had drunk alcohol at least once. Out of these, 1070 adolescents (67.3%) did not drink on a weekly basis (infrequent users), while 399 adolescents (25.6%) are regular (i.e. weekly) users. The non-users were more often female, were in higher education, had parents and peers who drank less alcohol in comparison with the users, both infrequent and regular users. In general, non-using adolescents and their parents were more likely to report restrictive rules and attitudes than infrequent and regular users. The same result was found for infrequent users; they reported more restrictive rules and attitudes than regular users (see Table 8.1).

Table 8.2 depicts the correlations between rules and attitudes reported by adolescents and their parents, and their alcohol use. Rules and attitudes about alcohol reported by adolescents were more strongly related to adolescent drinking than reported by parents. Correspondence between adolescents and parent reports on rules and attitudes was significant but quite low (ranging between .18, $p < .001$ to .24, $p < .001$).

Table 8.1 *Percentages, Means and Standard deviations of Model variables for Non-users and Users, and Infrequent and Regular Users*

Variable	Total *N* = 2 725	Total		Users	
		Non-users *n* = 1 157	Users *n* = 1 567	Infrequent *n* = 1 070	Regular *n* = 399
Gender					
Male (%)	52.1	43.6	58.5	57.9	58.1
Education level					
Low (%)	40.9	33.0	46.7	43.5	52.1
Family situation					
Single-parent (%)	18.0	15.2	20.0	18.5	23.3
Age	12.16 (0.49)	12.11 (0.47)	12.19 (0.51)[a]	12.16 (0.50)[a]	12.25 (0.52)[a,b]
Alcohol use peer	0.81 (5.55)	0.23 (3.01)	1.31 (6.96)[a]	0.42 (4.95)	3.44 (10.1)[a]
Alcohol use parent					
Mother	5.37 (7.15)	4.62 (5.99)	5.93 (7.85)[a]	5.94 (7.79)[a]	5.92 (8.23)[a]
Father	8.18 (9.26)	7.46 (8.63)	8.73 (9.68)[a]	8.53 (8.84)[a]	9.06 (10.47)[a]
Adolescents' report					
Rules about alcohol	4.56 (0.53)	4.76 (0.38)	4.42 (0.58)[a]	4.59 (0.44)[a]	3.98 (0.68)[a,b]
Attitudes about alcohol	4.52 (0.55)	4.68 (0.44)	4.41 (0.59)[a]	4.54 (0.50)[a]	4.09 (0.63)[a,b]
Parental report					
Rules about alcohol	4.88 (0.26)	4.91 (0.23)	4.86 (0.27)[a]	4.89 (0.25)[a]	4.78 (0.33)[a,b]
Attitudes about alcohol	4.66 (0.39)	4.75 (0.34)	4.59 (0.42)[a]	4.64 (0.39)[a]	4.50 (0.42)[a,b]

[a] Significantly different from non-users at $p < .01$, [b] Significantly different from infrequent users at $p < .01$.

Table 8.2 *Correlations between Alcohol-Specific Socialization Practices, Alcohol Use, Gender, Education, Family Situation, Age and Alcohol Use Peer based on Adolescent and Parent reports*

Variables	1	2	3	4	5	6	7	8	9	10	11
1. Gender	-										
2. Education	.05	-									
3. Family situation	-.01	-.07	-								
4. Age	-.07	-.25	.08	-							
5. Alcohol use peer	-.07	-.14	.05	.10	-						
6. Rules A	.01	.08	-.03	-.07	-.33	-					
7. Attitudes A	-.01	.01	-.03	-.05	-.29	.63	-				
8. Rules P	.01	.05	-.03	-.06	-.11	.24	.16	-			
9. Attitudes P	-.01	.06	-.01	-.04	-.11	.25	.18	.59	-		
10. Alcohol use A	-.17	-.15	..09	.14	.42	-.45	-.38	-.19	-.22	-	
11. Alcohol use M	.01	.12	-.02	-.05	.01	-.05	-.04	-.05	-.05	.06	-
12. Alcohol use F	.01	.09	.02	.02	-.01	-.04	-.03	-.04	-.02	.03	.28

Note. Reports on alcohol use are based on respectively adolescent and parent self-reports. A = adolescent, P = parent, M = mother, F = father. r = .06 is significant at p <.01. r ≥ .07 is significant at p < .001.

8.3.2 Alcohol use (non-user vs. user)

Alcohol-specific socialization and parental drinking

Based on reports of adolescents, we found restrictive parental rules and attitudes about alcohol to be negatively associated with the use of alcohol in adolescents (Table 8.3): adolescents who had drunk alcohol experienced less restrictive rules and negative attitudes about alcohol. In contrast, parental alcohol use was not of significant importance.

According to parent reports, restrictive attitudes about alcohol were the strongest correlates of non-alcohol use in their offspring (Table 8.3). No significant multivariate

relations were found for rules about alcohol and parental alcohol use on the one hand, and alcohol use in their children on the other.

The models accounted for 20% of the explained variance based on adolescent reports and 13% on parent reports.

Table 8.3. *Multiple Logistic Regression Analyses of Alcohol-Specific Socialization Practices and Parental Alcohol Use on Adolescents' Alcohol Use (N = 2 725, reference group is non-users)*

	Adolescent model		Parent model	
Variable	OR	99% CI	OR	99% CI
Gender	0.55***	0.43-0.71	0.55***	0.44-0.71
Education	0.87**	0.81-0.92	0.86***	0.81-0.92
Family situation	1.35	0.88-2.08	1.37	0.89-2.08
Age	1.05	0.80-1.39	1.03	0.79-1.34
Alcohol use peer	1.07	0.97-1.18	1.22***	1.06-1.41
Rules about alcohol	0.29***	0.20-0.43	1.30	0.70-2.41
Attitudes about alcohol	0.61***	0.44-0.86	0.34***	0.22-0.51
Parental alcohol use				
Mother	1.32	0.93-1.87	1.34	0.95-1.89
Father	1.15	0.82-1.61	1.21	0.87-1.68
R^2	.20		.13	

Note. Adolescent/parent model refers to inclusion of control variables reported by adolescents, alcohol-specific socialization variables reported by respectively adolescents and parents and parental alcohol use reported by parents.
**p < .01, ***p < .001.

Interaction effects between parental drinking and alcohol-specific socialization practices

In general, parental alcohol specific socialization appeared to be insensitive to parental drinking, i.e. its effects on alcohol consumption of their offspring were found in drinking and non-drinking parents alike. Our results with regard to adolescent and parent reports showed no significant interaction effects between parental alcohol use and alcohol specific socialization on adolescent alcohol use.

8.3.3 Drinking patterns

Alcohol-specific socialization and parental drinking

Based on adolescent reports, both restrictive rules and attitudes were related to non-use as compared to infrequent drinking (Table 8.4). According to parent reports only liberal attitudes about alcohol were associated with infrequent drinking in their children. The model accounted for 9% of the explained variance based on adolescent reports and 8% on parent reports.

For regular drinking compared to non-using adolescents, results showed that based on adolescent reports, restrictive rules and attitudes about alcohol were related to non-use in adolescents. According to parents however, only restrictive attitudes was related to non-alcohol use. Parental alcohol use was not related to regular drinking in adolescents (Table 8.4). The model accounted for 52% of the explained variance based on adolescent reports and 35% on parent reports.

Interaction effects between parental drinking and alcohol-specific socialization practices

Our results with regard to adolescent reports showed only one small significant interaction effect between maternal alcohol use and attitudes on adolescent regular alcohol use ($B = -.07$, $SE = .03$, $p < .01$). Inspection of the interaction effect revealed that the relation between having liberal attitudes and alcohol use in adolescents was stronger if the mother drank alcohol heavily.

Table 8.4. *Multiple Logistic Regression Analyses of Alcohol-Specific Socialization Practices and Parental Alcohol Use on Adolescents' Drinking Patterns (reference group is non-users).*

	Adolescent model				Parent model			
	Infrequent users		Regular users		Infrequent users		Regular users	
Variable	OR	CI	OR	CI	OR	CI	OR	CI
Gender	0.57	0.44-0.74	0.45	0.28-0.73	0.57	0.44-0.73	0.54	0.35-0.81
Education	0.87	0.82-0.94	0.82	0.73-0.92	0.88	0.82-0.94	0.83	0.75-0.93
Family situation	1.33	0.84-2.08	1.49	0.69-3.17	1.34	0.86-2.10	1.31	0.67-2.54
Age	0.89	0.74-1.32	1.22	0.79-2.02	0.98	0.74-1.30	1.22	0.79-1.15
Alcohol use peer	1.01	0.96-1.05	1.36	1.10-1.68	1.02	0.97-1.06	2.02	1.60-2.55
Rules about alcohol	0.53	0.36-0.78	0.09	0.05-0.16	1.54	0.79-2.99	0.91	0.38-2.18
Attitudes about alcohol	0.67	0.48-0.94	0.52	0.32-0.85	0.42	0.27-0.64	0.19	0.11-0.37
Heavy parental alcohol use								
Mother	1.33	0.92-1.91	1.34	0.69-2.58	1.39	0.97-1.99	1.13	0.63-2.03
Father	1.19	0.84-1.70	0.92	0.48-1.76	1.21	0.86-1.72	1.16	0.66-2.04
R^2	.09		.52		.08		.35	

Note. Adolescent/parent model refers to inclusion of control variables reported by adolescents, alcohol-specific socialization variables reported by respectively adolescents and parents and parental alcohol use reported by parents.

8.4 Discussion

The current study demonstrated that drinking alcohol in early adolescents is strongly related to alcohol-specific socialization of their parents, while parental alcohol use appears to be of little importance at that early stage of drinking. In early adolescents, restrictive alcohol-specific socialization was shown to be associated with a decreased risk of life-time alcohol use and decreased risk of regular drinking. In particular setting

restrictive rules appeared to be an effective alcohol-specific socialization practice. Though it was expected that in early adolescence parents may be more important for their child's drinking, our results revealed that heavy parental alcohol use was not of importance for onset of (regular) drinking in early adolescents.

In accordance with previous research (Spijkerman et al., 2008; Van der Vorst et al., 2006, 2007; Yu, 2003), the use of restrictive rule setting by parents is a powerful correlate of not getting involved in (regular) drinking in their children. However, these studies found restrictive rules to be most effective in preventing the onset of drinking, and less effective in preventing more regular drinking in middle and late adolescents (Van der Vorst et al., 2006, 2007). Thus, the relation of restrictive rules with regular drinking appears to be stronger for early than for middle and late adolescents. This may be explained by the decreasing influence of parents as adolescents grow older (Duncan et al., 2006).

In addition, because parents are the primary socializing agents during early adolescence (Duncan et al., 2006), one might expect that early adolescents are also more influenced by their parents' alcohol use. In contrast to that assumption, we found no significant associations of heavy parental alcohol use with either onset or infrequent and regular drinking in their children. This is remarkable, as previous research has found parental alcohol use to be related strongly with drinking in adolescents (Duncan et al., 2006; Jackson et al., 1997; Spijkerman et al., 2008; Yu, 2003). Two of these studies, Jackson et al. (1997) and Spijkerman et al. (2008), also took alcohol-specific socialization practices into consideration. After controlling for socialization practises, parental alcohol drinking still remained of importance. However, again these studies concerned samples of middle and late adolescents. The relation between parental alcohol use and the onset of drinking in adolescents appears to be far less pronounced in early adolescence. A possible explanation for this fact may be found in the findings of Huba & Bentler (1980). These authors found middle and late adolescents to be much more aware of their parents' alcohol use compared to early adolescents. Thus, early adolescents might not see the alcohol consumption of their parents adequately and as a result might be less influenced by it. In addition, for early adolescents – as young as 12 years of age – parents might not be a viable role model in this respect, as the distance between parental adult roles and early adolescence might be too large for such modeling effects to occur. More research

into the influence of parental drinking on youngsters in different stages of adolescence seems needed.

The role of heavy parental alcohol use was further explored by testing possible interactions between heavy parental drinking (maternal and paternal) and alcohol-specific parenting (rules and attitudes). No interaction effect was found for parental drinking and restrictive rules (Van der Vorst et al., 2005). That is, the relation between parental rules and adolescent alcohol use appeared not to be different for drinking and non drinking parents. Restrictive rules set by parents were, independently of their own alcohol use, related to absence of their children's drinking. With regards to attitudes about alcohol, one interaction effect was found between maternal alcohol use and attitudes. The association between restrictive attitudes about alcohol and no alcohol use by the adolescent was less strong when the mother drank alcohol heavily, according to the adolescent. Unlike rules reported by adolescents, that reflect a behavioral aspect, attitudes reflect an internal aspect in the development of the adolescent. It is possible that adolescents with positive attitudes about alcohol were more aware of maternal drinking, which strengthens the relation between positive attitudes and onset of (frequent) drinking.

Interesting are the findings for the differential reports of adolescents and their parents. Parental rules about alcohol reported by adolescents appeared to be highly correlated with onset of (regular) drinking, whereas parental reports showed no significant relation at all. It might be possible that due to the low variance of rules reported by parents (as they all reported to be highly restrictive), a significant relation with adolescent drinking can hardly be reached. Hence, parents reported more restrictive rule setting than their offspring did. Van der Vorst et al. (2005) demonstrated that parents and adolescents experience rule setting differently and that parents think they communicate about alcohol more often then their offspring think. Thus, it is important to acknowledge the different views of parents and their offspring on alcohol-specific parenting. Research is needed to examine the way parents enforce their rules and how adolescents assimilate this.

This study also has some limitations. Due to the cross-sectional design, we were not able to establish causal relations between alcohol-specific parenting and early adolescent drinking. Longitudinal studies could provide more insight into the long-term associations

between alcohol-specific parenting and the development of adolescent drinking. More information on the development of alcohol-specific socialization over time is necessary. Results from this study can be used as inducement for future research. Secondly, although we have included both adolescent and parent reports, we have not fully taken the influence of peers into consideration. We only controlled for the alcohol use of the best friend. However, by including more peer factors, preferably based on peer reports, it would be possible to examine their relation with parental factors. Future longitudinal research on the development of alcohol use in adolescence should therefore take not only parental but also peer influences into account. Taken these limitations into consideration, future longitudinal research on the influence of alcohol-specific socialization and peer related factors on adolescent alcohol use is required to give insight into these issues.

The present study indicates the significance of parental behavior (especially using restrictive rules) for the alcohol use in their offspring. It is essential that parents are made aware of their influence and the necessity to impose restrictive rules, whether they themselves drink alcohol or not. By doing so, parents appear to be able to postpone their adolescent's drinking onset. This is important, since an early age of onset is found to be a risk factor for several alcohol-related problems later in life.

9. Don't worry! Parental worries, alcohol-specific parenting and adolescents' drinking

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The present study first examined the bi-directional relations between parental worries and adolescents' alcohol use. Next, the mediating role of alcohol-specific parenting behavior (rule setting, frequency and quality of communication) was studied. Finally, this mediating model was examined in both parents with a low and a high self-efficacy regarding their parenting behavior. Longitudinal data including four waves from 703 parent-adolescent (M age = 12.2 years, SD = 0.5) dyads were used to conduct cross-lagged and mediation models in Mplus.

Results showed that parental worries at age 13 and 14 predicted more alcohol use among adolescents one year later, whereas adolescents' drinking did not predict more worries in parents. In addition, parental worries predicted less restrictive rule setting and a lower quality of communication. Less restrictive rule setting accounted for the effect of parental worries on adolescent alcohol use among parents with a low self-efficacy.

In conclusion, this study demonstrated that in parents who do not feel confident about their own parenting behavior, worries about the whereabouts of their child result in higher drinking rates due to the fact that worries result in less restrictive parenting. These findings implicate that alcohol interventions should provide parents with effective leads to tackle the drinking behavior in their children (e.g. strict rules about alcohol), thereby also increasing their level of self-confidence.

9.1 Introduction

Worrying about your child at some point in their development is inherent to parenthood. Particularly during adolescence, it is quite common for parents to be concerned about the whereabouts of their adolescent child, as he/she spends more time outside the supervision of the parent. In addition, during adolescence youngsters are more involved in risky behaviors, such as drinking alcohol and skipping school. At the age of 15 most Dutch adolescents have started drinking alcohol of whom 52% drink on a weekly basis (Monshouwer et al., 2008). Due to the heightened media attention for the risks involved in early adolescent drinking during the last years, Dutch parents may have become even more aware of these risks. As a result, parental worries about the potential alcohol use of their children may have increased, as well as their insecurity about their own role in preventing it. More than before, they may ask themselves what they can or should do to prevent early drinking in their offspring. In this study we question how parental worries about their children's behavior relate to their offspring's' drinking, and how these worries affect their parenting practices with respect to alcohol use.

As to our knowledge, little is known about the potential relation between parental worries and adolescent risk behavior, such as alcohol use. It is unknown whether alcohol use of the child promotes parental worrying or whether such worrying instigates more future alcohol use. Although Bogenschneider, Wu, Raffaelli, & Tsay (1998b) have demonstrated in their cross-sectional study that parental worries are related to a stronger awareness about their offspring's alcohol use, they did not reveal whether these worries were based upon the actual drinking of their children. In this regard, using adolescent reported drinking is important, because it is known that parents tend to underestimate the alcohol use in their offspring (Engels et al., 2007). Therefore, in the present study we will look at the relation between worries reported by parents and alcohol use reported by the adolescent. Insight into the relation between parental worries and adolescents' alcohol use may provide us with knowledge on the role of parental worries that can be used in alcohol prevention programs targeting parents.

A second relevant issue to get a broader understanding of is what parents do with their worries in terms of parenting. For instance, Bogenschneider et al. (1998b) examined

parental worrying in relation to adolescents' drinking and showed that worried parents are more likely to discuss the risks of engaging in alcohol use with their child. Thus, worrying seems to drive parents to talk more frequently about the risks involved in drinking, probably in an attempt to change their children's behavior. On the other hand, general studies on worrying showed that worriers have problems in generating and implementing solutions (Borkovec, Robinson, Pruzinsky, & DePree, 1983). According to these studies, worried parents would have problems with translating their worries into behavior. Thus, whereas the study by Bogenschneider et al. revealed parents who are worried about alcohol use seem to communicate their worries more frequently with their child, the literature on general worries suggests that worrying about the behavior of their children seems to prevent parents from acting.

In addition to the role of parental worries in the subsequent parenting behavior, the confidence parents have in their own parenting behavior may also be of importance. That is, concerns and doubts about the effectiveness of certain parenting behaviors is one of the factors preventing parents from undertaking action (Stöber & Joormann, 2001). Furthermore, feeling unconfident about the ability to influence the child's behavior result in less effective parenting (Jones & Prinz, 2005), that is reflected for instance by less general limit setting (Jones & Prinz, 2005) as well as less alcohol-specific rule setting (Järvinen & Östergaard, 2009). In turn, having confidence in the effectiveness of one's own alcohol-specific socialization practices seems to have a preventive impact on the alcohol use of the adolescent (Van der Vorst et al., 2005). It is likely that parents who worry about their child's behavior also feel less confident and have more concerns and doubts about their ability to influence the behavior of their child. So, it is assumed that worrying seems to stop parents from undertaking action, particularly when they feel uncertain about the effectiveness of their parenting behavior.

It is important to discuss these findings in the light of what is known about effective parenting with regard to alcohol use. Mainly trough restrictive parenting, parents can exert influence on the drinking of their children. There is a large body of evidence showing that restrictive rule setting helps to prevent adolescents from early (onset of) alcohol use (Chapter 3; Jackson et al., 1997; Van der Vorst et al., 2005; Yu, 2003). With respect to parental communication about alcohol, the associations with adolescent alcohol use are less obvious. Most studies showed that communicating more frequently

about alcohol use is related to enhanced levels of alcohol use (Ennett et al., 2001a; Spijkerman et al., 2008; Van den Eijnden et al., 2011; Van der Vorst, et al., 2005; Van der Vorst, Burk & Engels, 2010). A second aspect of parent-child communication which has been studied with respect to adolescents' alcohol use is the quality of communication. Overall, studies showed a consistent pattern, with lower rates of substance use (Den Exter-Blokland, Engels, Harakeh, Hale III, & Meeus, 2009; Otten, Harakeh, Vermulst, Van den Eijnden, & Engels, 2007; Spijkerman et al., 2008) related to a better quality of parent-child, although, until now, no longitudinal evidence for this association has been found regarding alcohol use (Van den Eijnden et al., 2011). Thus, a current state of the art suggests that an effective way to deal with alcohol-specific worries would be to have qualitative good parent-child conversations about alcohol use instead of very frequent (less qualitative) conversations. However, in case these alcohol conversations are of a high quality, the frequency of the conversation does not seem to matter (Chapter 10). Thus, in addition to setting strict rules regarding alcohol use, it would be wise for parents to have qualitative good conversations about drinking with their adolescent children (Chapter 10).

Worried parents seem to communicate more frequently about alcohol use than non-worried parents (Bogenschneider et al., 1998b). However, we do not have any information about the impact of parental worries on the quality of these conversations and on the degree of restrictive rule setting. Therefore, it is interesting to examine what worried parents actually do in terms of the frequency and quality of communication and rules about alcohol use.

In sum, this study addresses the bi-directional relationship between parental worries about the child's behavior and the actual drinking behavior of the child over time (12 to 16 years). To this end, a new measure of parental worries about the child's whereabouts is developed and included in this study. Second, we examine to what extent parental worries influence the frequency and quality of communication and rule setting about alcohol use. Based on earlier research, we expect that parents who worry more about the behavior of their child, communicate more frequently about alcohol use, but not in a more qualitative context. Moreover, since worrying seems to stop parents from undertaking action, we expect that worried parents do not set more restrictive rules regarding alcohol use than non-worried parents. Finally, these expectations are

hypothesized to be more pronounced in parents with a low self-efficacy than in parents with a high self-efficacy. A longitudinal sample of 703 early adolescents and their parents, followed over a period of three years is used to test the expectations.

9.2 Method

9.2.1 Design and procedure

The current study is part of a larger alcohol prevention randomized trial (see Chapter 2), wherein 19 schools were randomly selected and assigned to either of the three intervention conditions, or the control condition. For the purpose of this study, only adolescents and parents who were assigned to the control condition were included in current analyses. The baseline data (T1) were collected at the beginning of the first year in high school (September/October 2006). The first (T2) follow-up was 10 months later in May/June 2007, again in May/June 2008 (T3) and May/June 2009 (T4). Trained research assistants administered digital questionnaires to adolescents in the classroom. Questionnaires for parents and letters for consent were sent to their home addresses. Non-responding parents were reminded after three weeks by a letter and after another two weeks by phone.

9.2.3 Participants

Nine schools, including 935 adolescents were selected to participate in the study. Due to initial non-response (n = 29) in adolescents and parents (n = 184), 722 parent-child dyads participated in the first wave. Another 19 adolescents were omitted in the analyses due to unreliable data on the alcohol items. This resulted in 703 parent-child dyads eligible for analyses.

The adolescent sample had a mean age of 12.19 (SD = 0.5), including 53% boys and 47% girls, 60% in lower secondary vocational education (low education) and 40% in higher general secondary and pre-university education (high education). Most of the responding parents were female (81.9%). Most mothers (79%) and fathers (74.0%) had low educational levels (only vocational training).

9.2.4 Attrition analyses

A total of 843 adolescents (95.5%) at T2, 783 adolescents (88.7%) at T3 and 764 adolescents (86.5%) at T4, stayed in the program and completed the follow-up assessments after ten, 22 and 34 months respectively. Also a total of 618 parents at T2 (87.9%), 532 parents at T3 (75.7%) and 496 parents (66.7%) at T4 participated in the study.

Attrition analyses on demographic variables and alcohol use indicated that responding adolescents at T1, T3 and T4 were more likely to be younger, were more often in lower education and drank a lower average number of alcohol beverages per week at baseline. At T2, no significant differences were found on these characteristics. At all other follow-up measurements, participating parents had more often been into lower education, whereas no differences were found between responding and non-responding parents with respect to their rules and attitudes about alcohol and own alcohol use.

9.2.5 Measures

Except for parental worries and self-efficacy, all measures were reported by the adolescent. Parental self-efficacy was measured at baseline only; all other variables were measured at four waves.

Adolescents' alcohol use was measured by using a Quantity-Frequency measure. The Quantity-Frequency measure represented the average weekly alcohol use. Frequency was measured by asking the number of days the adolescent usually drank on weekdays (Monday to Thursday) and weekend days (Friday to Sunday) (Engels & Knibbe, 2000). Quantity was measured by asking how many glasses of alcohol the adolescent usually drinks on a weekday and weekend day (Engels, Knibbe, & Drop, 1999). Quantity-Frequency was computed by calculating the products of the number of days and the number of glasses and then summing the two products for week days and weekend days. The quantity-frequency of 1 or more indicated that the respondent drinks at least one day a week, one glass of alcohol.

Parental worries were measured by asking parents how often they worry about whether their child (1) will start using drugs, (2) will not complete school, (3) will get in

contact with the police, (4) will hang around with 'bad' peers and (5) whether parents worry about the (future) alcohol use of their child. Parents responded on a 5-point scale from 1 *'never'* to 5 *'very often'*. The mean score on these items describe the level of parental worries about the child with higher scores indicating more parental worries. The inter-item correlations between the five items measuring parental worries show moderate correlations ranging from .42 to .65 (Table 9.1). A one-factor confirmatory factor analysis (CFA) indicated high factor loadings on all worry items across all waves (ranging from 0.77 to 0.98). The model showed moderate to acceptable model fit (χ^2 (df)= 833 (163); CFI= .86; RMSEA=.07). In addition, the reliability of the scale across four waves shows high reliability (α = .84 to .87), which indicated that the set of worry items measured a single latent construct, i.e. parental worries about their child's behavior.

Rules about alcohol measured the degree of rule-setting of parents regarding alcohol use of the adolescent as perceived by the adolescent (Van der Vorst et al., 2005). Items included "I am allowed to have one glass of alcohol when my parents are at home", "I am allowed to drink several glasses of alcohol when my parents are not home" and "I am allowed to drink alcohol at a party with my friends." It consisted of the mean of ten items rated on a 5-point scale from 1 '*never'* to 5 '*always'* reversely scored, i.e. higher scores indicate more rule-setting behavior. Cronbach´s alphas ranged from .81 to .94.

Frequency of communication about alcohol referred to how often in the past 12 months the adolescent indicated that the parent had talked with him/her about specific alcohol-related issues, such as the negative consequences of use, rules about alcohol use, discipline, telling the adolescent not to use, media portrayal of alcohol, and ways to resist peer pressure (Ennett et al., 2001a; translated and adapted by Van der Vorst et al., 2005). We reduced the scale to six items (cf. Spijkerman et al., 2008) including a 5-point scale from 1 (*never*) to 5 (*very often*). Higher scores indicate higher frequency of communication. Cronbach's alpha ranged from .88 to .90.

Quality of communication about alcohol was measured by asking the adolescents' perceptions of the quality of communication about alcohol with their parents. The scale was developed for smoking (Harakeh, Scholte, de Vries, & Engels, 2005), but adapted for drinking (Spijkerman et al., 2008). Items included "My parents and I are interested in each other's opinion regarding alcohol use", "If my parents and I talk about alcohol, I feel understood". The mean of six items rated on a 5-point scale ranging from 1 (*not at all*) to

5 (*very much*) was used. Higher scores indicate a higher quality of communication. Cronbach´s alpha ranged from 0.79 to .86.

Parental self-efficacy assesses the level of confidence a parent has in one's own ability to prevent their child from drinking. The original five-item scale for smoking was developed by Engels and Willemsen (2004), but was adjusted for alcohol use by Van der Vorst et al. (2005) into a four-item scale. We excluded one item because of the young age of the adolescents ('Would your child listen if you tell him/her that you'd prefer that he/she not gets drunk?'). Other items are: 'If you undertake actions to curb your child's drinking, would they be effective?', 'Do you think you can stop your child from becoming drunk?' and 'Would your child accept your suggestions about not drinking too much?' The scale consists of five response categories ranging from 1 (*'definitely not'*) to 5 (*'definitely'*) and was measured at baseline only. The reliability was 0.67.

Table 9.1. *Description and Inter-Correlations among the Worry Items*

Worry items	1	2	3	4	5
How often do you worry about…					
1. …whether your child will start using drugs	X	.56***	.57***	.64***	.60***
2. …whether your child will not complete school	.47***	X	.65***	.52***	.49***
3. ...whether your child will get in contact with the police	.56***	.58***	X	.60***	.57***
4. …whether your child will hang around with 'bad' peers	.53***	.46***	.56***	X	.55***
5. … the (future) alcohol use of your child	.51***	.42***	.50***	.46***	X
Cronbach's Alpha across the four waves	.87	.84	.85	.84	X

Note. Under the diagonal line reflect the lowest correlations, above the diagonal line the highest correlations within the four waves.
*** p < .001

9.2.6 Strategy for analyses

First, to gain more insight into the parental worries measurement means and SD's were computed on parental worries over time in the total group and across subgroups (gender, level of education and self-efficacy of parents).

The longitudinal associations between parental worries and adolescents' alcohol use across four yearly intervals were examined in a cross-lagged model in Mplus5.0 (Muthen & Muthen, 2007). We controlled for gender, level of education of the adolescent, within waves correlations and stability paths. Next, what parents do with their worries in terms of alcohol-specific parenting and how this parenting behavior effects adolescents' drinking was analyzed in a mediation model. First, the effect of parental worries at wave 2 on the frequency and quality of communication and rules about alcohol at wave 3 was analyzed. Second, the effect of alcohol-specific parenting on adolescents' drinking at wave 4 was analyzed while controlling for the effect of parental worries. Last, it was tested whether the mediation effect was statistically significant (MacKinnon et al., 2002). Furthermore, multi-group analyses of the mediation model was run to investigate whether the change in parenting behavior as a result of worries differs across high and low self-efficacious parents (i.e. whether parenting behavior differs for parents who have a high self-efficacy versus a low self-efficacy about one's own behavior).

In order to evaluate the cross-lagged models, several fit indices were used (Brown, 2006). For good model fit, the χ^2 should be low. The Comparative Fix Index (CFI) should be above 0.90 and 0.95 for respectively acceptable and good fit. The Root Mean Square Error of Approximation (RMSEA) should be lower than 0.08 and 0.05 for respectively acceptable and good model fit. Maximum likelihood (ML) estimation was used for model estimation and, given that data were non-normally distributed, robust ML (MLM) was used, as this estimates a mean-adjusted χ^2 that is robust to non-normality (Brown, 2006). For comparing the multi-group mediation model (low vs. high efficacious parents), ΔCFI (delta) and $\Delta RMSEA$ were used. If $\Delta CFI<0.010$ and $\Delta RMSEA<0.015$, the models do not differ (Chen, 2007). Missing data were handled by using full estimation maximum likelihood (Muthen & Muthen, 2007).

9.3 Results

9.3.1 Descriptive data on parental worries

Table 9.2 shows the means and standard deviations of parental worries at the different waves for the total group, boys and girls, adolescents in low and high levels of education and parents with a low and high self-efficacy.

Overall, the level of parental worries significantly decreases over time. In addition, parents seem to worry more about boys compared to girls at all waves (W1: t = -3.46, p < 0.00, W2: t = -3.15, p < 0.00, W3: t = -3.56, p < 0.00, W4: t = -4.17, p < 0.00). No significant differences have been found for the level of parental worries with respect to the level of education the adolescents are in. Furthermore, parents with a low self-efficacy worry significantly more at all waves (W1: t = 5.97, p < 0.00, W2: t = 3.90, p < 0.00, W3: t = 3.74, p < 0.00, W4: t = 2.77, p < 0.00).

Table 9.2. *Means and SD's of Parental Worries for the Total Group, across Gender and Level of Education*

	Total	Gender		Level of education		Self-efficacy	
		Girls	Boys	Low	High	Low	High
Parental worries W1	1.90 (0.67)$_{a}$	1.81 (0.64)	1.99 (0.69)*	1.94 (0.69)	1.86 (0.65)	2.04 (0.67)	1.74 (0.63)†
Parental worries W2	1.83 (0.61)$_{a, b}$	1.75 (0.57)	1.90 (0.63)*	1.83 (0.63)	1.83 (0.58)	1.91 (0.62)	1.71 (0.57)†
Parental worries W3	1.80 (0.58)$_{c}$	1.70 (0.57)	1.88 (0.58)*	1.82 (0.59)	1.77 (0.57)	1.88 (0.60)	1.68 (0.55)†
Parental worries W4	1.76 (0.60)$_{d}$	1.63 (0.53)	1.87 (0.64)*	1.79 (0.62)	1.74 (0.59)	1.83 (0.64)	1.67 (0.52)†

Note. In the total group, comparisons are made over time. Means that do not share subscripts differ at p < .05.
* Significantly different from girls at p<.05.
† Significantly different from parents with a low self-efficacy at p<.05.

9.3.2 Correlations between parental worries, parenting and juvenile alcohol use

Table 9.3 depicts the correlations between parental worries, self-efficacy, rules about alcohol, frequency and quality of communication and alcohol use across four waves. Cross-sectionally, parental worries were related to a lower self-efficacy, less restrictive rule setting and a lower quality of communication at all waves, at T3 and T4 to higher rates of alcohol use and only at T4 to a higher frequency of communication. Longitudinally, these correlations were replicated, whereby parental worries was related to higher levels of alcohol use one year later at all waves. The highest and most consistent longitudinal correlation was found between parental worries and self-efficacy.

9.3.4 Cross-lagged paths between parental worries and adolescents' alcohol use

Figure 9.1 shows the cross-lagged model including parental worries and adolescent alcohol use measured across four waves. The model showed good model fit (χ^2 (df)= 38 (11); CFI= .98; RMSEA=.06). Parental worries as well as adolescents´ alcohol use were fairly stable over time. From T1 to T2, no significant cross-relations were found between parental worries and adolescents' alcohol use. However, parental worries at T2 predicted more alcohol use at T3 (ß = .09, *p* = 0.02) and at T4 (ß = .10, *p* = 0.02). No cross-relations were found from alcohol use to parental worries. So, whereas parental worries and adolescents drinking were not predictive during the first year of the study, parental worries predicted an increase in their children's alcohol use later on (T2 to T3 and T3 to T4).

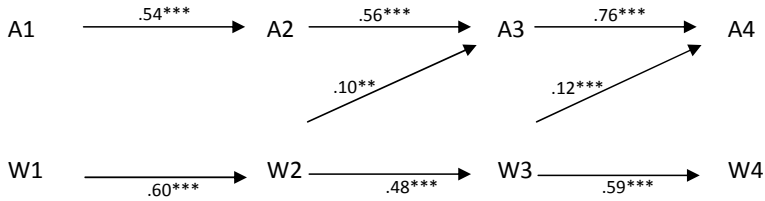

Figure 9.1. Associations of Parental Worries (W) and Adolescent Alcohol Use (A) across Four Waves.
Note. Only significant paths are shown. * p < .05, ** p < .01, *** p < .001.

9.3.5 Parental worries, parenting and adolescents' drinking

Figure 9.2 shows the effect of parental worries on frequency and quality of communication and rules about alcohol use and adolescents' subsequent alcohol use. The model showed good model fit (χ^2 (df)= 273(18); CFI= .98; RMSEA=.08).

Parental worries predicted less restrictive rule setting and a lower quality of communication. Frequency of communication was not associated with parental worries. With regard to the relation between parenting behavior and adolescents' alcohol use, results show that less restrictive rule setting and a lower quality of communication predicted more alcohol use one year later. Frequency of communication was not significantly related to alcohol use.

The indirect effect of parental worries through rules about alcohol (indirect effect = .04, p = 02) was statistically significant. That is, the effect of parental worries on adolescents drinking is caused by a decrease in the level of rule setting.

Table 9.3 *Correlations between Parental Worries, Self-efficacy, Parenting behavior and Alcohol Use across Four Waves.*

Variables	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.
Wave 1																							
1. Parental worry	-																						
2. Self-efficacy	-.26	-																					
3. Rules about alcohol use	-.11	.01	-																				
4. Freq. of communication	-.01	.08	.26	-																			
5. Qual. of communication	-.12	.09	.16	.42	-																		
6. Alcohol use	.05	.08	-.46	-.12	-.20	-																	
Wave 2																							
7. Parental worry	.58	-.19	-.18	-.02	-.13	.04	-																
8. Self-efficacy	-.19	.54	.06	.05	.05	.01	-.32	-															
9. Rules about alcohol use	-.05	-.02	.52	.24	.20	-.28	-.09	.03	-														
10. Freq. of communication	.02	.07	.14	.44	.24	-.10	-.06	.13	.13	-													
11. Qual. of communication	-.10	.08	.14	.27	.47	-.03	-.12	.06	.20	.42	-												
12. Alcohol use	.04	.02	-.40	-.09	-.23	.54	.13	-.04	-.48	-.08	-.14	-											
Wave 3																							
13. Parental worry	.54	-.17	-.11	-.04	-.11	.05	.65	-.19	-.09	-.04	-.19	.21	-										
14. Self-efficacy	-.17	.45	.12	.09	.01	.01	-.23	.54	-.02	.10	.05	-.04	-.24	-									
15. Rules about alcohol use	-.08	.03	.44	.20	.01	-.26	-.13	.10	.58	.16	.16	-.34	-.12	.08	-								
16. Freq. of communication	.03	.05	.10	.38	.16	-.01	.01	.14	.14	.49	.28	-.10	.04	.08	.20	-							
17. Qual. of communication	-.11	-.01	.10	.21	.40	-.03	-.10	.03	.17	.27	.55	-.15	-.15	.03	.14	.39	-						
18. Alcohol use	.13	.00	-.23	-.10	-.16	.27	.12	-.09	-.33	-.07	-.18	.54	.18	-.09	-.40	-.09	-.26	-					
Wave 4																							
19. Parental worry	.56	-.16	-.11	-.04	-.11	.04	.59	-.24	-.10	-.01	-.13	.16	.63	-.23	-.11	.08	-.12	.18	-				
20. Self-efficacy	-.22	.47	.12	.14	.04	.01	-.24	.53	.09	.07	.02	-.04	-.19	.65	.13	.10	.08	-.13	-.30	-			
21. Rules about alcohol use	-.09	.08	.40	.20	.13	-.11	-.13	.12	.46	.16	.19	-.29	-.10	.08	.57	.20	.15	-.35	-.15	.16	-		
22. Freq. of communication	.02	.03	.02	.04	-.04	.08	-.07	.10	.01	.14	.01	.05	-.01	-.01	-.04	.05	.01	.07	.15	.04	.06	-	
23. Qual. of communication	-.13	-.07	-.03	.21	.37	-.03	-.16	-.01	.10	.26	.43	-.06	-.15	-.02	.03	.29	.58	-.08	-.19	.06	.07	.36	-
24. Alcohol use	.22	-.05	-.31	-.12	-.14	.23	.30	-.16	-.38	-.10	-.15	.43	.19	-.09	-.37	-.06	-.24	.53	.34	-.20	-.48	-.11	-.16

r = .06 is significant at p <.01. r ≥ .07 is significant at p < .001.

9.3.6 Moderation of parental self-efficacy

The model testing for a moderation effect of self-efficacy, showed good model fit (χ^2 (df)= 302(36); CFI= .98; RMSEA=.09). Comparison of the two models demonstrated a significant difference (*ΔCFI* =.19 and *ΔRMSEA* = .21).

Low self-efficacy. Concerning the relation between parental worries and parenting behavior, only one significant relation was found. More parental worries predicted less restrictive rule setting one year later (ß = -.20, p < .00). With regard to the relation between parenting behavior and adolescents' alcohol use, results show that only less restrictive rule setting (ß = -.31, p = .00) significantly predicted more alcohol use. The indirect effect of parental worries through rules about alcohol (indirect effect = .06, p < .01) was statistically significant. That is, in parents with a low self-efficacy, worries result in less restrictive rule setting that in turn predicts more alcohol use in adolescents.

High self-efficacy. One significant relation was found between worries and parenting behavior; more worries predicted a lower quality of communication (ß = -.15, p = .02). With respect to the relation between parenting behavior and adolescents´ alcohol use, less restrictive rule setting (ß = -.34, p = .00) and a lower quality of communication (ß = -.26, p = .00) predicted more alcohol use one year later. The indirect effect of parental worries through quality of communication (indirect effect = .04, p = .06) was marginally significant. That is, in parents with a high self-efficacy, parenting behavior does not convincingly account for the effect of parental worries on adolescent alcohol use.

In sum, in parents with a low self-efficacy, less restrictive rule setting is accountable for the positive relation between worries and adolescent alcohol use, whereas in parents with a high self-efficacy, worrying does not convincingly affect parenting behavior and thereby adolescent alcohol use.

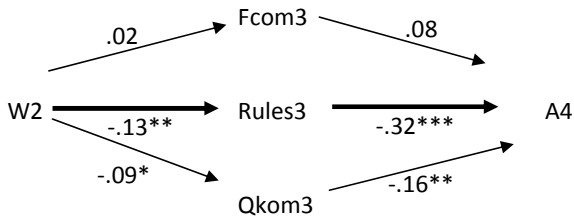

Figure 9.2. Mediation analyses of Parental Worries (W) on Adolescent alcohol use (A) through Frequency of Communication (Fcom), Rules about Alcohol Use (Rules) and Quality of Communication (Qcom).
Note. Bold arrows indicate significant mediation. Model fit: Chi square=274(18), CFI=.98, RMSEA=.08.

9.3.7 Additional analysis

Because there are relatively high cross-sectional correlations between parental worries and self-efficacy (ranging from r = -.24 to r = -.32), we decided to do an additional analyses whereby parental self-efficacy was added to the mediation model (as depicted in Figure 9.2) to test whether the effect of parental worries on parenting behavior and adolescents' alcohol use would sustain. The model showed good model fit (χ^2 (df)= 301(22); CFI= .98; RMSEA=.08). Results show that the all previously described relations of parental worries and parenting behavior sustained when self-efficacy was added to the model.

With respect to self-efficacy, a higher self-efficacy predicted a higher frequency of communication (ß = .18, p = .00), more restrictive rule setting (ß = .08, p = .05) and less alcohol use in adolescents (ß = -.10, p = .02). Furthermore, all three parenting behaviors predicted alcohol use in the hypothesized direction (frequency of communication: ß = .09, p = .05; quality of communication: ß = -.16, p < .00; rules about alcohol: ß = -.32, p < .00). The indirect effect of self-efficacy through rules about alcohol (indirect effect = .03, p = .06) was nearly statistically significant.

9.4 Discussion

The focus of this study was to gain more insight into the concept of parental worries about the child's behavior. To this end, a new reliable measure of parental worries was developed. The findings show that parental worries about the child's behavior predict more alcohol use in adolescents one year later, and that parental worries predicted a decrease in restrictive rule setting and in the quality of parent-child communication about alcohol use. The decrease in restrictive rule setting accounted for the effect of parental worries on adolescents' drinking, particularly among parents with a low self-efficacy regarding their alcohol-specific parenting behavior. In parents with a high self-efficacy, a lower quality of communication seemed to play a role. Overall, the findings suggest that parents who are worried about their adolescent children show less effective parenting behavior, and thereby enhance the risk of future alcohol use in their children.

The first aim of the study was to examine the bi-directional relations between parental worries and adolescents' alcohol use over time. Alcohol use in adolescents does not generate subsequent parental worries, but worries in parents predict subsequent alcohol use in adolescents. This indicates that it is not the actual alcohol use that makes parents worry, but that worried parents behave as such so that the alcohol use in their offspring increases. This finding implicates that parental worries can and should be targeted in order to curb adolescents' alcohol use.

The second aim of the study was to investigate what parents do with their worries in terms of alcohol-specific parenting (i.e. frequency and quality of communication and rules about alcohol use). This study showed that parents who worried more, showed less effective parenting behavior. That is, they set less restrictive rules, and had less qualitative conversations about alcohol with their child, whereas the frequency of communication was not influenced by worries of parents. This finding is in contrast with the cross-sectional study of Bogenschneider et al. (1998b) who found that more worries were related to a higher frequency of communication. The present study, thus, showed that longitudinally this finding could not be replicated. The current study, however, is in agreement with previous studies on general worries (Borkovec et al., 1983), showing that worried parents did not undertake action neither by communicating more frequently nor by setting restrictive rules for drinking. In addition, the quality of communication

decreased when parents worried more. Thus, worries seem to withhold parents from effective parenting behavior. However, only the decline in restrictive rule setting is accountable for the relation between worries and adolescent alcohol use. This leniency in parents eventually results in higher rates of drinking in their offspring (Jackson et al., 1997; Van der Vorst et al., 2005, 2006; Yu, 2003). These findings demonstrate that parental worries are an important concept in the understanding of alcohol-specific parenting.

Yet, the aforementioned findings only account for those parents who don't feel confident about influencing their child's drinking behavior. A low self-efficacy and high worries in parents, however, are strongly related. Thus, parents with a low self-efficacy worry more about their children. This combination seems to make it difficult for them to set restrictive rules. Thus, it is the combination of a low self-efficacy and worries about the child's behavior that result in ineffective parenting. Most likely parents who worry about their child's activities (Borkovec et al., 1983) are reluctant to set rules about alcohol due to feelings of incompetence. This finding is an important lead for the development of future alcohol prevention programs involving parents. Teaching parents about ways to effectively influence their offspring's alcohol use, for instance by setting strict rules, may not resolve their worries directly, but may increase their self-efficacy and their actual parenting behavior, and may thereby diminish worrying. More research is needed to test this hypothesis.

Moreover, the present data suggest that parents with a high self-efficacy tend to converse with a lower quality due to their worries. It seems that these parents feel confident enough to keep on being strict, but that the way they converse about alcohol changes as a result of their worries. This change in the quality of communication did however not significantly mediate the effect of worries on adolescents' drinking.

9.4.1 Limitations and strengths

In light of the strengths of this study, such as the innovative topic, the large sample size and the use of multi reports, some limitations should be addressed. First, parental worries reflect worries of parents about a variety of child behaviors (i.e. alcohol use, skipping school), whereas parenting behavior concerns alcohol-specific parenting. A measure that

consists of multiple items is considered to be more robust than a single item measure. Therefore, we decided to use a newly developed general parental worry scale, which showed to have a high internal validity. In this regard it should be noted that an additional analysis with the alcohol-specific worry item yielded similar outcomes, indicating that worries in parents reflect a general pattern of worries about their child. This study provided a first glance in the concept of parental worries and future research examining parental worries in relation to a broader array of child and parenting behaviors is desired. Second, the role of parental awareness about their child's drinking is not included in the current study as only adolescent reported alcohol use was used. Although this reflects the actual drinking behavior, and parents tend to underestimate their offspring's alcohol use, it is would be interesting to include parental reports of adolescents' alcohol use. In this way, more insight could be gained into the role of parental awareness about the alcohol use of their child in relation to their worries and parenting behavior (Bogenschneider et al., 1998b).

9.4.2 Implications

The current study has a number of implications that should be discussed. More insight is gained into the concept of parental worries and its relation to parenting behavior and adolescents alcohol use. In conjunction with a low degree of self-confidence about the effectiveness of one's parenting behavior, worries of parents result in less effective parenting and more alcohol use among adolescent children. Therefore, parents who worry about their child's behavior and who lack confidence about influencing this behavior should be considered as important targets in alcohol prevention. Parents should be made aware of their possibilities to influence their child's behavior, for example by prohibiting underage drinking within a high quality communication context. A Dutch alcohol prevention program (PAS: Chapters 2 and 5) effectively postponed the onset of drinking by increasing restrictive rule setting in parents (Chapter 3). Yet, the current findings indicate that, apart from pointing at the relevance of strict rules, parents should also be made aware of the importance of qualitative parent-child conversations about alcohol.

10. Alcohol-specific parenting profiles in adolescence: strict rule-setting and frequent and qualitative communication

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Submitted for publication

The present study examined different developmental profiles of alcohol-specific parenting (rule-setting, quality and frequency of communication about alcohol use) and how these patterns relate to the initiation and growth of adolescents' drinking. In addition, it investigated what socio-demographic, parental and adolescent factors predict these parenting profiles. A longitudinal sample of 883 adolescents and their parents including four measurements (between ages 12 and 16) was used. Latent class analysis revealed that five classes of parenting could be distinguished. Strict rule-setting in combination with a high quality and frequency of communication is the profile associated with the lowest amount of drinking; parents scoring low on all these behaviors show to be related to the highest amount of drinking. Communication about alcohol appeared to be fairly stable over time in all parenting classes, whereas the level of rule-setting declined in a subgroup of parents as adolescents grow older. In particular, adolescents' characteristics (early initiation, low self-control and self-disclosure) were more predictive of non-effective parenting profiles. This study showed that alcohol-specific rule-setting is most effective when it coincides with a good quality and frequency of communication about alcohol use.

10.1 Introduction

Parents are among the most important socializing agents in adolescents' lives (Duncan et al., 2006). In the Netherlands, parents are the ones who generally provide their 12/13 year old adolescent with alcohol (Monshouwer et al., 2008). As early alcohol use is associated with several risks (e.g., alcohol abuse, brain damage, school performance; Behrendt et al., 2009a; Brown & Tapert, 2004), this has led to an increased interest in the role of parents with respect to adolescents' drinking.

Adolescence is characterized as a period in which youngsters distance themselves from their parents; spending time with peers becomes more important (Steinberg et al., 1992). However, parents remain fairly influential throughout adolescence. Cross-sectional as well as longitudinal studies consistently show the importance of alcohol-specific parenting from early (Habib et al., 2010; Chapter 8) through middle (Van der Vorst et al., 2006) into late adolescence (Abar & Turrisi, 2008). Most youngsters initiate alcohol drinking during adolescence, going from irregular drinking patterns in early adolescence into more habitual patterns during middle and late adolescence (Poelen et al., 2005). In the course of this development parental influences tend to change, most likely due to adolescents' drive to gain (Masche, 2010) and parents' willingness to grant autonomy (Darling, Cumsille, Caldwell, & Dowdy, 2006).

10.1.2 Alcohol-specific parenting and adolescents' alcohol use

One of the most consistent predictors of alcohol use is a lack of restrictive parenting, mainly in younger (Habib et al., 2010; Van der Vorst et al., 2006; Yu, 2003) but also in older adolescents (Abar & Turrisi, 2008). That is, adolescents with parents who set restrictive alcohol-specific rules are less likely to start drinking early and tend to drink less compared to adolescents with permissive parents (Järvinen & Östergaard, 2009; Van der Vorst, et al., 2006; Yu, 2003). Although parental influences with respect to alcohol-specific rule-setting continue through adolescence, Dutch studies have shown that parental permissiveness increases with adolescents' age (Monshouwer, et al., 2008; Van der Vorst et al., 2006). For example, 7% of 12-13-year-olds are allowed to drink one glass of alcohol

at home, compared to 29% of 14-15-year-olds (Monshouwer et al., 2008). Restrictive parenting (e.g. setting rules about alcohol) also appeared to be most influential when youngsters are in the initiation phase of alcohol use (Van der Vorst et al., 2006).

The most direct way for parents to express their rules about alcohol is by communicating them via alcohol-specific communication (Ennett et al., 2001a). The way parents talk about alcohol with their child, i.e. the level of mutual understanding and respect, is referred to as the quality of communication. Longitudinal research on the perceived quality of communication about alcohol between parents and offspring and adolescents' drinking is relatively scarce. Although a number of cross-sectional studies reveal that a higher quality of communication is related to a lower level of drinking (e.g. Spijkerman et al., 2008), no evidence is provided for a longitudinal association (Van den Eijnden et al., 2011). Another aspect in parent-child communication about alcohol is frequency. In line with a review of significant parenting factors (Ryan, Jorm, & Lubman, 2010), a study of Van den Eijnden et al. (2011) did not show a significant effect of frequency of communication on adolescents' alcohol use two years later. However, Van der Vorst, Burk & Engels (2010) demonstrated that frequency of communication about alcohol use predicted an increase in alcohol use in heavy-drinking males. These inconsistent findings may be explained by the fact that the frequency of communication does not inform us about the exact content (e.g. which rules) or about how this communication (the quality) takes place. It is likely that the effect of the frequency of communication depends on the quality of this communication and the rules being set.

10.1.3 Coincidence of alcohol-specific parenting practices

As stated before, different alcohol-specific parenting practices are likely to coincide. Only a few studies report on the relations between parenting practices. For example, communicating more frequently about alcohol is related to less restrictive rule-setting (Van den Eijnden et al., 2011), with stronger relations in older adolescents (Van der Vorst et al., 2005) and those with higher drinking rates (Van der Vorst et al., 2010). In addition, a higher quality of communication is related to a higher frequency, yet no relation between quality of communication and rule-setting is found (Van den Eijnden et al., 2011). However, Miller-Day (2008) showed that with respect to general parenting

consensual families, characterized by their open conversations (discussing ideas and expressing opinions), used more often a no-tolerance rule than for example laissez-faire or protective families. In addition, adolescents with a qualitative relationship with their parents, and whose parents are fairly strict, are less likely to engage in high risk drinking (Mallett, Turrisi, Ray, et al., in press). For alcohol-specific parenting, this suggests that a good quality of communication is most likely to concur with restrictive rule-setting behavior. All in all, previous studies reveal some evidence that alcohol-specific parenting practices are interrelated in the course of adolescent development. How these practices act together and how this in turn relates to adolescent drinking remains unknown though. Insight into this matter will add to the understanding of effective alcohol-specific parenting with respect to adolescents' drinking.

Several shortcomings of previous studies will be addressed in this paper. First, as far as we know, no studies have examined the differential development of alcohol-specific parenting practices. Mostly, the development of alcohol-specific practices in parents as a homogeneous group are analyzed (Van der Vorst et al., 2006), yet it is known that large differences between parents are found in the way parenting behavior changes through adolescence. Some parents continue their monitoring activities, others diminish them for the benefit of the adolescent's autonomy (Masche, 2010). It is important to examine alcohol-specific parenting behavior from a developmental perspective, addressing different developmental profiles in order to get a better understanding of alcohol-specific parenting in adolescence.

Second, to our knowledge no former studies have examined such alcohol-specific parenting profiles in a longitudinal design. Previous studies have demonstrated the relevance of general parenting profiles (e.g. Adalbjarnardottir & Haffsteinson, 2001; Coley, Votruba-Dzal, & Schindler, 2008; Latendresse et al., 2009) for the child's alcohol use, yet no such analysis have been conducted for alcohol-specific parenting. In early as well as middle adolescence, general parenting practices predict subsequent alcohol use in adolescents later on (Adalbjarnardottir & Haffsteinson, 2001; Latendresse et al., 2009). For example, adolescents who perceived their parents as authoritative (high levels of warmth and strictness) were less likely to drink frequently (Latendresse et al., 2009) and heavily (Adalbjarnardottir & Haffsteinson, 2001) compared to adolescents with contrasting perceptions. In line with general parenting practices, it is interesting to take

the level of strictness (rules about alcohol) as well as a measure of parent-child relationship (quality and frequency of communication about alcohol) into account.

In this paper we investigate whether specific developmental parenting profiles based on rule-setting behavior and communication about alcohol can be distinguished from early to mid adolescence, and how these parenting profiles influence adolescents' drinking from initiation to habituation. It is hypothesized that restrictive rules are most effective when expressed through qualitative communication. Furthermore, it is expected that in case restrictive rule-setting is combined with a high quality of communication, a high frequency of communication is beneficial for adolescents' drinking behavior.

10.1.4 Parental and adolescent characteristics, and alcohol-specific parenting

Parents and adolescents with different alcohol-specific parenting profiles may distinguish themselves based on socio-demographic, parental and adolescent factors. With respect to socio-demographic factors, it is known that parents are less strict with boys (Choquet, Hassler, Morin, Falissard, & Chau, 2008) and communicate more frequently about alcohol with them (Van der Vorst et al., 2010) than with girls. Regarding parental factors it is known that parental alcohol use relates to less engagement in alcohol-specific socialization practices (Ennett, et al., 2001a; Van der Vorst et al., 2006). Alcohol-specific parenting is also influenced by parental attitudes about alcohol and parents' self-efficacy regarding their own parenting behavior; more positive attitudes and a lower perceived self-efficacy with respect to the effectiveness of their parenting behavior are related to less restrictive rule-setting (Järvinen & Östergaard, 2009; Van der Vorst et al., 2005, 2006). Previous studies have shown that child factors may influence parenting behavior too (e.g. Coley et al., 2008; Masche, 2010). For example, it is known that children who disclose more information about their activities and who have a higher self-control have relatively indulgent parents (Litovsky & Dusek, 1985; Smetana, Villalobos, Tascopoulos-Chan, Gettman, Campione-Barr, 2009), which is most likely related to higher levels of parental trust in their children (Kerr, Stattin & Trost, 1999). Parents may also respond to their child's alcohol use with either more rigorous (Van den Eijnden et al., 2011) or more tolerant (Van der Vorst et al., 2010) parenting. Insight into factors predicting specific parenting profiles may facilitate the development of group-specific interventions which

may subsequently result in stronger effects. It is therefore relevant to examine what socio-demographic (gender and educational level), parental (drinking, attitudes about alcohol and self-efficacy) and adolescent (initial alcohol use, self-control and disclosure) factors predict alcohol-specific parenting profiles over time. We hypothesize that both parental and adolescent factors are differentially related to the different parenting profiles.

10.1.5 Current study

The aim of the current study is to examine different developmental profiles of alcohol-specific parenting (rule-setting and communication about alcohol use) and how these profiles are related to the initiation and growth of adolescents' drinking. We will also examine which parental and adolescent factors predict these parenting profiles. These research aims will be studied in a longitudinal sample of 883 Dutch adolescents and their parents, including data from four different time points (between ages 12 and 15).

10.2 Method

10.2.1 Design and procedure

The current study is part of a larger alcohol prevention randomized trial (see Chapter 2) in which 19 schools were randomly selected and assigned to either of the three intervention conditions or to the control condition. For purposes of this study, only adolescents and parents who were assigned to the control condition were included in current analyses. In this way, the data are not affected by the interventions. Baseline data (T1) were collected at the beginning of the first high school year (September/October 2006). The first follow-up (T2) was 10 months later in June/July 2007, then again in June/July 2008 (T3) and June/July 2009 (T4). Trained research assistants administered digital questionnaires to adolescents in the classroom. Questionnaires for parents and letters of consent were sent to their home addresses. Non-responding parents were reminded after three weeks by mail and after another two weeks by phone.

10.2.2 Participants

Nine schools including 935 adolescents were selected to participate in the study. Due to initial non-response (n = 29) among adolescents and parents (n = 184) and unreliable data on the alcohol measure (n = 19), 883 adolescents and 703 parents were eligible for analyses.

The adolescent sample had a mean age of 12.19 (SD = 0.5) at baseline, including 53% boys and 47% girls, 60% in lower secondary vocational education (lower education) and 40% in higher general secondary and pre-university education (higher education). Most of the responding parents were female (81.9%). More than half of the mothers (79.1%) and fathers (73.6%) had lower educational levels (only vocational training).

10.2.3 Attrition analyses

A total of 843 adolescents (95.5%) at T2, 783 adolescents (88.7%) at T3 and 764 adolescents (86.5%) at T4 stayed in the program and completed the follow-up assessments after ten, 22 and 34 months respectively. A total of 618 parents at T2 (87.9%), 532 parents at T3 (75.7%) and 496 parents (66.7%) at T4 participated in the study.

Attrition analyses on demographic variables and alcohol use indicated that responding adolescents at T1, T3 and T4 were more likely to be younger, tended to follow lower education programs and drank a lower average number of alcoholic beverages per week at baseline. At T2, no significant differences were found on these characteristics. At all follow-up measurements participating parents had received lower education more often, whereas no differences were found between responding and non-responding parents with respect to their rules and attitudes about alcohol and their own alcohol use. At T2, adolescents of participating parents reported a significantly higher quality of communication. No other significant differences were found for the communication about alcohol, or for the self-efficacy of parents.

10.2.4 Measures

Adolescents' alcohol use was measured by using the Quantity-Frequency measure (at T1 to T4). The Quantity-Frequency measure represented the average weekly alcohol use. Frequency was measured by asking the number of days the adolescent usually drank on weekdays (Monday to Thursday) and weekend days (Friday to Sunday) (Engels & Knibbe, 2000). Quantity was measured by asking how many glasses of alcohol the adolescent usually drinks on a weekday and weekend day (Engels, Knibbe, & Drop, 1999). Quantity-Frequency was computed by calculating the products of the number of days and the number of glasses, then summing the two products for weekdays and weekend days. A quantity-frequency of one or more indicated that the respondent drinks one glass of alcohol at least one day a week.

Parenting measures: All parenting measures were reported by the adolescent.

Rules about alcohol measured the degree of parental rule-setting regarding the adolescent's alcohol use (at T1 to T4; Van der Vorst et al., 2005). Items included "I am allowed to have one glass of alcohol when one of my parents is at home", "I am allowed to drink several glasses of alcohol when one of my parents isn't home" and "I am allowed to drink alcohol at a party with my friends". The mean of ten items rated on a 5-point scale from 1 (*never*) to 5 (*always*) reversely scored was used, i.e. higher scores indicating more rule-setting behavior. Cronbach´s alpha ranged from .81 to .94

Frequency of communication about alcohol referred to how often in the past 12 months the parent had talked with the adolescent about specific alcohol-related issues (T1 to T4), such as the negative consequences of use, rules about alcohol use, discipline, telling the adolescent not to use, media portrayal of alcohol, and ways to resist peer pressure (Ennett et al., 2001; and translated and adapted by Van der Vorst et al., 2005). We reduced the scale to six items (cf. Spijkerman et al., 2008), including a 5-point scale from 1 (*never*) to 5 (*very often*). Higher scores indicate higher frequency of communication. Cronbach´s alpha ranged from 0.88 to .90.

Quality of communication about alcohol was measured at T1 to T4 by asking about the adolescents' perceptions of the quality of communication about alcohol with their parents. The scale was developed for smoking by Harakeh et al., (2005) and was recently adapted for drinking (Spijkerman et al., 2008). Items included "My parents and I are

interested in each other's opinion regarding alcohol use", "If my parents and I talk about alcohol, I feel understood". The mean of six items rated on a 5-point scale ranging from 1 (*not at all*) to 5 (*very much*) was used. Higher scores indicate a higher quality of communication. Cronbach's alpha ranged from 0.79 to .86.

10.2.5 Predictors at baseline

Parental alcohol use, attitudes about alcohol and self-efficacy were reported by the parent. In most cases (80%) this involved the mother. Self-control and child disclosure were reported by the adolescent.

Parental alcohol use was also measured using the Quantity-Frequency scale (only at T1). As most of the responding parents were mothers (80%), most paternal alcohol use is reported by their partner. This should not be a problem, as cross-reports between partners are found to be reliable (Connors & Maisto, 2003). The alcohol use measures are adapted according to the gender of the parents.

Attitudes about alcohol use measure the degree to which the parent finds it acceptable (1 = not at all acceptable to 5 = very acceptable) for a 12-13-year-old adolescent to drink alcohol in various situations (Brody et al., 1999; Van der Vorst et al., 2006). This measure originally contained seven items, but in this study we added one item (drinking alcohol on a Saturday evening with parents). Responses were rescaled so that higher scores indicate a more restrictive attitude. Alpha was .79.

Parental self-efficacy assesses the level of confidence parents have in their actions to prevent adolescents from drinking. The original five-item scale was developed by Engels & Willemsen (2004), but was adjusted for alcohol use by Van der Vorst et al. (2005) into a four-item scale. We excluded one item "Would your child listen if you tell him/her that you'd prefer that he/she not get drunk?" The other items were "Do you think you can stop your child from becoming drunk?", "Would your child accept your suggestions about not drinking too much?" and "If you undertake actions to curb your child's drinking, would that work?" The scale consists of five response categories ranging from 1 (*definitely not*) to 5 (*definitely*). The reliability was 0.67.

Self-control reflects the ability to control responses, interrupt undesired behavioral tendencies and refrain from acting on them. The measure is the shorter version of the

original measure developed and tested by Tangney, Baumeister, and Boone (2004). It consists of 13 items (Cronbach's alpha = .74) that were rated on a 5-point scale, ranging from 1 (*not at all like me*) to 5 (*very much like me*). Items were reversely scored; higher scores indicated higher self-control.

The *child-disclosure* measure comprised five items assessing the level at which the child provides information about his/her daily activities (Kerr, Stattin & Trost, 1999). Example items are "Do you talk at home about how you are doing in the different subjects in school?", and "If you are out at night, when you get home do you tell what you have done that evening?" Five-point response scales were used. Reliability was 0.69.

10.2.6 Strategy for analyses

To analyze our first research question of whether different alcohol-specific parenting profiles can be distinguished, different classes were identified by applying Latent Class Analysis (LCA) in Mplus 5.0 (Muthen & Muthen, 2007) to the list of three parenting behaviors (rules about alcohol, quality and frequency of communication about alcohol) measured at T1 to T4. LCA assumes that the association among the parenting variables is due to an underlying class structure. The goal of LCA is to identify the smallest number of latent classes that adequately describes the associations among the observed variables. We started with the most parsimonious 1-class model and fitted successive models with increasing numbers of classes. Goodness-of-fit statistics were used to select the optimal model (Brown, 2006). We compared successive models using the Bayesian information criterion (BIC), the Entrophy and the Vuong Mendell statistics. The model with a significant Vuong Mendell criterion was considered to be the optimal one.

Next, a linear growth model (LGM) was estimated (Mplus 5.0; Muthen & Muthen, 2007) based on the adolescent's alcohol use reported at four time points over a four-year period (T1, T2, T3, T4). The alcohol use scores were negatively skewed; therefore LGM was applied using a Poisson distribution with the adolescent's alcohol use as count variables (Muthen & Muthen, 2007). Two factors (intercept and slope) were a result of the linear growth model which was calculated for all alcohol-specific parenting profiles (multi-group analysis). The intercept represents information in the sample concerning the mean and variance of the collection of individual intercepts that characterize each

individual's growth curve. The linear slope has a mean and variance of the total sample, and represents the linear trend or slope of an individual's trajectory over time. The time scores for the slope growth factor are fixed, so that the intercept (zero time score) and the growth model parameterization could be estimated using Maximum Likelihood (ML; Muthen & Muthen, 2007). The residual variances of the outcome variables are estimated and allowed to be different across time. Next, the significance of differences between intercepts and slopes across parenting profiles were tested using Wald tests.

To test which socio-demographic, parental and adolescent characteristics predict fitting a parenting profile, we used multinomial regression analyses in Mplus 5.0. The class with the lowest probability of alcohol use was chosen as reference group. Missing data are handled in Mplus with a robust maximum likelihood estimator, which takes advantage of all available data rather than deleting cases with partially missing data in a listwise manner.

10.3 Results

10.3.1 Parenting profiles

Table 10.1 shows results for each of the LCA model fit statistics. A five-class solution was identified to best fit the data, according to the Vuong-Lo-Mendell-Rubin likelihood ratio test (five classes: $p < 0.03$, six classes: $p = .26$). The average class probabilities were high (.87–.91), which indicated that the participants were properly classified in their latent class. The five parenting profiles designed by LCA are described in Table 10.2.

Table 10.1. *Criteria for Deciding the Number of Classes*

No. of classes	H	BIC	LMR LRT statistic	LMR LRT *p*-value
2	.74	23311	1178	.000
3	.81	22721	670	.019
4	.80	22434	372	.008
5	.81	22232	287	.030
6	.83	22188	131	.255

Note: BIC: Bayesian Information Criterion; H: Entropy measure; LMR LRT: Lo Mendell Rubin Likelihood Ratio Test.

Class 1 (3%) was characterized by low and decreasing scores on rule-setting, indicating parents who are very lenient and who become even more lenient over time, fairly low scores on the quality of communication and low scores on frequency of communication about alcohol. Class 1 therefore could be termed *permissive.* Class 2 (22%) was characterized by a strong decline on rules about alcohol use over time and average scores on the quality and frequency of communication about alcohol use. Class 2 was defined as *decliners.* Class 3 (17%) was characterized by a high initial score on rule-setting, but a decline in restrictive rule-setting over time. Adolescents in this class reported extremely low scores on the quality and frequency of communication about alcohol with their parents. Class 3 therefore was termed *authoritarian.* Class 4 (42%) was characterized by relatively stable high scores on restrictive rule-setting and average scores on the quality and frequency of communication about alcohol. Class 4 was defined as *moderate authoritative.* Class 5 (16%) was characterized by relatively stable high scores on all parenting behaviors over time, therefore this class was defined as *authoritative.*

Table 10.2. *Descriptive Statistics for Parenting Profiles of Rules (R), Quality of Communication (Q) and Frequency of Communication (F) about Alcohol across the Four Waves (1 to 4)*

N=883	R1	R2	R3	R4	Q1	Q2	Q3	Q4	F1	F2	F3	F4
1. Permissive N=28, 3%	3.2	1.9	2.4	2.4	2.9	3.0	3.0	3.2	1.4	1.7	1.8	1.9
2. Decliners N=198, 22%	4.2	3.7	3.3	2.9	3.4	3.3	3.5	3.4	1.9	2.2	2.1	2.2
3. Authoritarian N=148, 17%	4.6	4.6	4.2	3.6	2.6	2.4	2.4	2.5	1.6	1.6	1.6	1.7
4. Moderately authoritative N=369, 42%	4.7	4.7	4.4	4.1	3.7	3.7	3.8	3.6	2.2	2.2	2.3	2.2
5. Authoritative N=140, 16%	4.8	4.7	4.5	4.2	4.1	4.2	4.2	4.0	3.3	3.4	3.5	3.2

10.3.2 Alcohol use across parenting profiles

Table 10.3 describes the intercept and slope of adolescents' alcohol use across the five parenting profiles. The intercept of adolescents in class 1 is significantly higher than those of class 3, 4 and 5. Class 2 has a significantly higher intercept score than class 4 and 5. In addition, the increase in alcohol use over time (slope) in class 1 is significantly higher than in class 3, 4 and 5. Classes 2 and 3 have a significantly higher slope than class 4 and 5.

Table 10.3. *Intercept and Slope of Adolescents' Alcohol Use (Weekly Drinking) across Five Parenting Profiles*

Class (N=883)	Intercept	Slope
1. Permissive	3.78 $_{a}$	5.18 $_{a}$
2. Decliners	1.09 $_{a,b}$	2.03 $_{a,b}$
3. Authoritarian	0.49$_{b,c}$	1.11 $_{b,c}$
4. Moderately authoritative	0.15 $_{c,d}$	0.32 $_{d}$
5. Authoritative	0.22 $_{c,d}$	0.28 $_{d}$

Shared subscripts indicate no significant difference.

Table 10.4. *Multinomial Regression of Parenting Profiles (reference group = authoritative) on Socio-Demographic, Parental and Adolescent Factors at Baseline*

	1. Permissive		2. Decliners		3. Authoritarian		4. Moderately authoritative	
	OR	p-value	OR	p-value	OR	p-value	OR	p-value
Parental factors								
Mother's educational level (1=low)	0.87	.59	1.00	.99	0.99	.92	0.82	.08
Father's educational level (1=low)	0.79	.39	0.79	.07	0.93	.65	1.09	.44
Maternal alcohol use	1.06	.25	1.07	.02	1.07	.07	1.07	.03
Paternal alcohol use	0.99	.79	0.99	.83	0.99	.88	0.98	.22
Parental attitudes about alcohol	0.79	.74	0.33	.01	0.72	.43	0.96	.91
Self-efficacy	0.67	.32	0.65	.05	0.83	.44	0.60	.01
Adolescent factors								
Gender (1=girl)	0.45	.10	0.83	.45	0.46	.01	0.88	.53
Educational level (1=high)	0.27	.05	0.73	.23	0.57	.04	0.95	.81
Initial alcohol use	1.47	.02	1.38	.03	1.05	.78	0.84	.28
Self-control	0.18	.00	0.44	.01	0.36	.01	0.58	.03
Child disclosure	0.28	.00	0.48	.00	0.29	.00	0.73	.11

OR = Odds ratio.

10.3.3 Predicting parenting profiles

Table 10.4 shows the results of multinomial regression of parenting profiles on parent and adolescent factors. Of the parental factors, more maternal alcohol use predicted class 2 and 4 memberships when compared to class 5. Parents' negative attitude toward alcohol predicted class 2 membership. Furthermore, parents' low self-efficacy predicted class 2 and 4 membership compared to class 5 membership. No significant associations were found between level of parental education and paternal alcohol use with any of the parenting profiles.

Of the adolescent factors, a lower level of education predicted class 1 and 3 membership compared to class 5. Being a boy predicted class 3 membership.

Adolescents' initial alcohol use predicted class 1 and 2 membership. Adolescents with a lower level of self-control were more likely to belong to class 1, 2, 3 or 4 in comparison to class 5, and adolescents with a lower level of child disclosure were more likely to belong to class 1, 2 and 3.

Thus, apart from maternal drinking, parental attitudes about alcohol and self-efficacy (parental factors), particularly adolescent factors, predicted class membership, with consistent significant associations between adolescents' level of self-control and rate of disclosure.

10.4 Discussion

This longitudinal study demonstrated that five different alcohol-specific parenting profiles could be distinguished based on level of rule-setting and quality and frequency of communication about alcohol over time. The level of rule-setting changed over time in all parenting profiles, whereas quality and frequency of communication about alcohol use remained fairly stable. The a*uthoritative* parenting profile, a combination of high restrictive rule-setting and a high quality and frequency of communication over time, was the optimal parenting profile with respect to adolescents' drinking. By contrast, parents who scored low on these behaviors (*permissive* parents) had adolescents who drank the most. Rules about alcohol use appeared to be most effective when conveyed in a qualitative and frequent communication style. In addition, adolescents' characteristics were more predictive of non-effective parenting profiles. Adolescents reporting more initial alcohol use, those in lower levels of education and those with lower levels of self-control and self-disclosure were more likely to have permissive, declining or authoritarian parents.

The combination of strict rule-setting and a high quality and frequency of communication about alcohol use appears to effectively curb adolescents' drinking behavior. The relevance of this profile corresponds with the cross-sectional findings of Coombs and Landsverk (1988) that showed that adolescents were least likely to drink alcohol if their parents set clear behavioral limits and maintained interpersonally satisfying relationships. In line with studies on general parenting profiles (Adalbjarnardottir & Haffsteinson, 2001; Latendresse et al., 2009; Mallett et al., in press),

the current findings point at the importance of conveying rules about alcohol in a satisfying family atmosphere, i.e. high quality and frequency of communication. This is exemplified when looking at the moderate authoritative and the authoritative profiles; both are fairly strict over time and report a relatively high quality and frequency of communication, and are the most effective when it comes to adolescents' drinking. On the other hand, adolescents who reported having lenient parents and a low quality and frequency of communication are the ones with the highest drinking rates. Our findings point at the importance of examining alcohol-specific parenting profiles.

The frequency of communicating about alcohol use does not seem to change with the adolescent's age, as suggested by Van der Vorst et al. (2010), and a higher frequency of communication is not linked to high rates of alcohol use (Van der Vorst et al., 2010). Over time, the way parents communicate (quality and frequency) with their offspring remained relatively stable. It seems that a more frequent communication will do no harm when it is qualitatively high. This is exemplified by the fact that quality and frequency of communication tend to go together: the better the quality of alcohol-related conversations, the more frequent these conversations are held. The continuing influence of parental rule-setting over time is in line with previous studies (Van der Vorst et al., 2006) — yet contrary to these previous findings which state that the level of strict rule-setting tends to decrease over time, we found that this only accounted for nearly half of the parents, as the other half remained strict throughout adolescence (ages 12 to 16). Note that Dutch adolescents are legally allowed to buy light alcoholic drinks at age 16. Adolescents whose profiles show low restrictive rules about alcohol (permissive) or decline in restrictiveness in the course of adolescence (decliners and authoritarian) drank more alcohol than those whose parents remained strict over time (moderate authoritative and authoritative). The current findings demonstrate that parents should be constantly setting restrictive rules as well as having constructive conversations about alcohol with their child during the course of adolescence in order to effectively influence their offspring's drinking behavior.

Based on the combinations of the different alcohol-specific parenting practices, we argue that the influence of communicating about alcohol depends on the level of rule-setting parents engage in, which may explain inconsistent findings of previous studies. The five parenting profiles that were distinguished in the current study showed no

combination of low level of restrictive rule-setting with high quality and frequency of communication. The absence of this combination implies that if parents don't set rules there is no reason to talk about alcohol. In this light, restrictive parenting can be considered as some form of parental involvement. This assumption is supported by Moore, Rothwell, & Segrott (2010), who showed that parental monitoring was strongly associated with family closeness. More research needs to be done to further unravel the family environment wherein parents guide their children toward responsible drinking behavior.

In order to characterize parents and their children in the different parenting profiles, several adolescent and parental factors at baseline were used as predictors of those profiles. Overall, the parenting profiles with the highest rates of adolescent drinking (permissive, decliners and authoritarian) are mostly predicted by adolescent characteristics (boys, lower educational level, high initial drinking, and low self-control and disclosure rate). These parenting profiles have in common that they either are very lenient (permissive) or become more lenient over time (decliners and authoritarian). However, where permissive and authoritarian parents also score low on the communication variables, declining parents report a relatively high frequency and quality of communication. This may be explained by the parental characteristics that also predict this profile, namely higher maternal drinking, lower self-efficacy and tolerant attitudes about alcohol. Parents in the declining profile may feel less efficacious and impelled to prohibit their child to drink alcohol due to their own alcohol use, which in turn leads to the decline in rule-setting that is observed in this parenting profile. Yet at the same time, these parents keep communicating with their children, most likely in an attempt to curb their drinking. More research is needed to investigate the bi-directional associations of parenting behavior and adolescent drinking across different parenting profiles.

Stable, restrictive rule-setting throughout adolescence is thus of importance to curb adolescents' drinking, but these rules are mostly effective when conveyed in an open and frequent communication style. Adolescents who perceive their parents as lenient or increasingly lenient over time and who experience a low or average parent-child interaction present high drinking rates.

10.4.1 Strengths and limitations

Notwithstanding the strengths of this study, there are several limitations to address. First, adolescents' alcohol use was based on self-reported data, whereas other methods such as cross-reports or diary reports may have yielded more reliable data. However, self-reports have been found to be fairly reliable (Koning et al., 2010; Wagenaar et al., 1993), and other methods are rather expensive when using large samples. Second, in this paper the uni-directional relationship between alcohol-specific parenting and adolescents' drinking is assumed. Although studies demonstrate that alcohol-specific parenting predicts more strongly adolescents' drinking (Jackson et al., 1999; Van der Vorst et al., 2007; Van den Eijnden et al., 2011), the effect of adolescents drinking on parenting has also been shown (Stice and Barrera, 1995; Van der Vorst et al., 2006). This is also demonstrated by the significant relation of alcohol use at baseline and some of the parenting profiles. Third, alcohol-specific parenting practices were reported by the adolescents. We should consider that reports of these practices might be related to child-specific characteristics (Tein, Roosa, & Michaels, 1994), such as emotionality and/or personality, which in turn may also be related to the differences in alcohol use behaviors among the adolescents. Yet, it is the perception of parenting practices which seems to determine adolescents' subsequent behavior. Fourth, as accounts for general parenting styles (Steinberg, Mounts, Lamborn, & Dornbusch, 1991), the influence of alcohol-specific parenting practices may also be subject to contextual influences — that is, across cultures parents may have different goals for socializing their children and drinking alcohol at an early age may have a different meaning. This contextual limitation has implications for the generalizability of our findings. We should also take into account that parental rule-setting concerning alcohol use is considered to be more legitimate and thus accepted by adolescents than rules regarding personal matters such as clothing (Smetana, 2000). The most effective parenting profile with respect to the use of alcohol may therefore differ for other risk behaviors.

10.4.2 Implications

Current findings have several implications for practice as well as science. First, more insight has been gained with respect to the combination of alcohol-specific parenting behaviors and adolescents' alcohol use. The role of restrictive rule-setting in combination with regular and qualitatively good communication about alcohol use is established. Practitioners working with parents in alcohol prevention programs should therefore not only focus on the relevance of rule-setting, but also on the importance that these rules will be conveyed regularly in an open communication style. In addition, both adolescents who end up drinking the highest amounts of alcohol and their parents should be targeted by alcohol prevention programs. A Dutch alcohol prevention program (PAS) succeeded at postponing the onset of drinking in adolescents (Chapter 2) by, amongst other things, increasing parents' restrictive rule-setting (Chapter 3). The current findings underline the relevance of targeting alcohol-specific parenting behaviors. More information about the relevance of an open and regular style of communication in combination with restrictive rule-setting should be provided in this and other prevention programs.

11. Conclusions and General Discussion

The present research investigated the separate as well as the combined effect of a parent and student intervention aiming at postponing the onset of (heavy) weekly drinking in early adolescents, hereby following up the participants up to four years after baseline (from 12-16 years). Until now, no Dutch research has been conducted on the effectiveness of interventions targeting adolescent alcohol use that included the parents (Cuijpers, Scholten, & Conijn, 2006; Van der Vorst, Vermeulen, van den Eijnden, 2010). Moreover, this study is the first in the Netherlands that examined the effects of a student- and parent-targeted intervention over a period of 5 years, from 12 to 16. This enabled us to examine the long-term effects of the PAS intervention up to the age of 16, which is considered the accepted drinking age in the Netherlands and the legal age for buying light alcohol beverages (with up to 5% alcohol). Moreover, this period of 5 years covers the phase in which most adolescents initiate drinking and develop more regular and heavy drinking habits (Poelen et al., 2005). Therefore, the findings described in this thesis provide important leads that are of interest for the prevention of alcohol use among early adolescents in the Netherlands.

The aim of this thesis was to a) examine the separate and combined effectiveness of a parent and a student targeted alcohol intervention (Prevention of Alcohol use in Students; PAS) on postponing the onset of drinking, b) identify the factors responsible for these effects both in parents (more restrictive attitudes and rules about alcohol) and in adolescents (increasing self-control and more restrictive perceived parental rules and attitudes about alcohol), c) investigate differential effects of the PAS intervention among low and high risk groups of adolescents (e.g. level of education and gender).

11.1 Discussion of the main findings

11.1.1 Prevention of Alcohol use in Students

More is more: superiority of multi-target over single-target interventions

Results indicated that when parents and their children were targeted simultaneously, the onset of (heavy) weekly drinking was effectively postponed 10, 22 (Chapter 2), and 34 (Chapter 5) months after baseline, respectively. Moreover, the combined intervention also curbed the intensity of drinking in adolescents aged 15 (Chapter 5). Targeting parents or adolescents, alone, did not reveal any significant effects. These findings demonstrate the significant and consistent effects of a brief universal school-based intervention for adolescents up to 15 years of age.

The combined intervention reduced the likelihood of (heavy) weekly drinking by at least 18% and the relative reduction (i.e. the difference in the prevalence of drinking between de control and the combined condition) ranged from 18 to 62%. In contrast, Spoth et al., (2011), who reported the effects of their family-school intervention (PROSPER) over several measurement points (Spoth et al., 2007), noted a maximum relative reduction of 40.6% for prevalence of use over the past month. Of note, most family-school interventions involve intensive programs that consist of multiple sessions and require active individual participation. For example, the PROSPER study consists of a family-focused intervention with 5 to 12 sessions and a school intervention with 11 to 15 sessions. Further, PROSPER's parent program showed a low attendance rate of parents, 17% of all eligible families, whereas over 80% of the parents in the PAS program attended the three parents meetings. Moreover, the parent intervention of the PAS program was incorporated into the general parents meeting. It is probably the delivery and intensity of the program that attributes to the participation of parents. Overall, a meta-analysis on the effects of family interventions that include parents and children and target the initiation of drinking in adolescents < 16 years of age (Smit et al., 2008) showed comparable odds ratios (summary OR of included studies = 0.62) to those reported in the current thesis (summary OR of all outcome measures over all follow-ups = 0.61).

In addition, Smit et al. (2008) showed a tendency of stronger effects among interventions that targeted both parents and children compared to those that targeted parents only (OR = 0.62 and 0.73, respectively). This trend is corroborated by the current thesis and other studies (Lopez et al., 2008; Foxcroft et al., 2003; Turissi, et al., 2009, Wu et al., 2003), which demonstrated significant superior effects of multi-target interventions over single-target interventions. In contrast to the well-known saying that 'less is more,' this is clearly a case of 'more is more'. Additionally, the present findings revealed substantial effects of the combined PAS intervention, a brief universal alcohol prevention program.

While the behavioral impact of student-targeted, school-based drug education programs is modest and often non-existent (Lopez et al., 2008; Spoth et al., 2008a; Perry et al., 1996; Williams et al., 1999), many alcohol interventions that target parents only have revealed positive effects (Smit et al., 2008, Koutakis et al., 2008). For example, the Örebro Prevention Program (ÖPP), a brief universal alcohol prevention program, effectively reduced drunkenness among 13-16-year- old Swedish youngsters. The lack of effectiveness of the parent intervention, considered in this thesis that was based on the ÖPP program, contradict the Swedish findings. In support of previous studies (e.g. Komro et al., 2008), current findings highlight the importance of conducting evaluations of previously validated programs in contexts that differ from the original study. Most likely, the more tolerant alcohol culture in the Netherlands, compared to Sweden, would explain the different outcomes found for programs in Sweden and the Netherlands (see also Koning, 2009). Further, with a legal age of 16 years for buying and consuming light alcoholic beverages, and a somewhat weak enforcement of laws prohibiting selling alcohol to underage youths (Gosselt, 2006), the Dutch cultural context promotes drinking at an early age. This is exemplified by the fact that nearly one third of the Dutch adolescents in the last year of elementary school (11 years of age) have already drunk alcohol (Van Dorsselaer et al., 2010). Targeting parents alone seems insufficient in such a lenient context; rather, targeting adolescents as well is necessary. It seems that interventions are culturally sensitive and should be adapted and evaluated according to cultural context. Moreover, a recent replication study on the effectiveness of the ÖPP as currently delivered in Sweden revealed no significant effects on drinking behavior (Bodin & Strandberg, 2011). This would also argue for replication studies over time, as the

implementation in the real world as well as the spirit of times may influence the effect of the intervention. In light of this, it is interesting to note that the PAS intervention was carried out during a time (2006-2009) when the rise of alcohol consumption in children and early adolescents – including the first cases of alcohol coma in children at first aid centers – was a major media event that shook up both parents and professionals and explicitly put the leniency, with respect to alcohol and children, on the agenda. As a result, the Dutch government launched several national campaigns to reduce underage drinking that addressed parents and paid more attention to the sale of alcohol to under aged youth. The spirit of the times may have augmented the positive effects of the combined PAS intervention.

In sum, evidence is clear on the effects of the parent and student intervention offered separately and combined. Specifically, only when parents and their offspring are targeted simultaneously, the age of onset for regular drinking, as well as the level of alcohol use can effectively be restrained. Our results suggest that a parent intervention that encourages strict alcohol-specific parenting (e.g. parental rule setting) may be best understood and taken seriously by adolescents when similar messages are voiced in other relevant social contexts, such as in school. Based on these findings, implementation of the combined parent and student intervention should be recommended.

Increasing control on personal and parental level

It was tested whether the intervention modified the theory-based factors as hypothesized and to what extent these changes accounted for a delay in onset of drinking at the 2nd follow-up (Chapter 3). This mediation analysis was an imperative step in analyzing the effects of the PAS intervention. Further, results demonstrated that the PAS intervention was effective by modifying theoretically intermediate factors addressed by the interventions. As such, the combined intervention increased restrictive parental rules and self-control, as reported by adolescents, and strict parental attitudes, as reported by parents. These modifications also accounted for a delay in onset of weekly drinking among adolescents. It is also apparent that self-control of adolescents is needed to resist alcohol temptations that they are faced during the course of adolescence. Yet, it seems

that adolescents feel they are capable of resisting temptations when their parents also set strict rules, as such. Rules may support adolescents in their decision not to drink. These findings underscore the importance of targeting both adolescent self-control and their parental rule setting beyond targeting either of them. Therefore, alcohol interventions that target early adolescents should involve at least components that also focus, at least, on the development of self-control in adolescents and on strict parenting.

In line with the findings of Cuijpers et al. (2002; HSD-program), the combined intervention was effective in delaying the onset of drinking via adolescent self-control, but not via adolescent attitudes toward alcohol use, once perceived parental rules were taken into account. The increase in self-control due to the parent-child alcohol intervention, particularly among non-drinking adolescents at baseline, was also been demonstrated by Komro et al. (2001). The PAS intervention may have provided support for not drinking and increases adolescent confidence and ability to resist offers to use alcohol (Komro et al., 2001). Additionally, it seems that changing adolescents' attitudes about alcohol use may not be effective; however increasing their self-control may be relevant to delay the onset of drinking. Moreover, parental restrictive rule setting (as reported by the adolescent) and parental restrictive attitudes were of major importance, which corroborate the effects of the ÖPP program on parental attitudes (Koutakis et al., 2008). Thus, the combined PAS intervention modified, exactly, the theoretically intermediate factors that were addressed by the separate interventions.

The need to target adolescents and their parents is supported by a change in the intermediate factors of the separate interventions. Whereas the separate parent intervention did change intervention-induced factors (i.e. parental attitudes about alcohol), the student intervention did not strengthen the self-control of the adolescents when conducted alone. However, the combined intervention did affect these factors (presumably by the student intervention that was part of the combined intervention and aimed to increase student self-control). This finding seems to indicate that, to increase adolescent self-control via the student intervention, parents should be targeted as well. From a developmental perspective, it is known that because of the parallel development of individuation (i.e., formation of identity) and separation from parents during early adolescence (Meeus, Iedema, Maasen, & Engels, 2005), youth increasingly reject the idea that rules must be obeyed (i.e. so-called de-idealization). Likewise, adolescents desire

confidence to make their own choices, independent of their parents' wishes. Maybe, the student intervention has convinced adolescents of the gains of not drinking, thereby, reinforced the rules set by parents. During the course of adolescence it may become even more important to voice consistent messages (i.e., strict rules) across multiple domains, as the individuation-separation process further develops (Meeus et al., 2005).

The lack of change in adolescents' attitudes due to the intervention and its subsequent relation to alcohol initiation, indicate that, with respect to the early initiation of alcohol, the role of adolescents' attitudes about alcohol use in alcohol prevention is not convincing. It is more likely that, as is suggested by social cognitive theory of Bandura (1986), that personal and environmental factors are interrelated with the adolescents' behaviors. In the combined PAS intervention, the level of self-control was increased in adolescents (personal factor), the parents restricted the use of alcohol (environmental factor), and as a result, the adolescents delayed the onset of drinking (behavior). However, contrary to social cognitive theory, parental alcohol use appeared to be of no importance when rules about alcohol were taken into account (see the discussion further on). Finally, according to social cognitive theory, limiting the access to alcohol at a community level could even further strengthen the effects of the PAS intervention. Investigating the effects of PAS in conjunction with activities carried out on a community level will put the 'more is more' assumption in a broader context.

In sum, the combined PAS intervention achieved its effects by changing the intervention's hypothesized intermediate factors. To delay the onset of drinking in adolescence, increasing restrictive parenting and adolescents' self-control are both of major importance. Thus, our results support the potential for this type of intervention on the postponement of alcohol use among adolescents in the Netherlands. Further, results indicate that interventions should involve the improvement of self-control in adolescents, preceded by the encouragement of restrictive rules and attitudes among parents.

High risk – high gain: superior effects of PAS in the high risk groups

In the third research question, it was tested whether the universal PAS intervention that targets adolescents and parents, in the general population, had similar effects across

subgroups of adolescents and parents. This study took several moderators into account so a comprehensive insight could be obtained concerning the effects of the universal PAS intervention across both high and low risk subgroups. Findings showed differential effects of the combined PAS intervention on the onset of (heavy) weekly drinking (Chapters 4 & 6). The 'high-risk, high-gain' proposition is applicable here; i.e. the combined PAS intervention was found to be effective in delaying (heavy) weekly alcohol use, but only in the high risk sub samples of adolescents. That is, the combined intervention was more effective in delaying onset of (heavy) weekly drinking among adolescents who (1) attend lower levels of education, (2) exhibited higher levels of externalizing behavior (risk factors), (3) report a lower level of self-control and (4) grew up with more lenient parents (intervention-induced factors). No moderation effects were found for adolescent gender, parents' level of education, heavy parental alcohol use, or parental attitudes about alcohol.

Adolescents in lower education, those with externalizing behaviors, those with lower levels of self-control, and those with more lenient parents are more predisposed to risky alcohol use, which makes the need for effective interventions imperative. Adolescents may respond differently to alcohol interventions due to the presence of risk and protective factors. However, previous research on moderation effects of school-based alcohol interventions yielded inconsistent findings. Some studies indicated more favorable outcomes among high-risk groups (Kellam et al., 2008), others found similar outcomes in low risk groups (Lillehoj et al., 2004), and still others reported no differential effects (Trudeau et al., 2003). In contrast, the effects of family-focused interventions did not differ according to family or adolescent characteristics (Guyll, Spoth, Chao, Wickrama, & Russell, 2004; Jones et al., 2006; Koutakis et al., 2008; Spoth et al., 1998; 2006). Thus, in contrast to the previous family-focused intervention studies, the combined PAS intervention is particularly effective among the aforementioned high-risk subgroups of adolescents. Additionally, it is assumed that adolescents at higher risk for substance abuse may be more prone to respond to the intervention (Stice et al., 2009). That is, adolescents might experience the intervention's positive effects relatively stronger because prevention messages and activities have more salience for them, as well as for their parents (Spoth et al. 2008).

Higher responsiveness to the PAS intervention by the high-risk groups can be a result of two processes. First, as suggested by LaBrie, Feres, Kenney. and Lac (2009), the greater perceived relevance of preventive information in high-risk groups may lead to more active processing of the information. Second, at-risk adolescents score low on the factors that may prevent them from becoming involved in drinking (e.g., strict parental rules) as well as on factors that may help them resist alcohol temptations (e.g., self-control). This makes it possible to induce more change in these high-risk groups as there is more to change by the intervention. For instance, it is more difficult for an intervention to increase the level of strict rule-setting in parents who are already strict; the so-called ceiling-effect (Judd & Kenny, 1981).

Both differential and universal (e.g. across gender and parental level of drinking) effects of the combined PAS intervention were found to delay the onset of (heavy) weekly drinking. There is more to gain in high risk groups, whereas in low risk groups the benefits are only moderate or even non-existing. Selective implementation of the combined PAS intervention in high schools involving lower levels of education is recommended.

Effects of PAS on 16+ adolescents; no evidence of catching up behavior

It was investigated whether the effects of the PAS intervention were sustained at the age of 16, which is the accepted age for drinking alcohol and the legal age for buying light alcoholic drinks in the Netherlands. It appeared that even in 16-year-old adolescents the combined intervention delayed the onset of heavy weekly drinking and decreased the drinking level among 16-year old adolescents (Chapter 7). Moreover, we were able to show that drinking initiation was delayed due to the combined intervention that resulted in lower rates of drinking among adolescents aged 16. That is, the effect of the combined intervention on the level of drinking in 16-year-old adolescents was only found with those adolescents who did not drink at ages 13 and 14.

The sustained effects of the combined intervention only, demonstrate the coherence of the combined PAS intervention throughout adolescence. In their review, Spoth et al. (2008a) found no evidence of an effect of family-based interventions on youth aged 16-20 years old, except among college students (in most parts in the U.S. 21 years is the legal

drinking age). To our knowledge, no researchers have evaluated family-school interventions that target underage drinking or the effects of such interventions after the legal drinking age had been reached. This insight underlines the practical significance of the combined PAS intervention.

The current findings provide no evidence for the 'catching up' hypothesis that suggests that delayed initiation of drinking results in higher rates of alcohol use later on as the adolescent has not 'learned' to drink responsibly. Exactly the opposite seems true; adolescents in the combined intervention, who postponed the use of alcohol up to the age of 14, drank less alcohol than controls when they were 16 compared to adolescents who drank at age 13 or 14 in the same intervention condition. Spoth, Trudeau, Guyll, Shin, & Redmond (2009) have shown that delayed substance use initiation in adolescence, mediated the effect of their family-school intervention on substance use among young adults. The current finding suggests that by delaying the onset of drinking, the course of drinking behavior is also pushed forward. Therefore, a delay in onset of drinking age should be encouraged among Dutch adolescents so adolescents tend to drink more responsibly later on. The delayed initiation, as well as the lower level of drinking only in those who do not drink weekly until after age 15, lowers the risk of developing a substance abuse pattern later in life (e.g. Behrendt et al., 2009a).

11.1.2 How can parent directed alcohol interventions be improved?

As described, the onset of (heavy) weekly drinking in adolescents who received the combined intervention was significantly reduced. However, a significant percentage of adolescents in the combined intervention still initiated weekly drinking early in adolescence (e.g., 31.5% started to drink weekly at age 14). Therefore, it remains imperative to explore the role of alcohol-specific parenting, so the parent intervention can be improved according to new insights.

Previous studies have demonstrated the relevance of strict rule setting about alcohol use by parents (e.g. Van der Vorst et al., 2006; Yu, 2003). Chapters 8 to 10 confirmed the importance of alcohol-specific parenting, with restrictive rule setting as the most significant parenting behavior relevant for reducing adolescents' alcohol use. Therefore,

the current thesis contributed to the existing knowledge on alcohol-specific parenting in three ways.

First, we showed the importance of restrictive rule setting beyond the role of heavy parental alcohol use on adolescents' onset of drinking (Chapters 4 & 8). Previous research indicated that parental alcohol use was related to drinking in adolescents (Duncan et al., 2006; Yu, 2003), even when strict rule setting was taken into consideration (Jackson et al., 1997; Latendresse et al., 2009; Spijkerman et al., 2008). As these studies included middle and late adolescents, it seems that the influence of parental alcohol use on the onset of drinking during early adolescence is far less pronounced (Van der Vorst, Vermulst, Meeus, Dekovic, & Engels, 2009). These findings further underline the importance of encouraging parents to set restrictive rules, whereas advice on their own drinking behaviors is not required to delay the onset of drinking of their children. As such, placing the focus on the relevance of strict rule setting and not addressing parents' own drinking behaviors is precisely the intent of the PAS intervention.

Second, we revealed that adolescents with parents who set strict rules throughout adolescence (age 12 to 16), are not only less likely to initiate drinking early, but they also increase their level of drinking at a slower pace (Chapter 10). Dutch studies showed that restrictive rule setting was most effective when adolescents are in the initiation phase of drinking and less effective in preventing more regular drinking in middle and late adolescence (Van der Vorst, 2006; 2007). The continuous influence of strict rule setting during adolescence further suggests that alcohol interventions should focus on encouraging parents to set strict alcohol-specific rules up to the age of 16, when most adolescents already drink regularly. Likewise, as the influence of peers seems to become stronger with age and drinking phase (e.g., Van der Vorst et al., 2009), future research should control for these peer influences while also examining the effect of parent interventions in adolescents up to age 16.

Third, it was revealed that setting restrictive rules during adolescence is most effective when these rules are combined with high quality and frequency of communication. To a large extent these findings are in line with the typology of general parenting styles defined by Baumrind (1967), who demonstrated that parenting style is characterized by level of control and support. In this thesis, we demonstrated the importance of these two dimensions in terms of alcohol-specific parenting. For example,

alcohol-specific rules about alcohol and quality of communication about alcohol reflect, respectively, general control and support dimensions. However, little is known concerning how communication about alcohol can be viewed qualitatively (i.e., how can rules be conveyed in a qualitative way). In general – and supported by our results - it is likely that alcohol-specific rules should be clear and firmly enforced; more importantly, the reasoning behind the rules should be explained. At the same time, parents should express interest in their children's needs and allow their children to question the rules (Stice, Barerra, & Chassin, 1993). Further, more research is needed to gain a better understanding of how a high quality communication about alcohol can be achieved. Of note, the current findings indicate that alcohol prevention programs should not only focus on the relevance of rule setting, but also on the importance that these rules are conveyed regularly in a high quality communication style.

Furthermore, findings reveal that parents who worry more and parents who have a low parenting self-efficacy have children who drink more alcohol due to fewer restrictive rules. Not only do high parental worries lead to more alcohol use, a study by Stattin, Kerr, & Bergman (2010) found that parents who were highly worried at age 13 were more likely to have an adolescent who engaged in a criminal act in childhood (so-called childhood-onset-desisters and life-course-persistent groups, based on Moffitt's trajectories of antisocial behavior). This implies that parental worries are an important predictor of adolescent risk behaviors in general. Hence, this finding is an important lead for the development of future alcohol prevention programs that involve parents. Teaching parents how to effectively influence their offspring's alcohol use, for instance by setting strict rules, may not resolve their worries directly, but may increase their self-efficacy and their parenting behaviors, which may diminish worrying and subsequent risk behaviors in their offspring.

Table 11.1. *Overview of the research questions, its main conclusions and the corresponding chapters*

Research question	Conclusion	Chapter(s)
Is it effective to target students and parents in alcohol prevention, or is targeting either of them sufficient?	Only when adolescents and their parents are targeted in the PAS intervention, did the onset and level of alcohol use decrease up to age 16. After reaching age 16, an effect of the combined intervention on intensity of drinking was only found with those who initiated weekly alcohol use after age 14.	2, 5, 7
How did PAS reach its goal?	The increase in adolescent-perceived restrictive rule setting, their level of self-control and parental attitudes accounted for the effect of the combined PAS intervention on the onset of weekly drinking.	3
Is the gain largest in high-risk groups?	The PAS intervention was most effective in high risk groups (i.e. lower level of education, externalized behavior, low self-control and lenient parents).	4, 6
What other elements of parenting may be targeted in future interventions?	Restrictive rule setting was the most relevant alcohol-specific parenting practice that strongly influenced onset and level of drinking. These rules were most effective when conveyed via a frequent and qualitative communication. The encouragement of strict rule setting may increase parents' self-efficacy, which in turn diminishes parental worries and its subsequent drinking behavior.	8, 9, 10

11.3 Limitations

11.3.1 Study design

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, 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 PAS study; as such, participating schools might not be representative of all schools in the Netherlands. This may limit the generalizability of our findings. However, as most schools declined participation due to other research going on in the school (in a highly populated country with a large number of universities, the pressure on schools to participate in research is rather high) we feel confident that the participating schools are not very different from other schools in the Netherlands. Moreover, no systematic differences were seen between participating and non-participating schools regarding size, region, or educational level. Second, parents and adolescents in the experimental and control groups may have responded to the assessment of their drinking behavior. The measurement of drinking behavior may have alerted respondents on their alcohol use, which may have resulted in participants reporting lower levels of drinking in subsequent measurements. Yet, even if this was the case in the current thesis, this would be observed across conditions and findings revealed significant differences between the experimental and control conditions, probably due to a lack of support for reactivity in intervention research (Jenkins, McAlaney, & McCambridge, 2009).

11.3.2 Method

Outcome measures were based on self-reported data. Although self-reports have been found to be a reliable method to measure alcohol use when confidentiality is assured (Del Boca & Darkes, 2003; Koning et al., 2010) objective measures are clearly superior, but not feasible, in a large study. Last, until the fourth wave some dropout occurred, specifically among older students and those in lower types of education. On the whole, especially during the first phase of the study, attrition was limited and unrelated to conditions; therefore was unlikely to affect our conclusions. Of note, the attrition rate during the fifth wave was relatively high and was related to conditions; more than half of the initial participants did not complete the fourth post-test data collection. A high attrition rate may result in certain types of individuals remaining in the study; thereby limiting the generalizability of findings. That is, participating adolescents were more likely to be younger and in higher levels of education, therefore were considered to be low-risk

adolescents. However, responding adolescents at T4 did not differ in average number of alcohol beverages per week at baseline.

11.3.4 Generalizability

One should be careful in generalizing the effects of the PAS intervention to other countries, since our findings may not reflect the situation in other drinking cultures. Therefore, evidence-based interventions in one culture should always be re-examined in another. Second, due to the exclusion of adolescents who drank weekly at baseline, which was necessary to analyze incidence rates, the current findings only apply to adolescents who were not involved in weekly drinking at age 12.

11.4 Future interests

This research highlighted a number of topics on which further research would be beneficial.

11.4.1 Improvement of the PAS intervention

Additional research is needed to assess the importance of the sequence wherein interventions carried out. Chapter 3 showed that the level of self-control in adolescents, which was targeted by the student intervention, only increased when parents were also targeted, whereas the separate parent intervention did change restrictive parenting attitudes. This indicates that the parent intervention should be conducted prior to the student intervention. It is likely that adolescents respond favorably to the student intervention because their parents became more strict following the parent intervention. This finding was discussed previously concerning individuation-separation development (Meeus et al., 2005) which assumes that adolescents do not accept parental rules as is; yet only if the same message is voiced in other contexts (e.g., at school). This development becomes more apparent by age; therefore additional research is warranted on the sequence of interventions and the number of targeted contexts. Further, knowledge on the relevance of the order of the interventions and the 'the more, the

better' also accounts later in adolescence may help increase the effectiveness of alcohol interventions.

An effort worth making is to explore whether we can apply the knowledge obtained in this thesis to the development of parents-child interventions that target smoking and cannabis use. According to problem behavior theory (Jessor & Jessor, 1977), this is feasible as shared underlying risk factors can account for different problem behaviors. However, studies have also shown that alcohol-specific parenting seems to have a different effect than do smoking-specific parenting. For example, restrictive rule setting is effective in curbing adolescent drinking, but tend to have counter effects pertaining to smoking in most (Harakeh et al., 2005; Den Exter Blokland, Hale, Meeus, & Engels, 2006), but not all studies (Huver, Engels, de Vries, 2006). Therefore, it is necessary to investigate the overlapping factors in parents and children that contribute to the use of substances that could be addressed by interventions. However, adding other substances to the PAS intervention may suppress (at least parts of) the alcohol-specific boosters. This may be critically important as Tolan, Gorman-Smith, Henry and Schoeny (2009) found that adding a booster to a family intervention improved outcomes of interest, particularly in high-risk groups. Finally, research on how a combined parent-child intervention can effectively address multiple substances while using the knowledge of the PAS intervention is needed.

11.4.2 Parenting in adolescence

The onset of adolescence is associated with a change in the parent-child relationship as well as an increased risk for developing risk behavior. Risk behaviors in adolescence can be attributed to the friction between biological maturation and access to adult privileges, such as drinking alcohol. That is, adolescents may be biological mature, however do not get the adult responsibilities and privileges; the so-called 'maturity-gap' (Moffitt, 1993). Therefore, to achieve an adult status, adolescents engage in risk behavior, such as alcohol use. Obviously, parents want to prevent their child from engaging in risky behaviors by monitoring the child's behavior, yet if parents are too protective this will enhance the risk of getting involved in risk behaviors (Creemers, Harakeh, Dick, et al., 2011). Furthermore, effective parenting may differ as a matter of the age of maturation. Taken this together, it would be interesting to examine the role of the 'maturity-gap' on the effectiveness of

family-school intervention studies such as the PAS intervention. Insight into this matter may contribute to the refinement of parent-child interventions with respect to optimal timing of implementation and appropriateness of information provided to parents.

In addition to parenting behaviors assessed in the current thesis, van den Eijnden and colleagues (2011) revealed that the availability of alcoholic drinks at home strongly predicts adolescent alcohol use; however this impact can be prevented when adolescents perceive strict alcohol-specific rules. As such, it would be interesting to examine whether the availability of alcoholic drinks at home is affected by the PAS intervention based on an increase in strict rule setting by parents who participate in the combined PAS intervention.

11.4.3 Parents versus peers

As discussed previously, parents remain influential throughout adolescence, although the strength of this influence tends to diminish. For example, knowledge of the child's whereabouts and spending time together remains crucial in adolescence (Laird, Pettit, Dordge, Bates, 2003). However, peers tend to become more important role models in each other's lives. A large body of research has shown that parental involvement moderates the influence of peers concerning alcohol use (e.g. Fitzgerald & Arndt, 2002; Marshal & Chassin, 2000; Wood, Read, Mitchell, & Brand, 2004). Therefore, it would be interesting to examine the effectiveness of a parent-child alcohol intervention at different stages of adolescence, thereby taking the role of peers into account in order to increase knowledge on the influence of parents versus peers during adolescence.

11.4.4 Alcohol-specific parenting and adolescence after age 16

Little is known about the influence of alcohol-specific parenting in Dutch adolescents older than 16. For example, it is known that the positive effect of strict rule setting earlier in adolescence, acts differently in older adolescents (Van der Vorst et al., 2006). Yet, as adolescents begin drinking more heavily and regularly after the age of 16 and most still live at their parents' home, it is likely that parents exert (indirect) influence into late adolescence (Abar & Turrisi, 2008). This was exemplified by the association of perceived parental permissibility of alcohol use in an U.S. sample of late high-school students (mean

age 18.6) who lived away from their parents a part of the year (Abar, Abar, Turrisi, 2009). In addition, Wood et al. (2010) demonstrated that their parent intervention increased students' perceptions of parental disapproval; however, the students (mean age = 18.4) also had to be targeted in order to foster change in their alcohol use. At the same time, peers tend to become more important role models in youth's life during adolescence. However, a large body of research has shown that parental involvement moderates the influence of peers concerning alcohol use (e.g. Fitzgerald & Arndt, 2002; Marshall & Chassin, 2000; Wood, Read, Mitchell, & Brand, 2004). When investigating effective parenting practices for curbing older adolescents' alcohol use research must take the role of peers into account. This may contribute to the development of parenting programs that target parents of 16+ adolescents. To date, effective alcohol interventions that target parents of adolescents 16 years and older is lacking in the Netherlands.

11.4.5 Parent-child interactions

The reciprocal interactions between parents and adolescents during adolescence have been established by previous research for several risk behaviors (Buist, Dekovic, Meeus, van Aken, 2004), including alcohol use (Van der Vorst et al., 2006). As such, a variety of child, parent and contextual factors may contribute to the bi-directional processes of influence. For example, parenting seems to be characterized more so by adolescent characteristics when the family context is described as a supportive environment (e.g., low stress, high support, high marital satisfaction; Grolnick, Weiss, McKenzie, & Wrightman, 1996). In chapter 10 we demonstrated that ineffective alcohol-specific parenting profiles were particularly predicted by adolescent characteristics. In addition, van der Vorst et al. (2006) revealed that parental control reduced adolescent alcohol use and that adolescent drinking behaviors led to lower levels of strict parental control. Although we already aware of some reciprocal processes between parents and their offspring, this knowledge could be enhanced with respect to the conditions under which the reciprocal interactions predominantly take place: that is, placing parent-child interactions within broader social contexts, such as the family, school, and cultural (cf. Bronfenbrenner's ecological system theory).

11.5 Practical implications

The results of the current thesis are not only of scientific interest, but predominantly of societal importance. All findings have direct practical implications and therefore have been depicted immediately upon reporting the conclusions. For an overview of the main practical implications, see Table 11.2.

Taken these implications together, it can be concluded that implementation of the combined PAS intervention is warranted. This study strengthened the evidence that both adolescents and their parents should be targeted in a multi-component intervention. The combined intervention is effective in delaying the onset of alcohol use among young adolescents whereas single-target attempts are not. To date, the Trimbos Institute (Dutch Institute of Mental Health and Addiction) sees to the implementation of the combined PAS intervention and since 2009, social workers have been trained to conduct the PAS intervention within the existing Healthy School and Drugs program.

Table 11.2. *Overview of main practical implications of this study*

	Practical implication
Alcohol prevention	Parents and adolescents should be targeted in alcohol prevention programs.
	The delay in onset of drinking among adolescents due to the combined PAS intervention also result in more responsible drinking at age 16, the accepted drinking age in the Netherlands. Therefore, the Dutch government should encourage the implementation of evidence-based alcohol interventions that focus on delaying the onset of drinking, such as the PAS intervention.
Alcohol-specific parenting	Parents should restrict the use of alcohol under the age of 16 instead of learning their child to drink
	Restrictive rule setting is relevant throughout different drinking phases in adolescence (i.e., from initiation to regular drinking).

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Summary

Part I: Prevention of Alcohol use in Students

Although declining, the rate of alcohol use among early adolescents in the Netherlands remains high. More than one third (39%) of the 14-year old adolescents drink on a monthly basis and this percentage increases to 71% at the age of 16. Moreover, once adolescents have started to drink, they tend to drink high amounts of alcohol. This is worrisome as the use of alcohol at an early age is associated with several (health) risks later in life. Therefore, it is important to curb the early use of alcohol. The Dutch alcohol prevention program 'Prevention of Alcohol use in Students' (PAS) aims to postpone the onset of drinking in adolescents aged 12 to 16 years. The PAS intervention consists of a parent and a student component. The separate as well as the combined effects of the parent- and student intervention is examined in the current thesis. The student intervention is the renewed digital alcohol module of the Dutch prevention program ´The Healthy School and Drugs´ (HSD). The alcohol module consists of four digital lessons carried out in the first year in high school and targets the students' abilities to develop a healthy attitude towards alcohol use and to train their refusal-skills. A paper booster session was provided in the second year. The parent intervention is modelled after a Swedish intervention, The Örebro Prevention program and targets parental rules for their children's alcohol use. The intervention was carried out at the first parents meeting at the beginning of each school year (September/October 2006 and 2007), in which also other school-related topics were discussed. Parents were provided with information about the risks involved in early drinking and were encouraged to set strict rules about alcohol. The purpose of this study is threefold: 1) what is the effectiveness of the parent- and student intervention offered separately and jointly on the onset of (heavy) weekly drinking, 2) did the theory-based intermediate factors that were targeted by the PAS intervention (attitudes regarding alcohol use and self-control in adolescents and rules and attitudes regarding alcohol use in parents) account for the effect on

adolescents' drinking (mediation analysis), and 3) is the effect of the PAS intervention different across (high risk) subgroups of adolescents and parents, such as adolescents in lower levels of education and those exhibiting externalized behavior.

These research questions were investigated in a sample of 2937 adolescents by means of a cluster randomized trial. Nineteen schools were randomly assigned to one of the following conditions: 1) parent intervention only, 2) student intervention only, 3) both parent and student intervention (combined intervention), and 4) control condition (business-as-usual). Data in adolescents and parents were collected at 5 subsequent years (age 12 to 16). The sample is characterized by an average age of 12.6 (SD=0.49) at baseline, consisting of 51% boys and 40% in lower secondary education. Most of the responding parents were female (80.9%). More than half of the mothers (61.9%) and fathers (55.5%) had low educational levels (only vocational training).

The effectiveness of the PAS intervention on delaying the onset of (heavy) weekly drinking after 10 (this is called T1, the adolescents are on average 13.4 years old), 22 (T2, average 14.5 years old) and 34 (T3 Average 15.4 years old) months after baseline is described in Chapters 2 and 5. The evaluation of the effectiveness of the PAS intervention revealed that only when parents and their children were targeted simultaneously, the onset of (heavy) weekly drinking was effectively postponed 10, 22 (Chapter 2) and 34 (Chapter 5) months later. For example, the onset of weekly drinking in 14-year old adolescents receiving the combined intervention was reduced by 10% in comparison with the control condition, a relative reduction rate of 24%. Targeting parents or adolescents separately did not reveal any significant effects. Thus, parents and adolescents should be targeted to effectively postpone the onset of (heavy) weekly drinking and to reduce the quantity of drinking in adolescents.

The second question examines whether the intervention modified the theory-based factors as hypothesized and to what extent these changes accounted for the delay in onset of drinking at T2 (Chapter 3). We examined the effects of the separate as well as the combined parent and student intervention on specific theory-based factors in adolescents (adolescents' self-control and attitudes towards drinking, and parental rules) as well as in parents (attitudes on juvenile drinking and rules about alcohol use of their child). The PAS intervention proved to be effective as predicted by the theoretical assumptions underlying the interventions. The parent intervention modified rules and

attitudes about alcohol as reported by parents. The combined intervention affected both adolescent reported and parent reported rules and attitudes about alcohol and adolescents' perceived self-control, yet only perceived rules and self-control, as reported by adolescents, and parental attitudes mediated the association between the combined intervention and onset of weekly drinking. No significant effects of the separate student intervention on the mediating factors were found. Thus, the PAS intervention effectively postponed the onset of weekly drinking by increasing its hypothesized intermediate factors; adolescents' self-control and perceived strict rule setting and parental attitudes about alcohol. Therefore, alcohol interventions targeting early adolescents should involve components that focus at least on the development of self-control in adolescents as well as on the rule setting by parents.

In Chapters 4 and 6 it is tested whether the universal PAS intervention that targets adolescents and parents in the general population indeed has positive effects across subgroups of adolescents and parents. A distinction was mad between two types of moderators, both measured at baseline. The first type of moderators are risk factors; gender of the adolescent, level of education of adolescent and parent, adolescents' externalized behavior and heavy maternal alcohol use (Chapter 4). The intervention-induced factors are the second type of moderators investigated in this study. These factors account for the effect of the PAS intervention on the onset of drinking (Chapter 6).

Differential effects of the PAS intervention on the onset of (heavy) weekly drinking were found for risk as well as intervention-induced factors. That is, the combined intervention was found to be effective in delaying the onset of heavy weekly drinking (measured at T2) among adolescents attending lower levels of education and those reporting higher levels of externalizing behavior. Gender of the adolescent, the level of education and maternal alcohol use did not moderate the effectiveness. Two conclusions can be drawn. First, the combined intervention is universally effective in delaying the onset of weekly drinking in the general population of adolescents. Second, the combined PAS intervention is only effective in delaying heavy weekly alcohol use in a higher-risk subsample of adolescents.

With respect to moderation of intervention-induced factors, the combined intervention was only effective in preventing weekly drinking (measured at T3) among those adolescents who reported to have a lower self-control and lenient parents at

baseline. No differential effect was found for the onset of heavy weekly drinking. As most beneficial effects were found in adolescents with a low self-control and lenient parents, both behaviors that were specific targets of the intervention, the relevance of targeting self-control in adolescents and restrictive parenting in their parents is underlined.

In Chapter 7 the effects of the PAS interventions in adolescents aged 16 years is examined. This is more than four years after baseline and is interesting to examine because of two reasons. First, at age 16, adolescents are legally allowed to buy light alcoholic drinks and informally allowed to drink alcohol. Second, the aim of the PAS intervention was to delay the onset of drinking until at least 16 years. Moreover, until recently most parents believed that adolescents' should be learned to drink responsibly by providing them alcohol before the age of 16, mostly in the home situations. By prohibiting the use of alcohol under the age of 16, adolescents may not be able to drink responsibly once they are allowed to drink and therefore may catch up their drinking behavior. This makes it interesting to examine the effects of the PAS intervention on adolescents' onset of drinking, as well as the growth of drinking at the age of 16. The results show that the combined intervention effectively delayed the onset of heavy weekly drinking and attenuated the increase of drinking in adolescents up to age 16, 50 month after baseline (Chapter 7). Half of the adolescents in the combined intervention (9.7%) initiated to drink heavily on a weekly basis in comparison with adolescents in the control condition (19.6%). Sixteen year old adolescents who are in lower levels of education and those with externalized behavior had more favorable effects of the combined PAS intervention. Furthermore, the delay in onset earlier in adolescence (up to age 14) accounted for a lower rate of drinking at age 16, ruling out the catching up hypothesis. These findings point at the public health benefits of postponing the onset of drinking as this will also result in more responsible drinking later on.

This is the first Dutch study that examined the effectiveness of a parent and student intervention on adolescents' alcohol use using 5 annual measurements, age 12 to 16. In sum, the studies in this thesis indicate that the PAS intervention is effective in delaying the onset of drinking by changing its theory based intermediate factors when parents and adolescents are targeted simultaneously. Targeting parents or adolescents separately did not reveal any significant effects. More specifically, the findings point at the importance of encouraging restrictive rule setting among parents and enlarging adolescents' self-

control to prevent the onset and the acceleration of alcohol use among youth during adolescence. Targeting these specific behaviors in adolescents and parents seem to be effective for curbing adolescents' alcohol use particularly in high-risk subgroups of adolescents. In addition, the relevance of strict parenting is confirmed independent of parents own alcohol use, that is exemplified by the lack of moderation in the effect of the PAS intervention by parents' own alcohol use. Moreover, the beneficial effects of the combined PAS interventions accounts up to age 16, the accepted drinking age in the Netherlands. The delay of onset of drinking should be a major focus of the Dutch government, as postponing the onset of drinking until at least 14 years also result in lower rates of drinking at age 16. This thesis demonstrates that parents and adolescents should be targeted simultaneously; encouraging restrictive rule setting among parents enhances the effect of a student only intervention.

Part II. Alcohol-specific parenting: a closer look

As described previously, the combined intervention significantly delays the onset of (heavy) weekly drinking in a subgroup of adolescents. Yet, still a significant percentage of adolescents in the combined intervention initiated drinking. For example, at age 14 31.5% of the adolescents receiving the combined intervention started to drink weekly. In order to be able to improve the current parent intervention, we took a closer look at alcohol-specific parenting practices. The last three chapters in this thesis examined more closely the role of alcohol-specific parenting practices in adolescents' alcohol use.

The cross-sectional findings presented in Chapter 8 show that in early adolescence alcohol-specific parenting is more important for adolescents' drinking than parental alcohol use. In line with studies involving middle/late adolescents, we found that early adolescents with strict parents were less likely to drink alcohol (lifetime / infrequent / regular). In addition, parental alcohol use was not found to be associated with early adolescent alcohol use, nor did parental alcohol use influence the impact of parental rules. Restrictive alcohol-specific socialization was, independent of parental alcohol use, related to absence of (regular) early adolescent drinking.

To get more insight into what parental factors contribute to effective parenting, we examined the role of parental worries about their child's wellbeing and parents' self-

efficacy regarding their parenting behavior. In Chapter 9 first we examined the associations of parental worries and adolescent alcohol use, where after it was tested whether this relation was mediated by alcohol-specific parenting (rules, frequency and quality of communication about alcohol use). In addition, this mediating model was examined in both parents with a low and a high self-efficacy regarding their parenting behavior. Alcohol use in adolescents was predicted by more parental worries directly as well as indirectly via less restrictive rule setting, particularly among parents with a low self-efficacy. Moreover, parents with a high self-efficacy diminish the risk of future alcohol use in their children by setting more restrictive rules about alcohol. These findings imply that by targeting parents' restrictive rule setting, their level of worries may decrease whereas their confidence in their own behavior may improve.

In Chapter 10 we examined how separate alcohol-specific parenting practices (rules, quality and frequency of communication about alcohol) coincide together and in turn what parenting profile is most optimal for adolescents' drinking behavior. It appeared that restrictive rules about alcohol are most effective when strict rules are set across adolescence and they coincide with a good quality and frequency of communication about alcohol. Alcohol-specific parenting behavior is affected by parent characteristics such as parental worries and their self-efficacy, as is shown in Chapter 9. Yet, it is known that parents also tend to react to the child's behavior. Chapter 10 shows that in particular adolescents' characteristics (early initiation, low self-control and self-disclosure) were predictive of non-effective parenting profiles.

Overall, Chapters 8 to 10 demonstrate the importance of alcohol-specific parenting, with restrictive rule setting as the most significant parenting behavior relevant for reducing adolescents' alcohol use. Restrictive rules about alcohol are relevant for delaying the onset of drinking as well as reducing the amount of drinking throughout adolescence and are most effective when combined with a good quality and frequency of communication. Yet, we also showed that alcohol-specific parenting is affected by parent as well as adolescent characteristics. That is, more parental worries about their child's wellbeing and a lower parental self-efficacy regarding the effectiveness of their parenting behavior relate to less restrictive rule setting. In addition, non-effective alcohol-specific parenting profiles are particularly predicted by adolescent characteristics.

Based on these findings, four implications can be formulated that may be relevant for the improvement of future parenting programs. First, with respect to the onset of drinking it can be said that the level of strict rule setting by parents is more important than their level of alcohol use. Second, strict rule setting is not only important in the initiation phase of drinking, but also once adolescents have started to drink the presence of strict rules curbs the level of drinking. Third, setting restrictive rules is most effective when conveyed in a frequent and qualitative way of communication. And last, pointing parents at the relevance of setting strict rules will also diminish the level of parental worries and will increase the confidence they have in the effectiveness of their parenting behavior.

Samenvatting (summary in Dutch)

Deel 1: Preventie van Alcoholgebruik in Scholieren (PAS)

Hoewel het alcoholgebruik van jongeren onder de 16 jaar in Nederland de laatste jaren is afgenomen, drinkt nog steeds een substantieel deel van deze jongeren. Meer dan een derde van de 14-jarigen (39%) en 71% van de 16-jarigen drinkt elke maand. Als jongeren eenmaal beginnen met drinken, neemt het gebruik van alcohol al snel toe. Dit is zorgelijk, omdat vroegtijdig drinken risico's oplevert voor de psychische en lichamelijke gezondheid van jongeren. Het is daarom van belang om het alcoholgebruik onder adolescenten zo veel mogelijk te beperken. Het Nederlandse programma Preventie Alcoholgebruik Scholieren (PAS) heeft als doel om beginnen met het drinken van alcohol bij jongeren onder de 16 zo lang mogelijk uit te stellen en te beperken. Dit programma bestaat uit een leerlingen- en een ouderinterventie. De effectiviteit van zowel de afzonderlijke ouder- en leerlingeninterventie, als de gecombineerde interventie (ouders en leerlingen samen), is onderzocht in dit proefschrift. De leerling-interventie bestaat uit de nieuwste alcoholmodule van De Gezonde School en Genotmiddelen (DGSG) van het Trimbos-instituut. Dit is een pakket van vier digitale lessen (1^{e} klas) en een papieren booster (2^{e} klas) gericht op vergroting van een gezonde attitude m.b.t. alcohol en versterking van de zelfcontrole in het gebruik van alcohol. De ouderinterventie betreft een aangepaste versie van het ÖPP-programma afkomstig uit Zweden (Örebro Prevention Program). De ouderinterventie bestaat uit een presentatie tijdens de algemene ouderavond aan het begin van het nieuwe schooljaar (jaar 1 t/m 3) waarin informatie wordt gegeven over de risico's van vroegtijdig alcoholgebruik en het stimuleren van restrictieve alcoholopvoeding. Het doel van dit onderzoek is drieledig: 1) wat is de effectiviteit van de afzonderlijke en de gecombineerde ouder- en leerlingen interventie op het uitstellen van het beginnen met (zwaar) wekelijks drinken, 2) welke mechanismen die PAS beoogde te veranderen (attitude m.b.t. alcoholgebruik en zelf-controle bij jongeren en regels en attitude m.b.t. alcoholgebruik bij ouders) zijn verantwoordelijk voor het effect van de

interventie op het uistellen van drinken (mediatie-analyses) en 3) wat zijn de effecten van PAS bij hoge risicogroepen (moderatie-analyses), zoals jongeren in de lagere opleidingsniveaus en jongeren met externaliserende problemen.

In dit onderzoek is gebruik gemaakt van een gerandomiseerde trial, waarbij 19 scholen willekeurig zijn toegewezen aan een van de vier condities: 1) alleen ouderinterventie, 2) alleen leerlingeninterventie, 3) combinatie van ouder- en leerlingeninterventie en 4) controle groep (geen interventie). Meer dan 3000 jongeren en hun ouders hebben meegedaan aan dit onderzoek gedurende 5 jaar met 5 jaarlijkse meetmomenten (tussen 12 en 16 jaar). Bij aanvang van de studie waren de jongeren gemiddeld 12.6 jaar oud, was 51% jongen en 40% in het lager secundair onderwijs (VMBO). Het merendeel van de deelnemende ouders waren moeders (80.9%). Meer dan de helft van de moeders (61.9%) en vaders (55.5%) heeft een lage opleiding (alleen beroepsopleiding) genoten.

De effectiviteit van PAS op het uistellen van het beginnen met (zwaar) wekelijks drinken na 10 (dit noemen we T1, de jongeren zijn gemiddeld 13.4 jaar oud), 22 (T2, gemiddeld 14.5 jaar oud) en 34 (T3, gemiddeld 15.4 jaar oud) maanden wordt beschreven in Hoofdstukken 2 en 5. Onderzoek naar de effectiviteit van PAS op alle nametingen heeft laten zien dat het aanbieden van de gecombineerde interventie (zowel de ouder- als de leerling-interventie) tijdens de 1^{e} drie leerjaren van het voortgezet onderwijs, een preventieve werking heeft. De gecombineerde interventie is effectief in het uitstellen van (zwaar) wekelijks drinken 10, 22 en 34 maanden na aanvang van de studie, als jongeren respectievelijk 13, 14 en 15 jaar oud zijn. Bij de 14-jarige leerlingen die de gecombineerde interventie ontvingen was het starten met wekelijks alcoholgebruik 10% lager dan in de controleconditie, een relatieve reductie van 24%. Het aanbieden van de afzonderlijke interventies aan jongeren of ouders blijkt niet effectief te zijn. Er kan dus geconcludeerd worden dat zowel ouders als jongeren betrokken moeten worden in alcoholpreventie om het beginnen met (zwaar) wekelijks drinken uit te kunnen stellen.

De volgende onderzoeksvraag is of de gecombineerde PAS interventie zijn effecten op het uitstellen van het beginnen met wekelijks drinken (na 2 jaar, T2) heeft behaald via de factoren die werden beoogd te veranderen (Hoofdstuk 3).Oftewel, welke mechanismen kunnen de effecten van de gecombineerde PAS interventie verklaren? Ook is gekeken of de afzonderlijke ouder- en leerlingeninterventie van invloed waren op de te

veranderen factoren. De attitude en regels jegens alcoholgebruik van ouders en attitude en regels jegens alcoholgebruik van jongeren en hun zelfcontrole op T1 (na 1 jaar) zijn meegenomen als mediatoren. De ouderinterventie leidde tot strictere regels en opvattingen over alcohol gerapporteerd door de ouders. Na de gecombineerde interventie rapporteren zowel jongeren als ouders striktere regels en opvattingen met betrekking tot alcoholgebruik en rapporteren jongeren een hogere zelfcontrole. Alleen de toename in regels en zelfcontrole in jongeren en de opvattingen over alcohol van ouders verklaarden het effect van de gecombineerde interventie op het uitstellen van het beginnen van wekelijks drinken. De afzonderlijke leerlingeninterventie had geen effect op de mediërende factoren. Deze bevindingen bevestigen de theoretische uitgangspunten van de gecombineerde PAS interventie. De gecombineerde PAS interventie heeft de te beogen factoren veranderd, namelijk; opvattingen over alcohol en gedrag van zowel ouders als adolescenten. Deze wijzigingen zorgen voor het uistellen van het beginnen met drinken bij adolescenten. De huidige resultaten benadrukken wederom het belang van het betrekken van zowel ouders als adolescenten in alcohol preventie.

Hoofdstukken 4 en 6 beschrijven de studies die onderzoeken of de universele PAS interventie die zich richt op jongeren en ouders in de algemene bevolking wel degelijk positieve effecten heeft in verschillende subgroepen van jongeren en ouders. Oftewel, is het effect van de PAS interventie verschillend voor verschillende subgroepen van jongeren en ouders? Hierin is onderscheid gemaakt tussen twee typen moderatoren, gemeten bij aanvang van de studie (T0). De eerste type moderatoren zijn de risicofactoren: geslacht van adolescent, opleidingsniveau van ouder en adolescent, externaliserend gedrag van de adolescent en zwaar alcoholgebruik van de moeder (Hoofdstuk 4)). De tweede type moderatoren zijn de zgn. geïnduceerde factoren. Dit zijn factoren die de effecten van PAS verklaren. Daartoe behoren de regels m.b.t. alcoholgebruik zoals gesteld door de ouders, opvattingen van ouders over alcoholgebruik, en zelfcontrole bij adolescenten (Hoofdstuk 6).

Verschillende effecten van de PAS-interventie op het beginnen met zwaar wekelijks drinken zijn gevonden voor risicofactoren en de interventie-geïnduceerde factoren. De gecombineerde interventie stelt effectief het beginnen met zwaar wekelijks drinken uit onder adolescenten in het VMBO (en niet in het HAVO/VWO) en adolescenten die externaliserend gedrag vertonen. Het geslacht van de adolescent, opleidingsniveau en

alcoholgebruik van de ouder hebben hier geen effect op. Dit leidt tot twee conclusies. De eerste conclusie is dat de gecombineerde PAS interventie *universeel* effectief is in het uitstellen van het beginnen met *wekelijks* drinken. De tweede conclusie is dat de combineerde PAS alleen effectief is in het uitstellen van *zwaar* wekelijks drinken bij een hoge *risicogroep* adolescenten. Ook met betrekking tot de interventie-geinduceerde factoren is de gecombineerde PAS effectiever in hoge risicogroepen. Het uitstellen van wekelijks drinken is effectief voor adolescenten met een lage zelfcontrole en adolescenten met tolerante ouders. De effectiviteit van de gecombineerde PAS interventie komt vooral door de gerichte beïnvloeding van de zelfcontrole bij adolescenten en het restrictief opvoeden van de ouders.

In Hoofdstuk 7 beantwoorden we of PAS effectief is bij jongeren wanneer ze 16 jaar zijn. Dit is ruim 4 jaar (50 maanden) na de nulmeting (T4). Dit is om twee redenen interessant: de lange-termijn effecten kunnen worden beoordeeld, en dat is vooral interessant omdat 16 jaar de leeftijd is in Nederland waarop jongeren legaal (licht) alcoholische drank mogen kopen. Ten tweede, ouders en leerlingen van het PAS-project hebben de boodschap ontvangen dat alcoholgebruik onder de 16 jaar niet verantwoord is. Om die reden is het belangrijk om na te gaan hoe het alcoholgebruik van jongeren zich ontwikkelt als jongeren de leeftijd van 16 jaar eenmaal bereikt hebben. Uit de analyses naar de effecten van de interventie condities op het (uitstellen van) zwaar drinken laat alleen de combinatie interventie positieve effecten zien. Het blijkt dat de helft van de jongeren in de combinatie interventie (9.7%) begint met zwaar drinken in vergelijking met de controle groep (19.6%). De toename van het aantal glazen dat jongeren drinken is minder sterk wanneer zowel jongeren als ouders zijn betrokken in de interventie. Op 16 jarige leeftijd hebben alleen VMBO leerlingen baat bij de gecombineerde PAS interventie. Jongeren met externaliserend gedrag hebben meer baat bij de gecombineerde interventie dan jongeren zonder externaliserend gedrag. Door de combinatie interventie is het aantal glazen dat 16-jarigen jongeren drinken lager, als ze op 13 en 14 jarige leeftijd nog geen alcohol dronken. De effectiviteit van de gecombineerde interventie lijkt toe te schrijven aan het uitstellen van wekelijks drinken tot in ieder geval 15 jaar.

Dit is de eerste Nederlandse studie waarin de effecten van een alcoholpreventie programma zijn onderzocht in jongeren van 12 tot en met 16 jaar, met 5 jaarlijkse metingen. Alleen wanneer jongeren en ouders beide worden betrokken in

alcoholpreventie, kan het beginnen met (zwaar) wekelijks drinken uitgesteld worden en drinken deze jongeren minder alcohol. Het betrekken van alleen de jongeren of alleen de ouders is niet effectief. De positieve effecten van de gecombineerde interventie gelden vooral voor jongeren die een hoger risico hebben om te gaan drinken: jongeren in het VMBO, met externaliserend gedrag, een lage zelfcontrole en tolerante ouders. Het effect van de gecombineerde interventie op 16-jarige leeftijd wordt veroorzaakt door het vroegtijdig interveniëren op het uitstellen van het drinken, eerder in de adolescentie. Dit wijst op het belang van het uitstellen van het beginnen met drinken door het verhogen van de zelfcontrole in jongeren en het stellen van strikte regels door ouders vroeger in de adolescentie. Het uitstellen van het drinken van alcohol tot in minimaal 15 jaar, resulteert in minder alcoholgebruik van jongeren drinken als ze 16 jaar zijn. Het huidige onderzoek laat zien dat de gecombineerde PAS interventie op lange termijn het alcoholgebruik vermindert, zelfs onder 16 jarigen, de leeftijd waarop het in Nederlands geaccepteerd is om te drinken. De PAS interventie verbetert de zelfcontrole in jongeren en de mate van regels stellen in ouders. Juist deze factoren dragen bij aan het uitstellen van drinken en uiteindelijk aan een verminderd alcoholgebruik. Het belang van het implementeren van PAS binnen het project De Gezonde School en Genotmiddelen wordt hiermee onderstreept.

Deel II: Alcohol-specifieke opvoeding

Zoals hierboven beschreven, verlaagt de gecombineerde PAS interventie het percentage adolescenten dat begint met (zwaar) wekelijks drinken. Toch is er nog steeds een groot aantal adolescenten in de gecombineerde interventie die vroeg begint met drinken (bijvoorbeeld 31.5% begint wekelijks te drinken op de leeftijd van 14). Daarom blijft het noodzakelijk om de rol van alcoholspecifieke opvoeding verder te verkennen, zodat de ouder interventie kan worden verbeterd volgens deze nieuwe inzichten. In het tweede deel van dit proefschrift staat de rol van ouders in het alcoholgebruik van hun kind, middels de alcoholspecifieke opvoeding centraal.

In Hoofdstuk 8 is voor 2725 ouder-kind koppels gekeken naar de relatie tussen enerzijds de alcoholspecifieke opvoedstrategieën en zwaar alcoholgebruik van ouders en anderzijds het alcoholgebruik van adolescenten. De cross-sectionele analyses laten zien

dat het infrequent en regelmatig drinken is geassocieerd met (waargenomen) tolerante regels en attitude van ouders (zoals gerapporteerd door adolescenten), en door tolerante attitude van ouders (gerapporteerd door ouders). In tegenstelling tot voorgaande studies onder midden en late adolescenten, is het alcoholgebruik van ouders niet gerelateerd aan het drinkgedrag van vroeg adolescenten. Ook is het alcoholgebruik van ouders niet van invloed op de associatie tussen regels m.b.t. alcoholgebruik en het drinkgedrag van adolescenten. Restrictieve alcoholspecifieke opvoeding leidde erto dat vroeg adolescenten niet (regelmatig) dronken, onafhankelijk van het ouderlijk alcoholgebruik. Deze studie toont aan dat in de vroege adolescentie alcoholspecifieke opvoeding belangrijker is voor het alcoholgebruik onder adolescenten, dan het alcoholgebruik van ouders. Deze bevinding vergroot de toepasbaarheid van de gecombineerde PAS interventie.

De manier waarop ouders hun kind opvoeden op het gebied van alcohol, en vooral waardoor dat wordt bepaald, is het onderwerp van Hoofdstuk 9. Twee van deze factoren zijn geselecteerd voor verdere studie: bezorgdheid van ouders over hun kind en het vertrouwen dat ouders hebben in hun eigen gedrag (zelfeffectiviteit). Ouderlijke bezorgdheid op 13- en 14-jarige leeftijd resulteert in meer alcoholgebruik onder adolescenten een jaar later, terwijl het alcoholgebruik van adolescenten niet meer bezorgdheid in ouders voorspelt. Bovendien stellen bezorgde ouders minder restrictieve regels en hebben zij een lagere kwaliteit van de communicatie over alcoholgebruik. Het stellen van minder restrictieve regels medieert het effect van ouderlijke bezorgdheid op het alcoholgebruik van de adolescent onder ouders met een lage zelfeffectiviteit. Ouders met een hoge zelfeffectiviteit stellen meer restrictieve regels. In ouders die geen vertrouwen over hun eigen opvoedingsgedrag hebben, resulteren de zorgen over hun kind in meer alcoholgebruik door het kind, ten gevolge van het stellen van minder stricte regels. Deze bevindingen impliceren dat alcohol interventies ouders handvaten moeten geven om effectief om te gaan met het alcoholgebruik van hun kind (bijvoorbeeld het stellen van strikte regels m.b.t. alcohol), waardoor ook het zelfvertrouwen in deze ouders wordt verhoogd.

In dit onderzoeksveld werd tot nu toe vooral de invloed van afzonderlijke alcoholspecifieke opvoedstrategieën bestudeerd (regels m.b.t. alcoholgebruik, kwaliteit en frequentie van communicatie over alcohol). Echter, deze opvoedstrategieën zijn

mogelijk niet afzonderlijk; waarschijnlijk hangen ze samen. Namelijk, de regels die ouders stellen zullen op een of andere manier overgebracht moeten worden op hun kinderen: regels en communicatie komen hier samen. Hoofdstuk 10 beschrijft 5 alcoholspecifieke opvoedprofielen aan de hand van 4 metingen en hoe deze profielen gerelateerd zijn aan de initiatie en groei van het alcoholgebruik van adolescenten. Het stellen van stricte regels in combinatie met een hoge frequentie en kwaliteit van communicatie is de meest effectieve opvoedingsstijl voor het verminderen van het alcoholgebruik. Ouders die laag scoren laag op deze beide kenmerken zijn het minst effectief. Vooral kenmerken van adolescenten (vroege initiatie alcoholgebruik, een lage zelfcontrole en openheid) voorspelden niet-effectieve opvoedprofielen.

Deze studie heeft een aantal implicaties die relevant zijn voor alcohol preventie programma's die zich richten op ouders. Ten eerste, het stellen van regels door ouders voor het beginnen met drinken is belangrijker dan het alcoholgebruik van de ouders zelf. Ten tweede, het stellen van stricte regels is niet alleen effectief om het beginnen met drinken uit te stellen, ook om het alcoholgebruik te verminderen als jongeren eenmaal drinken. Ten derde, het stellen van regels is het meest effectief als deze worden gecombineerd met een kwalitatieve en frequente communicatie. Tenslotte zal het wijzen van ouders op het belang van het stellen van regels ook de bezorgdheid van ouders doen afnemen en het zelfvertrouwen in hun eigen opvoeding doen toenemen.

Publications

The current thesis

Koning, I.M., Engels, R.C.M.E., Verdurmen, J.E.E., & Vollebergh, W.A.M. (2010). Alcohol-specific socialization practices and alcohol use in Dutch early adolescents. *Journal of Adolescence, 33*, 93-100.

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Kepper, A., Koning, I.M., Monshouwer, K., & Vollebergh, W.A.M. Development of heavy substance use by adolescents in residential youth care institutions over a period of one year: a two wave study. Submitted for publication.

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De mensen die ik het meest heb lastig gevallen in de afgelopen 5 jaar zijn Regina en Jacqueline. Jullie zullen ook wel blij zijn dat dit boekje er ligt! Jacqueline, de eerste en hele belangrijke periode van het project hebben we veel samengewerkt. Alles hing namelijk af

van het werven van scholen en de uitvoer van de dataverzameling. Heel fijn dat je me wegwijs hebt gemaakt in het opzetten en uitvoeren van een dergelijk groot project! Maar, nog belangrijker, ik kon altijd bij je terecht. Bedankt voor de fijne samenwerking en het vertrouwen dat je in me stelt! Regina, toen je bij ons op de afdeling kwam werken, werd als eerste besloten dat jij mijn dagelijkse begeleidster zou worden. Ik had me er geen betere kunnen wensen! Met jouw kunde, oprechtheid en openheid heb ik veel inzicht gekregen in hoe je een goede wetenschapper kunt zijn. Ik heb heel fijn met je samengewerkt en veel van je geleerd. Hopelijk blijven we in de toekomst ook samenwerken!

Het uivoeren van de interventies in de eerste drie jaar was een grote uitdaging, ofwel, een hels karwei. Verschillende mensen hebben het mogelijk gemaakt om dit tot een goed einde te volbrengen. Ingrid, zowel bij de opzet als bij de uitvoering van de interventies was je zeer betrokken. Jouw praktische, pragmatische en vooral kritische visie was van groot belang voor het slagen van de uitvoering. Maar je bijdrage ging verder dan dat; ook nam je deel aan de wetenschappelijke discussies en het verzamelen van de data. Ingrid, bedankt!

Tom, we hebben heel wat afgereisd samen, eerst met het openbaar vervoer, en daarna toch maar met de auto of zelfs taxi. Sommige scholen zijn namelijk niet zo goed bereikbaar met het openbaar vervoer, vooral als je daar ’s avonds om 10 uur weg wilt komen. Maar, je was er altijd. Bij alle ouderavonden die we hadden, was je bereid om met een goed humeur die hele belangrijke presentatie te geven. Daar ben ik je erg dankbaar voor! Die keren dat je echt verhinderd was, of dat er twee scholen op een avond gepland stonden, was Haske bereid het van je over te nemen. Bedankt Haske!

Een heleboel mensen op het Trimbos-instituut hebben geweten dat het PAS-project werd uitgevoerd. Ik kreeg van Saskia een drill cursus statistiek, waar ik nu nog steeds de vruchten van pluk! Ellen, jij werd vaak opgezadeld met allerlei klusjes die niet altijd even leuk waren, maar wel heel belangrijk. Even snel 1000 afdrukken van een folder; geen probleem voor Jan. Het team van IDM, Yvonne, Nancy en Harry, mede door jullie inzet kwamen de juiste vragenlijsten op het juiste adres terecht. De eerste twee jaren hebben we zelf de ouders in de avond uren nagebeld om het belang van het invullen en terugsturen van de vragenlijst te benadrukken. Daar zijn heel wat uurtjes in gegaan, die verschillende mensen geheel vrijwillig hebben opgeofferd. Echt top, Ingrid, Saskia en

Jacqueline! Alle andere medewerkers van Epidemiologie bedankt voor de gezellige gesprekken en de fijne samenwerking!

Op de uni zat ik op een kamer met 4 andere AiO's. Daar werd natuurlijk heel hard gewerkt, maar ook gezellig gekletst en koffie gedronken. Annelies, Margreet en Violaine, het is echt fijn om een werkplek te hebben waar je zowel werk- als sociaal gerelateerde dingen kwijt kunt! De vierde persoon is toch wel degene met wie ik een bijzondere band heb opgebouwd. Hanneke, er is veel gebeurd de afgelopen jaren en dat heb ik allemaal met jou kunnen delen. Heel fijn dat je er altijd bent; voor de gezelligheid (koffie!), wetenschappelijke discussies en ook persoonlijke issues!

Het is heel prettig om in een groep te werken waar ik me thuis voel, zoals dat bij Jeugdstudies het geval is. Stuk voor stuk hele competente en fijne collega's! De formele afronding van mijn proefschrift is helemaal in orde gekomen door de inzet van Barbel. Wil, als er iets was wat geregeld moest worden, jij maakte het in orde. Hartstikke bedankt daarvoor!

Ik kan van veel mensen zeggen dat het schrijven van dit proefschrift niet was gelukt zonder hem/haar. Voor een aantal mensen gaat dat echt op; de scholen, jongeren en ouders. Het vergt nogal wat tijd en inzet van scholen om aan zo'n langdurig project deel te nemen. En toch, elke keer als ik weer iets nodig had van de school, waren de contactpersonen altijd weer zeer behulpzaam. Het VMBO Stek, Florijn College, RSG de Borgen, CSG 'Ulbe van Houten', Mill-Hill College, Wellantcollege, Porta Mosana, RSG Steenwijk, Moller lyceum, Hoofdvaartcollege, Canisius College, Visser 't Hooft Lyceum, Dalton scholengemeenschap, A. Roland Holst College, CSG Walcheren, Trajectumcollege, SG Stevensbeek en het Teylingen College; hartelijk dank voor jullie deelname, motivatie en inzet! De ouders en jongeren die hebben meegedaan aan PAS, elk jaar weer vragenlijsten hebben ingevuld; zonder jullie bestond PAS niet! Het was heel bemoedigend om ook van een aantal ouders het belang van dit onderwerp mee te krijgen. Ook de onderzoeksassistenten en studenten die hebben geholpen al die data te verzamelen waren onmisbaar. Bedankt!

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intervention in Sweden. Ylva, I named our daughter after you. Terese, I hope we can worry a lot more about the articles we will write together! That would be great!

Mijn familie is het belangrijkste in mijn leven. Pa en ma, jullie hebben me altijd gestimuleerd om verder te gaan, mijn grenzen op te zoeken. Jullie hebben me alle mogelijkheden geboden om mezelf te ontwikkelen, ook al was dat niet altijd de makkelijkste en de meest voor de hand liggende weg. Jullie onvoorwaardelijke steun is ongekend. Na de geboorte van Ilva, hebben jullie mij veel uit handen genomen; van het oppassen, tot eten koken tot de alledaagse huis-, tuin- en keukenklusjes. Daardoor kon ik met een gerust gevoel veel tijd aan mijn werk besteden; de Pallasplantsoen is een tweede thuis voor Ilva. Jullie vinden het zelfs jammer dat dit boekje af is, nu hoeven jullie niet meer zoveel op te passen. Wet un mazzul mit son voddur in moedur! Budankt! Mijn ouders zorgen ook altijd voor een gezellig samenzijn met lekker eten, waar ook mijn Albert, Jack, Manon, Travis en Zola bij zijn. Dat zijn altijd gezellige momenten die ik koester, evenals de gezellige momenten met mijn schoonfamilie. Sandra, jij bent inmiddels een onderdeel van mijn familie, je hoort bij het meubilair. Laten we nog vele koppies doen, dat doet me altijd goed!

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