

# Parental alcohol-specific rules effectively reduce adolescents' tobacco and cannabis use: A longitudinal study

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## ABSTRACT

**Aims:** The current study aimed to longitudinally examine the direct and indirect effects (via alcohol use) of parental alcohol-specific rule-setting on adolescent tobacco and cannabis use. Based on the gateway hypothesis, we expected parental alcohol-specific rules to affect adolescent tobacco and cannabis use through adolescent alcohol use.

**Design and participants:** A longitudinal design including three waves and 906 Dutch adolescents ( $M_{\text{age}} = 13.51$  years,  $SD = 0.60$ ) was used to apply zero-inflated Poisson models (ZIP).

**Measurements:** Self-report questionnaires measured adolescents' perceived rules about alcohol at  $T_1$ , cigarette use at  $T_1$  and  $T_3$  (frequency of life-time and current smoking), cannabis use at  $T_1/T_3$  (frequency of yearly and monthly use) and frequency of monthly alcohol use at  $T_1/T_2$ .

**Findings:** Stricter alcohol-specific rules at  $T_1$  predicted lower incidence and prevalence rates of cigarette (lifetime:  $\beta = -0.20$ ,  $p < .00$ ; current:  $\beta = -0.21$ ,  $p = .04$ ) and cannabis use (monthly:  $\beta = -0.43$ ,  $p = .02$ ; yearly:  $\beta = -0.28$ ,  $p = .19$ ) two years later ( $T_3$ ). This direct effect was no longer significant when alcohol use at  $T_1$  was controlled for. Moreover, a significant indirect effect of alcohol-specific rules at  $T_1$  on tobacco and cannabis use  $T_3$  via monthly alcohol use  $T_2$  was found.

**Conclusions:** The current study demonstrated that strict rules regarding alcohol may not only reduce alcohol but subsequently also other substance use such as tobacco and cannabis. Thus, interventions targeting the prevention of alcohol use, which appears to serve as a gateway, also affects the involvement in other substances.

## 1. Introduction

In industrialized countries, the initiation into using substances such as alcohol, tobacco and cannabis typically occurs during adolescence. In the Netherlands, alcohol is the most prevalent substance among adolescents, followed by tobacco and cannabis. Among 12- to 16-year olds in 2015, 45% had consumed alcohol, 23% had smoked a cigarette, and 10% had tried cannabis (Van Dorsselaer et al., 2016). These rates were relatively high as compared to other industrialized countries (ESPAD group, 2016). Moreover, early substance use is associated with a higher risk of adverse health and social outcomes later in life, as well as substance dependence (Wayne et al., 2016). Therefore, adolescent substance use has been a public health priority over the past decades (De Looze et al., 2017).

Adolescent alcohol, tobacco and cannabis use do not occur in isolation; the co-occurrence rates of these substances are high (Kandel et al., 2006). To illustrate, while 51% of all adolescents in the Netherlands regularly consume alcohol, 87% of smokers do so. In addition,

regular cannabis use is almost 12 times more prevalent among drinkers, compared to non-drinkers (94% versus 8%) (Van Laar et al., 2010). Most parents in the Netherlands are nowadays aware of the risks involved in adolescent alcohol use (De Looze et al., 2014, 2017). Ample evidence shows that alcohol-specific rule-setting by parents can be effective in postponing and reducing adolescent alcohol use (Koning et al., 2009, 2011; Kuntsche and Kuntsche, 2016; Mares et al., 2012; Van den Eijnden et al., 2011; Van der Vorst et al., 2009). It is unclear, however, whether alcohol-specific rule-setting can affect other forms of substance use, such as tobacco smoking and cannabis use. The present longitudinal study examines the direct and indirect effect of parental alcohol-specific rules on adolescent tobacco and cannabis use.

Only a few cross-sectional studies examined whether alcohol-specific rule-setting is effective in reducing adolescents' tobacco and cannabis use. For example, Abdelrahman and colleagues (Abdelrahman et al., 1998), among 2849 American 7th and 8th graders, showed that adolescents with parents who do not set clear rules against alcohol and drug use are at higher risk to engage in alcohol, tobacco and cannabis

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use compared to those with parents who do set clear rules. Harakeh and colleagues (Harakeh et al., 2012) showed similar findings among 1742 Dutch 15–16 year-olds. Specifically, they showed that adolescents with parents who set permissive rules on alcohol drinking were more likely to engage in alcohol use, daily tobacco smoking, monthly cannabis use and early sexual intercourse, compared to adolescents with parents who set strict rules. In contrast, a study by De Looze and colleagues (De Looze et al., 2012) showed, among 5642 Dutch 12–16 year-olds, that stricter parental rules on alcohol were not related to daily smoking or lifetime cannabis use, but they were associated with lower levels of binge drinking and a smaller likelihood of early sexual intercourse. As all of these studies are cross-sectional, no conclusions can be drawn on the question whether parental rules on alcohol predict a lower prevalence of cigarette smoking and/or cannabis use, and whether this is a direct effect.

There are ample longitudinal studies showing that parental alcohol-specific rules reduces alcohol use (e.g. Koning et al., 2009; Van Der Vorst et al., 2007). As adolescents typically experiment with alcohol before trying out tobacco and cannabis (Kandel et al., 2006), one possible explanation on how parental alcohol-specific rules may reduce cigarette smoking and/or cannabis use, is that alcohol serves as a gateway to involvement of other substance use. Thus, adolescents whose parents set strict alcohol-specific rules, are less likely to get involved in tobacco and cannabis use due to their lower involvement in alcohol use. Alternatively, the common liability model proposes that different forms of substance use (without sequential progression of drug use) may occur because of the influence of a common liability, such as proneness to deviancy or a specific context in which youth are raised (e.g., Pedersen et al., 2001). As such, parental alcohol-specific rule-setting may affect adolescent substance use in general through social factors (Borsari and Carey, 2001), or through individual factors, such as impulsiveness (Patock-Peckham et al., 2011). Substance use behavior often occurs in a specific social context, especially in the presence of peers (Van Ryzin and Dishion, 2014; Wagner and Anthony, 2002). If adolescents are not allowed to drink alcohol, they are less likely to find themselves in a context of going to bars and pubs, which in turn decreases the likelihood to get in touch with peers who use other substances (Kiesner et al., 2010). Moreover, keeping adolescents away from a context wherein not only alcohol, but also cigarettes and cannabis are used, limits the opportunity to get involved in other substances. Finally, alcohol-specific rules could impact adolescent smoking and cannabis use through adolescents' generalization of the alcohol message to other substances (Van Zundert et al., 2006). Adolescents may expect their parents to be consistent (i.e., if they are not allowed to drink alcohol, they are also not allowed to smoke tobacco and cannabis). As a result, adolescents' motivations and skills for behavior change induced by parental rule-setting on alcohol might generalize to the other substances (i.e., adolescents may not only put internal goals for alcohol use, but also for tobacco and cannabis use) (Tanner-Smith et al., 2015).

In the current longitudinal study, we examined the direct and indirect (via alcohol use) effects of parental alcohol-specific rule-setting on adolescent tobacco and cannabis use. We examined the hypothesized link in a relatively young cohort of adolescents (age 13.5 years old at T1), so we could examine the effect of the rules on incidence rates (ever use) as well as prevalence rates (regular use). First, we tested the longitudinal association between alcohol-specific rule-setting at T1 and adolescent tobacco and cannabis use at T3 (direct effect), with and without controlling for adolescent alcohol use at T1, to replicate the findings of previous cross-sectional studies. Second, we tested whether alcohol-specific rule-setting affects adolescent tobacco and cannabis use via alcohol use at T2 (indirect effect). It was hypothesized that strict alcohol-specific rule-setting leads to lower prevalence and incidence rates of tobacco and cannabis use through alcohol use.

## 2. Method

### 2.1. Procedure and participants

In April 2006, 80 schools were randomly selected out of a list of all Dutch public secondary schools and invited to participate in an alcohol intervention study (PAS) (Koning et al., 2009). Schools were allowed to participate if the following inclusion criteria were met: (i) at least 100 first-year students, (ii) less than 25% students from migrant populations, (iii) no special education was offered. 19 schools from different regions and neighborhoods in the Netherlands participated in this study. From these schools, all first-year students ( $N = 3490$ ) were asked to participate. Schools were randomly assigned to one of four groups: three experimental and one control. Only the data from the control group ( $N = 935$ ) were selected for this study to avoid intervention contamination. All different educational levels in the Netherlands, from prevocational education to pre-university secondary education, are represented by the participating high schools.

The data were collected in classrooms under supervision of a trained research assistant, by means of an online-questionnaire that was made available on a secure website. The students participated annually from 2006 to 2009 (T<sub>1</sub> to T<sub>4</sub>). The current study only includes the last three waves, now referred to as T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub>, as there is more variance in adolescents substance use at older ages. Parents received a letter of consent and were given the opportunity to refuse their child's participation. Students were able to refuse participation prior to the administration of the questionnaires. The original trial protocol (NTR649) was approved by the Medical Ethical Committee.

Because of initial nonresponse among adolescents ( $n = 29$ ), 906 adolescents were eligible for analysis. Non-response at each wave occurred due to student absence on the day of the assessment or because students moved away. Of the 906 students that participated in the first wave, 52.5% were boys and 60.2% were in lower secondary education (pre-vocational vs high-level education; general and pre-university secondary education). The average age at T<sub>1</sub> was 13.51 years old (SD = 0.60).

### 2.2. Loss to follow-up

Adolescents who did not participate at T<sub>2</sub> (104: 115%) or T<sub>3</sub> (123: 13.6%) differed as compared to completers at T<sub>1</sub>, with higher year frequency of cannabis use at T<sub>2</sub> ( $F = 4.48, p = 0.035$ ), higher frequency of life-time smoking ( $F = 5.86, p = 0.016$ ), higher amounts of alcohol consumption at T<sub>2</sub> ( $t = 2.83, p = 0.006$ ) and T<sub>3</sub> ( $t = 2.29, p = 0.024$ ), and with a higher average age at T<sub>2</sub> ( $t = 2.48, p = 0.013$ ) for the non-completers. No gender differences were found for those not participating at T<sub>2</sub> ( $X^2 = 0.12(1), p = 0.730$ ) and T<sub>3</sub> ( $X^2 = 2.19(1), p = 0.139$ ) as compared to the completers.

### 2.3. Measures

*Parental alcohol-specific rules* measured the degree of rule setting that parents used to prevent their child from drinking (Van der Vorst et al., 2005). This instrument has proved to be a reliable measure (Cronbach's alphas between 0.80 and 0.93) with a good content validity (factor loadings between 0.56 and 0.93; Van der Vorst et al., 2007). The reliability and predictive validity of the measure has been supported in several other studies (e.g. Creemers et al., 2017; Schelleman-Offermans et al., 2012). Adolescents reported at T<sub>1</sub> on ten items reflecting different drinking situations, e.g., "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". The response options ranged from 1 (Never) to 5 (Always), and Cronbach's alpha was .93.

*Smoking (lifetime, current)* was measured by two questions (Currie et al., 2012) at T<sub>1</sub> and T<sub>3</sub>, asking if the adolescent has ever smoked a

cigarette (1 = yes, only a few puffs, 2 = yes, a whole cigarette or more, 3 = no, never), reflecting life-time smoking. A second item assessed current smoking by asking how often the adolescent smokes (1 = every day, 2 = at least once a week, not every day, 3 = less than once a week, 4 = I don't smoke). Both items were recoded such that a higher score indicated higher levels of lifetime smoking and current smoking respectively.

*Cannabis use (monthly and yearly)* was assessed by asking the adolescent at T<sub>1</sub> and T<sub>3</sub> how often he/she has used cannabis in the last year and in the previous month (ranging from 0 = never to 14 = 40 times or more) (O'Malley et al., 1983). Due to a negatively skewed distribution, the items were recoded (0 = 0, 1–3 = 1, 4–7 = 2, 8–10 = 3, 11–14 = 4).

*Alcohol use (monthly)* was assessed at T<sub>1</sub> and T<sub>2</sub> by asking the adolescent how often he/she had drunk at least one glass of alcohol in the previous month. Again, the original 14-point Likert scale was recoded into four categories; 0 = never to 4 = 11 times or more.

## 2.4. Analysis

First, descriptive statistics and Pearson correlations are presented. Second, to examine the direct effects of parental alcohol-specific rules at T<sub>1</sub> on substance use (cigarette, cannabis) at T<sub>3</sub>, we used structural equation modelling. Since there were many zeros on the outcome measures, e.g. life-time smoking (53%) and monthly cannabis use (87%), a zero-inflated Poisson model (ZIP) was used (Atkins and Gallop, 2007). In the first model, the control variables (age, gender, level of education and substance use at T<sub>1</sub>) and alcohol-specific rules at T<sub>1</sub> were added. Second, we tested whether the effects would differ when alcohol use at T<sub>1</sub> was controlled for. Third, the indirect effect of alcohol-specific rules at T<sub>1</sub> on substance use at T<sub>3</sub> via alcohol use at T<sub>2</sub> was tested using the indirect command in Mplus while controlling for age, gender, level of education, and substance use and alcohol use at T<sub>1</sub>.

Because of the use of a ZIP-model, no model fit indicators like the comparative fit index (CFI) or root means square error of approximation (RMSEA) were available (Peeters et al., 2012). Maximum likelihood with robust standard errors (MLR) was chosen as estimation method and FIML was used to deal with missing data. All analyses were performed using Mplus version 7.3.

## 3. Results

### 3.1. Descriptive data

The descriptive statistics are presented in Table 1. Table 2 shows the correlations between the demographic variables, adolescent tobacco, cannabis and alcohol use, and parental alcohol-specific rules. Alcohol-specific rules at T<sub>1</sub> were significantly correlated with cigarette and cannabis use at T<sub>1</sub> and T<sub>3</sub>.

**Table 1**  
Descriptives of Demographic variables, Alcohol-Specific Rules and Substance use.

	T1		T2		T3	
	M (SD)	% = 0	M (SD)	% = 0	M (SD)	% = 0
Alcohol-specific rules (1–5)	4.33(0.79)	–	–	–	–	–
Lifetime smoking (0–2)	0.36(0.69)	76.0	–	–	0.78(0.89)	52.7
Current smoking (0–3)	0.18(0.60)	89.9	–	–	0.52(1.03)	77.0
Monthly cannabis use (0–4)	0.24(0.90)	92.5	–	–	0.26(0.83)	87.1
Yearly cannabis use (0–4)	0.26(0.93)	91.2	–	–	0.42(1.01)	80.4
Monthly alcohol use (0–4)	0.45(0.80)	68.2	0.76(1.03)	52.2	–	–

### 3.2. Longitudinal associations of alcohol-specific rules on cigarette and cannabis use

First, we performed the longitudinal associations without controlling for alcohol use. Table 3 depicts the effects of alcohol-specific rules at T<sub>1</sub> on substance use at T<sub>3</sub>. Stricter alcohol-specific rules at T<sub>1</sub> significantly predicted less involvement in all substances at T<sub>3</sub>, apart from monthly cannabis use. However, the beta on monthly cannabis use is quite large ( $\beta = -0.28$ , medium effect size) (Cohen, 1998). Although not significant, it was considered meaningful because the prevalence of monthly cannabis use at this age is low which may cause power issues.

Second, we added the frequency of monthly drinking at T<sub>1</sub> as a control variable. As a result, the effect of alcohol-specific rules on smoking (life-time:  $\beta = -0.05$ ,  $p = .55$ ; current:  $\beta = -0.06$ ,  $p = .62$ ) and cannabis use (monthly:  $\beta = -0.05$ ,  $p = .84$ ; yearly:  $\beta = -0.08$ ,  $p = .74$ ) all become insignificant. Moreover, higher frequency of monthly alcohol use at T<sub>1</sub> significantly predicted more involvement in cigarette (life-time:  $\beta = 0.29$ ,  $p < .00$ ; current:  $\beta = 0.31$ ,  $p < .00$ ) and cannabis use (monthly:  $\beta = 0.38$ ,  $p = .05$ ; yearly:  $\beta = 0.57$ ,  $p < .00$ ) at T<sub>3</sub>.

### 3.3. Indirect effects of alcohol-specific rules on cigarette and Cannabis use

The indirect effect of alcohol-specific rules at T<sub>1</sub> on tobacco and cannabis use at T<sub>3</sub> via monthly alcohol use at T<sub>2</sub> was tested, controlling for age, gender, level of education and substance use at T<sub>1</sub>. First, stricter alcohol-specific rules at T<sub>1</sub> significantly predicted a lower frequency of monthly drinking at T<sub>2</sub> ( $\beta = -0.20$ ,  $p = .00$ ). Second, more frequent monthly drinking at T<sub>2</sub> significantly predicted tobacco (lifetime:  $\beta = 0.41$ ,  $p < .00$ ; current:  $\beta = 0.54$ ,  $p < .00$ ) and cannabis use (monthly:  $\beta = 0.73$ ,  $p < .00$ ; yearly:  $\beta = 0.83$ ,  $p < .00$ ) one year later. The direct effects of alcohol-specific rules on cigarette (lifetime:  $\beta = 0.02$ ,  $p = .82$ ; current:  $\beta = 0.02$ ,  $p = .86$ ) and cannabis use (monthly:  $\beta = 0.09$ ,  $p = .60$ ; yearly:  $\beta = 0.07$ ,  $p = .63$ ) were no longer significant. The indirect effect of alcohol-specific rules at T<sub>1</sub> on monthly (indirect =  $-0.14(.04)$ ,  $p = .002$ ) and yearly (indirect =  $-0.12(.04)$ ,  $p = .001$ ) cannabis use, and on life-time (indirect =  $-0.05(.02)$ ,  $p = .004$ ) and current smoking (indirect =  $-0.08(.03)$ ,  $p = .004$ ) at T<sub>3</sub> via monthly alcohol use at T<sub>2</sub> were significant (see Fig. 1).

## 4. Discussion and conclusion

### 4.1. Discussion

This longitudinal study examined whether alcohol-specific rule setting by parents predicts lower involvement in tobacco and cannabis use among early adolescents, and tested whether this effect is indirect through alcohol use. Our findings show that parents who set strict rules regarding alcohol may not only reduce alcohol but also other substance use such as tobacco and cannabis. Although we did not find significant direct effects when controlling for earlier alcohol use, we did find indirect effects via monthly alcohol use. This indicates that parental alcohol-specific rules impact adolescent alcohol use, which in turn impacts tobacco and cannabis use.

**Table 2**  
Correlations between Substance Use, Alcohol-specific Rules and Demographics.

	1	2	3	4	5	6	7	8	9	10	11	12
Gender (1 = boy)	X											
Level of education (1 = high)	.03	X										
Alcohol-specific rules T1	-.04	.16**	X									
Lifetime smoking T1	.05	-.18**	-.33**	X								
Current smoking T1	-.01	-.11**	-.36**	.63**	X							
Monthly cannabis use T1	.04	-.07*	-.19**	.29**	.32**	X						
Yearly cannabis use T1	.05	-.07*	-.22**	.36**	.42**	.97**	X					
Monthly alcohol use T1	.13**	-.19**	-.52**	.42**	.46**	.27**	.31**	X				
Monthly alcohol use T2	.16**	-.17**	-.40**	.37**	.34**	.10**	.13**	.48**	X			
Lifetime smoking T3	-.08*	-.22**	-.24**	.45**	.34**	.08*	.11**	.33**	.36**	X		
Current smoking T3	-.02	-.21**	-.25**	.47**	.45**	.05	.08*	.35**	.36**	.66**	X	
Monthly cannabis use T3	.15**	-.02	-.11**	.28**	.16**	.06	.08*	.17**	.29**	.28**	.36**	X
Yearly cannabis use T3	.13**	-.03	-.17**	.36**	.28**	.09*	.12*	.24**	.34**	.40**	.47**	.86**

\*  $p < 0.05$ .  
\*\*  $p \leq 0.00$ .

**Table 3**  
Effects of Alcohol-Specific Rules at T<sub>1</sub> on Cigarette and Cannabis Use at T<sub>3</sub>.

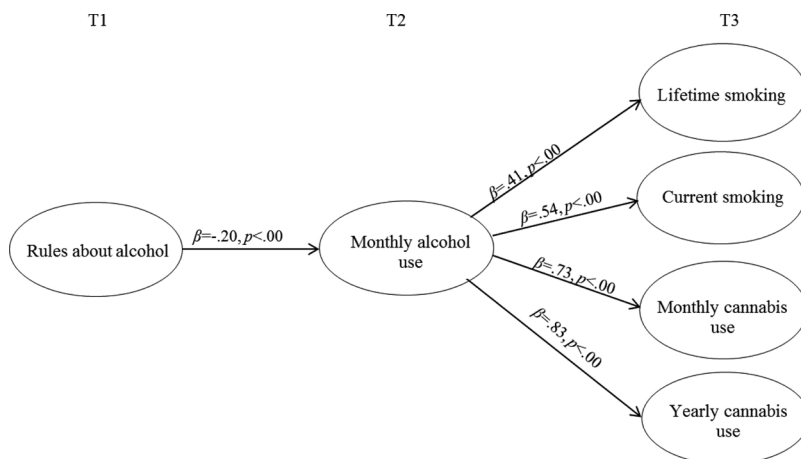
	Lifetime smoking		Current smoking		Yearly cannabis use		Monthly cannabis use	
	$\beta$ (SE)	$p$	$\beta$ (SE)	$p$	$\beta$ (SE)	$p$	$\beta$ (SE)	$p$
Age	0.01(.09)	.97	0.02(.13)	.85	-0.34(.20)	.08	-0.28(.19)	.16
Gender (1 = boy)	-0.27(.08)	.00	-0.09(.11)	.45	0.78(.11)	.00	0.92(.08)	.00
Level of education (1 = high)	-0.35(.09)	.00	-0.61(.10)	.00	-0.09(.21)	.68	-0.13(.13)	.48
Outcome T1	0.75(.06)	.00	0.60(.09)	.00	0.37(.15)	.01	0.18(.13)	.17
Alcohol-specific rules	-0.20(.07)	.00	-.21(.11)	.04	-0.43(.18)	.02	-0.28(.21)	.19

Our findings may support the hypothesis that alcohol functions as a gateway drug for tobacco and cannabis (Kandel et al., 2006). A possible biological explanation is that adolescents' first encounter with substance use is often alcohol and thus, the (frequent) intake of this specific substance may change the reward system of the brain and result in an increased vulnerability to also start using other substances (Durazzo et al., 2011; Goldstein and Volkow, 2011; Oscar-Berman et al., 1997; Philpot and Kirstein, 1998; Scaife and Duka, 2009). Animal studies have examined this explanation in rats and showed that drugs (e.g., alcohol) indeed appear to alter brain areas and affect the reward system in the brain (Ahmed et al., 2002; Kenny et al., 2006; Markou and Koob, 1991). However, these results are not directly generalizable to adolescents because of differences between the human and the rat brain, the timing and course of adolescence in humans, and the extreme quantities of alcohol administered to these rats which are unrealistic, even for high-risk adolescents (Boelema, 2014). Longitudinal research on adolescents is needed to determine whether the use of alcohol causes changes in the rewarding system in the brain and thereby increases

adolescents' susceptibility to start using other drugs.

A more social explanation, in line with the common liability model, is that parental alcohol-specific rule-setting affects the social context in which adolescents typically use substances (i.e., first alcohol, then tobacco and cannabis) and thereby reducing the opportunities for adolescent neurobehavioral specificities, such as impulsiveness (e.g. Patock-Peckham et al., 2011), to take effect. To illustrate, adolescents who are not allowed to drink alcohol may be less likely to find themselves in contexts in the presence of peers such as bars and pubs and may thus have fewer opportunities and temptations to drink, smoke tobacco, and use cannabis. Also here, longitudinal research is needed to test whether delaying the onset of drinking withhold adolescents from exposure to risky (peer) contexts and potential subsequent involvement in other substances.

As alcohol-specific rule-setting decreases not only adolescent alcohol use, but also tobacco and cannabis use, one may conclude that it is useful to implement alcohol-specific rules in intervention programs that aim to reduce multiple substance use behaviors simultaneously.



**Fig. 1.** Significant mediation effects of rules about alcohol on monthly (*indirect* = -.14 (.04),  $p = .002$ ) and yearly (*indirect* = -.12 (.04),  $p = .001$ ) cannabis use, and lifetime (*indirect* = -.05 (.02),  $p = .004$ ) and current (*indirect* = -.08 (.03),  $p = .004$ ) smoking via monthly alcohol use.

Note. Controlled for age, gender, level of education and alcohol use and outcomes at T<sub>1</sub>.

However, it is important to note that an intervention study is necessary to actually conclude that such a program would be beneficial. Koning and Vollebergh (2016) performed such an intervention study and showed that stimulating parents to set strict rules on the alcohol use of their child had a marginal *iatrogenic* effect on adolescent tobacco and cannabis use. A potential explanation for the seemingly contradictory findings by Koning and Vollebergh (2016) and the current study is that parents who set strict alcohol-specific rules by themselves (thus: not as the result of an intervention), tend to have stricter monitoring practices in general (e.g., adolescents actively needing permission to go out at night; parents actively informing with whom or where the adolescents was or will be when leaving the house). Thus, if a random group of parents is encouraged to set strict alcohol-specific rules (while their general monitoring remains as it is), the alcohol-specific rules may be less effective (or even have a *iatrogenic* effect) in reducing tobacco and cannabis use among those adolescents whose parents do not also practice strict monitoring in general. Therefore, it may be crucial that the encouraged behavior (by an intervention) is in line with parents' general parenting style. Thus, parent's general parenting style might function as a marker, and does not necessarily have a direct impact on substance use (Berge et al., 2016). Furthermore, studies overall have shown that alcohol-specific parenting practices are more strongly related to adolescent substance use, as compared to general parenting practices (e.g., Vermeulen-Smit et al., 2015). The interplay between general and specific parenting practices has been hardly studied. Future research should therefore examine whether the indirect effects we found only or mainly apply to adolescents with parents who also practice strict monitoring in general.

#### 4.2. Strengths and limitations

A few limitations of this study should be mentioned. First, we were not able to test whether general parenting style, a combination of controlling and supporting parental behaviors, is a moderator in the effect of alcohol-specific rules on adolescent substance use. Second, we did not test whether alcohol-specific rules also decrease adolescent illicit drug use, although this type of drug use hardly occurs in this young age group. In addition, it would be interesting to test the effect of rules about smoking on involvement in other drugs that commonly follow smoking. This study also has some strengths worth mentioning. First, it is the first longitudinal study on secondary effects of alcohol-specific parental rule-setting, i.e., focusing on tobacco as well as cannabis. Second, we examined direct as well as indirect effects of alcohol-specific parental rule-setting on other substance use.

#### 4.3. Conclusion

While various cross-sectional studies suggested a direct effect of alcohol-specific rules on the involvement in other substances, this study longitudinally demonstrates that alcohol-specific rules affect adolescent smoking and cannabis use indirectly, via alcohol use. We have shown that parents who set strict rules regarding alcohol may not only reduce their child's alcohol use but also its engagement in other substances such as tobacco and cannabis. In this sense, alcohol use may act as a gateway drug for adolescent tobacco and cannabis use. By reducing the likelihood of adolescent alcohol use (by setting alcohol-specific rules), parents may also decrease the likelihood of their child's engagement in (future) tobacco and cannabis use. As intervention research is not necessarily in line with our findings, future longitudinal and intervention research is needed to examine how general and specific parenting behaviors coincide to effectively delay the use of alcohol and other substances.

#### Contributors

I.K. and M.E.d.L. conceived of the study. I.K., M.E.d.L. and Z.H.

participated in the design and coordination of the study, interpreted the data and drafted the manuscript. I.K. conducted the statistical analyses. All authors read and approved the final manuscript.

#### Declaration of Competing Interest

None.

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#### Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.drugalcdep.2020.108226>.

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