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How Specific is Domain-Specific Self-Control?  
A Longitudinal Study of the Mediating Role of Alcohol-  
Specific Self-Control in the Effect of General Self-Control on  
Adolescent Alcohol Use

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**Abstract**

Although accumulating studies indicate that alcohol-specific self-control can be useful in predicting adolescent alcohol use, little is known about the specificity of this concept. This longitudinal study advances our understanding of domain-specific self-control by examining whether alcohol-specific self-control only mediates the effect of general self-control on adolescent alcohol use or also the effect of general self-control on other behaviour (adolescent digital media use). Data from 906 adolescents ( $M = 12.19$ ,  $SD = 0.51$ ) who were enrolled in the Dutch study named 'PAS' (Prevention of Alcohol Use in Students) were used. Data were collected using online questionnaires at four annual measurements. As expected, structural equation modelling revealed that higher alcohol-specific self-control completely mediated the effect of higher general self-control on less adolescent alcohol use. Consistent with the second hypothesis, alcohol-specific self-control did not mediate the effect of higher general self-control on less adolescent digital media use. These results demonstrate that alcohol-specific self-control is actually domain-specific. This provides evidence for the theoretical use of this concept in the explanation of adolescent alcohol use. Besides, the results emphasize the need of intervention programs to focus on improving alcohol-specific self-control in order to efficiently reduce the level of adolescent alcohol use.

*Keywords: adolescents, alcohol use, general self-control, alcohol-specific self-control, domain-specific*

### Samenvatting

Hoewel onderzoek aantoont dat alcohol-specifieke zelfcontrole een belangrijke voorspeller is van alcoholgebruik onder adolescenten, is er weinig bekend over de vraag in hoeverre dit concept daadwerkelijk domein-specifiek is. De huidige longitudinale studie draagt bij aan onze kennis over domein-specifieke zelfcontrole door te onderzoeken of alcohol-specifieke zelfcontrole alleen het effect van algemene zelfcontrole op alcoholgebruik van adolescenten medieert of ook het effect van algemene zelfcontrole op ander gedrag van adolescenten (digitaal mediagebruik). In deze studie is gebruikgemaakt van data van 906 adolescenten ( $M = 12.19$ ,  $SD = 0.51$ ) die deelnamen aan 'PAS' (Preventie Alcoholgebruik Scholieren). De data is verzameld met behulp van online vragenlijsten tijdens vier jaarlijkse meetmomenten. Zoals verwacht laten structurele vergelijkingsmodellen zien dat (1) het effect van een hogere algemene zelfcontrole op minder alcoholgebruik volledig wordt gemedieerd door een hogere alcohol-specifieke zelfcontrole, (2) alcohol-specifieke zelfcontrole geen mediator is van het effect van een hogere algemene zelfcontrole op minder digitaal mediagebruik. Hieruit blijkt dat alcohol-specifieke zelfcontrole daadwerkelijk domein-specifiek is. Dit levert bewijs voor het gebruik van dit concept in de theoretische uitleg van alcoholgebruik onder adolescenten. Daarnaast benadrukken de resultaten het belang van interventies die zich richten op het verhogen van alcohol-specifieke zelfcontrole om alcoholgebruik onder adolescenten te verminderen.

*Kernwoorden: adolescenten, alcoholgebruik, algemene zelfcontrole, alcohol-specifieke zelfcontrole, domein-specifiek*

Self-control is an important predictor of a variety of behaviours (De Ridder, Lensvelt-Mulders, Finkenauer, Stok, & Baumeister, 2012). It is a personal characteristic that reflects the ability to control and adjust thoughts, emotions and behavioural tendencies, and refrain from acting on them in order to achieve a goal or conform to standards (De Ridder et al., 2012; D'lima, Pearson, & Kelley, 2012). It includes emotion regulation, thought suppression, temptation resistance and behaviour modification (De Ridder et al., 2012). Low self-control is related to a variety of risk behaviours among youth. Research shows that adolescents with low self-control are more likely to engage in delinquent behaviour, unhealthy dietary behaviour and sexual risk behaviour, and that they show higher levels of substance use and problematic internet use (Gerrits et al., 2010; Li, Li, & Newman, 2013; Nakhaie, Silverman, LaGrange, 2000; Quinn & Fromme, 2010; Wills & Stoolmiller, 2002). Although self-control is a quite stable trait that has a genetic basis, it can be improved and strengthened over time by exercise and practice (Strayhorn, 2002).

A theory that identifies self-control as the key concept in understanding risk behaviour among adolescents is the Self Control Theory of Gottfredson & Hirschi (1990). This theory has originally been developed to predict and explain delinquency, but it is also applicable to other problem behaviours (Beaver et al., 2016; Piquero, Gibson, & Tibbetts, 2002; Vazsonyi, Trejos-Castillo, & Huang, 2006). The theory assumes that individuals with low levels of self-control are more likely to engage in risk behaviour, because they have a greater likelihood to react to stimuli in the environment that makes them overstep their norms (Visser, De Winter, Veenstra, Verhulst, & Reijneveld, 2013). Adolescence is a period of increased vulnerability to involvement in risk behaviour as a consequence of increased peer influences and not yet fully developed brain regions that govern impulse and motivation (Arain et al., 2013). In this vulnerable period, high self-control can play an important role in preventing engagement in and reducing risk behaviour (Tangney, Baumeister, & Boone, 2004).

A risk behaviour which is very common during adolescence and which is strongly predicted by self-control is the use of alcohol. In 2015, 45% of Dutch adolescents between the age of 12 and 16 years had consumed alcohol at least once, 24% had been drunk or tipsy at least once and 18% had been involved in binge drinking (five or more alcoholic drinks in one session) in the past month. Among only 16-year olds, these percentages are notably higher; respectively 76%, 55% and 44% (Van Dorsselaer et al., 2016). Adolescent alcohol use is associated with alcohol problems in adulthood (DeWit, Adlaf, Offord, & Ogborne, 2000) and problem behaviour in middle and high school, such as early school leaving, violent and delinquent behaviour, sexual risk behaviour and co-morbid substance use (Ellickson, Tucker,

& Klein, 2003; Green et al., 2016; Kebede et al., 2005; Komro, Tobler, Maldonado-Molina, & Perry, 2010). Besides, drinking at an early age can have damaging effects on adolescent brain development, especially on their learning and attention abilities (Bava & Tapert, 2010). Because of these negative outcomes it is important to prevent and reduce adolescent alcohol use. Since self-control has a direct influence on adolescent alcohol use (e.g., Griffin, Botvin, Epstein, Doyle, & Diaz, 2000) and given the possibility to improve this personal characteristic (Strayhorn, 2002), it is an important factor to target in preventing and reducing adolescent alcohol use.

In the literature a distinction is made between general self-control and alcohol-specific self-control (Lindgren, Neighbors, Westgate, & Saleminck, 2014; Oei & Burrow, 2000). Alcohol-specific self-control refers to the ability to refrain from drinking alcohol (Jang, Rimal, & Cho, 2013). A number of studies suggest that both general self-control and alcohol-specific self-control are related to adolescent alcohol use (e.g., Bogg, Finn, & Monsey, 2012; Lindgren et al., 2014; Yeh, Chiang, & Huang, 2005). However, it has not yet been investigated whether the relationship between general self-control and adolescent alcohol use is mediated by alcohol-specific self-control and whether this mediating role is domain-specific. It is assumed that self-control can be linked to specific behaviour. This means that an individual can have high self-control in one domain (e.g., substance use) and at the same time low self-control in another domain (e.g., sexual risk behaviour, digital media use; Strayhorn, 2002). However, little is known about the extent to which this so-called domain-specific self-control is actually specific for that domain. The level of self-control in one domain can be predictive for the level of self-control in another domain (Strayhorn, 2002). Thus, perhaps it makes no sense to distinguish between general self-control and domain-specific self-control. This study advances our knowledge about domain-specific self-control by examining whether alcohol-specific self-control only mediates the effect of general self-control on adolescent alcohol use or also the effect of general self-control on other behaviour, such as adolescent digital media use. The answer to this question, whether the effect of general self-control on adolescent alcohol use is mediated by alcohol-specific self-control and whether this mediating role is actually domain-specific, has important implications for the use of this concept in the explanation of adolescent alcohol use and for the content and efficiency of alcohol-related interventions.

### **General Self-Control and Adolescent Alcohol Use**

A wide range of empirical studies examined the relationship between general self-control and adolescent alcohol use and revealed that high general self-control is an important

protective factor for several alcohol-related outcomes (Bogg et al., 2012; Bräker, Göbel, Scheithauer, & Soellner, 2015; Cheung, 2014; Davies, Kuipers, Junger, & Kunst, 2017; Griffin et al., 2000; Innamorati & Maniglio, 2015; Koning, Van den Eijnden, & Vollebergh, 2014; Kwon, 2013; Lindgren et al., 2014; Piquero et al., 2002; Quinn & Fromme, 2010; Vazsonyi et al., 2006). A cross-sectional study among high school students in Hong Kong with a mean age of 16 years found that low general self-control was associated with binge drinking (Cheung, 2014). Another cross-sectional study among Dutch high school students also showed that binge drinking was more prevalent in those with lower scores on general self-control (Davies et al., 2017). This negative relationship between general self-control and adolescent alcohol use is also found in longitudinal studies. Kwon (2013) followed 11-year old Korean adolescents until age 15 and found that the level of general self-control at age 11 predicted the frequency of alcohol use at age 15. The frequency rates of adolescents who reported high general self-control increased significantly less from age 11 to age 15 than the frequency rates of adolescents who reported low general self-control at age 11 (Kwon, 2013). Moreover, in a sample of Dutch adolescents higher general self-control at age 13 predicted a lower frequency and quantity of alcohol consumption one year later (Koning et al., 2014). Hence, the conclusion can be drawn that a higher level of self-control is associated with lower levels of alcohol use among adolescents.

### **Alcohol-Specific Self-Control and Adolescent Alcohol Use**

Previous research not only provide evidence for a negative relationship between general self-control and adolescent alcohol use, but also for a negative relationship between alcohol-specific self-control and adolescent alcohol use. Most studies which examined this relationship are conducted among college students (Ehret, Ghaidarov, & LaBrie, 2013; Klanecky, Woolman, & Becker, 2015; Oei & Burrow, 2000; Lindgren et al., 2014; Oei & Jardim, 2007; Oh & Kim, 2014). However, two cross-sectional studies demonstrated that high alcohol-specific self-control is also associated with less alcohol use in samples of high school students (Jang et al., 2013; Yeh et al., 2005). A study that used longitudinal data confirmed this. In this study alcohol-specific self-control was found to be a significant predictor of the frequency and quantity of drinking among high school students one year later (Conner, George, Gullo, Kelly & Young, 2011). Thus, although little longitudinal evidence among high school students is available, current studies do indicate that a higher level of alcohol-specific self-control is associated with less adolescent alcohol use.

### **General Self-Control, Alcohol-Specific Self-Control and Adolescent Alcohol Use**

Though both general and alcohol-specific self-control relate to adolescents' drinking, alcohol-specific self-control may be a proximal factor that accounts for the more distal influence of general self-control on adolescent alcohol use. Lindgren et al. (2014) investigated the unique influence of both general self-control and alcohol-specific self-control on the quantity and frequency of alcohol use, alcohol-related problems and alcohol cravings among college students. Both types of self-control were related to more favourable outcomes, but the relationship with alcohol-specific self-control was stronger than with general self-control. This indicates that alcohol-specific self-control may be a more proximal factor and general self-control a more distal factor of alcohol use. Furthermore, general self-control was found to be positively related to alcohol-specific self-control (Lindgren et al., 2014). However, as the study of Lindgren et al. (2014) had a cross-sectional design, no conclusion can be drawn about the direction of the effect. Nonetheless, adolescents with high general self-control have less difficulty in resisting temptations in general, because they are better able to foresee the long-term costs of their behaviour (De Ridder et al., 2012). So it is expected that those adolescents, in turn, have less difficulty in resisting alcohol, like any other temptation (Gullo, Dawe, Kambouropoulos, Staiger, & Jackson, 2010). The mediating role of alcohol-specific self-control in the relationship between general self-control and adolescent alcohol use has not yet been examined. However, lack of self-control is linked to the concept impulsiveness, which can be defined as acting without forethought (Strayhorn, 2002) and one study investigated whether the relationship between this concept and alcohol misuse was mediated by alcohol-specific self-control. A lower level of alcohol-specific self-control was found to be a significant mediator of the relationship between a higher level of impulsiveness and more alcohol misuse (Gullo, Dawe, Kambouropoulos, Staiger, & Jackson, 2010). Based on these empirical findings it is expected that the effect of general self-control on adolescent alcohol use can (partly) be explained by alcohol-specific self-control.

### **Domain-Specificity of Alcohol-Specific Self-Control**

Little research has been conducted on how specific alcohol-specific self-control is in relation to alcohol use, i.e. the specificity of alcohol-specific self-control. One study examined whether alcohol-specific self-control is related to alcohol use and not to smoking, caffeine consumption and exercise behaviour (Oei & Burrow, 2000). The findings showed that alcohol-specific self-control did not significantly predict these other behaviours, but did significantly predict the quantity of alcohol consumption. This supports the idea that alcohol-specific self-control is actually domain-specific. However, cross-sectional data were used and

the participants in the study were first-year psychology students (mean age 20 years; Oei & Burrow, 2000). Due to this, it is not possible to draw conclusions about the direction of the effect and the findings may not be generalized to adolescents in general. Therefore, more research is needed on the domain-specificity of alcohol-specific self-control. Based on the study of Oei and Burrow (2000), it is expected that alcohol-specific self-control is specifically related to adolescent alcohol use and not to other behaviours such as adolescent digital media use.

### **Current Study**

The research question that will be answered in this longitudinal study is: To what extent is the mediating role of alcohol-specific self-control in the effect of general self-control on adolescent alcohol use domain-specific? To answer this research question, it must be investigated whether this mediation effect only applies for the effect of general self-control on adolescent alcohol use or also for the effect of general self-control on behaviour that is conceptually unrelated to alcohol-specific self-control. Therefore, adolescent digital media use will be included as a control outcome measure. The following sub questions will be addressed: to what extent is the effect of general self-control on adolescent alcohol use mediated by alcohol-specific self-control? And, is this mediation effect only related to adolescent alcohol use or also to adolescent digital media use? Based on the Self Control Theory and previous empirical research, two hypotheses are formulated. First, the effect of a higher level of general self-control on less adolescent alcohol use is mediated by a higher level of alcohol-specific self-control. Second, the mediating role of alcohol-specific self-control in the effect of general self-control on adolescent alcohol use is only related to adolescent alcohol use and not to adolescent digital media use (see Figure 1).

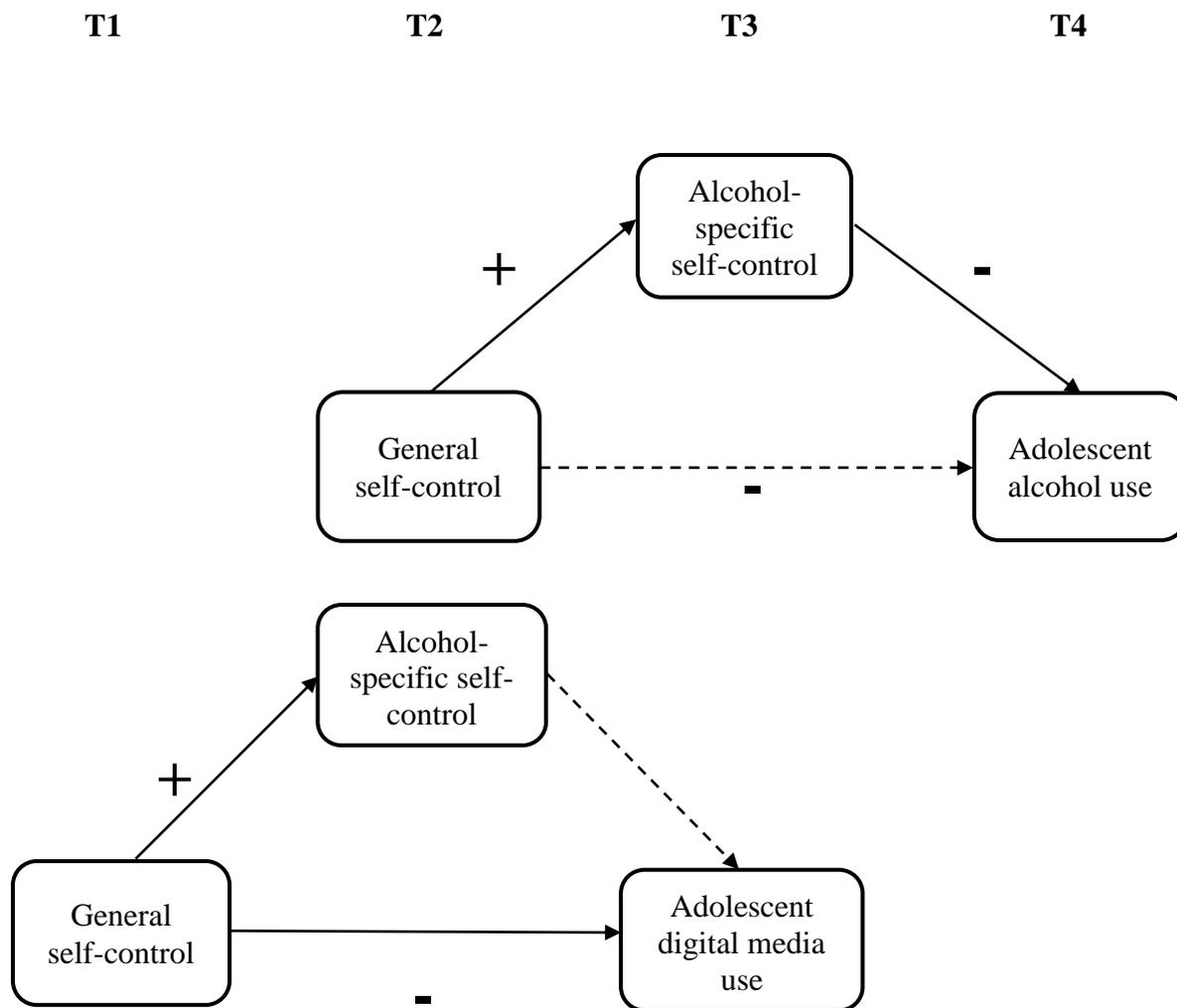


Figure 1. Research model

## Method

### Procedure

The longitudinal data used in this study are part of a cluster randomized trial of a Dutch alcohol prevention program for adolescents called 'PAS' (Koning et al., 2009). In this randomized trial, 80 schools were randomly selected from a list of all Dutch public secondary schools and invited to participate. Eventually, 19 schools that did not offer special education, with at least 100 first-year students and of which less than 25% of the students had a migrant background participated in the study. The schools were randomly assigned to one of the four conditions: three intervention conditions and one control condition which did not receive any intervention. In the current study, only data from the control condition were used to ensure that the data were not affected by possible intervention effects. All first-year students were involved in the study. Data of the students were obtained using online questionnaires which

were available on a secured website. Parents of the students received a letter of consent in order to give them the possibility to refuse their children's participation (0.01% refusal). The data were collected in classrooms during school time by trained research assistants in 2006, reflecting Time 1 (T1); 2007, reflecting Time 2 (T2); 2008, reflecting Time 3 (T3); and 2009, reflecting Time 4 (T4). The study protocol was assessed and approved by the Medical Ethical Committee.

### **Participants**

At T1, 906 adolescents between the age of 11 and 14 years ( $M = 12.19$ ,  $SD = 0.51$ ) from four different secondary schools participated in the study. Of these adolescents, 52.5% were boys and 95.5% were born in the Netherlands. Sixty comma two percent enrolled in lower secondary vocational education and 39.7% in higher general secondary and pre-university education. Religious background of the adolescents were primarily non-religious (46.1%) and Roman Catholic (34.5%). A total of 865 adolescents (95.47%) at T2, 802 adolescents (88.52%) at T3 and 783 adolescents (86.42%) at T4 completed the follow-up assessments. Reasons for attrition were no permission or adolescents who were not present at the day of data collection. Attrition analyses showed no differences at T1 between adolescents who completed the follow-up assessment at T2 and adolescents who did not with respect to gender, age, educational level, general self-control and alcohol use. Nonresponding adolescents at T3 and T4 significantly differed from responding adolescents at these follow-up assessments in being older (T3:  $t(121) = -2.26$ ,  $p = .25$ ; T4:  $t(155) = -2.52$ ,  $p = .013$ ), being in lower education (T3:  $F(1, 904) = 19.10$ ,  $p < .001$ ; T4:  $F(1, 904) = 17.41$ ,  $p = .000$ ) and having lower general self-control at T1 ( $t(901) = 2.87$ ,  $p < .05$ ; T4:  $t(901) = 2.57$ ,  $p = .01$ ). No differences were found for gender and alcohol use at T1.

### **Measures**

*Alcohol use* was the outcome variable in this study. By using the Quantity-Frequency measure the average number of glasses consumed in a week was computed (Koning et al., 2009). Adolescents were asked how many days they usually consume alcohol during the week (Monday to Thursday) and during the weekend (Friday to Sunday) to assess the frequency of alcohol use. The quantity of alcohol use was measured by asking how many glasses of alcohol the adolescent usually drinks on a weekday and on a weekend day. Thereafter, the average weekly alcohol use was computed by calculating the product of the number of days and the number of glasses for weekdays and weekend days separately, after which these two products were added up. Higher scores indicated higher levels of alcohol use.

*Digital media use* was the control outcome variable and was measured by asking how many hours adolescents spent doing the following activities on a weekday and on a weekend day: watching television (films and DVD's included), playing computer games or video games (PlayStation, Xbox, GameCube, etc.) and using the Internet for chatting, messaging, surfing the Web, etc. Response options ranged from "never" (1) to "7 hours or more" (9). The sum of the 6 items were computed. Higher scores indicated higher levels of digital media use.

*General self-control* is the ability to control and adjust thoughts, emotions and behaviours (De Ridder et al., 2012). It was measured by using the brief Self-Control Scale developed and tested by Tangney, Baumeister and Boone (2004) which consists of 13 items. Response options ranged from "not at all like me" (1) to "very much like me" (5) on a 5-point scale. Example items are "I am good at resisting temptation", "I often act without thinking through all the alternatives" and "I say inappropriate things". The mean score of the 13 items was computed. Several items were reversely scored, so that higher scores reflected higher general self-control. Cronbach's alpha was .72 at T1 and .77 at T2.

*Alcohol-specific self-control* refers to the ability to refrain from drinking alcohol (Jang et al., 2013) and was measured by two items: "Are you able to resist drinking alcohol when your friends are offering you a glass of alcohol?" and "Are you able to resist drinking alcohol when all your friends are drinking?". The mean score of these two items rated on a 4-point scale from "definitely not" (1) to "definitely" (5) was used, with higher scores indicating higher alcohol-specific self-control. Pearson correlation was .80 at T2 and .83 at T3.

*Gender, age and educational level* were included as control variables, because these factors are related to alcohol use (Johnson et al., 2010; Van Dorsselaer et al., 2016; Webb, Bray, Getz, & Adams, 2002). Adolescents reported their gender (boy = 0, girl = 1) and date of birth. Educational level was known, because the data were collected at schools and adolescents were in classes representing a specific level of education (lower secondary vocational education = 0, higher general secondary and pre-university education = 1).

### **Data Analysis**

Before analysis, all variables of interest were inspected for accuracy of data entry, missing values and outliers, and descriptive statistics and correlations were obtained using IBM SPSS Statistics 24. Main analyses were performed in Mplus 7.4 (Muthén & Muthén, 2015). Data were imputed using the maximum likelihood (ML) estimator. To establish whether the effect of general self-control on both adolescent alcohol use and adolescent digital media use is mediated by alcohol-specific self-control, structural equation modelling (SEM) was used. First, the direct effect of general self-control on adolescent alcohol

use/digital media use two years later was tested. Second, the effect of general self-control on the mediating variable alcohol-specific self-control was analysed. Third, the effect of alcohol-specific self-control on adolescent alcohol use/digital media use was tested while controlling for the effect of general self-control. Finally, the model indirect command in Mplus was used to examine whether the mediated effect was statistically significant. In the analyses was controlled for gender, age and educational level at T1 and alcohol-specific self-control and adolescent alcohol use/digital media use at previous time points. Partial mediation occurs if there is a significant indirect effect of general self-control on adolescent alcohol use/digital media use via alcohol-specific self-control and the effect of general self-control on adolescent alcohol use/digital media use is smaller, but still significant, when alcohol-specific self-control is included in the model. Complete mediation occurs if there is a significant indirect effect of general self-control on adolescent alcohol use/digital media use via alcohol-specific self-control and the effect of general self-control on adolescent alcohol use/digital media use is no longer significant when alcohol-specific self-control is taken into account. Since the assumption of normality was violated, bootstrapping (500) was conducted. A *p*-value of  $< .05$  was used to determine statistical significance.

Alcohol-specific self-control was not included in the questionnaire at T1 and adolescent digital media use was not included in the questionnaire at T1 and T4. Therefore, the following measurement moments were used for the different analyses. General self-control at T2, alcohol-specific self-control at T3 and adolescent alcohol use at T4 were used in order to examine actual change over time and to assess a mediation effect with regard to alcohol use. In the analyses was controlled for alcohol-specific self-control and adolescent alcohol use at T2. In the analyses with digital media use as outcome measure, general self-control at T1, alcohol-specific self-control at T2 and adolescent digital media use at T3 were used (see Figure 1). Adolescent digital media use at T2 was included as control variable.

## Results

### Descriptive Results

Descriptive data for all research variables are given in Table 1. The average amount of alcohol adolescents consumed at T2 was 1.9 glasses per week ( $SD = 8.43$ ). At T4 the average amount was substantially higher: 6 glasses per week ( $SD = 13.10$ ). On the contrary, general self-control and alcohol-specific self-control were quite stable over time; general self-control: 3.6 ( $SD = 0.51$ ) at T1 and 3.5 ( $SD = 0.57$ ) at T2; alcohol-specific self-control: 3.2 ( $SD = 0.88$ ) at T2 and 3.2 ( $SD = 0.91$ ) at T3. Adolescents spent, on average, 21.2 hours ( $SD = 10.05$ ) in

total per week watching television, playing computer games or video games and using the Internet at T2 and 21.8 hours ( $SD = 10.29$ ) at T3.

Table 1

*Descriptive Statistics of Research Variables*

	<i>n</i> (%)	<i>M</i> ( <i>SD</i> )	Min	Max
Gender (boys)	476(52.5%)			
Educational level (lower)	546(60.3%)			
Age T1		12.2(.51)	11	14
General self-control T1		3.6(.51)	2	4.92
General self-control T2		3.5(.57)	1.23	5
Alcohol-specific self-control T2		3.2(.88)	1	4
Alcohol-specific self-control T3		3.2(.91)	1	4
Alcohol use T2		1.9(8.43)	0	104
Alcohol use T4		6.0(13.10)	0	104
Digital media use T2		21.2(10.05)	0	48
Digital media use T3		21.8(10.29)	0	48

*Note.* *n* = number of participants; *M* = mean; *SD* = standard deviation.

**Correlations**

Table 2 presents the correlations between all variables of interest. Both types of self-control were significantly negatively correlated with alcohol use, indicating that higher general and alcohol-specific self-control were related to less drinking. In addition, a higher level of general self-control was significantly related to a higher level of alcohol-specific self-control. Furthermore, higher general and alcohol-specific self-control were significantly correlated with less digital media use.

Table 2

*Correlations between Alcohol Use, Digital Media Use, Alcohol-Specific Self-Control, General Self-Control and Control Variables*

Variable	1	2	3	4	5	6	7	8	9	10	11
1. Gender (ref = boys)	1.00										
2. Age	-.05	1.00									
3. Educational level (ref = lower)	-.03	-.23**	1.00								
4. General self-control T1	.04	-.08*	.17**	1.00							
5. General self-control T2	.08*	-.07*	.13**	.54**	1.00						
6. Alcohol-specific self-control T2	.06	-.01	.08*	.20**	.36**	1.00					
7. Alcohol-specific self-control T3	-.00	-.02	.09*	.17**	.30**	.37**	1.00				
8. Alcohol use T2	-.08*	.13**	-.14**	-.18**	-.29**	-.30**	-.20**	1.00			
9. Alcohol use T4	-.17*	.07	-.09*	-.15**	-.21**	-.27**	-.35**	.42**	1.00		
10. Digital media use T2	-.12**	.03	-.16**	-.20**	-.23**	-.13**	-.09*	.20**	.16**	1.00	
11. Digital media use T3	-.15**	.02	-.17**	-.18**	-.18**	-.09**	-.09**	.13**	.19**	.44**	1.00

*Note.* Spearman correlation was used for ordinal and continuous variables. Pearson Correlation was used for dichotomous variables.

\*  $p < .05$ . \*\*  $p < .01$ .

### Adolescent Alcohol Use

#### Direct effect of general self-control on adolescent alcohol use

First the direct effect of general self-control at T2 on adolescent alcohol use at T4 was tested. Results showed that general self-control significantly predicted future alcohol use while controlling for gender, age, educational level and adolescent alcohol use at T2 (see Table 3). Adolescents who reported higher levels of general self-control consumed less alcohol on a weekly basis two years later,  $\beta = -.101$ ,  $SE = .046$ ,  $p = .028$ , 95% CI [-0.18, -0.03]. The model explained 16.8% of the variance in adolescent alcohol use.

#### Indirect effect of general self-control on adolescent alcohol use via alcohol-specific self-control

To test the indirect effect of general self-control on adolescent alcohol use via alcohol-specific self-control, first the effect of general self-control at T2 on alcohol-specific self-control at T3 was examined. As Table 3 and Figure 2 present, general self-control was a significant predictor of alcohol-specific self-control while controlling for gender, age, educational level and alcohol-specific self-control at T2. Higher levels of general self-control predicted higher levels of alcohol-specific self-control,  $\beta = .226$ ,  $SE = .042$ ,  $p < .001$ , 95% CI [0.16, 0.30]. The model explained 18.8% of the variance in alcohol-specific self-control.

Then, the full mediation model was tested. These results are also given in Table 3 and Figure 2. According to Hu and Bentler's (1999) cut-off criteria for fit indexes to evaluate model fit, the mediation model showed a good fit to the data: CFI = .99, RMSEA = .031,  $[\chi]^2 = 3.762(2)$ ,  $p = .152$ . A significantly negative effect was found of alcohol-specific self-control at T3 on adolescent alcohol use at T4 while controlling for the effect of general self-control at T2,  $\beta = -.200$ ,  $SE = .046$ ,  $p < .001$ , 95% CI [-0.28, -0.12]. In this step, the effect of general self-control at T2 on adolescent alcohol use at T4 was no longer significant,  $\beta = -.043$ ,  $SE = .041$ ,  $p = .297$ , 95% CI [-0.11, 0.03]. The model indirect command was used to determine whether the mediated effect was statistically significant. A significant total indirect effect of general self-control on adolescent alcohol use via alcohol-specific self-control was found, indirect = -.045,  $SE = .014$ ,  $p = .001$ , 95% CI [-0.07, -0.02]. The model explained 19.4% of the variance in adolescent alcohol use.

Table 3

*Structural Equation Model of the Effects of General Self-Control and Alcohol-Specific Self-Control on Adolescent Alcohol Use.*

Variable	Step 1 (X on Y): Adolescent alcohol use T4		Step 2 (X on M): Alcohol-specific self-control T3		Step 3 (X on Y via M): Adolescent alcohol use T4	
	$\beta$	<i>SE</i>	$\beta$	<i>SE</i>	$\beta$	<i>SE</i>
	Gender (ref = boys)	-.14***	.03	-.03	.03	-.15***
Age	.03	.04	-.01	.04	.03	.04
Educational level (ref = lower)	-.03	.03	.03	.03	-.03	.03
Alcohol use T2	.32*	.13			.29*	.13
Alcohol-specific self-control T2			.29***	.05		
General self-control T2	-.10*	.05	.23***	.04	-.04	.04
Alcohol-specific self-control T3					-.20***	.05

*Note.*  $\beta$  = standardized coefficient; *SE* = standard error.

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

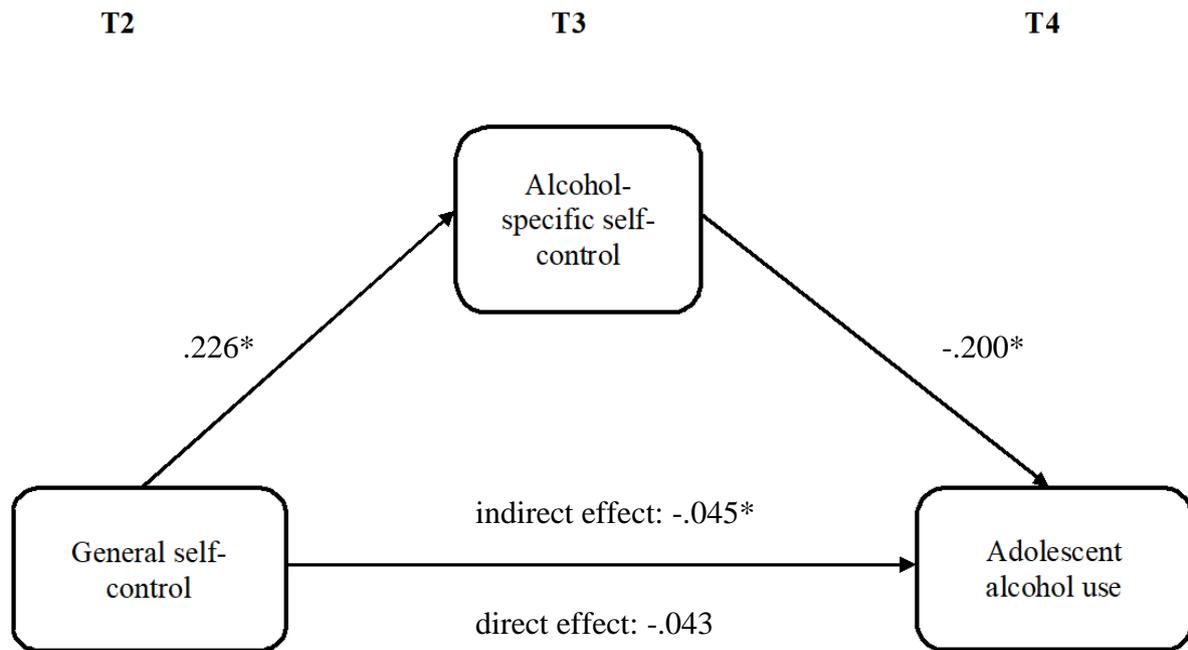


Figure 2. Structural equation model of the effect of general self-control on adolescent alcohol use via alcohol-specific self-control.

\*  $p \leq .001$ .

### Adolescent Digital Media Use

#### Direct effect of general self-control on adolescent digital media use

The direct effect of general self-control at T1 on adolescent digital media use at T3 was examined while controlling for gender, age, educational level and adolescent digital media use at T2. As Table 4 shows, a significant negative effect was found. That is, adolescents with higher general self-control reported less digital media use two years later,  $\beta = -.089$ ,  $SE = .035$ ,  $p = .012$ , 95% CI [-0.15, -0.03]. The model explained 22% of the variance in adolescent digital media use.

#### Indirect effect of general self-control on adolescent digital media use via alcohol-specific self-control

In order to determine whether the mediating role of alcohol-specific self-control in the effect of general self-control on adolescent alcohol use is domain-specific, another mediation analysis was performed with adolescent digital media use as outcome measure. Results are presented in Table 4 and Figure 3. First, the effect of general self-control at T1 on alcohol-specific self-control at T2 was examined. A higher level of general self-control at T1 was a significant predictor of a higher level of alcohol-specific self-control at T2 while controlling for age, gender and educational level,  $\beta = .201$ ,  $SE = .033$ ,  $p < .001$ , 95% CI [0.15, 0.26]. The model explained 4.8% of the variance in alcohol-specific self-control.

The full mediation model showed an acceptable/good fit to the data,  $CFI = .96$ ,  $RMSEA = .098$ ,  $[\chi]^2 = 9.694(1)$ ,  $p < .05$ . No significant effect was found of alcohol-specific self-control at T2 on adolescent media use at T3,  $\beta = -.016$ ,  $SE = .039$ ,  $p = .686$ , 95% CI [-0.94, 0.57]. Also the model indirect command showed no significant indirect effect of general self-control on adolescent digital media use via alcohol-specific self-control, indirect =  $-.003$ ,  $SE = .008$ ,  $p = .693$ , 95% CI [-0.02, 0.01] (see Table 4 and Figure 3). The model explained 21.9% of the variance in adolescent digital media use.

Table 4

*Structural Equation Model of the Effects of General Self-Control and Alcohol-Specific Self-Control on Adolescent Digital Media Use*

Variable	Step 1 (X on Y): Digital media use T3		Step 2 (X on M): Alcohol-specific self-control T2		Step 3 (X on Y via M): Digital media use T3	
	$\beta$	$SE$	$\beta$	$SE$	$\beta$	$SE$
	Gender (ref = boys)	-.12***	.03	.05	.03	-.12***
Age	-.06	.03	.01	.04	-.06	.03
Educational level (ref = lower)	-.11***	.03	.05	.03	-.11***	.03
Digital media use T2	.38***	.04			.38***	.04
General self-control T1	-.09*	.04	.20***	.03	-.09*	.04
Alcohol-specific self-control T2					-.02	.04

*Note.*  $\beta$  = standardized coefficient;  $SE$  = standard error.

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p \leq .001$ .

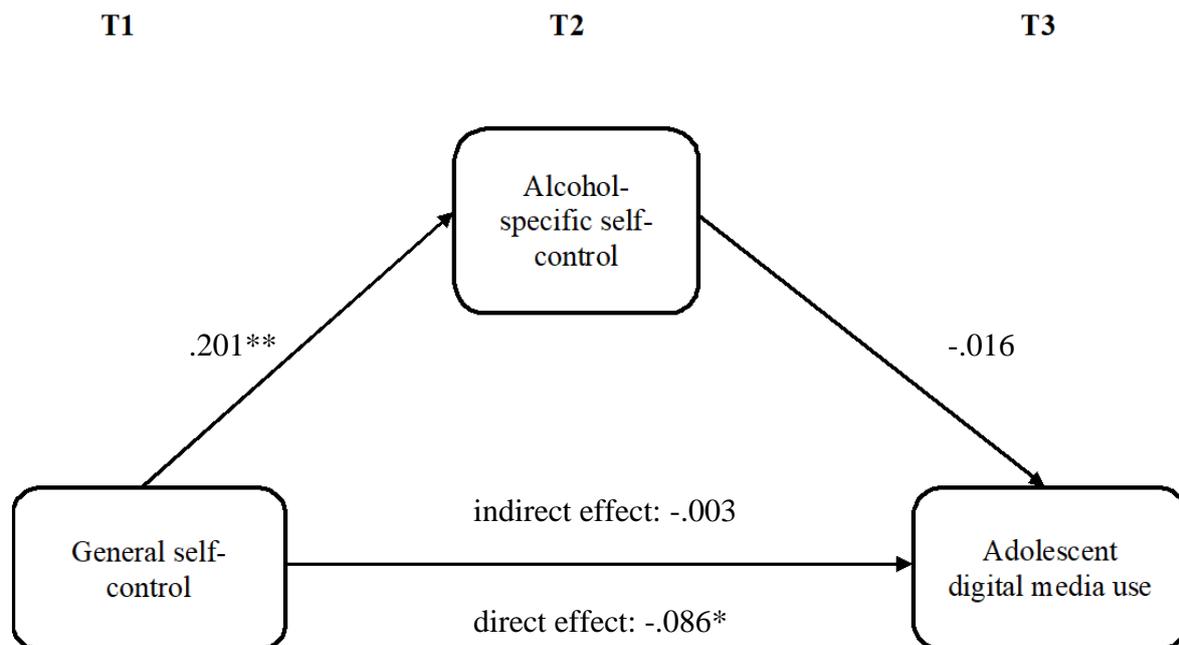


Figure 3. Structural equation model of the effect of general self-control on adolescent digital media use via alcohol-specific self-control.

\*  $p < .05$ . \*\*  $p < .001$ .

### Discussion

As far as we know, this is the first study that longitudinally investigated whether the effect of general self-control on adolescent alcohol use is mediated by alcohol-specific self-control and whether this mediating role is domain-specific. In order to answer the question whether this mediating role is domain-specific, it was examined whether this mediation effect only applies for the effect of general self-control on adolescent alcohol use or also for the effect of general self-control on adolescent digital media use. Results showed that the effect of a higher level of general self-control on less adolescent alcohol use was completely mediated by a higher level of alcohol-specific self-control. However, alcohol-specific self-control did not mediate the effect of a higher level of general self-control on less adolescent digital media use. These results imply that general self-control precedes alcohol-specific self-control and that the latter is actually domain-specific.

Consistent with previous research (e.g. Cheung, 2014; Kwon, 2013; Nakhaie et al., 2000; Quinn & Fromme, 2010) and the Self-Control Theory (Gottfredson & Hirschi, 1990), high general self-control seemed to be a protective factor of adolescent risk behaviour, because it predicted less alcohol use as well as less digital media use in adolescence two years later. However, the effect of general self-control on adolescent alcohol use was completely explained by the level of alcohol-specific self-control. In line with the first hypothesis, a

higher level of general self-control had an indirect effect on less adolescent alcohol use via a higher level of alcohol-specific self-control. That is, adolescents with a greater ability to control and adjust thoughts, emotions and behavioural tendencies had less difficulty in resisting alcohol, which in turn led to less alcohol consumption. The fact that alcohol-specific self-control completely mediated the effect of general self-control on adolescent alcohol use implies that alcohol-specific self-control can eliminate the effect of general self-control on adolescent alcohol use. This indicates that alcohol-specific self-control is a more proximal predictor of weekly alcohol use of adolescents than general self-control. This is an expansion of the finding of Lindgren et al. (2014) that the association between alcohol consumption and alcohol-specific self-control was stronger than the association between alcohol consumption and general self-control. It is possible that, in contrast to the level of adolescent alcohol use, general self-control is a better predictor rather than alcohol-specific self-control with regard to the onset of adolescent alcohol use. That is because Tipton and Worthington (1984) suggested that domain-specific self-control is a better predictor of an individual's behaviour in a clearly defined and familiar situation and that general self-control is a better predictor of someone's behaviour in situations which are more ambiguous and less familiar to the individual. An example of a more ambiguous and unfamiliar situation is a situation in which an adolescent is for the first time exposed to peers who use substances. Research shows that alcohol initiation is associated with exposure to peers who use alcohol (Dupre, Miller, Gold, & Respenda, 1995; Kosterman, Hawkins, Guo, Catalano, & Abbott, 2000; Mundt, 2011). Based on this, adolescents who already drink are expected to be more familiar with situations in which their friends are drinking or in which they are offered a drink by a friend. In contrast, adolescents who do not drink yet are less familiar with situations involving alcohol use, because probably their friends do not drink either. Therefore, with regard to the suggestion made by Tipton and Worthington, it is expected that alcohol-specific self-control is a better predictor of the level of adolescent alcohol use and general self-control a better predictor of the onset of adolescent alcohol use. The finding of the current study that alcohol-specific self-control is a more proximal predictor of the frequency and quantity of adolescent alcohol use than general self-control supports that suggestion. However, it remains for future studies to examine whether alcohol-specific self-control also acts like a perfect mediator of the effect of general self-control on the age of initiation of alcohol use or not.

The effect of a higher level of general self-control on less adolescent digital media use was not mediated by the level of alcohol-specific self-control, because alcohol-specific self-control did not significantly predict digital media use. This is in line with the second

hypothesis, that the mediating role of alcohol-specific self-control in the effect of general self-control on adolescent alcohol use is only related to adolescent alcohol use and not to adolescent digital media use. This result is a longitudinal confirmation of the cross-sectional finding of Oei and Burrow (2000) that alcohol-specific self-control is actually domain-specific. In other words, it provides evidence that domain-specific self-control is indeed distinct from general self-control, because domain-specific self-control is not generalizable across different behaviours. As a consequence, strengthening adolescent's ability to refrain from drinking alcohol does not have beneficial effects on their ability to resist temptations in other domains. The finding that alcohol-specific self-control is actually domain-specific supports the use of this concept in the explanation of adolescent alcohol use.

Since the results of the current study showed that the ability to refrain from drinking alcohol plays an important role in predicting the quantity and frequency of adolescent alcohol use, it is important to know which factors affect this ability. In this study a significant positive effect was found of general self-control on alcohol-specific self-control, but the model only explained 18.8% of the variance in alcohol-specific self-control. This indicates the influence of other factors in addition to the influence of general self-control on alcohol-specific self-control. For example, Spoth, Yoo, Kahn and Redmond (1996) showed that environmental factors such as peers having prosocial norms and parent-child attachment can affect adolescent alcohol refusal skills. A close examination of the predictors of the ability to refrain from drinking alcohol would be helpful in identifying effective means of improving this ability.

### **Strengths and Limitations**

The present study is based on a large sample and longitudinal data. Due to the longitudinal design it was possible to establish causal relationships. Furthermore, sophisticated analyses were performed using SEM. Despite these strengths, there are several limitations that should be mentioned. First, alcohol-specific self-control was measured by only two items. Further research should use a validated scale with more items, because this would be a more reliable measure of alcohol-specific self-control. Second, adolescents' self-reports were used which could have led to bias. Anyhow, self-reports are found to be a reliable and valid method to measure alcohol use among adolescents (Koning, Harakeh, Engels, & Vollenbergh, 2010) and other approaches such as using diary reports are not feasible in large studies. Third, because of the fact that not all research variables were included in the questionnaire at all four moments, the measurement moments that were used for the analysis with alcohol use were one year later in time than the measurement moments

used for the analysis with digital media use. As a consequence, the analysis with alcohol use was based on a sample in which the participants were older than in the sample used for the analysis with digital media use. With respect to the comparison between the two analyses, it would have been better when both analyses were based on the same sample. However, priority was given to the option to optimize the internal validity of the mediational analysis with adolescent alcohol use instead of using the same measurement moments in both analyses. Fourth, we did not examine whether alcohol-specific self-control is also specifically related to alcohol use and not to other substance use. For future studies it would be interesting to test this, because the answer to the question whether alcohol-specific self-control is generalizable to other substances or not has important implications for the content of interventions related to substance use.

### **Conclusions and Implications**

In the current study we gained more insight into the relationship between general and alcohol-specific self-control and the level of alcohol use among adolescents, and the extent to which alcohol-specific self-control is actually domain-specific. The results showed that alcohol-specific self-control completely mediated the effect of general self-control on adolescent alcohol use. Due to its critical role, alcohol-specific self-control should be targeted rather than general self-control in order to efficiently reduce the level of alcohol consumption among adolescents. Interventions can make use of this knowledge by offering training aimed at improving alcohol resistance skills. Based on the suggestion made by Tipton and Worthington (1984) and the current findings, it is assumed that interventions aimed at delaying the onset of adolescent alcohol use should, in contrast, target general self-control. Future studies should examine whether general self-control or alcohol-specific self-control is a more proximal predictor of the onset of adolescent alcohol use in order to confirm this assumption. The finding that alcohol-specific self-control is actually domain-specific provides evidence for the use of this concept in the explanation of adolescent alcohol use. The domain-specificity of alcohol-specific self-control implies that strengthening adolescent's ability to refrain from drinking alcohol does not have beneficial effects on their ability to resist temptations in other domains. This has implications for the design of interventions aimed at reducing adolescent risk behaviour in general. Since high general self-control can play an important role in reducing multiple adolescent risk behaviours via its effect on domain-specific self-control, these interventions may focus on improving general self-control.

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