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## Gender differences in alcohol onset and drinking frequency in adolescents: an application of the theory of planned behavior

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### ABSTRACT

The Theory of Planned Behavior (TPB) is a model utilized to predict human behavior that was used to examine adolescents' alcohol drinking behavior (onset and frequency of drinking). Longitudinal data collected over a 2 year period from Norwegian junior high school students ( $N=1,563$ ) was used. Multilevel structural equation models was used to examine the utility of the TPB to explain variance in adolescents' onset and frequency of alcohol use. Gender differences between the different TPB components and alcohol use was tested. Onset and frequency of alcohol drinking were predicted by intention, for both genders. Intention to onset drinking was in turn predicted by subjective norms (SN) for both girls and boys while intention to drinking frequency was predicted by SN and attitude for girls, and SN for boys. Onset of drinking and frequency of alcohol use were directly related to perceived behavior control (PBC) for girls. Gender differences in TPB were detected. Alcohol preventive programs will benefit from focusing on attitude, SN and PBC for girls and SN for boys.

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### KEYWORDS

Theory of planned behavior; adolescent alcohol use; gender; structural equation modelling

### Introduction

Alcohol is the intoxicating substance most frequently used among European adolescents in junior high schools (ESPAD, 2020). Early onset of alcohol drinking is associated with risky behaviors in later adolescence, like early drunkenness and problematic behaviors (Barry et al., 2016; Kirby & Barry, 2012; Kuntsche et al., 2013; Masten et al., 2008). In Norway, 12% of junior high schools students declare to have been intoxicated more than once during the last year, with an increase from 3% for both genders in 8<sup>th</sup> grade (about 13 years old) to 22% of the boys and 25% of the girls in 10<sup>th</sup> grade (about 15 years old; Bakken, 2018). This marked increase in drunkenness during junior high school suggests that it could be a key period for implementing alcohol preventive interventions. Interventions that aim to deter the onset of alcohol drinking or prevent drunkenness among adolescents need to focus on factors that influence human behavior and researchers thus should use tools that help unravel behavior.

### The theory of planned behavior

The Theory of Planned Behavior (TPB) is a theory aimed at explaining human behavior in a specific context (Ajzen, 1985, 1991). The TPB suggests that intention is the most important determinant to perform a behavior. Intention is, in turn, determined by attitudes, subjective norms and perceived behavioral control. According to the TPB, a behavior such as

alcohol use among adolescents is predicted by adolescents' intention to use alcohol, which, in turn, is predicted by attitudes towards alcohol, subjective norms related to alcohol, and perceived behavioral control (Ajzen, 1991; Conner & Sparks, 2005; Fishbein & Ajzen, 2010).

Intention is an indication of the person's motivation and readiness to perform a behavior (Fishbein & Ajzen, 2010), and is defined as "the instruction people give themselves to perform particular behaviors or to achieve certain goals" (Sheeran et al., 2005). Fishbein and Ajzen (2010) defined attitude as "a latent disposition to respond with some degree of favorableness or unfavorableness to a psychological object". Alcohol-related attitudes among adolescents are a measure of how they evaluate alcohol use (e.g., consequences of alcohol use) and whether they are in favor of using alcohol (e.g., positive or negative judgements of alcohol use; Conner & Sparks, 2005; Francis et al., 2004).

Subjective norms refer to what is acceptable or permissible in a group regarding behavior, and may be considered as indicators of social pressure (Fishbein & Ajzen, 2010). Group norms are usually operationalized as what members of a group think or perceive should be done (Conner & Sparks, 2005). Subjective norms (SN) are defined by Fishbein and Ajzen (2010) as an "individual's perception that most people who are important to them think they should (or should not) perform a particular behavior".

Perceived Behavioral Control (PBC) represents the overall control an individual perceives he/she has over the performance of his/her behavior (Conner & Sparks, 2005). PBC is defined by Fishbein and Ajzen (2010) as “the extent to which people believe that they are capable of performing a given behavior or attaining a certain goal”.

### **Applying the TPB to alcohol use**

The general efficacy of the TPB as a predictor of intentions and behavior has been supported by several meta-analyses (Armitage & Conner, 2001; Godin & Kok, 1996), and a few studies have demonstrated the predictive validity of the TPB in the specific context of alcohol consumption (Collins & Carey, 2007; Johnston & White, 2003; McMillan & Conner, 2003). Criticism of the TPB theory has also been raised, primarily in relation to its validity and to the lack of explanation for variability in behavior, for example with age (Sniehotta et al., 2014). However, a quite recent meta-analysis based on 40 studies provided support for the utility of the TPB when applied to alcohol consumption and intentions (Cooke et al., 2016).

Most of the studies examined by Cooke et al. (2016) used adult samples, but a few authors also have examined how the TPB predicted alcohol use in adolescents under the age of 18 years (Dempster et al., 2005; Kam et al., 2009; Marcoux & Shope, 1997; Phuphaibul et al., 2011). Although Cooke et al. (2016) showed that the TPB had a greater predictive ability when applied to adult samples, they also advocated for further research on adolescents.

### **Gender differences in alcohol drinking**

Gender differences exist among adults in alcohol consumption, as men generally consume more alcohol than women (Wiltsack et al., 2000). A cross-sectional study of European adolescents has shown that boys drink more frequently than girls (Kuntsche et al., 2015). Other studies also found boys to have an earlier onset of alcohol use than girls (Adolfson et al., 2014), and to be drunk more often than girls (Masten et al., 2008). These differences may be due to distinct social and peer influences experienced by boys and girls towards drinking (Dir et al., 2017), which could affect the TPB relationships and influence onset and frequency of alcohol use (de Visser & McDonnell, 2013). Cooke et al. (2016) found that the only TPB relationship moderated by gender was the attitude-intention relation, which was significantly stronger in female than in male samples.

For adolescents, few studies have examined how gender moderated TPB relationships in the context of alcohol use. Phuphaibul et al. (2011) used the TPB to predict alcohol drinking among Thai adolescents, and found gender differences in the predictors of intention to drink alcohol. However, the applicability of Phuphaibul et al. (2011) findings is limited in a European context as more than 90% of the participants were Buddhist, and thus influenced by religious beliefs and a cultural setting different from what is found in most Western cultures. As such, further research is needed to explore the

relationships between TPB and adolescents alcohol use from a gender perspective.

### **The current study**

The overall aim of the present study was to examine the longitudinal relationships of TPB and drinking behavior among Norwegian adolescents, see Figure 1. More precisely the aims were to: (1) examine the utility of the TPB to explain variance in adolescents' onset and frequency of alcohol use; and (2) examine possible differences between genders in the TPB relationships. As only a minority of adolescents in junior high schools has experience with alcohol drinking, we expected as our first hypothesis that the TPB relationships will be weaker in our adolescent sample as compared to previous findings on adults. Regarding the moderating effect of gender on the TPB, the existing literature has shown variable effects which are hard to conclude on (Hassan & Shiu, 2007; Zimmermann & Sieverding, 2010). The most robust finding is from Cooke et al. (2016) who highlighted a moderating effect of gender on the attitude-intention relationship. Following their finding, we therefore expected (second hypothesis) that attitude will be a stronger predictor of intention to drink for girls than for boys.

## **Methods**

### **Participants**

Data are derived from a longitudinal study called W8 [wait, [www.w8.uit.no](http://www.w8.uit.no)] which investigated alcohol consumption through a questionnaire filled by students in junior high schools ( $K=41$ ) in Norway (Adolfson et al., 2014; Strøm et al., 2015). The eligible sample included 4,356 adolescents, and 2,020 agreed to participate by written consents from their parents and themselves. Of the 2,020 adolescents participating, 738 were recruited from comparison schools and 1,282 from schools receiving an alcohol-preventing intervention. This intervention proved to have no effect either on the alcohol drinking behavior of the adolescents or on the main TPB constructs (Strøm et al., 2015). We therefore included all participants as one homogeneous group in our analyses. Demographic information describing the sample (e.g., religion, socio-economic status, school performance) are detailed in Adolfson et al. (2014).

### **Procedures**

The questionnaire was implemented alongside an intervention given in 8<sup>th</sup> and 9<sup>th</sup> grades where some schools received the Youth & Alcohol preventing program, with contents about drugs and alcohol (Wilhelmsen et al., 1994) while the control schools received the usual curriculum (see Strøm et al. (2015) for more details). At the beginning of 8<sup>th</sup> grade ( $T_1$ , before intervention), 1,563 students (49.6% boys and 50.4% girls) with a mean age of 13.5 ( $SD=0.7$ ) years answered the digital questionnaire during school hours. The response rate at  $T_1$  was thus 77%. The adolescents also

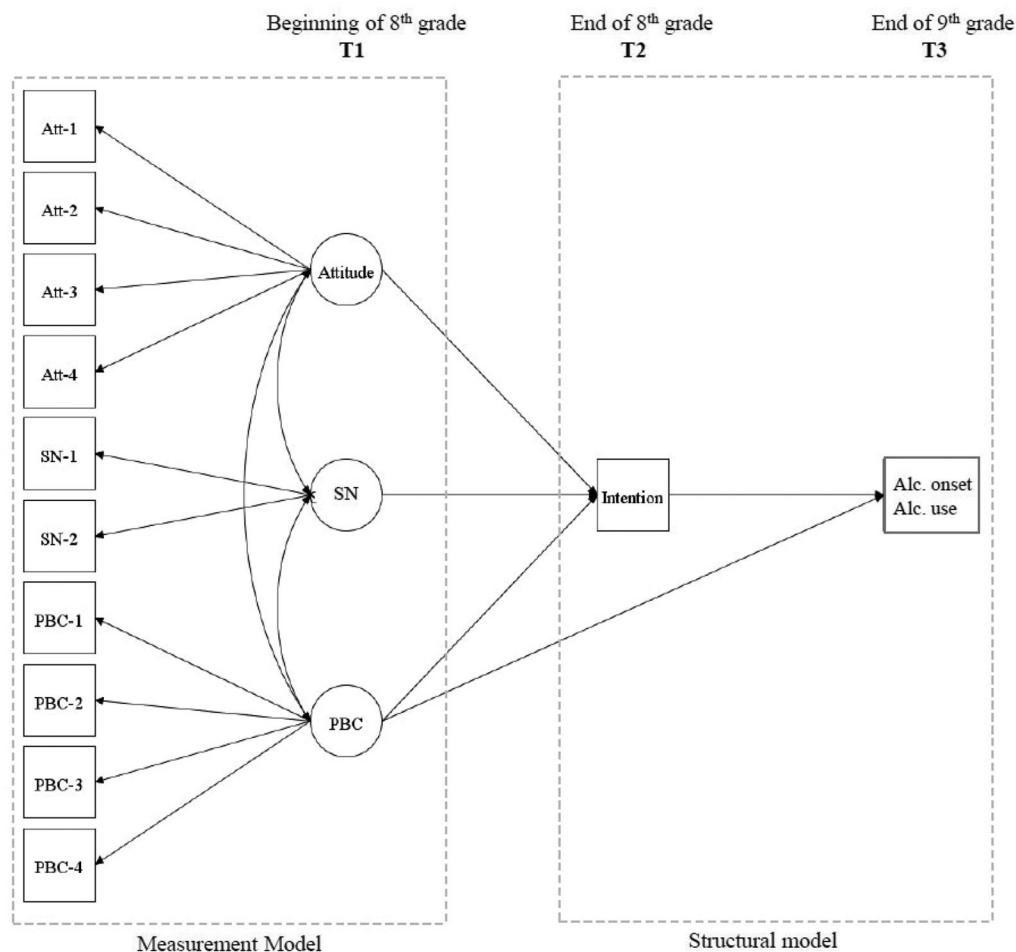


Figure 1. Illustration of the model.

answered the questionnaire at the end of 8<sup>th</sup> grade ( $T_2$ ,  $N = 1,196$ ) with a response rate of 59% and after 1 year at the end of 9<sup>th</sup> grade ( $T_3$ ,  $N = 1,149$ ), with a response rate of 57%. When examining the onset of alcohol drinking (alcohol debut), we included only participants who reported not to have onset drinking at  $T_1$  ( $N = 1,189$  students, 46.5% boys and 53.5% girls). The study was approved by the Regional Committee for Medical and Health Research Ethics.

### Measures

The questionnaire items are listed in Tables 1 and 2. The questionnaire used in W8 [wait] measured all main constructs included in the TPB (Ajzen & Fishbein, 1980; Conner & Sparks, 2005). The same questionnaire was administrated at all time-points ( $T_1$ ,  $T_2$ , and  $T_3$ ) and we used measures from different time-points in our longitudinal models: the determinants of intention (Attitude, Subjective Norm and Perceived Behavioral Control) were extracted from  $T_1$ ; intention to drink alcohol was extracted from  $T_2$  and the behavioral outcomes (onset of drinking and frequency of alcohol use) were extracted from  $T_3$ . We used recommendations detailed in Francis et al. (2004) to determine which questionnaire items should be used to measure the different TPB constructs.

#### Attitude

The scale measuring attitude towards alcohol drinking consisted of 4 items (Table 1), e.g., “Adolescents become happy and feel good when they drink alcohol” and “Parties become more fun when alcoholic beverages are consumed there”. Those 4 items were chosen from the Alcohol Expectancy Questionnaire for Adolescents (Aas, 1993) following recommendations from Francis et al. (2004). Answer alternatives rated on a 7-item scale ranged from “Strongly disagree” (1) to “Strongly agree” (7). The scale had a adequate internal consistency ( $\alpha = .75$ ; EFPA, 2013).

#### Subjective norms

Two questions were used to assess SN about alcohol drinking (Table 1): one related to friends (“Would your friends like or dislike it if you had at least one glass of alcohol?”), and one related to parents/guardians (“Would your parents/guardians like or dislike it if you had at least one glass of alcohol?”). The answer alternatives ranged from “disliked it strongly” (1) to “liked it a little or very much” (4).

#### Perceived behavioral control

The scale measuring adolescents’ perceived control over their alcohol consumption (PBC) consisted of 4 items (Table 1).

**Table 1.** Observed variables predicting latent variables included in structural equation models.

		Boys			Girls		
		M	SD	n	M	SD	n
<i>Attitude (T<sub>1</sub>)</i>							
1. Att-1	"Adolescents become happy and feel good when they drink alcohol"	2.72	1.80	764	2.60	1.63	784
2. Att-2	"It is OK to drink alcohol because then one can join with others who are having fun"	1.91	1.53	751	1.65	1.18	781
3. Att-3	"Parties become more fun when alcoholic beverages are consumed there"	3.00	2.02	746	2.69	1.77	775
4. Att-4	"Many alcoholic drinks taste good"	2.83	1.96	751	2.52	1.73	773
<i>Subjective norm (T<sub>1</sub>)</i>							
1. SN-1	"Would your friends like or dislike if you were drinking at least one glass of alcohol?"	2.38	.83	771	1.97	.78	785
2. SN-2	"Would your parents/guardians like or dislike if you have drunk at least one glass of alcohol?"	1.32	.56	771	1.22	.48	786
<i>PBC (T<sub>1</sub>)</i>							
1. PBC-1	"I think it would be difficult/easy to say no thanks to a glass of alcohol at a school party if someone I liked a lot were drinking themselves and offered me a glass"	5.57	1.87	759	5.78	1.63	778
2. PBC-2	"If I am offered alcohol I think it is difficult/easy to say no thanks"	5.94	1.73	753	6.11	1.41	777
3. PBC-3	"For me it will be difficult/easy to not drink any alcohol the next three months"	6.19	1.78	749	6.53	1.32	774
4. PBC-4	"If someone offers me a glass of alcohol I don't know/I know ways to say no thanks"	5.53	1.86	769	5.70	1.54	785
<i>Intention (T<sub>2</sub>)</i>							
	"How likely is it that you will drink at least one glass of alcohol in the next 3 months?"	1.78	1.24	565	1.63	1.08	631

Note. Att: Attitude (from "Strongly disagree" (1) to "Strongly agree" (7)); SN: Subjective Norm (from "Disliked it strongly" (1) to "Like it a little/very much" (4)); PBC: Perceived Behavioral Control (from "Very difficult" (1) to "Very easy" (7) for items 1 to 3, and from "I do not know any" (1) to "Yes, I know several" (7) for item 4); Intention rated from "Totally unlikely" (1) to "Totally likely" (5).

Questions were of the type: "If I am offered alcohol I think it is easy/difficult to say no thanks" and the answer alternatives ranged from "very difficult" (1) to "very easy" (7). The internal consistency was adequate ( $\alpha = .77$ ).

### Intention to drink alcohol

Intention to drink alcohol was estimated on a 5-point scale by one single item (Table 1): "How likely is it that you are going to drink at least one glass of alcohol during the next

three months?" The answer alternatives ranged from "quite unlikely" (1) to "quite likely" (5).

### Alcohol onset and frequency of alcohol use

The onset of adolescents' alcohol drinking was assessed by one single item: "Have you ever had at least one glass of alcohol?" The response categories were "no" (0) or "yes" (1). The variable measuring the frequency of alcohol use employed one single item: "How often have you consumed alcohol during the past three months?" The response alternatives were "no times in the past three months" (0); "1-2 times in the past three months" (1); "1-3 times per month in the past three months" (2); and "1-7 times a week in the past three months" (3) (Table 2).

### Statistical analyses

The statistical analyses were carried out with the Statistical Package for Social Science (SPSS 25) and Mplus version 7.4 (Muthén & Muthén, 1998–2015). We used latent factors structural equation models (SEMs) to examine how the TPB model predicts onset of alcohol drinking (binary variable: (0) never been drinking/(1) been drinking) and frequency of alcohol use (treated as a continuous variable). SEMs allow for simultaneous confirmatory model testing, which is suitable for evaluating a well-described model like the TPB. The structure of the data was hierarchical (Strøm et al., 2015). Therefore, we used the COMPLEX procedure in Mplus to compute standard errors that take into account non-independence of observations between classes (Muthén & Muthén, 1998–2015). The multilevel analyses handled missing values by the full-information maximum likelihood (FIML) approach (Singer & Willett, 2003). We ran our analyses using the Weighted Least Square with Mean and Variance adjusted chi-square-test statistics (WLSMV) estimator and the Theta parametrization. The Comparative Fit Index (CFI), and the Root Mean Square Error of Approximation (RMSEA) were used to assess model fit (Cheung & Rensvold, 2002). Acceptable model fit is indicated by a CFI  $\geq .95$ , and RMSEA  $< .05$  with a confidence interval (CI) between .00 and .08 (Schreiber, 2008, 2017). The adjusted  $R^2$  was used as a measure of explained variance (Hankins et al., 2000). In the first step of the analyses, we tested the relationships of the observed variables to the hypothesized latent variables (Attitude, SN and PBC) in a saturated measurement model. In a second step, we ran two structural models, to evaluate respectively the onset of alcohol drinking and frequency of alcohol drinking. As we were interested to test whether gender moderated relationships in our TPB models, we conducted each of our TPB models separately for boys and girls. Next, we verified measurement invariance across gender by comparing a model where factor loadings and thresholds were free across groups (configural model) with a model where factor loadings and thresholds were constrained to be equal across groups (scalar model). As the scalar model was not significantly different from the configural model, we present results from this model to examine differences between boys and girls in onset of drinking and frequency of alcohol use. Results from the models are presented as standardized coefficients  $\pm$  SE.

**Table 2.** Descriptive statistics for alcohol variables at 8<sup>th</sup> and 9<sup>th</sup> grade.

	Boys		Girls	
	<i>n</i>	%	<i>n</i>	%
<i>Onset alcohol drinking</i>				
8 <sup>th</sup> grade ( <i>T</i> <sub>1</sub> )	776	28.8	787	19.2
9 <sup>th</sup> grade ( <i>T</i> <sub>3</sub> )	435	51.0	482	47.3
<i>Frequency of alcohol use</i>				
8 <sup>th</sup> grade ( <i>T</i> <sub>1</sub> )	220 <sup>a</sup>		150 <sup>a</sup>	
0		"No times in the past three months"		58.7
1		"1-2 times in the past three months"		27.3
2		"1-3 times per month in the past three months"		12.6
3		"1-7 times a week in the past three months"		1.3
9 <sup>th</sup> grade ( <i>T</i> <sub>3</sub> )	194 <sup>a</sup>		220 <sup>a</sup>	
0		"No times in the past three months"		27.7
1		"1-2 times in the past three months"		35.0
2		"1-3 times per month in the past three months"		27.7
3		"1-7 times a week in the past three months"		9.6

Note. <sup>a</sup>Frequency of alcohol use is answered only by adolescents who have onset alcohol drinking at that timepoint.

### Attrition analysis

We used generalized multilevel analysis to compare participants who dropped out after the pretest (*n* = 191) with those who completed each measurement of the study (*n* = 750) on the main TPB variables. Results showed that boys had 2.03 higher odds of dropping out than girls did (*t* = 3.11, *p* = .002). When taking sex into account, no further significant differences were found for other constructs included in the TPB models (alcohol onset, alcohol-drinking frequency, intention to drink, attitude, SN or PBC).

## Results

### Descriptive statistics

Descriptive statistics per gender for the different items used in our models are presented in Tables 1 and 2. Results on alcohol use showed that more boys had onset drinking at *T*<sub>1</sub> (28.8% of the boys vs. 19.2% of the girls, Table 2). At *T*<sub>3</sub>, a similar proportion of boys and girls had onset drinking (51.0% of the boys vs. 47.3% of the girls), but girls reported drinking more frequently than boys (41.8% of the boys vs. 27.7% of the girls reporting no drinking in the past 3 months at *T*<sub>3</sub>, Table 2).

### The predictive value of the TPB for adolescents' onset of alcohol drinking

#### Measurement model

The measurement model for adolescents' onset of alcohol drinking provided an acceptable fit for the data (CFI = .987, RMSEA = .042 (90% CI: .033–.052)). When looking at boys and girls separately, the model fit was slightly better for girls (CFI = .992, RMSEA = .035 (90% CI: .020–.050)) as compared to boys (CFI = .978, RMSEA = .059 (90% CI: .046 – .073)). All factor loadings were significant and above .50 for both genders (Table 4).

#### Structural models

The TPB model for onset of alcohol drinking fitted well both for girls and boys as models run separately for boys and girls provided good fit to the data (girls: CFI = .985, RMSEA = .038 (90% CI: .026–.050); boys: CFI = .976, RMSEA = .051

**Table 3.** Fit indices for models testing for measurement invariance across gender in TPB models for onset of drinking and frequency of drinking.

	df	Diff <i>X</i> <sup>2</sup> <sup>a</sup>	<i>p</i>	CFI	RMSEA
Onset of drinking					
<i>H</i> <sub>1</sub> : Configural	142			.984	.039
<i>H</i> <sub>0</sub> <sup>a</sup> : Scalar	102	51.28	.11	.982	.035
Drinking frequency					
<i>H</i> <sub>1</sub> : Configural	144			.985	.038
<i>H</i> <sub>0</sub> <sup>a</sup> : Scalar	104	37.22	.60	.985	.032

Note. <sup>a</sup>The difference in chi-square values between the two nested models is not chi-square distributed when using the WLSMV estimator in Mplus. The DIFFTEST option was therefore used to obtain a correct chi-square difference test between the scalar model (*H*<sub>0</sub>) and the configural model (*H*<sub>1</sub>).

(90% CI: .039–.063)). When considering boys and girls as two different groups in a common TPB model, the model where factor loadings and thresholds were equal between groups was not significantly different from the configural model (scalar model, *p* = .11, Table 3) and provided a good fit for the data (CFI = .982, RMSEA = .035 (90% CI: .028–.042), Table 3). We present results from this model separately for girls and boys in Table 4. The model explained 12.4% of the variance in intention to drink for girls and 12.8% for boys. Furthermore, the model accounted for 14.9% of the variance in girls' onset of alcohol drinking and 21.3% of boys'. For both genders, intention to drink was significantly related to onset of alcohol drinking (boys: 0.40 ± 0.07, girls: 0.25 ± 0.06, *p* < .001). PBC was a significant predictor of onset of alcohol drinking among girls (–0.25 ± 0.07, *p* < .01), and close to be significant among boys (–0.16 ± 0.09, *p* = .059). Intention to drink was related to SN for both genders (boys: 0.21 ± 0.11, *p* < .05; girls: 0.25 ± 0.06, *p* < .001). Neither Attitudes nor PBC predicted intention to drink among the adolescents who had not onset drinking. Boys and girls did not appear to have significantly different means in the latent variables Attitude, and PBC (all *p* > .41) but girls had a significantly lower mean SN than boys (–0.52 ± 0.09, *p* < .001).

### The predictive value of the TPB for adolescents' frequency of alcohol use

#### Measurement model

The measurement model for the frequency of alcohol drinking provided an acceptable fit for the overall data (CFI = .992, RMSEA = .035 (90% CI: .026–.043)). When looking at

**Table 4.** Results from the MSEM TPB models examining onset of drinking and frequency of alcohol use in the last 3 months.

Measurement model	Onset of drinking				Frequency of alcohol use			
	Boys		Girls		Boys		Girls	
	$\beta$	(SE)	$\beta$	(SE)	$\beta$	(SE)	$\beta$	(SE)
Att1—Attitude	.62***	(.03)	.63***	(.03)	.64***	(.02)	.63***	(.02)
Att2—Attitude	.85***	(.04)	.84***	(.03)	.86***	(.02)	.87***	(.02)
Att3—Attitude	.78***	(.03)	.78***	(.03)	.78***	(.02)	.77***	(.02)
Att4—Attitude	.61***	(.04)	.62***	(.03)	.66***	(.03)	.67***	(.02)
Sn1—SN	.80***	(.09)	.90***	(.07)	.79***	(.06)	.92***	(.05)
Sn2—SN	.54***	(.05)	.54***	(.05)	.55***	(.04)	.59***	(.04)
PBC1—PBC	.86***	(.02)	.83***	(.02)	.85***	(.02)	.82***	(.02)
PBC2—PBC	.95***	(.02)	.91***	(.02)	.95***	(.02)	.93***	(.01)
PBC3—PBC	.83***	(.02)	.81***	(.03)	.77***	(.02)	.77***	(.02)
PBC4—PBC	.60***	(.03)	.58***	(.03)	.54***	(.03)	.52***	(.03)
Structural model								
Attitude—Intention	.16	(.10)	.09	(.07)	.20	(.11)	.22***	(.06)
SN—Intention	.21*	(.11)	.25***	(.06)	.34	(.11)	.24***	(.05)
PBC—Intention	-.07	(.07)	-.11	(.06)	-.05	(.05)	-.09	(.05)
Intention—Alcohol behavior <sup>a</sup>	.40***	(.07)	.25***	(.06)	.58***	(.05)	.49***	(.05)
PBC—Alcohol behavior <sup>a</sup>	-.16	(.09)	-.25**	(.07)	-.05	(.06)	-.17**	(.05)

Note. Standardized coefficients. \* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ . <sup>a</sup>Alcohol behavior is onset of drinking in the first model and frequency of drinking in the second model.

boys and girls separately, the model fit was slightly better for girls (CFI = .993, RMSEA = .034 (90% CI: .021–.047)) as compared to boys (CFI = .985, RMSEA = .049 (90% CI: .037–.061)). All factor loadings were significant and above .50 for both genders (Table 4).

### Structural models

The TPB model for frequency of alcohol use fitted well for both girls and boys, as models run separately for each gender provided good fit to the data (girls: CFI = .988, RMSEA = .036 (90% CI: .026–.046), boys: CFI = .979, RMSEA = .047 (90% CI: .037–.057)). When considering boys and girls as two different groups in a common TPB model, the model where factor loadings and thresholds were equal between groups was not significantly different from the configural model (scalar model,  $p = .60$ , Table 3) and provided a good fit for the data (CFI = .985, RMSEA = .032 (90% CI: .026–.038), Table 3). We present results from this model separately for girls and boys in Table 4. The model explained 20.4% of the variance in intention to use alcohol for girls and 27.0% for boys. Furthermore, the model accounted for 30.6% of the variance in girls' frequency of alcohol use and 35.8% for boys'. For both genders, intention to drink was significantly related to the frequency of alcohol drinking (boys:  $0.58 \pm 0.05$ , girls:  $0.49 \pm 0.05$ ,  $p < .001$ ). PBC was a significant predictor of the frequency of alcohol drinking among girls ( $-0.17 \pm 0.05$ ,  $p = .001$ ), but not among boys ( $-0.05 \pm 0.06$ ,  $p = .41$ ). Intention was significantly related to SN for both genders (boys:  $0.34 \pm 0.11$ ,  $p = .001$ ; girls:  $0.24 \pm 0.05$ ,  $p < .001$ ). In addition, Intention was related to Attitudes for girls ( $0.22 \pm 0.06$ ,  $p < .001$ ), and the same relation was close to be statistically significant for boys ( $0.20 \pm 0.11$ ,  $p = .056$ ). Intention was not significantly related to PBC among any of the genders in adolescent's frequency of alcohol drinking (all  $p > .097$ ). Boys and girls did not appear to have significantly different means in the latent variables Attitude and PBC (all  $p > .19$ ) but girls had a significantly lower mean SN than boys ( $-0.56 \pm 0.08$ ,  $p < .001$ ).

## Discussion

To our knowledge, this study is the first to examine the ability of the TPB to predict onset of alcohol drinking among non-drinking adolescents. The TPB explained up to 13% of the variance in intention to drink and up to 21% of the variance in onset of drinking for non-drinking adolescents. Regarding frequency of drinking, the TPB explained up to 27% of the variance in intention to drink and up to 36% of the variance in the reported drinking frequency. Intention was found to be the most important predictor of adolescents' alcohol use behavior, but other factors were also significant.

### Factors explaining onset, frequency of drinking and intention to drink

Intention and PBC were both significant predictors of the onset and frequency of alcohol drinking. Intention had the strongest effect on behavior. PBC also had a direct, negative effect on both onset and frequency of drinking. This negative effect can be due to the adolescents claiming a lack of control when performing non-desirable behaviors, such as alcohol drinking. Lower control correlates with more alcohol use in our and other studies (Conner et al., 1999; Cooke et al., 2016).

Interestingly, we did not find any effect of PBC on intention to drink in our adolescent sample. Cooke et al. (2016) showed that PBC was negatively related to alcohol consumption, but positively related to intention to drink. PBC, which represents an evaluation of the difficulty or easiness to perform a behavior, is assumed to reflect the obstacles encountered in past experiences. In general, it thus seems that adults feel they manage to control intention to drink, while avoiding the actual drinking is more challenging. In our sample, PBC at the beginning of 8<sup>th</sup> grade did not relate to intention to drink at the end of 8<sup>th</sup> grade, but was associated to alcohol consumption at the end of 9<sup>th</sup> grade. It might be that adolescents, who for most of them do not have a lot of

experience with alcohol drinking and can't plan alcohol drinking in the same way as adults (Kuther, 2002), do not manage to determine if they will be able to control intention to drink. On the other side, the negative effect of PBC is reaffirmed when applied to the actual drinking behavior, even if the behavior is recorded more than one year after measuring PBC.

Cooke et al. (2016) did not identify any studies examining the relation between PBC and intention among adolescents, but showed that the relationship between intention and self-efficacy (SE, a component of the PBC) was statistically larger for adults than for adolescents. Results from Phuphaibul et al. (2011), which identified PBC to be a strong and positive predictor of intention in Thai adolescents, differ from our findings. A possible explanation for this is how PBC is measured and which components of PBC are included. Phuphaibul et al. (2011) measured both perceived control (PC) and self-efficacy (SE, a component of the PBC) by 14 items, whereas our study measured only perceived control using only four items. This is a limitation of our study which is further discussed below.

Attitude, which is another component of the TPB that is known to be usually strongly related to intention to drink (Cooke et al., 2016), had only a moderate effect in our sample. Indeed, we found its effect to be significant in our full sample, but not in the sample including only adolescents who had not started drinking at the beginning of 8<sup>th</sup> grade. This supports our first hypothesis regarding TPB relationships that we expected to be weaker in our adolescent model. Cooke et al. (2016) showed that attitudes among adults had stronger associations with intentions compared to adolescents. Evaluating one's own attitudes towards alcohol might be a challenging task for adolescents who do not have any experience with alcohol drinking. As suggested by Marcoux and Shope (1997), alcohol-related attitudes might not be fully developed at a very young age.

SN on the opposite, were quite strongly related to intention to drink in our sample. This finding indicates that adolescents in the age of 13–14 years old, who still have not established a resolute position towards their drinking behavior, are mostly influenced by beliefs about how their family and friends would like them to behave. In line with Marcoux and Shope (1997), we suggest that external factors might be central to influence adolescents drinking, and overcome their own attitudes towards drinking. SN may particularly be important for adolescents in a period where finding a place in the group is so critical (Ragelienė, 2016).

### **Gender differences in alcohol consumption and the TPB relationships**

In our study, the reported frequency of alcohol use at the end of 9<sup>th</sup> grade was higher for girls than for boys, even though more boys had onset drinking at baseline. This finding is in line with results from the European School Survey Project on Alcohol and Other Drugs showing that Norwegian girls report use of alcohol in the past 30 days more frequently than boys 27% of the girls vs. 23% of the boys; ESPAD

(2020). Additionally, the national trends in Norway show that more boys than girls have started drinking in 8<sup>th</sup> grade, while girls exceed boys in alcohol drinking in 9<sup>th</sup> (Bakken, 2018). One explanation for why girls drink more than boys once they have onset drinking could be the reduced stigma against female drinking (Cheng & Anthony, 2018). Another explanation might be linked to the early sexual maturation among girls (Bratberg et al., 2005) that again could lead to an easier access to alcohol through older friends or romantic partners. In addition, same-age peer influence and social sharing of experiences might be more prominent for girls than for boys (Cheng et al., 2016). The TPB explained more variance in alcohol use for boys than for girls. This is contrary to Zimmermann and Sieverding (2010) results showing that the TPB explained more variance in women's alcohol consumption as compared to men in a sample with young adults. Zimmermann and Sieverding (2010) argue that women's alcohol consumption is explained more by the TPB perceived behavior control variables, while other factors, such as intentionally pursuing actor images and rejecting abstainer image, are more important for men. As such, one explanation for the unequal findings between our adolescent sample and Zimmermann and Sieverding (2010) sample can be the different age of the participants and thus, a different drinking pattern. Our findings point thus towards adolescent boys being more compliant to the TPB than girls. The dissimilarities between genders in the TPB relationships will now be examined in more details.

### **Attitudes—intention**

Cooke et al. (2016) showed in their meta-analysis that the attitude-intention relationship was the only relationship moderated by gender as stronger correlations were found for females as compared to men. We therefore hypothesized that attitude would be a more important predictor among girls than for boys. We detected a slight gender difference in the attitude-intention relationship, as girls' intention to drink alcohol was significantly predicted by attitudes, while the same relationship was only close to significance among boys. As suggested by Cooke et al., 2016, a reason for this finding might be that girls focus more on the expected positive outcomes of drinking, while boys might be more concerned by social pressures to drink. Indeed in our full sample, boys had a slightly stronger relationship between SN and intention than girls so it seems that this pattern suggested by Cooke et al. (2016) is verified in our adolescent sample.

### **Subjective norms and PBC—intention**

No gender differences were detected neither in the SN-intention nor in the PBC-intention relationships in the present study. This is in line with Cooke et al. (2016) showing no gender moderation in those two relationships. In our study, both boys' and girls' intention to drink was influenced by the perception of what significant persons, such as parents and friends, would think of their drinking (SN), while the PBC was not related to intention to drink, neither for boys nor girls. However, we found a significant difference in mean SN, with girls having lower



mean SN than boys. This indicates that girls expect their family and friends opinion about their alcohol drinking to be more negative than boys. The review by Dir et al. (2017) showed that it is more socially acceptable for boys to drink and, that SN can thus serve as a preventive factor for girls' alcohol drinking.

### **Intention and PBC—alcohol use behavior**

We did not detect any gender differences in the relationships between intention and the examined alcohol behaviors. The TPB explained a fair amount of intention to drink for the adolescents, and intention had a strong and significant relationship to behavior for both genders and both drinking behaviors. Cooke et al. (2016) also found a large sized relationship between intention and alcohol consumption, a relationship which was not either moderated by gender. On the other side, we found that PBC influenced drinking behavior differently for boys and for girls as it was significantly related to girls' onset of drinking and drinking frequency, but not boys'. Our finding is in line with Zimmermann and Sieverding (2010) who identified a significant relationship between self-efficacy and alcohol consumption among women, but not among men. Zimmermann and Sieverding (2010) explain their results through traditional gender roles where alcohol consumption is more socially acceptable among males while females' alcohol consumption is more premeditated. However, Cooke et al. (2016) report that there is a lack of studies testing the moderating effects of gender in the relationship between PBC and drinking behavior. As such, our study is, to our knowledge, the first to examine and reveal a gender difference in the relationship between PBC and alcohol use among adolescents.

### **Strengths and limitations**

A strength with this study is the use of SEM that allows for a more thorough testing of the TPB compared to studies using multivariate regression analysis. Indeed, SEMs estimate the statistical significance and magnitude of the relationships between the theoretical constructs, and are thus well-aimed at testing a well-described model as the TPB (Tarka, 2018). Another strength is the longitudinal design of our study, which allows to examine for example how intention to drink alcohol at the end of 8<sup>th</sup> grade predicts onset of drinking among non-drinking adolescents one year later. This permits to unravel how behavior constructs at a quite young age translate with time into the development of a specific drinking behavior. Another strength is that the present sample comes from a large number of schools and with a high response rate, so our results can be considered as representative of Norwegian junior high school students. Nonetheless, methodological limitations exist.

As previously mentioned, one potential limitation of this study is how the PBC was measured. PBC should contain items measuring self-efficacy as well as controllability (Ajzen, 2002). The questionnaire used in the present study assessed solely controllability (PC), but there could be an additive effect of self-efficacy, which we could have investigated by including measures of self-efficacy (Wolfe & Higgins, 2008).

As in other longitudinal studies, we also find boys to drop-out more often than girls (Sun et al., 2008; Vogl et al., 2009; Zethof et al., 2016). However, as we have used a full-information maximum likelihood (FIML) approach to estimate our models, individuals with missing data are included for the time-points when they participate. This means that individuals that drop-out after T<sub>1</sub> are not totally excluded from our analyses. In addition, since there was no differences in drop-out for the other TPB constructs, we don't expect drop-out of boys to have influenced the relationships we present. This might however be one of the reasons why model fit was slightly better for girls than for boys.

Another limitation is that our adolescent sample might be constituted of different types of drinkers (for example who drink little and socially versus who drink a lot and to get inebriated), who might have different attitudes and perceptions over their drinking control. Glassman et al. (2010) showed that the TPB relationships are different for groups of social drinkers' versus those engaging in a lot of drinking and such differences between types of drinkers might also exist and remain non investigated in our study. Also, we only examine the overall alcohol consumption during the past 3 months, but patterns of drinking can potentially vary within that period of time. Cooke et al. (2016) have shown that the pattern of alcohol consumption can have a moderating effect on the TBP relationships. It is therefore possible that the relationships we highlight in our study will vary if adolescents change or develop a different pattern of consumption over time.

Adolescents in our study were under the legal drinking age in Norway, and this may cause an under-reporting of alcohol use, due to a fear of unknown consequences. Conversely, adolescents may also over-report alcohol use based on what they perceive to be socially desirable. Even though the phenomenon of overestimating peers' alcohol use has been found in a Norwegian survey to be exaggerated (Pape, 2012). The general validity of self-reports can be criticized (Brenner et al., 2003). Still, the primary assessment form for alcohol use is individual self-reports (Del Boca & Darkes, 2003) and it is probably the best data to have access to when dealing with adolescents samples. Finally, other determinant factors not included in the TPB, like access to alcohol, religious belonging, smoking behavior, temperamental factors and deviant friends (Adolfson et al., 2014; Enstad et al., 2017; Pedersen et al., 2015), might also be of importance when predicting the onset and frequency of alcohol drinking among adolescents and were not considered in our study.

### **Implications for practice**

The applicability of the TPB to predict adolescent's intention to drink and alcohol drinking behavior, was prominent in the present study. Our results showed that the constructs of the TPB explained more variance in frequency of alcohol use than onset of alcohol drinking.

Past behavior has been found to influence future behavior (Conner & Armitage, 1998) and increase the amount of

explained variance in later behavior, as well as in behavioral intentions (Fishbein & Ajzen, 2010). As such, the previous drinking experience could be a reasonable explanation that more variance of frequency of alcohol use was explained compared to adolescents that were non-drinkers at baseline and, thus, did not have any previous experience with alcohol drinking. Our findings indicate that several TPB relationships were of importance for girls only, such as the relationship between attitude and intention, and the direct influence of PBC on drinking frequency. These findings indicate that girls have more conservative attitudes than boys and perceive less controllability over their alcohol use than boys. Additionally, girls were more socially influenced by friends and parents opinion about their drinking, in line with other studies (Callas et al., 2004; Dir et al., 2017; Kumpfer et al., 2008). However, both genders SN were related to both onset and frequency of drinking. As such, SN can be considered a meaningful preventive factor to deter adolescents from drinking. Interventions that address the impact of social influence on drinking, and which include developing drinking refusal skills and drinking moderation strategies, may thus be beneficial to an adolescent sample (Larimer & Cronce, 2007). Based on the limitations of the present study, future research on the TPB should also try to estimate other factors that research has shown to be associated with alcohol use among adolescents and include them as covariates in the TPB.

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## References

- Aas, H. (1993). Adaptation of the Alcohol Expectancy Questionnaire (AEQ-A): A short version for use among 13-year-olds in Norway. *Scandinavian Journal of Psychology*, 34(2), 107–118. <https://doi.org/10.1111/j.1467-9450.1993.tb01106.x>
- Adolfsen, F., Strøm, H. K., Martinussen, M., Natvig, H., Eisemann, M., Handegård, B. H., & Koposov, R. (2014). Early drinking onset: A study of prevalence and determinants among 13-year-old adolescents in Norway. *Scandinavian Journal of Psychology*, 55(5), 505–512. <https://doi.org/10.1111/sjop.12151>
- Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. In J. Kuhl & J. Beckmann (Eds.), *Action control: From cognition to behavior* (pp. 11–39). Springer. [https://doi.org/10.1007/978-3-642-69746-3\\_2](https://doi.org/10.1007/978-3-642-69746-3_2)
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
- Ajzen, I. (2002). Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior. *Journal of Applied Social Psychology*, 32(4), 665–683. <https://doi.org/10.1111/j.1559-1816.2002.tb00236.x>
- Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Prentice-Hall.
- Armitage, C. J., & Conner, M. (2001). Efficacy of the theory of planned behaviour: A meta-analytic review. *The British Journal of Social Psychology*, 40(Pt 4), 471–499. <https://doi.org/10.1348/014466601164939>
- Bakken, A. (2018). *Ungdata. Nasjonale resultater [Youth data. National results]* (8/18). (Ungdata, Issue). <https://fagarkivet.oslomet.no/en/item/ungdata-2019-nasjonale-resultater>
- Barry, A. E., King, J., Sears, C., Harville, C., Bondoc, I., & Joseph, K. (2016). Prioritizing alcohol prevention: Establishing alcohol as the gateway drug and linking age of first drink with illicit drug use. *Journal of School Health*, 86(1), 31–38. <https://doi.org/10.1111/josh.12351>
- Bratberg, G. H., Nilsen, T. I. L., Holmen, T. L., & Vatten, L. J. (2005). Sexual maturation in early adolescence and alcohol drinking and cigarette smoking in late adolescence: A prospective study of 2,129 Norwegian girls and boys. *European Journal of Pediatrics*, 164(10), 621–625. <https://doi.org/10.1007/s00431-005-1721-0>
- Brener, N. D., Billy, J. O. G., & Grady, W. R. (2003). Assessment of factors affecting the validity of self-reported health-risk behavior among adolescents: evidence from the scientific literature. *The Journal of Adolescent Health: official Publication of the Society for Adolescent Medicine*, 33(6), 436–457. [https://doi.org/10.1016/S1054-139X\(03\)00052-1](https://doi.org/10.1016/S1054-139X(03)00052-1)
- Callas, P. W., Flynn, B. S., & Worden, J. K. (2004). Potentially modifiable psychosocial factors associated with alcohol use during early adolescence. *Addictive Behaviors*, 29(8), 1503–1515. <https://doi.org/10.1016/j.addbeh.2004.02.028>
- Cheng, H. G., & Anthony, J. C. (2018). Male-female differences in the onset of heavy drinking episode soon after first full drink in contemporary United States: From early adolescence to young adulthood. *Drug and Alcohol Dependence*, 190, 159–165. <https://doi.org/10.1016/j.drugalcdep.2017.12.035>
- Cheng, H. G., Cantave, M. D., & Anthony, J. C. (2016). Taking the first full drink: Epidemiological evidence on male-female differences in the United States. *Alcoholism, Clinical and Experimental Research*, 40(4), 816–825. <https://doi.org/10.1111/acer.13028>
- Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling: A Multidisciplinary Journal*, 9(2), 233–255. [https://doi.org/10.1207/S15328007SEM0902\\_5](https://doi.org/10.1207/S15328007SEM0902_5)
- Collins, S. E., & Carey, K. B. (2007). The theory of planned behavior as a model of heavy episodic drinking among college students. *Psychology of Addictive Behaviors: Journal of the Society of Psychologists in Addictive Behaviors*, 21(4), 498–507. <https://doi.org/10.1037/0893-164X.21.4.498>
- Conner, M., & Armitage, C. J. (1998). Extending the theory of planned behavior: A review and avenues for further research. *Journal of Applied Social Psychology*, 28(15), 1429–1464. <https://doi.org/10.1111/j.1559-1816.1998.tb01685.x>
- Conner, M., & Sparks, P. (2005). Theory of planned behaviour and health behaviour. In M. Conner & P. Norman (Eds.), *Predicting health behaviour* (pp. 170–223). Open University Press.
- Conner, M., Warren, R., Close, S., & Sparks, P. (1999). Alcohol consumption and the theory of planned behavior: An examination of the cognitive mediation of past behavior. *Journal of Applied Social Psychology*, 29(8), 1676–1704. <https://doi.org/10.1111/j.1559-1816.1999.tb02046.x>
- Cooke, R., Dahdah, M., Norman, P., & French, D. P. (2016). How well does the theory of planned behaviour predict alcohol consumption? A systematic review and meta-analysis. *Health Psychology Review*, 10(2), 148–167. <https://doi.org/10.1080/17437199.2014.947547>
- de Visser, R. O., & McDonnell, E. J. (2013). “Man points”: Masculine capital and young men’s health. *Health Psychology: Official Journal of the*

- Division of Health Psychology, American Psychological Association, 32(1), 5–14. <https://doi.org/10.1037/a0029045>
- Del Boca, F. K., & Darkes, J. (2003). The validity of self-reports of alcohol consumption: State of the science and challenges for research. *Addiction*, 98, 1–12. <https://doi.org/10.1046/j.1359-6357.2003.00586.x>
- Dempster, M., Newell, G., & Marley, J. (2005). Explaining binge drinking among adolescent males using the theory of planned behaviour. *The Irish Journal of Psychology*, 26(1–2), 17–24. <https://doi.org/10.1080/03033910.2005.10446205>
- Dir, A. L., Bell, R. L., Adams, Z. W., & Hulvershorn, L. A. (2017). Gender differences in risk factors for adolescent binge drinking and implications for intervention and prevention. *Frontiers in Psychiatry*, 8, 289. <https://doi.org/10.3389/fpsy.2017.00289>
- EFPA (2013). *EFPA Review Model for the Description and Evaluation of Psychological and Educational Tests*. EFPA.
- Enstad, F., Pedersen, W., Nilsen, W., & von Soest, T. (2017). Predicting early onset of intoxication versus drinking-A population-based prospective study of Norwegian adolescents. *Addictive Behaviors Reports*, 6, 1–7. <https://doi.org/10.1016/j.abrep.2017.04.002>
- ESPAD (2020). *ESPAD report 2019 - results from the European School survey project on alcohol and other drugs*. Publications Office of the European Union. <http://www.espad.org/espad-report-2019>
- Fishbein, M., & Ajzen, I. (2010). *Predicting and changing behavior: The reasoned action approach*. Psychology Press.
- Francis, J., Eccles, M. P., Johnston, M., Walker, A. E., Grimshaw, J. M., Foy, R., Kaner, E. F. S., Smith, L., Bonetti, D. (2004). Constructing questionnaires based on the theory of planned behaviour: A manual for health services researchers. <https://openaccess.city.ac.uk/id/eprint/1735/>
- Glassman, T., Braun, R. E., Dodd, V., Miller, J. M., & Miller, E. M. (2010). Using the Theory Of Planned Behavior To Explain The Drinking Motivations Of Social, High-Risk, And Extreme Drinkers On Game Day. *Journal of Community Health*, 35(2), 172–181. <https://doi.org/10.1007/s10900-009-9205-1>
- Godin, G., & Kok, G. (1996). The theory of planned behavior: A review of its applications to health-related behaviors. *American Journal of Health Promotion : AJHP*, 11(2), 87–98. <https://doi.org/10.4278/0890-1171-11.2.87>
- Hankins, M., French, D., & Horne, R. (2000). Statistical guidelines for studies of the theory of reasoned action and the theory of planned behaviour. *Psychology & Health*, 15(2), 151–161. <https://doi.org/10.1080/08870440008400297>
- Hassan, L. M., & Shiu, E. M. K. (2007). Gender differences in low-risk single-occasion drinking: An application of the theory of planned behaviour. *International Journal of Consumer Studies*, 31(4), 317–325. <https://doi.org/10.1111/j.1470-6431.2006.00555.x>
- Johnston, K. L., & White, K. M. (2003). Binge-drinking: A test of the role of group norms in the theory of planned behaviour. *Psychology & Health*, 18(1), 63–77. <https://doi.org/10.1080/0887044021000037835>
- Kam, J. A., Matsunaga, M., Hecht, M. L., & Ndiaye, K. (2009). Extending the theory of planned behavior to predict alcohol, tobacco, and marijuana use among youth of Mexican heritage. *Prevention Science: The Official Journal of the Society for Prevention Research*, 10(1), 41–53. <https://doi.org/10.1007/s11121-008-0110-0>
- Kirby, T., & Barry, A. E. (2012). Alcohol as a gateway drug: A study of US 12th graders. *The Journal of School Health*, 82(8), 371–379. <https://doi.org/10.1111/j.1746-1561.2012.00712.x>
- Kumpfer, K. L., Smith, P., & Summerhays, J. F. (2008). A wakeup call to the prevention field: Are prevention programs for substance use effective for girls? *Substance Use & Misuse*, 43(8–9), 978–1001. <https://doi.org/10.1080/10826080801914261>
- Kuntsche, E., Rossow, I., Simons-Morton, B., Bogt, T. T., Kokkevi, A., & Godeau, E. (2013). Not early drinking but early drunkenness is a risk factor for problem behaviors among adolescents from 38 European and north american countries. *Alcoholism, Clinical and Experimental Research*, 37(2), 308–314. <https://doi.org/10.1111/j.1530-0277.2012.01895.x>
- Kuntsche, E., Wicki, M., Windlin, B., Roberts, C., Gabhainn, S. N., van der Sluijs, W., Aasvee, K., Gaspar de Matos, M., Dankulinová, Z., Hublet, A., Tynjälä, J., Välimaa, R., Bendtsen, P., Vieno, A., Mazur, J., Farkas, J., & Demetrovics, Z. (2015). Drinking motives mediate cultural differences but not gender differences in adolescent alcohol use. *The Journal of Adolescent Health: Official Publication of the Society for Adolescent Medicine*, 56(3), 323–329. <https://doi.org/10.1016/j.jadohealth.2014.10.267>
- Kuther, T. L. (2002). Rational decision perspectives on alcohol consumption by youth: Revising the theory of planned behavior. *Addictive Behaviors*, 27(1), 35–47. [https://doi.org/10.1016/S0306-4603\(00\)00161-1](https://doi.org/10.1016/S0306-4603(00)00161-1)
- Larimer, M., & Cronce, J. (2007). Identification, prevention, and treatment revisited: Individual-focused college drinking prevention strategies 1999–2006. *Addictive Behaviors*, 32(11), 2439–2468. <https://doi.org/10.1016/j.addbeh.2007.05.006>
- Marcoux, B. C., & Shope, J. T. (1997). Application of the Theory of Planned Behavior to adolescent use and misuse of alcohol. *Health Education Research*, 12(3), 323–331. <https://doi.org/10.1093/her/12.3.323>
- Masten, A. S., Faden, V. B., Zucker, R. A., & Spear, L. P. (2008). Underage drinking: A developmental framework. *Pediatrics*, 121(Supplement 4), S235–S251. <https://doi.org/10.1542/peds.2007-2243A>
- McMillan, B., & Conner, M. (2003). Using the theory of planned behaviour to understand alcohol and tobacco use in students [Peer Reviewed]. *Psychology, Health & Medicine*, 8(3), 317–328. <https://doi.org/10.1080/1354850031000135759>
- Muthén, L. K., & Muthén, B. O. (1998–2015). *Mplus user's guide* (7th ed.). Muthén & Muthén.
- Pape, H. (2012). Young people's overestimation of peer substance use: An exaggerated phenomenon? *Addiction (Abingdon, England)*, 107(5), 878–884. <https://doi.org/10.1111/j.1360-0443.2011.03680.x>
- Pedersen, W., Bakken, A., & von Soest, T. (2015). Adolescents from affluent city districts drink more alcohol than others. *Addiction*, 110(10), 1595–1604. <https://doi.org/10.1111/add.13005>
- Phuphaibul, R., Nuntawan, C., & Loveland-Cherry, C. J. (2011). Predicting alcohol drinking intention and behavior of Thai adolescents. *Pacific Rim International Journal of Nursing Research*, 15, 28–38.
- Ragelienė, T. (2016). Links of adolescents identity development and relationship with peers: A systematic literature review. *Journal of the Canadian Academy of Child and Adolescent Psychiatry = Journal de l'Académie canadienne de psychiatrie de l'enfant et de l'adolescent*, 25(2), 97–105.
- Schreiber, J. B. (2008). Core reporting practices in structural equation modeling. *Research in Social & Administrative Pharmacy: RSAP*, 4(2), 83–97. <https://doi.org/10.1016/j.sapharm.2007.04.003>
- Schreiber, J. B. (2017). Update to core reporting practices in structural equation modeling. *Research in Social & Administrative Pharmacy: RSAP*, 13(3), 634–643. <https://doi.org/10.1016/j.sapharm.2016.06.006>
- Sheeran, P., Milne, S., Webb, T. T., & Gollwitzer, P. M. (2005). Implementation intentions and health behaviour. In M. Conner & P. Norman (Eds.), *Predicting health behaviour* (pp. 276–323). Open University Press.
- Singer, J. D., & Willett, J. B. (2003). *Applied longitudinal data analysis: Modeling change and event occurrence*. Oxford University Press.
- Sniehotta, F. F., Presseau, J., & Araújo-Soares, V. (2014). Time to retire the theory of planned behaviour. *Health Psychology Review*, 8(1), 1–7. <https://doi.org/10.1080/17437199.2013.869710>
- Strøm, H. K., Adolfsen, F., Handegård, B. H., Natvig, H., Eisemann, M., Martinussen, M., & Kuposov, R. (2015). Preventing alcohol use with a universal school-based intervention: Results from an effectiveness study. *BMC Public Health*, 15(1), 11. <https://doi.org/10.1186/s12889-015-1704-7>
- Sun, P., Sussman, S., Dent, C. W., & Rohrbach, L. A. (2008). One-year follow-up evaluation of Project Towards No Drug Abuse (TND-4). *Preventive Medicine*, 47(4), 438–442. <https://doi.org/10.1016/j.ypmed.2008.07.003>
- Tarka, P. (2018). An overview of structural equation modeling: Its beginnings, historical development, usefulness and controversies in the social sciences. *Quality & Quantity*, 52(1), 313–354. <https://doi.org/10.1007/s11135-017-0469-8>
- Vogl, L., Teesson, M., Andrews, G., Bird, K., Steadman, B., & Dillon, P. (2009). A computerized harm minimization prevention program for alcohol misuse and related harms: Randomized controlled trial. *Addiction (Abingdon, England)*, 104(4), 564–575. <https://doi.org/10.1111/j.1360-0443.2009.02510.x>
- Wilhelmsen, B. U., Laberg, J. C., & Klepp, K. I. (1994). Evaluation of two student and teacher involved alcohol prevention programmes.

- Addiction (Abingdon, England)*, 89(9), 1157–1165. <https://doi.org/10.1111/j.1360-0443.1994.tb02792.x>
- Wilsnack, R. W., Vogeltanz, N. D., Wilsnack, S. C., Harris, T. R., Ahlström, S., Bondy, S., Csémy, L., Ferrence, R., Ferris, J., Fleming, J., Graham, K., Greenfield, T., Guyon, L., Haavio-Mannila, E., Kellner, F., Knibbe, R., Kubicka, L., Loukomskaia, M., Mustonen, H., ... Weiss, S. (2000). Gender differences in alcohol consumption and adverse drinking consequences: Cross-cultural patterns. *Addiction (Abingdon, England)*, 95(2), 251–265. <https://doi.org/10.1046/j.1360-0443.2000.95225112.x>
- Wolfe, S. E., & Higgins, G. E. (2008). Self-control and perceived behavioral control: An examination of college student drinking. *Applied Psychology in Criminal Justice*, 4, 108–134.
- Zethof, D., Nagelhout, G. E., de Rooij, M., Driezen, P., Fong, G. T., van den Putte, B., Hummel, K., de Vries, H., Thompson, M. E., & Willemsen, M. C. (2016). Attrition analysed in five waves of a longitudinal yearly survey of smokers: Findings from the ITC Netherlands survey. *European Journal of Public Health*, 26(4), 693–699. <https://doi.org/10.1093/eurpub/ckw037>
- Zimmermann, F., & Sieverding, M. (2010). Young adults' social drinking as explained by an augmented theory of planned behaviour: The roles of prototypes, willingness, and gender. *British Journal of Health Psychology*, 15(Pt 3), 561–581. <https://doi.org/10.1348/135910709X476558>