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Personality traits as predictors of early alcohol inebriation among young adolescents: Mediating effects by mental health and gender-specific patterns

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Abstract

The aim of this study was to predict alcohol inebriation and mental health (internalizing and externalizing problems plus well-being), and potential gender-specific patterns among young adolescents, by a biopsychosocial model of personality traits. Self-reported data from 853 adolescents (479 girls) in Sweden, aged 13-15 years, from the *Longitudinal Research on Development In Adolescence* (LoRDIA) program were used. Predictions from personality to inebriation and mediating effects of mental health were estimated by means of logistic regression and generalized structural equation modelling. Separated gender analyses were performed throughout the study to reveal potential gender-specific patterns. Externalizing problems, Novelty Seeking and Cooperativeness had independent effects on alcohol inebriation for both genders as well as Harm Avoidance among girls and Internalizing problems among boys. Novelty Seeking and Self-Directedness had indirect effects through externalizing problems and Harm Avoidance and Self-Directedness had indirect effects through internalizing problems for boys. Self-directedness showed an indirect effect through externalizing problems for girls. The combination of an immature character (low Self-directedness and Cooperativeness) with an extreme temperament profile (high Novelty Seeking and low Harm Avoidance) was a predictor of inebriation across gender, both directly and indirectly through mental health. This study contributes with valuable information about gender-specific considerations when developing and conducting preventative interventions targeting psychological risk and resilience factors for early alcohol inebriation among young adolescents.

Keywords: Adolescence; alcohol inebriation; biopsychosocial model of personality; externalizing problems; internalizing problems; mental well-being

Introduction

Alcohol is usually introduced during adolescence and consumption of alcohol increases rapidly and almost linear during this developmental phase (Behrendt et al., 2009; Duncan et al., 2006; Young, et al., 2002). Alcohol inebriation is an excessive drinking pattern related to intoxication, drunkenness and "binge drinking". The National Institute on Alcohol Abuse and Alcoholism (NIAAA) defines the term "binge drinking" as a pattern of drinking that brings a person's blood alcohol concentration (BAC) to 0.08% or above. This typically happens when men consume five or more drinks and women consume four or more drinks in about two hours. Hence, binge drinking implicitly involves inebriation, especially in growing young adolescents with immature biological systems. The blood alcohol concentration when inebriated can be hazardous for adolescents (Patrick et al., 2013). For example, brain development can be interrupted for adolescents that recurrently are inebriated, which may lead to cognitive impairment (Guerri et al., 2010). Moreover, alcohol inebriation is associated with several unfavorable outcomes, including future heavy drinking, alcohol related problems and injuries, illicit drug use and mental health problems (Behrendt et al., 2012; Behrendt, et al., 2009; Lin et al., 2016; Pampati et al., 2018; Pedersen and Skrondal, 1998; Wennberg and Andersson, 2013; Wennberg et al., 2000). Hence, alcohol policies, laws and prevention programs intend to reduce the number of adolescent inebriation (Brand et al., 2007).

Due to the risk factors (e.g., biological, psychological and social) associated with alcohol inebriation, it is important to investigate which adolescents are more vulnerable to inebriate. We know since previously that specific personality traits, such as impulsiveness and sensation seeking, are highly associated with alcohol inebriation (for an overview, see Adan et al., 2017). However, there are few studies that have investigated a wider range of personality traits and their associations to alcohol inebriation.

The *biopsychosocial model of personality* is a theoretical model of the whole personality separating between temperament and character dimensions and taking into account the interaction of these dimensions (Cloninger, 1994). For example, the character dimension Self-directedness (i.e., the ability to steer and maneuver behavior, self-acceptance, and self-efficacy) is related to more positive and less negative feelings among adolescents, especially combined with high Cooperativeness (i.e., the ability to cooperate with, accept, and help others; Schütz et al., 2013). High levels on these two character dimensions imply a *mature* personality and the capacity to regulate behavior despite a challenging temperament (Cloninger, 1994; Cloninger et al., 1993). Individuals with temperament dimensions of both high Novelty Seeking (high impulsivity) and high Harm Avoidance (neuroticism/negative emotionality) without a mature character dimension that can regulate these temperament dimensions, are vulnerable individuals' e.g., regarding early onset of alcohol problems (Mulder, 2002). Despite the knowledge of specific personality traits that are associated with alcohol inebriation, there is still lacking research investigating how the interaction of different personality dimensions impact the risk of alcohol inebriation.

Alcohol inebriation has also been associated with mental health problems especially externalizing (behavioral) problems (Miettunen, et al., 2014; Pedersen, et al., 2018; Steele, et al., 1995; Young, et al., 2002). Regarding externalizing problems, consistent gender differences have been found among adolescents cross-nationally where boys report higher levels of externalizing (behavioral) problems and girls report more internalizing (emotional) problems (Berlin, et al., 2012; Boson, et al., 2016; Currie, et al., 2012; Koskelainen, et al., 2001; Lundh, et al., 2008; Ronning, et al., 2004). Studies on externalizing problems suggest a strong link to alcohol use and other substances (e.g., tobacco, cannabis and other illicit substances) for both girls and boys (Miettunen, et al., 2014; Pedersen, et al., 2018; Steele, et al., 1995; Young, et al., 2002), although the link might be even stronger for boys (Steele, et

al., 1995). On the contrary, higher scores on internalizing behavior problems as a child relates to less alcohol consumption in the future among girls (Lac and Donaldson, 2016; Steele, et al., 1995) and internalizing problems is not stated as an individual risk factor regarding substance use (e.g., alcohol use), but rather an effect (Miettunen, et al., 2014).

Another important factor in adolescence, that may be related to alcohol inebriation, but is scarcely investigated, is the experience of well-being (i.e., emotional, social and psychological; Keyes, 2005). A majority of young adolescents in western countries report high well-being (Berlin, et al., 2012; Currie, et al., 2012; Petersen et al., 2010). However, girls show a decline in well-being from age 11 to 15 (Currie, et al., 2012) and have significantly lower levels of well-being at age 15 compared to boys (Currie, et al., 2012; Moksnes and Espnes, 2013). Low well-being among children/adolescents aged 11-14 years is associated with early alcohol initiation and there seem to be somewhat different patterns for girls and boys (Boson et al., 2016; Proctor and Linley, 2014; Salmi et al., 2013). However, less is known about the link between well-being and alcohol inebriation and potential gender differences among young adolescents.

Estimating individual risk factors for alcohol inebriation can provide important information and provide guidance for practitioners and organizations in identifying young adolescents at higher risk of dysfunctional development regarding alcohol problems as well as mental health problems. Personality is an important predictor for inebriation; however, the interacting effects of internalizing and externalizing problems, low well-being and gender on the relation of personality and inebriation is still not investigated.

Aims and hypotheses

The main aim of this study was to investigate how different aspects of personality (temperament and character) could predict alcohol inebriation in adolescents directly or

indirectly through externalizing-, internalizing problems and well-being with regard to gender differences.

Our hypotheses were the following:

- We hypothesized that Novelty Seeking predicts inebriation directly but also indirectly through externalizing problems and that this association is more accentuated in boys.
- We hypothesized that less ability in character traits related to a mature personality (self-directedness and cooperation) predict inebriation, possibly directly but also indirectly through externalizing problems

Our research questions were the following:

- Is well-being or the absence of well-being related to alcohol inebriation?
- Is Harm Avoidance a predictor for inebriation, directly or indirectly through externalizing/internalizing problems?
- Do predictors differ between girls and boys?

Method

This study is a part of the ongoing prospective longitudinal program *Longitudinal Research on Development In Adolescence* (LoRDIA) which focus on social, behavioral and psychological developmental trajectories from age 12-18 in a general population. The adolescents are recruited from four towns and 15 different schools in the south of Sweden with a total study population of 1866 which is 88 % of all invited. Data have so far been collected annually from 2013 to 2017. Data in the present study was collected when the adolescents were 12 – 13 years (2013; T1), 13 – 14 years (2014; T2) and 14 – 15 years (2015; T3). For a detailed description of the program and procedure, see Boson, et al. (2016). The Regional Research Ethics Board in Gothenburg, Sweden, approved the program 2013-09-25

(No. T362-13) and confirmed the approval 2014-05-20 (No. T446-14) and 2015-07-31 (No. T553-15).

Participants

The study included 855 adolescents (56 % girls), aged 13‑15, and data from T1 ‑ T3 collection waves in LoRDIA. Inclusion criteria were complete responses on target variables at all three time points. Mean ages (standard deviations) at T3 were 14.36 years (0.65) for girls and 14.32 (0.61) for boys. Of these, 95% were born in Sweden; 77% had caregivers who lived together; and 79% perceived their family to have about the same amount of money as other families in their neighborhood, while 5% reported having less and 16% reported having more money. The internal loss at T3 was 452 subjects (41% girls) and analyses of attrition revealed a higher prevalence at T2 of both alcohol drinking (32% [opt out at T3] vs. 22%) and alcohol inebriation (17% [opt out at T3] vs. 12%). Further analyses of attrition at T3 indicated that boys (at T1 and T2) with alcohol experiences, lower school grades, absenteeism, and immigrant background, were especially likely to opt out over time.

Procedure

Some weeks before the start of the first data collection all caregivers and children received an information letter that briefly explained the purpose of the study. Passive consent from the caregiver was requested for the children's participation (i.e., no active "no" response). An active written consent (i.e., active yes/no response) was requested from the adolescent and the questionnaire was group administered in classroom settings using paper and pen. Absent students got their questionnaire posted to their home by regular mail.

Measures

Alcohol experiences were mapped from T1-T3 with modifications on time perspective (ever tried and ever been) at baseline (T1): "Have you (ever) been drinking alcohol, more than just a sip within the last year (Not light beer or light cider)" and "Have you (ever) been

inebriated within the last year". Answers were given on an ordinal scale with the following choices: "No", "Once the last year", "Several times the last year", "Once a month", "A couple of times a month" and "Every week". Due to limited variability, responses were binary coded to "Yes" for all answers reporting anything else than "No". The inebriation question "Have you been inebriated within the last year" at T3 was set as outcome variable in the analyses.

The Swedish self-report version of the Junior Temperament and Character Inventory (JTCI; Boson et al., 2018) was used to assess the child's personality at T2. The JTCI is a modified version of the adult Temperament and Character Inventory (TCI) validated and adapted for children and adolescents (Boson, et al., 2018; Luby et al., 1999). The inventory builds on Cloninger's seven-dimensional biopsychosocial model of personality and consists of four dimensions of temperament and three of character to describe the underlying structure of an individual's personality. The self-reported version of JTCI includes 108 items to be answered as "true" or "false". The four temperament dimensions are Novelty Seeking (activity level, impulsivity, need for exploration), Harm Avoidance (emotionality, level of anxiety, fear, distrust of the unknown), Reward Dependence (reward-seeking behavior, level of attachment, social dependence) and Persistence (endurance in problem-solving, commitment to tasks and goals despite frustration and fatigue) (Cloninger, 1994). The character scales are Self-Directedness (ability to steer and maneuver behavior, self-acceptance, self-efficacy), Cooperativeness (ability to cooperate with, accept, and help others), and Self-Transcendence (level of spiritualism and ability to experience a larger universal perspective). According to standard, no more than 5 % missing items in total were accepted to obtain reliable scores on each dimension (Boson, et al., 2018).

The Swedish self-report version of *The Strengths and Difficulties Questionnaire* (SDQ-S), used at T3, consists of 20 items with the aim of detecting emotional and behavioral problems

(Goodman, 1997, 2001; Goodman et al., 1998). The questionnaire contains four subscales with five items each: hyperactivity/inattention, emotional symptoms, conduct problems and peer problems. Answers are given on a 3-point Likert scale from 0 = not true, 1 = somewhat true, to 2 = certainly true. The four subscales can in turn be summed up to a two-factor model consisting of internalizing problems (emotional symptoms and peer problems) and externalizing problems (conduct problems and hyperactivity/inattention) which are preferably to use in low risk community samples as the LoRDIA sample. Thus, in this study we used the two-factor model (Boson, et al., 2016; Goodman and Goodman, 2009; Goodman et al., 2010). Cronbach's alphas were 0.73 for internalizing problems and 0.75 for externalizing problems. Cut-offs were set at 8 out of 20 for internalizing problems and 9 out of 20 for externalizing problems (Boson, Berglund, Wennberg, & Fahlke, 2016).

The Mental Health Continuum-Short Form (MHC-SF) was used at T3. It consists of 14 items and measures three components of well-being: emotional well-being, social well-being, and psychological well-being (Keyes, 2009). Answers are given on a 6-point Likert scale from 0 = never, 1 =once or twice, 2 = about once a week, 3 = about 2 or 3 times a week, 4 = almost every day, 5 = every day. Scores on each well-being component were summed up and categorized into Flourishing, Moderately healthy or Languishing according to official MHC-SF guidelines (Keyes, 2009). Cronbach's alphas were 0.92 for emotional well-being, 0.88 for social well-being, 0.92 for psychological well-being, and 0.95 for the total well-being scale.

Statistical methods

Chi-square test of independence was carried out to compare frequencies between girls' and boys' reports on having or not having experiences of alcohol inebriation and to compare categorical levels of mental health (internalizing and externalizing problems plus well-being) among those with or without inebriation experiences. Logistic regression analyses were performed to ascertain the direct effects of mental health on inebriation the last year, both

measured at T3, and effects of personality (i.e., temperament and character dimensions), measured at T2. Path analyses by means of generalized structural equation modelling (GSEM) were conducted with inebriation as endogenous variable. All exogenous variables (personality and mental health) were initially included and non-significant ($p > .05$) paths were removed from the final models. Modification indices and model fit estimates are not available with a binary endogenous variable and paths will be interpreted by their level of significance. Both the logistic analyses and path analyses were adjusted (as appropriate) for subjective socioeconomic status and school grade. Chi-square test of independence and logistic regression analyses were conducted using SPSS (version 25.0, 2017) and GSEM were conducted in STATA (version 15.1, 2017).

Results

Table 1 presents the frequency of alcohol use and inebriation in the three data collection time points (T1, T2, and T3) with regard to gender differences. Significant differences between boys and girls were found on alcohol use and inebriation in the first data collection (T1; age 12 – 13 years). Boys were more likely to have tried alcohol and girls were more likely to have been inebriated.

Insert Table 1 about here

Sample characteristics by inebriation the last 12 months in grade 8-9 (T3; age 14 – 15 years) are presented in Table 2. Inebriation experiences among both genders were more often reported by those in 9th grade (compared to 8th grade), and among girls from families perceived as having both less and more money than other families (this underpinned the relevance of these covariates in further analyses). Externalizing problems, not internalizing problems, among both genders and low well-being (i.e., languishing) among girls were more

commonly reported in the group with inebriation experiences. Low Persistence was more typical among girls and low Self-Directedness and Cooperativeness were more commonly reported in the group with inebriation experiences for both gender.

Insert Table 2 about here

Four logistic regression models on the likelihood of inebriation were tested and evaluated separately by gender (Table 3). The first logistic regression model tested the effect of mental health levels on girls' inebriation and was significant, χ^2 (7) = 71.39, p <.001. Externalizing problems was a significant predictor and the model explained 26% (Nagelkerke *R2*) of the variance in inebriation and correctly classified 89.2 % of the cases. Goodness-of-fit test (Hosmer & Lemeshow) was not significant, p = .588. In the second model; temperament and character dimensions were added and contributed significantly, χ^2 (21) = 105.82, p <.001. The explained variance increased to 37% and the model correctly classified 89.4 % of cases. Externalizing problems, high Novelty Seeking, low Persistence and low Cooperativeness were associated with an increased likelihood of inebriation for girls. Goodness-of-fit test (Hosmer & Lemeshow) was not significant, p = .362. Next, the third logistic regression model on boys' inebriation and occurrence of mental health problems and well-being was statistically significant, χ^2 (7) = 35.802, p <.001. Externalizing problems was a significant predictor and the model explained 21% of the variance of inebriation among boys and correctly classified 89.3 % of the cases. Goodness-of-fit test (Hosmer & Lemeshow) was not significant, p = .409. Temperament and character dimensions contributed significantly to the fourth model, χ^2 (21) = 68.20, p <.001. The explained variance increased to 37% and the model correctly classified 90.4% of the cases. Externalizing problems and low Cooperativeness were associated with an increased likelihood of inebriation for boys. Odds

ratio for the impact of low Novelty Seeking for boys could not be estimated due to zero subjects in this category. Goodness-of-fit test (Hosmer & Lemeshow) was not significant, p = 0.160.

Insert Table 3 about here

Figure 1 and 2 show final generalized structural equation models (GSEM-models) and path-estimates to inebriation for girls and boys respectively with significant direct and indirect effects displayed. For both gender, direct paths from personality traits to alcohol inebriation were found regarding high Novelty Seeking (increased the probability of inebriation) and high Cooperativeness (decreased the probability of inebriation). Especially for girls, high Harm Avoidance decreased the probability of inebriation. An indirect path to inebriation for boys was the following: High Novelty Seeking predicted high levels of externalizing problems which increased the probability of inebriation. Another path that decreased the probability of alcohol inebriation among boys was: High Harm Avoidance predicted internalizing problems in boys which in turn decreased the likelihood of inebriation. Moreover, high levels of Self- directedness decreased the probability of externalizing problems for both girls and boys and could be seen as a protector against alcohol inebriation since high levels of externalizing problems was a significant predictor of alcohol inebriation. Persistence, Self-Transcendence and well-being had no effect on alcohol inebriation in the GSEM-models. This was consistent across gender.

Insert Figure 1 & 2 about here

Discussion

The aim of this study was to predict alcohol inebriation among young adolescents through personality traits (i.e., temperament and character dimensions) and to investigate potential mediating effects by internalizing and externalizing problems, plus well-being. We investigated how levels of temperament and character dimensions were linked to inebriation, both directly and indirectly through self-reported mental health status. The results indicate that personality traits' associations with mental health and early inebriation differ somewhat between girls and boys.

Concurrent externalizing problems (conduct problems and hyperactivity/inattention) had the strongest link to inebriation for both gender. Especially if the adolescent also reported low Self-directedness (for both gender) and high Novelty Seeking (for boys). These results are in line with previously findings on early alcohol inebriation and associations with externalizing problems (Adan, et al., 2017; Boson, et al., 2016; Mulder, 2002; Steele, et al., 1995; Young, et al., 2002). High Novelty Seeking increased externalizing problems among boys and high Self-Directedness decreased externalizing problems among both gender. Thus, a personality characterized by impulsivity, curiosity, enthusiasm and disorderliness (high Novelty Seeking) among boys and immaturity, unreliableness, purposelessness and self-blaming (low Self-Directedness) among both gender are related to externalizing problems and in turn increases the risk of inebriation.

Internalizing problems decreased the risk of inebriation among boys and had no effect among girls. This implies that boys with internalizing problems in early adolescence tend to avoid heavy alcohol use, and possible alcohol drinking generally. High Harm Avoidance increased and high Self-Directedness decreased boys' internalizing problems, which suggest that these personality dimensions, in particular, affect boys' self-reported internalizing problems. Concurrent internalizing problems may not be a significant mental health factor

related to inebriation among girls in early adolescence as previously reported (Boson, et al., 2016; Kessler, et al., 1996; Malmgren, et al., 2008), even when concurrent externalizing problems is accounted for as suggested before (Boson, et al., 2016).

Low well-being (i.e., languishing - the feeling of time and life waste as well as thoughts of life purposeless) was only related to inebriation when unadjusted for subjective socioeconomic status and school year and other mental health variables, not elsewhere. This contrast previously findings on the negative outcomes of anything except high well-being (i.e., flourishing; Keyes, 2013; Keyes and Annas, 2009). However, in the present study, low well-being was strongly affected by personality traits, especially among girls. High Novelty Seeking, high Harm Avoidance decreased and high Reward Dependence and high Self-Directedness increased well-being among girls. High Harm Avoidance was also related to lower well-being and high Self-Directedness to higher well-being among boys.

The general structural equation models indicate that high Harm Avoidance decrease the risk of inebriation among girls. In addition, high Cooperativeness seems to function as protectively against early inebriation among both genders. However, high Novelty Seeking across gender emerged as significant risk factor of early inebriation within the next year regardless of concurrent externalizing problems. These results once again support high Novelty Seeking as the key temperament component in behaviors of problematic alcohol use among young adolescents. Findings are in line with previous studies (Cloninger, et al., 1981; Cloninger, et al., 1988, 1996; Mulder, 2002; Oreland et al., 2018).

Some limitations come with this study. First, correct responses on JTCI validation-items and no more than 5% missing answers totally were required for the included sample. This excluded approximately 35 % of the study sample from T3. Analyses of internal loss showed that alcohol experiences in the selected sample were less compared to the excluded cases, particularly among boys. However, the total prevalence of alcohol experiences (drinking and

inebriation) in the selected vs. total study sample were similar (23 % vs. 26% for drinking and 12 % vs. 14 % for inebriation). Not filling out the questionnaire properly might also be interpreted as part of a larger structure of problem behaviors including concentration problems, conduct problems and misbehavior (e.g., early alcohol, nicotine and drug use), more commonly occurring among boys. The findings should therefore be interpreted with caution due to potential underrepresentation of externalizing problems. On the other hand, boys not filling in the questionnaire thoroughly may tend to answer "Yes" when asked "Have you been inebriated within the last year" even though it is untrue due to norm breaking tendencies. Hence, the selected sample might have answers that are more reliable. Further, mental health and inebriation experiences last year were measured simultaneously and no causal effect can be drawn. Externalizing problems and inebriation might work reciprocal as heavy alcohol drinking and the social context in which young adolescents drink alcohol might increase the level of externalizing problems.

A lack of interpersonal skills (low Cooperativeness) has an effect on inebriation across gender. The ability to cooperate, accept and help others represents a substantial basis for the development of important interpersonal competencies through the life-span. Hence, caregivers, teachers and significant others are encouraged to promote these skills in everyday life as part of the adolescent's personality maturation (Cloninger, 1994; Cloninger, et al., 1993). The combination of high Novelty Seeking and low Cooperativeness relate to concurrent externalizing problems in present study. Among girls, a personality described as optimistic, confident, outgoing and vigorous (low Harm Avoidance) was also related to inebriation. This suggests that self-assertive and extrovert behavior is part of early inebriation among girls, however the combination of low Harm Avoidance with high Novelty Seeking and low Cooperativeness might be especially challenging.

This study provides knowledge about the etiology of mental health related to early alcohol inebriation from a personality perspective. Some gender-specific considerations are relevant when targeting psychological risk and resilience factors for early alcohol inebriation. However, further studies on interventions targeting personality maturation are recommended.

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Table 1. *Participant characteristics: alcohol use within the last year among girls and boys*

	Girls		Boys			
	n (total)	(% Yes)	n (total)	(% Yes)	χ^2 (*df*)	Cramér's V/ *p*
Alcohol consumption one time or more						
Grade 6-7 ever tried	50 (497)	10.1	60 (390)	15.4	5.702 (1)	0.080 / .017
Grade 7-8	75 (578)	13	65 (466)	13.9	0.210 (1)	0.014 / *ns*
Grade 8-9	119 (481)	24.7	76 (374)	20.3	2.334 (1)	0.052 / *ns*
Been inebriated one time or more						
Grade 6-7 ever been	14 (495)	2.8	3 (385)	0.8	4.800 (1)	0.074 / .028
Grade 7-8	32 (579)	5.5	16 (467)	3.4	2.605 (1)	0.050 / *ns*
Grade 8-9	65 (480)	13.5	37 (375)	9.9	2.706 (1)	0.056 / *ns*

Table 2. *Sample characteristics by alcohol inebriation within the last year when in grade 8-9*

	Been inebriated last year when in grade 8-9							
	Girls				Boys			
	n	(% Yes)	χ^2 (*df*)	Cramér's V/ *p*	n	(% Yes)	χ^2 (*df*)	Cramér's V/ *p*
Grade	480		33.499 (1)	0.264 / .000	375		13.616 (1)	0.191 / .000
8'		**4.3**				**4.5**		
9'		**22.4**				**15.9**		
Subjective SES	480		18.177 (2)	0.195 / .000	369		5.001 (2)	0.116 / *ns*
Less than other families		**36.0**				14.3		
Same as other families		10.7				8.0		
More than other families		**23.0**				16.4		
Internalizing problems	479		0.964 (1)	0.045 / *ns*	374		0.521 (1)	-0.037 / *ns*
Normal		12.8				10.2		
Borderline/abnormal		16.5				6.3		
Externalizing problems	479		30.779 (1)	0.253 / .000	374		15.576 (1)	0.204 / .000
Normal		10.7				7.8		
Borderline/abnormal		**39.6**				**27.5**		
Well-being	472		10.497 (2)	0.149 / .005	362		1.992 (2)	0.074 / *ns*
Flourishing		9.3				7.6		
Moderately healthy		14.9				12.1		
Languishing		**28.6**				10.0		
Novelty Seeking	480		33.395 (2)	0.264 / .000	375		14.107 (2)	0.194 / .001
Low		5.2				**0.0**		
Moderate		10.1				9.7		
High		**32.6**				**20.7**		
Harm Avoidance	480		1.895 (2)	0.063 / *ns*	375		0.627 (2)	0.041 / *ns*
Low		18.0				8.9		
Moderate		12.7				9.3		
High		11.7				12.3		
Reward Dependence	480		4.198 (2)	0.094 / *ns*	375		1.867 (2)	0.071 / *ns*
Low		16.8				5.6		
Moderate		11.1				10.8		
High		18.5				11.1		
Persistence	480		17.473 (2)	0.191 / .000	375		1.114 (2)	0.055 / *ns*
Low		**25.5**				12.5		
Moderate		10.5				8.4		
High		8.9				10.5		
Self-Directedness	480		14.927 (2)	0.176 / .001	375		8.589 (2)	0.151 / .014
Low		**25.9**				**19.3**		
Moderate		11.9				9.3		
High		6.6				3.4		
Cooperativeness	480		25.087 (2)	0.229 / .000	375		17.541 (2)	0.216 / .000
Low		**33.3**				**23.3**		
Moderate		11.7				8.8		
High		4.8				**1.6**		
Self-Transcendence	480		1.674 (2)	0.059 / *ns*	375		1.803 (2)	0.069 / *ns*
Low		11.1				5.1		
Moderate		13.1				10.7		
High		18.1				10.9		

Note. Bold font indicates major contributor concerning the significant result, R > 1.96

Table 3. *Adjusted*[a] *odds ratios and 95% confidence interval for associations between alcohol inebriation and occurrence of mental health problems, well-being and personality dimensions.*

	Girls n = 471			Boys n = 355		
Predictors	*SE B*	*p*	OR (CI)	*SE B*	*p*	OR (CI)
Alcohol inebriation last year						
Step 1						
Constant	0.39	.000***	0.08	0.43	.000***	0.07
Internalizing problems (0 = normal, 1 = borderline/abnormal)	0.40	*ns*		0.85	*ns*	
Externalizing problems (0 = normal, 1 = borderline/abnormal)	0.40	.000***	4.97 (2.27 - 10.91)	0.54	.000***	9.51 (3.30 - 27.40)
Well-being (ref: flourishing)						
Moderately healthy	0.51	*ns*		1.12	*ns*	
Languishing	0.56	*ns*		1.13	*ns*	
Step 2						
Constant	0.53	.000***	0.09	1576.21	*ns*	
Internalizing problems (0 = normal, 1 = borderline/abnormal)	0.46	*ns*		1.08	*ns*	
Externalizing problems (0 = normal, 1 = borderline/abnormal)	0.46	.000***	5.30 (2.16 - 12.97)	0.62	.002**	6.47 (1.93 - 21.67)
Well-being (ref: flourishing)						
Moderately healthy	0.56	*ns*		1.32	*ns*	
Languishing	0.62	*ns*		1.33	*ns*	
Novelty Seeking (ref: average)						
Low	0.68	*ns*		4728.63	-	NA
High	0.39	.016*	2.55 (1.19 - 5.43)	0.54	*ns*	
Harm Avoidance (ref: average)						
Low	0.45	*ns*		0.70	*ns*	
High	0.59	*ns*		0.60	*ns*	
Reward Dependence (ref: average)						
Low	0.43	*ns*		0.67	*ns*	
High	0.41	*ns*		0.56	*ns*	
Persistence (ref: average)						
Low	0.40	.028*	2.43 (1.10 - 5.36)	0.53	*ns*	
High	0.45	*ns*		0.57	*ns*	
Self-Directedness (ref: average)						
Low	0.47	*ns*		0.57	*ns*	
High	0.62	*ns*		0.91	*ns*	
Cooperativeness (ref: average)		.038*	NA		.003**	NA
Low	0.43	.02*	2.74 (1.17 - 6.41)	0.53	.004**	4.63 (1.64 - 13.10)
High	0.69	*ns*		1.11	*ns*	
Self-Transcendence (ref: average)						
Low	0.48	*ns*		0.73	*ns*	
High	0.45	*ns*		0.60	*ns*	

Note. Referent = adolescents with normal levels of internalizing and externalizing problems, flourishing well-being and average levels on each personality dimension. NA = not applicable.

[a] Adjusted (as appropriate) for subjective socioeconomic status and school grade.

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

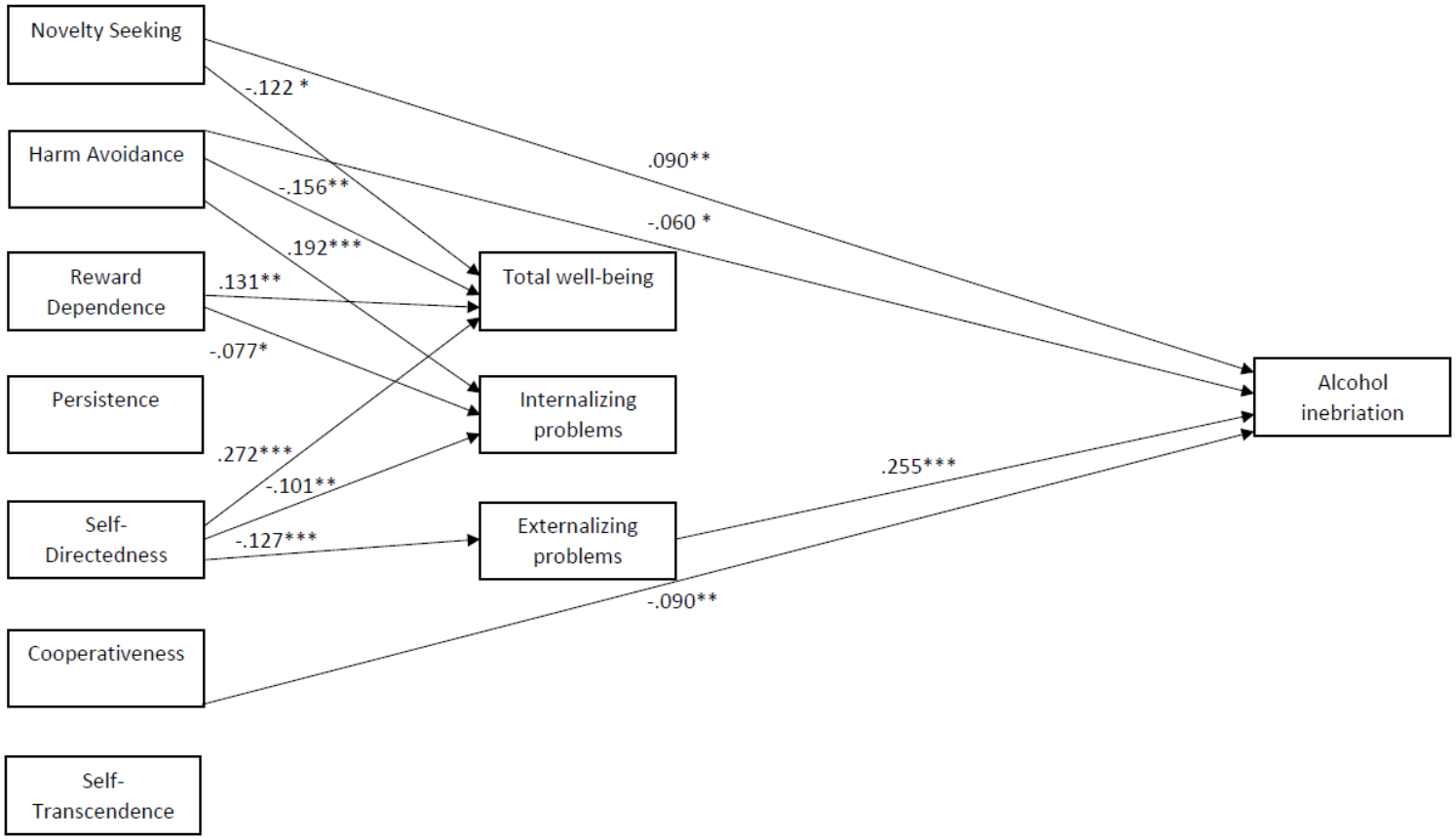

Figure 1. Path diagram for alcohol inebriation among girls * p < .05 ** p < .01 *** p < .001.

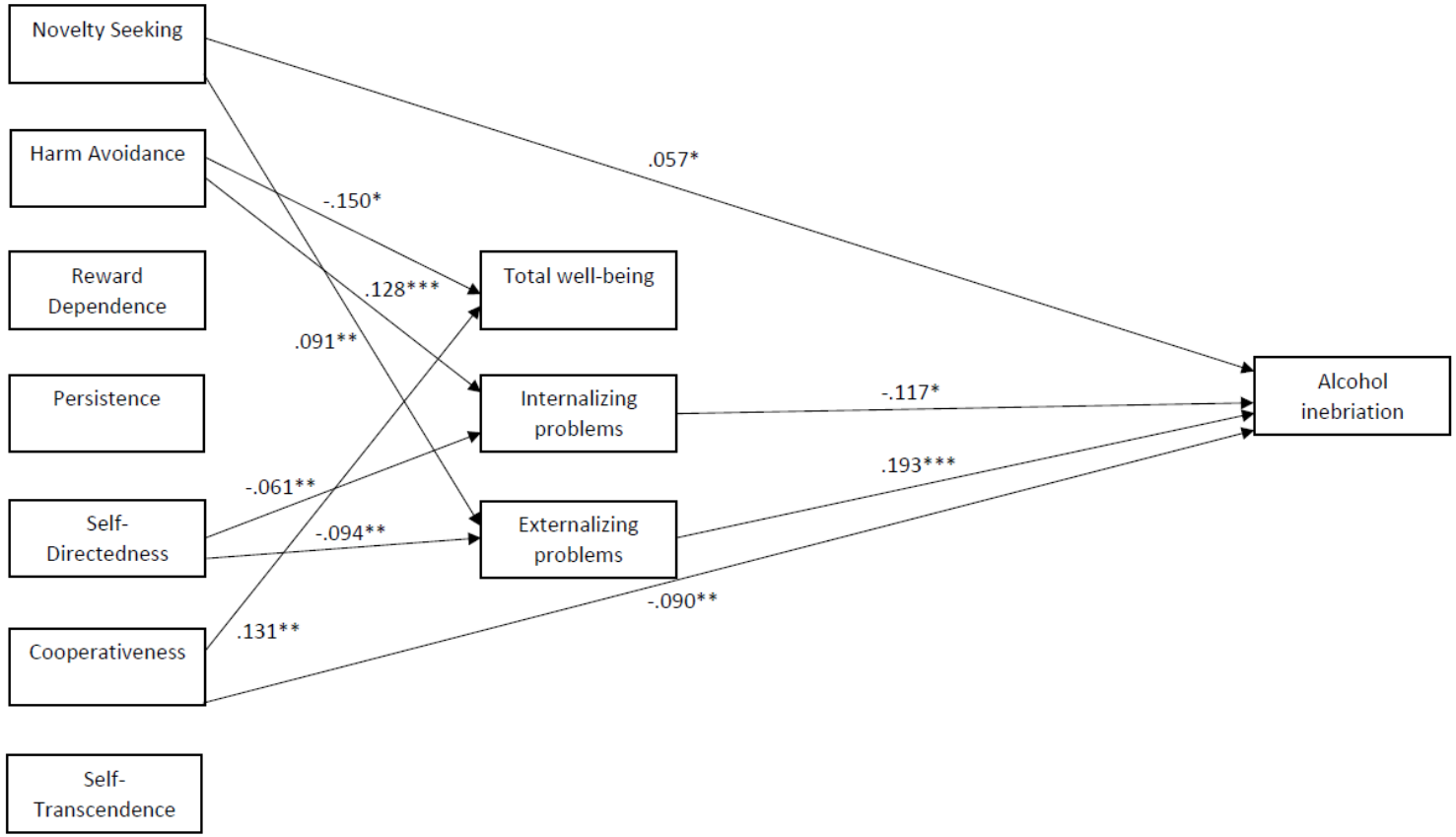

Figure 1. Path diagram for alcohol inebriation among boys * p < .05 ** p < .01 *** p < .001.

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Contributors

Karin Boson designed the study, organized the data collection, and drafted the first version of the manuscript. Karin Boson, Kristina Berglund, and Claudia Fahlke participated in the data collection and were actively involved in revising the manuscript. Peter Wennberg and Karin Boson carried out the statistical analyses. All authors have read and approved the final manuscript.

Conflict of Interest

All authors declare that they have no conflicts of interest.

Highlights:

- Novelty Seeking and Cooperativeness predicted alcohol inebriation for both genders
- Low Harm Avoidance was related to alcohol inebriation among girls
- Internalizing problems had a "protective" function against inebriation among boys
- Self-Directedness had indirect effect through externalizing problems for both genders