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MASTERTHESIS

The Influence of Personality Traits and Parental Behavior
in Risky Drinking among Dutch Adolescents

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Abstract

At least 74% of Dutch adolescents between 12-18 years of age have reported risky drinking, which could lead to some negative outcomes like poor academic achievement, car accidents, and alcohol poisoning. Researchers and interventionists seek a more complete understanding of the etiology of risky drinking during adolescence. Developmental perspectives are particularly helpful in this regard. Yet, studies are lacking in examining the interactions between an adolescent's personality traits and parental behavior on risky drinking. Hence, to fill this gap, in this longitudinal study, we examined whether parental control interacted with the behavioral inhibition system (BIS) and the two facets of the behavioral approach system (BAS Fun-seeking and BAS-Drive) in the prediction of adolescents' risky drinking. Participants in the current study took part in the second and third wave of a three-year longitudinal research project called the *Adolescent Risk-Taking* (ART) project. The participants were 601 adolescents (12-17 years old) who completed questionnaires about their personality traits, parental control, and risky drinking. Contrary to our hypotheses, results indicated that the association between BAS Fun-seeking and risky drinking became weaker when parental control was high. These results raise new questions regarding the role of parental control by suggesting that high parental control increases risky drinking for adolescents with BAS Fun-seeking.

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At least 74% of Dutch adolescents between 12-18 years of age have reported risky drinking, which is defined as drinking four or more alcoholic beverages on one occasion (van der Vorst, Engels, Meeus & Deković, 2006; Gilligan, Kypri, Johnson, Lynagh & Love, 2012). In the current study, we operationalize risky drinking as a combination of pre-drinking, binge drinking, and alcohol frequency on one occasion. According to the literature, Dutch girls between 12-18 years of age drink on average four alcoholic beverages on one occasion, and boys on average six. At the age of 18 this number peaks with Dutch girls drinking five and boys on average almost nine glasses of alcohol at this age. Risky drinking could lead to some negative outcomes like poor academic achievement, car accidents, alcohol poisoning, social problems and poor sleep quality (van der Vorst, Engels, Meeus & Deković, 2006). Researchers and interventionists seek a more complete understanding of the etiology of risky drinking during adolescence.

Developmental perspectives are particularly helpful in this regard (Gilligan, Kypri, Johnson, Lynagh & Love, 2012). According to bioecological theories, individual development is driven by an individual's characteristics, his/her proximal social environment, and the interactions among them. Applied to adolescents' risky drinking, specific adolescent personality traits and parental behavior can make risky drinking more likely (Schulenberg & Maggs, 2008). Yet, studies are lacking in examining the interactions between an adolescent's personality traits and parental behavior on risky drinking. Hence, to fill this gap, the current study focuses on one set of personality traits related to behavioral inhibition and excitation and one set of parental behavior related to parental monitoring.

With respect to personality, the current study focuses on approach and avoidance sensitivity. Gray's Reinforcement Sensitivity Theory (RST) describes two basic brain systems that may be useful for understanding risky drinking: the behavioral inhibition system (BIS) and the behavioral activation system (BAS) (Gray, 1987; Franken & Muris, 2006). The BIS responds to punishment of rewards with anxiety and avoidance behavior. According to the RST, high BIS sensitive individuals are characterized by high levels of uncertainty and anxiety in response to reward and punishment cues. Since alcohol use has both desirable (e.g., tension reduction) and undesirable (e.g., health risks) outcomes, it may be associated with both reward and punishment cues (Gray, 1987). This leads to the prediction that high BIS sensitivity might protect against risky drinking (Gray, 1987). The BAS, on the other hand, responds to stimuli of reward with a positive response and approach behavior. The BAS is based in dopaminergic reward circuits in

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the brain and underlies positive affect, approach motivation, and reinforcement learning processes (Gray, 1987; Franken & Murriss, 2006). This basic brain system consists of quick goal pursuit (Drive), desire for new and potentially rewarding experiences (Fun Seeking) and receptivity to reward (Reward Responsiveness). According to the RST, high BAS sensitive persons are more likely to engage in approach behavior and experience positive affect in situations with stimuli that are associated with reward (Carver & White's, 1994). This results in the prediction that high BAS sensitivity may pose a risk for risky drinking that is motivated by positive reinforcement (Gray, 1987).

BIS and Risky Drinking

With respect to BIS, only three studies examined the relationship between BIS and risky drinking among adolescents. One study has found an association between BIS and alcohol use among adolescents (Van Leeuwen et al., 2011), two other studies have not (Loxton & Dawe, 2001; Jonker, Ostafin, Glashouwer, van Hemel-Ruiter & de Jong, 2014). The study by Van Leeuwen and colleagues (2011) found that behavioral control at age 11 was the best predictor of alcohol abuse at age 16 for adolescents. Loxton and Dawe (2001) have not found an association between heightened sensitivity to punishment and alcohol misuse among adolescent girls. These results are also confirmed by a study conducted by Jonker, Ostafin, Glashouwer, van Hemel-Ruiter and de Jong (2014). Jonker and colleagues (2014) found no association between sensitivity to punishment and alcohol onset or severity among adolescents. These mixed results suggest that BIS may be a predictor of future alcohol use particularly when adolescents are starting to use alcohol but may no longer predict alcohol use once adolescents are drinking heavily.

BAS and Risky Drinking

With respect to the facets of BAS, heightened impulsivity has been identified as a risk factor for problematic alcohol use, particularly during adolescence. This developmental period is characterized by impulsive decision making and behavior. Adolescents tend to act without forethought, seek new experiences and take risks (Stautz & Cooper, 2013). Researchers have proposed that impulsivity consists of three components, termed reward sensitivity, lack of perseverance and sensation seeking (Stautz & Cooper, 2013). Although various studies have

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found a positive relationship between impulsivity and alcohol use among adolescents, it is less clear how different impulsivity traits, for example, BAS, is associated with different alcohol use outcomes such as risky drinking. Many studies which have examined the effects of impulsivity on alcohol use have considered impulsivity a unitary construct. This makes it difficult to make distinctions among different impulsivity-related personality traits and their relative associations to the more problematic forms of alcohol use, for example, risky drinking (Shin, Hong & Jeon, 2012).

The review of Stautz and Cooper (2013) assessed the degree to which impulsivity-related traits of sensation seeking, lack of perseverance and reward sensitivity are associated with alcohol consumption and problematic alcohol use among adolescents. The results showed that all traits were positively associated with alcohol consumption and problematic alcohol use. Sensation seeking showed the largest associations with heavy/binge drinking. A study conducted after the review showed that traits associated with reward-seeking (BAS Drive/ or Fun-seeking) positively predicted hazardous alcohol use among adolescents (non)offenders (Morgan, Bowen, Moore & van Goozen, 2014). These results are also consistent with another study which found a positive relationship between reward sensitivity and alcohol use (Jonker, Ostafin, Glashouwer, van Hemel-Ruiter & de Jong, 2014). Two other studies found that sensation seeking predicted heavy drinking or alcohol problems (Thompson, Roemer & Leadbeater, 2015; Fernández-Artamendi, Martínez-Loredo, Grande-Gosende, Simpson & Fernández-Hermida, 2018). All in all, impulsivity, reward sensitivity, and sensation seeking are important factors of adolescents' alcohol use, however, only one study examined whether BAS-Drive and BAS Fun-seeking are important factors of the more problematic forms of alcohol use. Therefore, the current study further investigates this relation, examining both facets of BAS on risky drinking.

Parental Control and Risky Drinking

With respect to parental behavior, the current study focuses on one aspect of parental monitoring, in particular, parental control. Parental control is defined as: *'the amount of supervision parents exercise, the decisions parents make about their children's activities and friends, and the rules parents hold for their children'* (Suchman, Rounsaville, DeCose & Luthar, 2007). Despite the increasing influence of peers as adolescents mature, parents still play an important role in decisions related to adolescents' alcohol use (McMorris, Catalano, Kim,

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Toumbourou & Hemphill, 2011). In particular, family environments characterized by high levels of monitoring, such as control, consistent discipline and rule enforcement of the adolescent's activities, are associated with lower alcohol abuse (Walther et al., 2012). However, research is still lacking for the role of parental control, as an aspect of parental monitoring, in the association between personality traits and risky drinking among adolescents.

A recent systematic review and meta-analysis found four protective factors (parental monitoring, parent-child relationship quality, parental support, and parental involvement) as longitudinal predictors of both adolescent alcohol initiation and levels of later alcohol use/misuse (Yap, Cheong, Zaravinos-Tsakos, Lubman & Jorm, 2017). Specifically, high parental monitoring, high parental involvement, high parental support and better parent-child relationship (both with mother and father) led to delayed alcohol initiation and reduced adolescent's risk of later alcohol use/misuse. A study which was not included in the systematic review and meta-analysis but supports the above results is the study conducted by Carroll et al. (2016). Carroll and colleagues (2016) found that parental monitoring was more strongly associated with lower alcohol use and alcohol problems in the US than in Sweden. These findings suggest that cultural differences in parenting style are driving differences in the efficacy of parental monitoring. Parents in the US may have more influence and power behind their knowledge of situations related to alcohol consumption for adolescents, given the higher legal age of drinking, the influence behind the hierarchy of parenting, and the laxer alcohol regulations in the US (Carroll et al., 2016). Another study found that parental monitoring was associated with a lower frequency of adolescent alcohol (mis)use in the US and had protective effects against drinking frequency among adolescents with higher levels of depressed mood (Kelly, Becker & Spirito, 2017). Thus, the effects of parental monitoring could depend on culture and parental monitoring may not be as important among adolescents from Western Europe.

Current studies focused specifically on parental control (Balázs, Piko & Fitzpatrick, 2017; Mak & Iacovou, 2019). Balázs, Piko and Fitzpatrick (2017) found that parental control was a protective factor for problem drinking behavior among adolescents. A recent study found that parental control inhibits the initiation of alcohol use in adolescence (Mak & Iacovou, 2019). These findings suggest that parental control could play a role in the delay of drinking and the prevention of problematic drinking. The current study examines whether parental control is associated with risky drinking among Dutch adolescents.

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Interactions between Parental Behavior, Personality Traits, and Risky drinking

Bioecological theories assume that interactions between individual characteristics and ecological contexts are critical factors of individual development (Bronfenbrenner & Morris, 2006). Therefore, the effects of the BIS/BAS and parental control are also relevant factors in the development of adolescents' risky drinking behavior. Such processes can provide a more complete picture of how these personality traits and/or contexts might work together to decrease or increase risky drinking. When risk factors co-occur, they may be particularly harmful. For example, when adolescents' disinhibition traits interact with low-structured family environments, their possibility for risk behavior is increased. The possibility of risk behavior is decreased when adolescents' inhibition traits interact with high-structured family environments. Furthermore, structured and high-quality family environments are shown to buffer against risk vulnerabilities (Marshall, 2014). As mentioned earlier, parental monitoring was associated with a lower frequency of adolescent alcohol (mis)use and had protective effects against drinking frequency among adolescents with higher levels of depressed mood. Therefore, the role of parental control in predicting adolescents' risky drinking behavior may vary as a function of adolescents' personality traits, such as disinhibited traits, which have also been shown to be associated with adolescents' alcohol use (Stautz & Cooper, 2013). Parents of adolescents with disinhibited traits may be able to decrease risky drinking by controlling their adolescents' activities.

Only two studies assessed whether parental behavior interacts with personality traits to influence adolescents' alcohol use (Rogers, Elam, Chassin, Sternberg & Bui, 2018; Rioux, Castellanos-Ryan, Parent, Vitaro & Séquin, 2019). The first study conducted by Rogers, Elam, Chassin, Sternberg and Bui (2018) investigated whether sensation seeking and parental control in early adolescence predicted adolescents' alcohol use trajectories proximally (middle-adolescence) and distally (early adulthood). The findings of this study revealed a significant interaction between sensation seeking and parental control in the prediction of alcohol use at the age of 16. However, this study was limited to alcohol use frequency and not risky drinking. Therefore, it is unclear how well its findings generalize to more problematic forms of alcohol use, like risky drinking. The second study conducted by Rioux, Castellanos-Ryan, Parent, Vitaro and Séquin (2019) examined whether interactions of parental knowledge of adolescent's whereabouts with impulsivity and sensation seeking in the prediction of adolescent substance use supported the diathesis-stress or differential susceptibility model. Results showed parental

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knowledge and impulsivity in adolescence interact in a diathesis-stress way to predict substance use, with adolescents with high impulsivity traits binge drinking more frequently than their peers when parental knowledge is low. Building on this previous work, this study examined whether parental control moderates the association between BIS and two facets of BAS and adolescents' risky drinking behavior.

The Present Study

The present study drew on a three-wave longitudinal study of adolescents and took personality traits and parental behavior into account in analyzing individual differences in adolescent's risky drinking. In the current study, we operationalized risky drinking as a combination of pre-drinking, binge drinking, and alcohol frequency. First, we examined the association between the adolescent's personality traits on risky drinking. Findings on the role of BIS in adolescents risky drinking are inconsistent. Yet, we expected that adolescents high on BIS would report less risky drinking (Gray, 1987; Van Leeuwen et al., 2011). We also expected that adolescents high on BAS Fun-seeking and BAS-Drive would report more risky drinking (Gray, 1987; Morgan et al., 2014). Second, we investigated the association between parental control on adolescent's risky drinking. Based on previous studies, we expected to find a main effect of parental control (Balázs, Piko & Fitzpatrick, 2017; Mak & Iacovou, 2019). This means that adolescents of parents who control their adolescents more would report less risky drinking. The third aim of this study was to investigate whether parental control moderated the association between BIS, BAS Fun-seeking, BAS-Drive and adolescent's risky drinking. We expected that low parental control would make the association between the personality traits (BIS, BAS-Drive and Bas Fun-seeking) stronger. Finally, we expected that high parental control would weaken the association between the personality traits and risky drinking.

Methods

Participants

Participants in the current study took part in the second and third wave of a three-year longitudinal research project called the *Adolescent Risk-Taking (ART)* project (Defoe, Dubas, Somerville, Lutig & van Aken, 2016), which is a research project on adolescent risk-taking in multiple domains that began in 2012. Participants were recruited via schools throughout the

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Netherlands. The participants were at Wave 1 (W1) 601 adolescents (12-17 years old; 46,4 % girls) and either in the first or 3rd year of ‘preparatory middle-level applied education’ (in Dutch VMBO) or ‘higher general continued education’ (in Dutch HAVO). One year later we followed up these adolescents (W2). This time, 582 adolescents took part in the study. At Wave 3 (W3) 442 adolescents took part in the study. 93.2% of the participants were born in the Netherlands 61.6% was Dutch, 9.3% Turkish or Turkish-Dutch, 7.4% Surinamese or Surinamese-Dutch, and 5.5% Moroccan or Moroccan-Dutch, and the rest (16.2%) was identified with various other ethnicities. To estimate the pattern of missing values, Little’s Missing Completely at Random (MCAR) test was conducted. The data were missing completely at random, as indicated by the MCAR test, $\chi^2(578) = 824.84, p = .861$.

Procedure

Participants were recruited from high-schools throughout the Netherlands. The schools were first emailed a letter describing the study and then called. Parents received information letters about the research project as well as dissent letters if parents did not want their adolescents to participate in the study. Data-collection took place at the schools and was led by trained research assistants. As a participation prize, participants could choose to receive a chocolate candy or enter their name in a raffle for a chance to win a 50 euro gift voucher. Data were collected annually for three years. The sample sizes across the three waves were 601, 582, and 442.

Measures

Risky drinking. Risky drinking was operationalized as a combination of pre-drinking, binge drinking, and alcohol frequency. We used four items that were adapted from previous studies (e.g., Nieuwenhuijzen, 2009). The first question participants had to fill in was: “Do you drink alcohol?”. Answers ranged from 0 to 5 (0= No I have never drank alcohol, 1=I used to drink, but I didn’t drink alcoholic beverages in the last 12 months, 2=yes less than once a month, 3= yes, at least once a month, but not weekly, 4= yes, at least once a week, but not every day to 5= yes, every day). The remaining three questions measured risky drinking behaviors such as binge drinking, frequency, and pre-drinking. An example item was, “How many times during the past four weeks did you drink five or more alcoholic drinks in a row? For example at a party or

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in one night?”. A mean score was computed from the standardized items, with higher scores indicating more risky drinking. Reliabilities were computed for Wave 2 ($\alpha = .88$) and Wave 3 ($\alpha = .90$).

BIS/BAS. The current study used a Dutch translated version of the BIS/BAS scale from Carver and White (1994) that was validated against the psychometric properties of the original BIS/BAS scale (Yu, Branje, Keijsers & Meeus, 2011). The BIS/BAS scale is a self-report questionnaire that has been constructed to assess individual differences in personality dimensions that reflect the sensitivity of two motivational systems, the punishment and reward system (Carver & White, 1994). The BIS/BAS Scale consists of 20 items and is being divided into the Behavioral Inhibition System scale (BIS; 7 items) and the Behavioral Approach System scale (BAS; 13 items). An example item of the BIS was, “I worry about making mistakes”. The BAS scale can be divided into three subscales: Fun Seeking (BAS-Fun; 4 items), Reward Responsiveness (BAS-Reward; 5 items), and Drive (BAS-Drive; 4 items). In the current study, we focused on the BAS-Fun and BAS-Drive subscale. An example item of the BAS-Fun was, “I crave excitement and new sensations”, and an example item of the BAS-Drive was, “I go out of my way to get things I want”. All answer categories ranged from 1 to 4 (1= totally disagree, 2= somewhat disagree, 3= somewhat agree to 4= totally agree). The internal consistency of the BIS subscale was acceptable, $\alpha = .62$. The internal consistency of the BAS-Fun subscale was acceptable, $\alpha = .62$, and the internal consistency of the BAS-Drive subscale was acceptable, $\alpha = .60$.

Parental control. Parental control was measured with six items that were adapted from previous studies (e.g., Kerr & Stattin, 2000). An example item was, “If you have been out very late one night, do your parents require you to explain what you did and with whom you were with?”. Answer categories ranged from 1 to 5 (1= Never, 2= sometimes, 3=regularly, 4= often to 5= (almost) always). A mean score was computed from the standardized items, with higher scores indicating perceiving higher parental control. The internal consistency of the subscale was good, $\alpha = .84$.

Strategy of Analysis

All data were interpreted with SPSS (version 24). To measure risky drinking, a total risky drinking score was computed by using Z-scores. BIS, BAS Fun-seeking, BAS-Drive, and

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parental control were centered prior to computing interaction terms. Before interpreting the results of the hierarchical linear regression analysis, a number of assumptions were tested, and checks were performed. First, boxplots indicated that each variable in the regression was normally distributed and free from univariate outliers. Second, the assumption of multicollinearity is also met because the variables are centered. This means that there was not a strong correlation between the independent variables and the dependent variable in the regression model. Finally, the assumption of linearity and homoscedasticity has been met, as described above. We performed the single moderator analyses using SPSS with the PROCESS macro Hayes for Windows (version 3.3). To examine the associations between BIS, BAS Fun-seeking, BAS-Drive, and parental control on risky drinking, a hierarchical linear regression analysis was performed. To examine the longitudinal prediction, we entered control variables (risky drinking W2, gender, and adolescent age) in block 1. On the second block, the predictors, BIS, BAS Fun-seeking, BAS-Drive, and parental control (W2) were entered. On the third block of the models the interaction terms, BIS x Parental control, BAS Fun-seeking x Parental control, and BAS-Drive x Parental control, were entered.

Results

Descriptive Results

Table 1 shows the Pearson correlations and descriptive statistics for all variables used in the current study.

Table 1.

Correlations, means, and standard deviations for measures of drinking, personality traits, and parental behavior.

	M	SD	1	2	3	4	5	6
1. Risky Drinking W2	-.01	.87	-					
2. Risky Drinking W3	.02	.87	.71**	-				
3. BIS	.00	3.71	.02	-.03	-			
4. BAS Fun	-.00	2.34	.24*	.15**	.38**	-		
5. BAS-Drive	-.00	2.14	.07	.03	.34**	.50**	-	
6. Parental control	-.00	6.14	-.10*	.13*	.18**	-.04	.06	-

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

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As expected, results showed a significant positive correlation between BAS Fun-seeking and risky drinking, $r(552) = .15, p < .01$. Results also showed as expected a significant negative correlation between parental control and risky drinking, $r(510) = 1.13, p < .05$. Results showed a significant positive interaction between BIS and parental control on risky drinking, $r(508) = .17, p < .01$. Furthermore, results showed a significant positive interaction between BAS Fun-seeking and parental control on risky drinking, $r(509) = .16, p < .05$. The results of the hierarchical regression analyses are presented in Table 2.

Main Effects of Personality Traits and Parental Behavior

Adolescent gender and age did not predict any of the adolescents' risky drinking (block 1). Only risky drinking at W2 predicted risky drinking at W3. In block 2 no main effects were found of adolescent's personality traits or parental control. Adolescent gender and age did not predict any of the adolescents' risky drinking. Only risky drinking at W2 predicted risky drinking at W3.

Moderation of Personality Traits by Parental Behavior

Interactions involving parental control were examined next (block 3). When interactions were taken into account, a main effect of BIS on risky drinking was found. Adolescent gender and age did not predict any of the adolescents' risky drinking. However, parental control interacted with BAS Fun-seeking in predicting risky drinking.

Table 2

Hierarchical linear regression analysis predicting risky drinking at W3 using personality traits, and parental behavior at W2

	Risky Drinking W3			
	R^2	B	SE	β
Block 1	.49*			
Risky drinking W2		.82	.05	.70*
Gender		-.05	.08	-.03
Age		.00	.01	.00

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Block 2		.49		
Risky drinking W2		.82	.05	.69*
Gender		-.00	.08	-.00
Age		-.00	.01	-.01
BIS		-.02	.01	-.06
BAS Fun-seeking		-.01	.02	-.02
BAS-Drive		.03	.02	.06
Parental control		-.01	.01	-.06
Block 3		.52*		
Risky drinking W2		.83	.05	.70*
Gender		.02	.8	.01
Age		-.00	.00	-.01
BIS		-.03	.01	-.10*
BAS Fun		-.02	.02	-.06
BAS-Drive		.03	.02	.07
Parental control		-.01	.01	-.05
BIS x Parental control		.00	.00	.03
BAS Fun x Parental control		.01	.00	.18*
BAS-Drive Parental control		-.00	.00	-.02

* $p < .05$

Probing Significant Interaction

To follow up on this interaction, we examined simple slopes. As illustrated in Figure 1, contrary to our hypothesis, high parental control predicted a stronger association between BAS Fun-seeking and risky drinking among adolescents ($\beta = -.05, p = .743$). Moderate parental control did not predict a weaker association between BAS Fun-seeking and risky drinking ($\beta = .15, p = .123$). Similarly, low parental control did not predict a weaker association between BAS Fun-seeking and risky drinking ($\beta = .34, p = .003$). Figure 1 also shows that parental control is an important factor for risky drinking. Adolescents with a low BAS Fun-seeking and with the

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lowest levels of parental control drink the most, adolescents with a low BAS Fun-seeking with moderate levels of parental control drink on average and adolescents with a low BAS Fun-seeking with the highest levels of parental control drink the least.

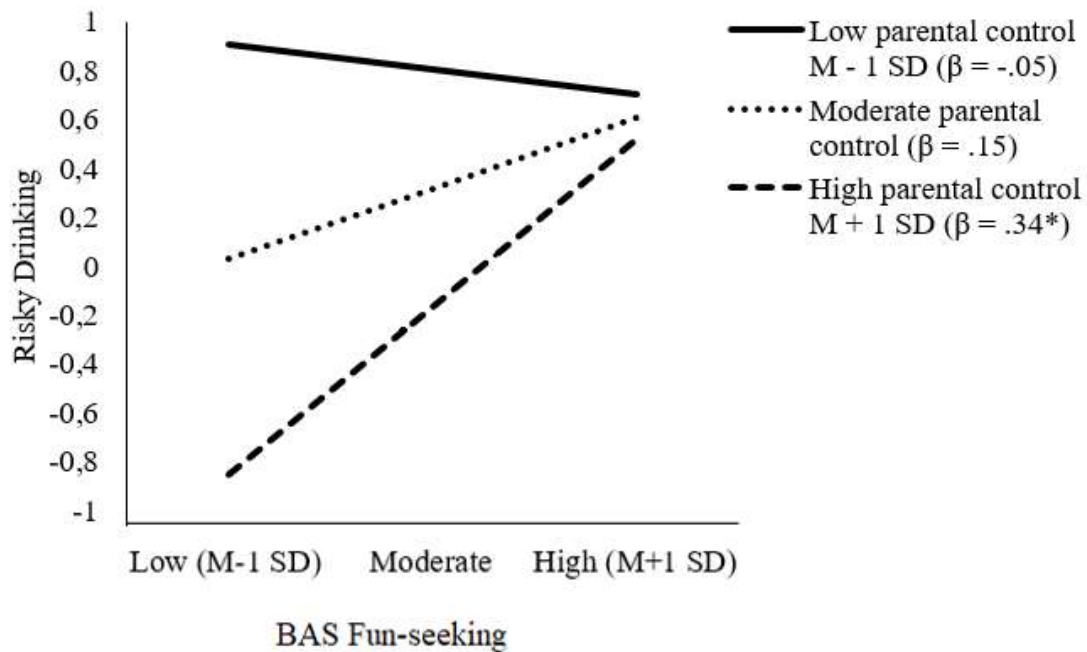


Figure 1. Simple slopes for the association between BAS Fun-seeking and risky drinking computed at one standard deviation below the mean (low), the mean (moderate), and one standard deviation above the mean (high) of parental control.

Discussion

Previous research has indicated that personality traits are important factors for individual differences in risky drinking among adolescents (e.g., Fernández-Artamendi et al., 2018). Also, the role of parental behavior in the domain of alcohol use is important (e.g., Mak & Iacovou, 2019). In this longitudinal study, we examined the association between BIS/BAS personality traits and risky drinking among Dutch adolescents. Second, we examined the association between parental control and risky drinking. Third, we examined whether parental control moderated the association between BIS/BAS personality traits and risky drinking among Dutch adolescents. We found that BIS had a negative influence on risky drinking, only when interactions were taken into account. Further, there was no association between parental control

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and risky drinking. Finally, we found an interaction effect between parental control and BAS Fun-seeking on risky drinking.

Contrary to the hypothesized interaction, we found a stronger association between BAS Fun-seeking and risky drinking when parental control was high. This shows that the environment is an important factor to consider for explaining individual differences in adolescent's risky drinking. However, it was contrary to our hypothesis that high parental control made the association between BAS Fun-seeking and risky drinking stronger. We expected that low parental control would make the association stronger. These results suggest that adolescents with a high BAS may be more sensitive to environmental influences, putting them at greater risk for risky drinking. Environmental influences, like high parental control, could encourage risky drinking for adolescents with BAS Fun-seeking. If parents are restrictive or do not accept challenging activities, adolescents will find other and probably illegal ways to get the challenges and thrills they want. Especially adolescents with BAS Fun-seeking (Hansen & Breivik, 2001). These results also suggest that adolescents with a high BAS are considered to be at greater risk for risky drinking independently from the control they are receiving from their parents. This is also consistent with a study which addresses the appropriateness of sensation seeking as a risk factor to screen adolescents for binge drinking (Sargent, Tanski, Stoolmiller & Hanewinkel, 2010). Finally, the results of the current study also suggest that parental control is an important factor for risky drinking among adolescents when BAS Fun-seeking is taken into account. Specifically, adolescents with a low BAS Fun-seeking and with the lowest levels of parental control drink the most, adolescents with a low BAS Fun-seeking with moderate levels of parental control drink on average and adolescents with a low BAS Fun-seeking with the highest levels of parental control drink the least.

Our findings suggest that there is no association between BIS and risky drinking, however, when the three interactions were taken into account, the main effect of BIS was found. These findings do not fit with the RST theory, which states that high BIS sensitive persons are less likely to engage in approach behavior and this leads to the prediction that high BIS sensitive persons should be less engaged in risky drinking (Gray, 1987). They also do not fit with the study of Van Leeuwen et al. (2011) on which the hypothesis of the current study was based. Perhaps this finding can be explained by how BIS was measured in the current study. Studies conducted by Loxton and Dawe (2001) and Jonker et al. (2014) used like the current study the

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BIS/BAS scale from Carver and White (1994) and no association between BIS and alcohol use was found. However, Van Leeuwen et al. (2011) used a behavioral measure to measure BIS and found that BIS predicted alcohol use among adolescents. As mentioned by a review conducted by Nigg (2000), behavioral inhibition can be conceptualized as including executive, motivational, and automatic inhibitory processes, each of which could correspond to separate cognitive and personality assessments. This would imply the importance to begin assessing this personality trait using behavioral measures.

With respect to BAS, our findings suggest that BAS Fun-seeking and BAS-Drive do not predict risky drinking among adolescents. Several authors have stressed the role of sensation seeking and reward sensitivity in explaining heavy drinking or alcohol use among adolescents (Morgan et al., 2014; Thompson et al., 2015; Fernández et al., 2018). They found that these personality traits positively predicted adolescents' heavy drinking or alcohol use. These findings do not fit with the RST theory, which states that high BAS sensitive persons are more likely to engage in approach behavior and this leads to the prediction that high BAS sensitive persons should be more engaged in risky drinking (Gray, 1987). They also do not fit with the study of Morgan et al. (2014) on which the hypothesis of the current study was based. Perhaps this finding can be explained by the fact that we used a non-clinical adolescent sample. The study conducted by Morgan et al. (2014) included offenders which were heavier drinkers, and the results might not be generalizable. Also, that we did not find associations between BAS and risky drinking might be because such effects have been found mainly among older adolescents (Jonker et al., 2014; Thompson et al., 2015; Fernández-Artamendi et al., 2018). This discrepancy may be because personality, although fairly stable, continues to develop during life, being shaped by normative transitions and stressful events (Meyer & Hofmann, 2005).

Contrary to expecting the main effect of parental control, it was only significant when personality traits were taken into account. This is also according to the social-ecological model of Bronfenbrenner, which states that individual characteristics and ecological contexts are critical factors of individual development and that they interact together (Bronfenbrenner & Morris, 2006). These results implicate for future studies to take personality traits into account when the association between parental control and risky drinking is examined. That we did not find an association may be due to the more equal responsibilities and opportunities which are spread between Dutch adolescents and their parents (Mares, Lichtwarck-Aschoff, Burk, van der Vorst &

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Engels, 2012). These results are also consistent with the study conducted by Carroll et al. (2016). Also, that we did not find an association might be because parental control was assessed with adolescents only, and the effect might be different from parents. Research shows that there are discrepancies in parents' and adolescents' reports on alcohol outcomes (Abar, Jackson, Colby & Barnett, 2015). A systematic review implies that studies examining parental influences on adolescent outcomes should, in most cases, seek to incorporate observational ratings or reports of parental control and sources of parental knowledge and control in addition to parents' and adolescents' reports because adolescents tend to under-report and parents over-report. Therefore, it is important for future research to, besides taking different informants into account, incorporate observational ratings or collateral reports of parental control in addition to parents' and adolescents' reports (Abar, Jackson, Colby & Barnett, 2015).

Strengths, Limitations and Future Directions

Only two studies before this one had examined the interaction between personality traits and parental behavior in the prediction of alcohol use, with most participants from Canada. The current study extends previous research by (a) looking at parenting and personality traits variables that were shown to be related to alcohol use before but not risky drinking and in interaction with each other; (b) using a mostly ethnically diverse Dutch sample; (c) its longitudinal design. Despite these strengths, there are also limitations inherent in the current study that should be noted. It is worth to remark that besides personality traits and parental behavior, other factors undoubtedly contribute to individual differences in risky drinking. These could include their deviant peer affiliations, parental alcohol use (Leung, Toumbourou & Hemphill, 2014) or internalizing problems (Castellanos-Ryan, Seguin, Vitaro, Parent & Tremblay, 2013). Thus, it is recommended for future studies to take more proximal predictors into account to predict risky drinking among adolescents.

It should also be noted that all data were obtained through self-report, which is susceptible to bias, notably social desirability. However, self-reports are considered reliable in assessing alcohol use among adolescents (Rioux et al., 2019). In addition, parental control was assessed with adolescents only, and this effect might be different from parents. A systematic review showed that there are discrepancies in parents' and adolescents' reports on alcohol outcomes (Abar, Jackson, Colby & Barnett, 2015). It is recommended for future studies to take

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into account different informants and to incorporate observational ratings or reports of parental behavior in addition to parents' and adolescents' reports because adolescents tend to under-report and parents over-report. Also, the conceptualization of parental control may change with age. More research is needed to determine whether measures of parental control tap similar constructs across development (Rioux et al., 2019). Finally, only parental control was examined, and future studies are needed to determine whether the effects found in the current study generalize to parental monitoring or are specific to parental control.

Conclusion

The present study is the third to examine the interaction between personality traits and parental behavior on adolescents' alcohol outcomes. We examined the moderating effect of parental control on the relationship between personality traits and adolescents' risky drinking. In the current study, we did not find an association between personality traits and risky drinking, only when the interactions were taken into account. We also did not find an association between parental control and risky drinking. Results raise new questions regarding the role of parental control by suggesting that high parental control increases risky drinking for adolescents with BAS Fun-seeking. It shows also the importance of taking more than one factor into account when explaining individual differences in risky drinking among adolescents. It is recommended for future studies to examine interactions between personality traits and parental behavior to explain adolescents' alcohol outcomes. More research is needed to determine the mechanisms through which parental control increases risky drinking, particularly for adolescents high on BAS Fun-seeking. Results of the current study also showed the importance of parental control on risky drinking for adolescents low on BAS Fun-seeking. Thus, more studies should examine which personality traits are susceptibility factors for risky drinking and with which parental behaviors they interact so that intervention strategies can be directed at the individuals they will most benefit.

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