

# Common and Distinct Associations Between Aggression and Alcohol Problems with Trait Disinhibition

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**Abstract** Disinhibition (vs. Constraint; DvC) represents the tendency to act in an undercontrolled (vs. controlled) manner and has been shown to be strongly linked to externalizing psychopathology. Further, recent research has found lower-order DvC components to have distinct patterns of associations with important externalizing-related outcomes, suggesting that although DvC represents a general diathesis to externalizing behaviors, lower order components likely present more specific risks for particular behaviors. To further characterize the association between components of DvC and externalizing behaviors, the current study aimed to expand upon these recent findings by examining common and distinct associations between components of DvC and aggression and alcohol problems within a large, diverse sample of undergraduates ( $N=933$ ; 36.8 % Black/African-American, 34.3 % White, 14.6 % Asian/Asian-American). Results of structural equation modeling analyses revealed that low Agreeableness and low Self-Control/Premeditation evidenced distinct patterns of associations with externalizing outcomes. Although low Agreeableness and low Self-Control/Premeditation were both associated with all externalizing outcomes, low Agreeableness was most strongly associated with Proactive Aggression whereas low Self-Control/Premeditation was most strongly associated with Reactive Aggression and alcohol problems. These associations did not vary by either race (White vs. African-American) or gender. Further, the three DvC components significantly interacted with one

another in explaining these externalizing outcomes. Taken together, these findings suggest both common and distinct associations between DvC and externalizing behaviors that are generalizable to both White and African-American, as well as both male and female, participants. The current study therefore confirms the importance of focusing on lower-order DvC components in future research in service of further explicating differential DvC-related etiological mechanisms associated with various phenotypic expressions of the externalizing spectrum of behavior.

**Keywords** Aggression · Alcohol problems · Disinhibition · Proactive Aggression · Reactive Aggression

## Introduction

An extensive, well-replicated empirical literature indicates that aggressive antisocial behavior and substance use share a common underlying link (Iacono et al. 1999; Krueger et al. 2005; 2007). Moreover, their shared genetic and neurobiological diatheses are also linked to the broad personality dimension of Disinhibition (vs. Constraint; DvC) and, as such, are components of the broad dimension of disinhibitory psychopathology or externalizing behaviors (Kendler et al. 2003; Krueger et al. 2005; Krueger et al. 2007). Yet, important questions remain about the generality and specificity with which aggression and substance use relate to specific components of DvC. Latzman and colleagues (2011) recently found lower-order DvC components previously elucidated via factor analytic work (Vaidya et al. 2010) to have distinct patterns of associations with these externalizing-related outcomes. Specifically, although DvC appears to represent a general diathesis to these externalizing-related behaviors, the three factor-analytically derived lower order components of

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Agreeableness, Self-Control, and Accomplishment were found to present more specific risks for particular behaviors. To further characterize the association between components of DvC and externalizing behaviors, and to confirm the generalizability of findings across various racial groups and genders, the current study aimed to expand upon these recent findings by examining the specificity and generality of the association between components of DvC and aggression and alcohol problems within a large, diverse undergraduate sample. Aggression and alcohol problems were specifically chosen as the externalizing behaviors of interest in the current study as recent structural studies on the externalizing spectrum suggest aggression and substance use represent the two second-order dimensions within this spectrum of behavior (Krueger et al. 2007). Better elucidating how various indicators of externalizing relate differentially to components of DvC may help to reveal shared processes underlying normal and pathological traits and behaviors which, in turn, may inform models of the development and persistence of externalizing behaviors.

## DvC

DvC represents one of the broad, higher order dimensions in the prominent three-factor or “Big Three” model of personality (Eysenck 1990; Markon et al. 2005; Tellegen 1985; Watson et al. 1994). A number of structural models have been proposed to characterize the lower order dimensions or components within this domain. For example, Whiteside and Lynam’s (2001) UPPS model posited four constructs associated with impulsive behavior: Urgency, lack of Premeditation, lack of Perseverance, and Sensation Seeking. Urgency and Sensation Seeking relate positively to Neuroticism and Extraversion, respectively—traits outside of the DvC domain—whereas lack of Premeditation and lack of Perseverance have been shown to be key components of DvC (Barratt 1985; Roberts et al. 2004; Saucier and Ostendorf 1999; Tellegen and Waller 2008). Another prominent model with extensive empirical support posits that DvC represents a higher order factor that can be decomposed into the Big Five traits of Agreeableness and Conscientiousness (Clark and Watson 2008; Markon et al. 2005; Watson et al. 1994). Consistent with the emerging consensus that DvC can be divided meaningfully into distinct dimensions (Roberts et al. 2004; Whiteside and Lynam 2001), Vaidya and colleagues (2010), using a broad range of DvC measures, found that DvC could be decomposed into three meaningful components: low Accomplishment, low Self-Control, and low Agreeableness. Low Accomplishment and low Self-Control map onto the UPPS model’s lack of Perseverance and Premeditation, respectively (Vaidya et al. 2010; Whiteside and Lynam 2001). The third component explicated by Vaidya et al., low Agreeableness, however, is not represented explicitly in the UPPS

model. It is, however, one of the traits in the Big Five model of personality and is well represented on all instruments designed to assess these five dimensions of personality.

## DvC and Aggression

A number of studies have examined the link between DvC and aggression, although relatively few have focused on well-defined components of DvC or aggressive behaviors. Although there is currently no consensus on the lower order structure of aggression, a number of investigators (e.g., Poulin and Boivin 2000; Fossati et al. 2009; Fung et al. 2009) have concentrated on reactive versus proactive aggression (for criticisms of this distinction, however, see Anderson and Bushman 2002). Based on previous research as well as the distinct conceptualizations of these aspects of aggression, it is likely that reactive aggression is more strongly linked with low Self-Control whereas proactive aggression is more strongly linked to Accomplishment. Specifically, reactive aggression refers to behaviors, often retaliatory in nature, carried out in negative affective states such as anger or frustration. In contrast, proactive aggression, sometimes also called instrumental aggression, represents behaviors that are motivated by the desire to achieve a specific goal. These behaviors are not generally explicitly provoked, but are implemented for personal gain (Poulin and Boivin 2000). In general, this distinction has been supported in the extant literature as reactive and proactive aggression have been shown to be differentially associated with social cognitive biases (Crick and Dodge 1996) and neurobiological structures (e.g., Gregg and Siegel 2001; Blair 2010). Less is known, however, concerning the specificity of associations with DvC specifically. With regard to general aggression, meta-analytic work (Miller & Lynam 2001) has shown that the Big Five trait of Agreeableness evidences the strongest association (negative), followed by Conscientiousness (negative). When lower order facets of Conscientiousness are examined, those related to poor impulse control (e.g., deliberation) are most consistently strongly related (Miller and Lynam 2006; Miller et al. 2008), suggesting that Agreeableness is the key predictor of general aggression with a smaller contribution from poor impulse control.

Furthermore, not only has there been relatively little focus on studying components of DvC with aspects of aggression, no studies to date have identified the impact of demographic variables such as race and gender on these associations. Such an examination is critical in establishing the generalizability of the structural findings. In fact, there is evidence that there are racial differences in regards to levels of aggression. For example, African Americans have been found to exhibit higher levels of aggression than Whites (e.g., Sampson et al. 2005; Laird et al. 2005). Further,

although levels of reactive and proactive aggression do not seem to vary by gender (e.g., Connor et al. 2003; Teten Tharp et al. 2011), differences in correlates of these two forms of aggression include both developmental risk factors (e.g., Connor et al. 2003) and genetic and environmental contributors (e.g., Baker et al. 2008). It is therefore critical for examinations of correlates of aggression to examine the extent to which findings generalize across racial groups and genders.

#### DvC and Alcohol Problems

In addition to aggression, the other second-order dimension that emerges within the externalizing spectrum is substance use/abuse (Krueger et al. 2007). With regard to alcohol use/abuse, specifically, much of the concern with drinking in youth has to do with negative alcohol-related consequences of such drinking because the quantity and frequency of alcohol use may not be sufficient in determining problems associated with alcohol consumption. As such, instruments designed specifically to assess symptoms and/or consequences of alcohol may be more appropriate (White and Labouvie 1989). Meta-analytic research suggests that individuals with alcohol-related problems are characterized by low Agreeableness and low Conscientiousness, with the latter being a stronger predictor (Hong and Paunonen 2009). When facets of Big Five traits have been examined, low competence, low dutifulness, and low deliberation (components of Conscientiousness) have been shown to be related to alcohol use (Ruiz et al. 2003). Consistent with the Big Five findings, the broad dimension of impulsivity has repeatedly been shown to be associated with alcohol problems (Magid et al. 2007; MacKillop et al. 2007). Further, when considering specific DvC-related impulsivity components using both samples of community-dwelling emerging adults (Shin et al. 2012) and university students (Magid and Colder 2007), after including a number of covariates, low Premeditation, but not low Perseverance, was found to be a significant unique predictor of alcohol problems.

With regard to differences between demographic groups, there is significant evidence that African-American students are much less likely to use or abuse alcohol than White students (e.g., Caetano and Clark 1998; O'Malley and Johnston 2002). Further, it has been repeatedly found that females consume significantly less alcohol and are less likely to experience problems associated with alcohol. Nonetheless, risk factors for alcohol use/abuse have not generally been found to vary by gender (see Nolen-Hoeksema 2004, for a comprehensive review). Given some evidence of differential rates and predictors of alcohol problems by race and gender, it is important to explicitly examine whether associations vary by race and gender.

#### Summary

Taken together, it is clear that the broad dimension of DvC represents a general diathesis to the externalizing spectrum of psychopathology in general, and aggression and alcohol problems more specifically. Nonetheless, rarely have studies investigated associations between specific expressions of externalizing behaviors (e.g., aggression, alcohol problems) and these three factor-analytically derived lower-order components of DvC in the same sample. Recently, however, in a large sample of undergraduates, Latzman and colleagues (2011) did examine the association between components of DvC and different externalizing indicators. Results of their investigation suggest that while DvC represents a general diathesis to the aggression and alcohol use, it is the second-order components that confer more specific risks for particular behaviors. Specifically, low Agreeableness was found to be unique to aggression, including both reactive and proactive aggression, whereas low Self-Control was unique to alcohol consumption and reactive aggression. These findings suggest both generality and specificity with regard to associations between DvC and externalizing behaviors.

#### Current Study

The current study sought to expand on previous work in several important ways. First, the study by Latzman and colleagues (2011) utilized a sample of primarily White undergraduate students. The relatively homogenous nature of the sample, racially speaking, limits our ability to draw clear conclusions concerning the generalizability of specific associations between DvC and externalizing behaviors to other racial groups. Thus, in the present study, we utilized a large, racially diverse group of participants to specifically examine the impact of race. Specifically, given racial differences found in previous studies (e.g., Sampson et al. 2005; Laird et al. 2005; Caetano and Clark 1998; O'Malley and Johnston 2002), we sought to determine if race moderated the association between DvC and externalizing in exploratory analyses. Additionally, given previous mixed findings with regard to gender differences (e.g., Connor et al. 2003; Nolen-Hoeksema 2004), we also examined whether associations varied by gender.

Furthermore, the alcohol index examined by Latzman and colleagues (2011) was specifically focused on consumption frequency and binge drinking but did not assess alcohol problems, more specifically. As noted earlier, as much of the concern with drinking among youth has to do with negative alcohol-related consequences of drinking (Hingson et al. 2005), the quantity and frequency of alcohol use is likely not sufficient in determining problems associated with alcohol consumption. Further, personality traits have been

shown to be differentially associated with alcohol use as opposed to alcohol problems (e.g., Curcio and George 2011; Magid et al. 2007). For example, among undergraduates, while Sensation Seeking has been found to be specifically associated with alcohol use, Urgency has been shown to be uniquely associated with alcohol-related problems (Curcio and George 2011). Consequently, in the present study, we utilized a well-established measure of problem drinking to investigate associations between this variable and DvC.

Finally, as another means of examining the generalizability of the findings previously reported by Latzman and colleagues (2011), we used a parallel set of DvC component measures in the present study. As mentioned earlier, previous structural analyses of DvC have revealed two components that conceptually map onto the UPPS model (Whiteside and Lynam 2001; Vaidya et al. 2010). Thus, in this study, we specifically utilized the UPPS Impulsivity Scale to tap these two dimensions—namely, (lack of) perseverance to index Accomplishment (A/P), and (lack of) premeditation to index Self-Control (SC/P). Because Agreeableness, the third component of our DvC model, is not measured by the UPPS, we utilized a commonly used measure of Big Five traits to assess this dimension.

Consistent with previous findings (Latzman et al. 2011), we expected to find evidence of both generality and specificity. We expected low Agreeableness to be associated with both forms of aggression, but as noted earlier, for the other DvC components to be uniquely associated with reactive aggression but not proactive aggression. Specifically, we expected reactive aggression to be more strongly associated with low SC/P and proactive aggression to evidence a stronger association with low A/P. With regard to alcohol problems, we expected SC/P to evidence the strongest unique association. Because we measured alcohol problems in the current study, rather than simply alcohol consumption as examined by Latzman and colleagues (2011), we expected that Agreeableness would additionally evidence a significant unique association as many alcohol use problems are associated with interpersonal consequences (White and Labouvie 1989). We expected mean level race differences in externalizing-related behaviors, with African-Americans evidencing lower levels of alcohol problems and higher levels of aggression. Further, given lack of gender differences found in previous studies with regard to mean level gender differences of either proactive or reactive aggression (e.g., Connor et al. 2003; Teten Tharp et al. 2011), we did not expect to find differences in our sample. With regard to alcohol problems, consistent with the existing literature (Nolen-Hoeksema 2004), we expected males to report higher rates than females. No specific predictions were made as to whether associations between externalizing-related behaviors and DvC would vary by race or gender.

## Method

### Participants

Participants included 933 undergraduates between the ages of 18 and 58 years ( $M_{age}=20.81$ ,  $SD=5.02$ ; 73.5 % female) who completed an online survey in partial fulfillment of a research exposure requirement for an introductory psychology course at a large public Southeastern university. The sample was racially diverse, with 36.8 % self-identifying as Black/African-American, 34.3 % as White, 14.6 % as Asian/Asian-American and 14.3 % as other, which includes Hispanic, when asked to choose the racial/ethnic identity that best describes them. All students accessed a secure website where they provided informed consent and completed the surveys. All study procedures were approved by the appropriate Institutional Review Board.

### Measures

As no single DvC measure exists that assesses all three components identified by previous work (Vaidya et al. 2010), participants in the present study completed two personality instruments in order to assess these key dimensions of DvC. Participants also completed a measure of reactive and proactive aggression and a measure of alcohol problems. All instruments were administered electronically through an internet-based assessment program as part of a larger survey on the psychological health of university students including other personality scales not relevant to the current study.

### DvC

*UPPS-P Impulsivity Scale—(lack of) Premeditation & (lack of) Perseverance* The UPPS-P Impulsivity Scale (UPPS-P; Whiteside and Lynam 2001; Cyders et al. 2007) is a 59-item instrument designed to assess distinct personality pathways to impulsive behavior. For the current study, the 10-item (lack of) Perseverance scale (e.g., “I am a person who always gets the job done,” reversed) was used to assess the DvC component of Accomplishment (A/P) and the 11-item (lack of) Premeditation scale (e.g., “I like to stop and think things over before I do them”, reversed) was used as an index of the DvC component of Self-Control (SC/P) (see Vaidya et al. 2010). Participants respond to items using a 4-point Likert-type scale ranging from “Strongly Agree” to “Strongly Disagree” to indicate to the extent to which they agree with each statement. The UPPS-P has been shown to demonstrate excellent internal consistency and convergent validity with other measures that tap DvC related traits (Whiteside and Lynam 2001; Cyders et al. 2007). In the current sample, internal consistencies were 0.85 for (lack of) Perseverance and 0.88 for (lack of) Premeditation.

**Big Five Inventory (BFI)–Agreeableness** To assess the DvC component of Disagreeableness, the 9-item Big Five Inventory (BFI; John et al. 2008) Agreeableness scale was used. The BFI is a 44-item, self-report measure, designed to assess the Big Five personality traits: neuroticism, extraversion, openness, agreeableness, and conscientiousness. Participants rate the extent to which various statements describe them on a 5-point Likert-type scale ranging from *Agree Strongly* to *Disagree Strongly*. Alpha reliabilities typically range from 0.75 to 0.90 (John et al. 2008) and show good convergent validity with other Big Five inventories (e.g., Watson and Hubbard 1996). In the current sample, the internal consistency for Agreeableness was 0.79.

### Aggression

**Reactive-proactive aggression questionnaire** The Reactive-Proactive Aggression Questionnaire (RPQ; Raine et al. 2006) is a 23-item measure that consists of two scales: Reactive Aggression and Proactive Aggression. Participants respond to items using a 3-point scale (*Never*; *Sometimes*; *Often*) to indicate how often they have engaged in various behaviors associated with reactive aggression (e.g., “Got angry or mad or hit others when teased”) and proactive aggression (e.g., “Hurt others to impress people”). The RPQ has been shown to demonstrate adequate reliability with internal consistencies ranging from 0.86 for proactive aggression to 0.84 for reactive aggression (Raine et al. 2006). In the current sample, internal consistencies were 0.91 for reactive aggression and 0.91 for proactive aggression.

### Alcohol Problems

**Rutgers alcohol problem index** The Rutgers Alcohol Problem Index (RAPI; White and Labouvie 1989) consists of 23-items that asks participants to indicate how many times each negative consequence (e.g., “neglected responsibilities”, “felt you were going crazy”, “relatives avoided you”) happened while drinking or because of drinking during the last year. Participants respond to the items on a 5-point scale (“0”=Never; “1”=1–2 times, “2”=3–5 times, “3”=6–10 times, and “4”=more than 10 times). The RAPI has been shown to demonstrate adequate reliability in terms of both internal consistency (White and Labouvie 1989) and test-retest reliability (Miller et al. 2002). In the current sample, the internal consistency was 0.96.

### Analyses

We first examined the zero-order correlations of DvC with the aggression and alcohol problem scales. As noted earlier, we then used items from the UPPS (lack of) Perseverance and (lack of) Premeditation scales and items from the BFI

Agreeableness scale to model DvC’s three latent components: A/P, SC/P, and Agreeableness. Additionally, latent reactive and proactive aggression factors were modeled using items from the RPQ scales as indicators and alcohol problems were modeled using items from the RAPI as indicators. We then employed structural equation modeling (SEM) procedures to examine associations between the three latent DvC components and latent reactive aggression, proactive aggression, and alcohol problems controlling for age, gender (0=male, 1=female), and race (1=White, 0=Other). We analyzed a single SEM model with all three externalizing behaviors examined simultaneously and allowed to correlate, which accounts for shared variance among them. The three DvC components were also allowed to correlate. Next, to examine whether associations between components of DvC and aggression and alcohol problems vary by race, a subset of participants that included the two largest racial groups, White and African-American ( $N=669$ , 51.9 % African-American), were next examined via multi-group SEM analyses. Specifically, a model in which regression weights were constrained between the two groups was compared to a model in which regression weights were free to vary. Model fit was evaluated using the Bayesian information criterion (BIC) and Draper’s information criterion (DIC), two widely used model selection fit indices that have been shown to perform best across a range of conditions (Markon and Krueger 2006). This approach to model selection involves the comparison of omnibus criteria (i.e., BIC, DIC) which value a model’s goodness of fit and penalizes a model’s complexity in the interest of achieving parsimony. A parallel approach was used to examine whether associations between DvC and externalizing behaviors varied by sex in the full sample. Lastly, controlling for age, gender, and race, we examined two-way interactions between each of the three DvC components in predicting the three externalizing behaviors via separate SEM models.

## Results

### Preliminary Analyses

Table 1 shows scale-level bivariate correlations between aggression and alcohol problems. Consistent with previous research (Raine et al. 2006), reactive and proactive aggression were significantly and strongly positively correlated with one another ( $r=0.61$ ). Additionally, proactive aggression was moderately positively associated with alcohol problems ( $r=0.56$ ) while reactive aggression evidenced a small positive association with alcohol problems ( $r=0.31$ ). Also shown in Table 1 are the bivariate correlations of the three DvC scales with aggression and alcohol problems. These results indicate that correlations between the three components of DvC and

**Table 1** Correlations among externalizing behavior scales and DvC scales

	RAgg	PAgg	Alcohol Problems	(low) A/P	(low) SC/P	A
Externalizing behaviors						
Reactive aggression (RAgg)						
Proactive aggression (PAgg)	0.61					
Alcohol problems	0.31	0.56				
DvC						
(low) A/P	0.21	0.43	0.38			
(low) SC/P	0.27	0.44	0.45	0.68		
Agreeableness (A)	-0.38	-0.54	-0.33	-0.50	-0.42	
Mean	8.95	3.95	30.07	19.45	20.85	33.35
SD	4.17	4.43	11.51	5.15	5.58	5.98
Range	0–22	0–24	23–90	10–35	11–44	14–45

N=933. All correlations significant at  $p < 0.01$ . A/P=Accomplishment/Perseverance. SC/P=Self-Control/Premeditation

these externalizing-related behaviors ranged from small to moderate ( $Mdn r = |0.38|$ ) with the strongest association found between proactive aggression and Agreeableness ( $r = -0.54$ ). Lastly, consistent with previous examinations of these three DvC components, albeit measured via different instruments, all DvC scales were significantly interrelated ( $Mdn r = |0.50|$ ), with the strongest association between A/P and SC/P ( $r = 0.68$ ).

SEM Analyses

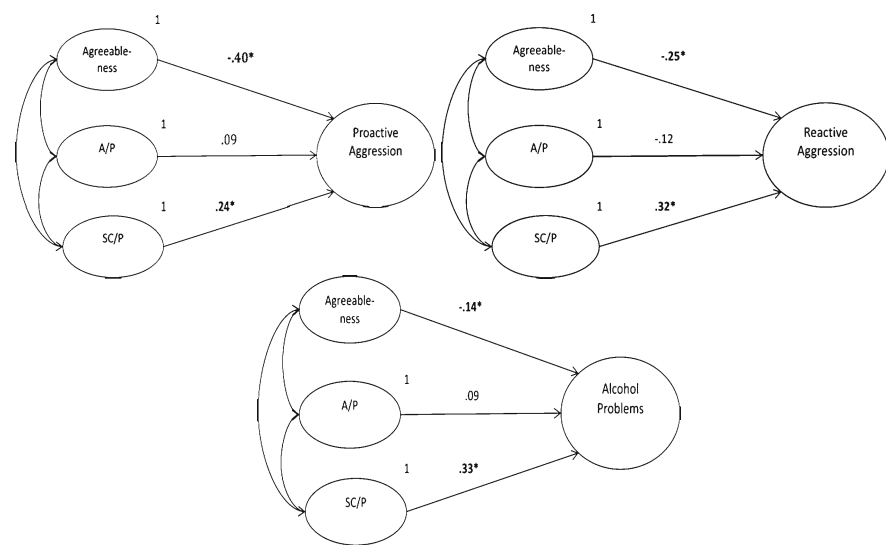
As noted above, to examine the unique associations between components of DvC and aggression and alcohol problems, the three latent DvC components were regressed on latent reactive aggression, proactive aggression, and alcohol problems in a single SEM model in which age, gender, and race were included as covariates. In terms of demographics included as covariates, non-Whites reported higher levels of both reactive ( $\beta = -0.07, t = -2.06, p < 0.05$ ) and proactive aggression ( $\beta = -0.14, t = -5.24, p < 0.001$ ) and males reported higher levels of proactive aggression ( $\beta = -0.14, t = -4.95, p < 0.001$ ). Further, age was negatively associated with reactive aggression ( $\beta = -0.07, t = -2.01, p < 0.05$ ). Neither age, nor gender, nor race was significantly associated with alcohol problems (all  $\beta s < |0.04|$ , all  $t s < |1.18|$ , all  $p s > 0.24$ ). As expected, all three latent DvC components were found to be moderately associated with one another ( $Mdn r = |0.51|$ ) with the strongest association between A/P and SC/P ( $r = 0.79$ ). Further, latent reactive and proactive aggression were strongly associated with one another ( $r = 0.61$ ) and also associated with alcohol problems ( $r s = .47$  and  $0.22$  with reactive and proactive aggression, respectively). Further, As shown in Figure 1, low Agreeableness and low SC/P contributed uniquely to the prediction of both reactive and proactive aggression with low SC/P evidencing the largest contribution to reactive aggression and low Agreeableness

evidencing the largest contribution to proactive aggression. We tested the significant differences in the size of associations using the Wald Test of Parameter Constraints (Kline 2011). SC/P had a significantly stronger association with reactive aggression as compared to Agreeableness (Wald = 45.26,  $p < 0.001$ ) and Agreeableness had a significantly stronger association with proactive aggression as compared to SC/P (Wald = 83.26,  $p < 0.001$ ). Consistent with the aggression results, with regard to alcohol problems, low Agreeableness and low SC/P emerged as significant unique predictors with SC/P clearly evidencing the largest contribution (Wald = 43.29,  $p < 0.001$ ).

To examine whether associations between components of DvC and aggression and alcohol problems vary by race, multi-group SEM analyses were run with a subset of participants that included the two largest racial groups, White and African-American, as described earlier. Specifically, a model in which regression weights were constrained between the two groups was compared to a model in which regression weights were free to vary. Model fit indices revealed a better fit for the model in which regression weights were constrained to be equal across racial groups (BIC = 89689.20, DIC = 1267.44) than for the model in which regression weights were freed to vary (BIC = 89726.81, DIC = 1298.75) indicating that associations between components of DvC, aggression, and alcohol problems do not differ by race.

Consistent with models for race, two additional models were fit to determine whether associations between DvC and externalizing-related behaviors varied by gender with the complete sample. Consistent with findings for race, model fit indices revealed a better fit for the model in which regression weights were constrained to be equal across gender groups (BIC = 129169.52, DIC = 912.98) than for the model in which regression weights were freed to vary (BIC = 129221.84, DIC = 935.48) indicating that associations

**Fig. 1** Components of DvC predicting reactive aggression, proactive aggression, and alcohol problems



Note.  $X^2 = 10307.82$ ;  $\ln(L) = -63012.11$ ;  $k = 252$ ;  $RMSEA = .05$ ;  $SRMR = .06$ ;  $AIC = 126528.21$ ;  $BIC = 127747.22$ . \* $p < .01$ . A/P = (low) Accomplishment/Perseverance. SC/P = (low) Self-Control/Premeditation. As described in text, loadings shown are from full SEM model. Latent variable indicators, not shown, are all observed variables. Model controls for age, gender, and race as described in the text.

between components of DvC, aggression, and alcohol problems do not differ by gender.

Lastly, to examine potential interactions among DvC components in the prediction of externalizing behaviors we next examined two-way interactions between each of the three DvC components in predicting the three externalizing behaviors via separate SEM models that, again, included age, gender, and race as covariates. Results revealed a number of significant interaction effects between the DvC variables in predicting aggression and alcohol problems. In general, the results indicate that low levels of one DvC component in conjunction with low levels of another DvC component was associated with the highest scores on the externalizing variables. For reactive aggression, low Agreeableness was associated with greater reactive aggression and this effect was stronger for subjects who were also lower on SC/P ( $\beta = -0.21$ ,  $t = -3.86$ ,  $p < 0.001$ ). Agreeableness also interacted with A/P to predict reactive aggression ( $\beta = -0.19$ ,  $t = -3.29$ ,  $p < 0.01$ ). In this case, high and low A/P did not differ at low levels of Agreeableness but at high levels of Agreeableness, high A/P was associated with relatively greater reactive aggression.

For proactive aggression, Agreeableness interacted with both SC/P ( $\beta = -0.68$ ,  $t = -6.21$ ,  $p < 0.001$ ) and A/P ( $\beta = -0.72$ ,  $t = -6.17$ ,  $p < 0.001$ ). Both interactions demonstrated a pattern where low Agreeableness alongside low SC/P or A/P was associated with greater proactive aggression. The third interaction between A/P and SC/P ( $\beta = 0.25$ ,  $t = 3.98$ ,  $p < 0.001$ ) indicated that low levels on both were associated with the greatest level of proactive

aggression. Finally, for alcohol problems, low Agreeableness along with low levels of either SC/P ( $\beta = -0.51$ ,  $t = -4.07$ ,  $p < 0.001$ ) or A/P ( $\beta = -0.54$ ,  $t = -4.10$ ,  $p < 0.001$ ) was associated with the greatest level of alcohol problems. Further, consistent with findings for proactive aggression, the A/P by SC/P ( $\beta = 0.25$ ,  $t = 3.96$ ,  $p < 0.001$ ) interaction indicated that low levels of SC/P along with low levels of A/P was associated with the greatest degree of alcohol problems.

## Discussion

Though externalizing behaviors have been broadly linked to individual differences in DvC, there is a relatively limited understanding of common versus distinct patterns of associations between various aspects of externalizing and DvC. This is due, in part, to the heterogeneous nature of the DvC construct that is often measured using a number of differences scales and inventories. To begin to address this limitation in the literature, in the present study, we built on earlier factor analytic and developmental work that suggests that DvC consists of three distinct components: A/P, SC/P, and Agreeableness (Vaidya et al. 2010). Using this model, previous research (e.g., Litzman et al. 2011) has shown both general and specific patterns of association between key externalizing constructs—namely, proactive aggression, reactive aggression, and alcohol use/misuse—and components of DvC. Here, to further characterize the specificity of the associations between externalizing and DvC, we expand on this work in a number of important ways. In a

racially diverse sample using an alternative set of DvC and alcohol use/misuse measures, the results of the current study confirm some specificity in the associations between externalizing and DvC. Despite differences with respect to measurement and participant characteristics, results of the current study largely replicate previous findings providing convincing support for the generalizability of DvC-externalizing associations previously reported (Latzman et al. 2011).

#### Generality versus Specificity

Consistent with expectations, as well as previous findings (e.g., Latzman et al. 2011), when considered within the framework of the DvC dimension, results of the current study supports the assertion that there does not appear to be any one externalizing profile that characterizes externalizing behaviors. For example, whereas proactive aggression was defined by relatively low Agreeableness and moderate levels of SC/P, alcohol problems were defined by relatively moderate levels of low Agreeableness and relatively low levels of SC/P. Nonetheless, although there is strong evidence for specificity, results of the current study also provide evidence for generality as well. For instance, all three externalizing behaviors were linked to high Disagreeableness and low levels of SC/P, although the strength of associations varied across externalizing constructs. Overall, however, given the level of specificity, results of the current study demonstrate that DvC components effectively distinguish between distinct forms of externalizing psychopathology.

Although the results of the present study largely replicate earlier findings, there were some notable differences as well. In the current study, Disagreeableness and SC/P were significant unique predictors of all externalizing outcomes. However, Latzman and colleagues (2011) found only Disagreeableness to be uniquely associated with Proactive Aggression and only SC/P to be uniquely associated alcohol consumption. Nonetheless, consistent with previous studies of aggression (e.g., Miller & Lynam 2001; Miller et al. 2008) and alcohol use/misuse (e.g., Hopwood et al. 2007; Ruiz et al. 2003; Sher et al. 2000), as noted earlier, comparisons of the size of associations confirmed low Agreeableness to be the strongest predictor of Proactive Aggression and SC/P to be the strongest predictor of alcohol problems. These discrepant findings have a number of potential explanations. For example, the current study utilized a much more diverse sample of participants and employed different scales to measure both components of DvC as well as externalizing outcomes. In this regard, it is noteworthy that the zero-order correlations among the three DvC scales in the present study ( $r_s=0.68, 0.50, \text{ and } 0.42$ ) were moderately higher than in previous studies ( $r_s=0.52, 0.35, 0.28$ ) (Latzman et al. 2011). Importantly, Latzman et al. (2011) used factor-analytically derived scale level indicators of

each DvC component potentially resulting in greater discrimination between components. To the degree that is indeed the case, the UPPS scales used in the current study may not be as effective in differentiating lower-order DvC components as multi-scale indicators. Thus, whereas the UPPS represents an empirically valid and economical means of assessing components of DvC, its discriminant validity could potentially be approved upon.

In addition to significant main effects suggesting distinct DvC associations with various externalizing outcomes, a number of significant interaction effects between the DvC components in predicting aggression and alcohol problems emerged. Though findings were not entirely consistent with previous research on the interactions among DvC components (i.e., Latzman et al. 2011), they do highlight the complex route to externalizing behaviors consisting of not only direct effects of DvC components, but also interactions among components. Additionally, results highlight the importance of considering both structural issues (e.g., lower-order components of broad dimensions such as DvC) and potential mechanisms elucidated via examinations of interaction effects associated with externalizing psychopathology.

Interestingly, both in the current study as well as in previous research (e.g., Latzman et al. 2011), high A/P emerged as a significant unique marker of reactive aggression when considered in interaction with the other DvC components in SEM analyses; that is, higher A/P was found to be associated with higher levels of reactive, but not proactive, aggression, specifically. In other words, while not evidencing a main effect in the prediction of any of the externalizing behaviors examined, A/P appears to become important when considered in the context of other DvC components. A/P is a component of DvC that represents goal-directed, achievement-oriented tendencies. The frustration-aggression hypothesis (Dollard et al. 1939; Berkowitz 1989) may be a promising framework within which to understand this finding. Specifically, the original frustration-aggression hypothesis asserted that aggression is a consequence of frustration (Dollard et al. 1939). A subsequent reformulation of this hypothesis asserted that frustrations generate tendencies toward aggression to the degree to which they evoke negative affect (Berkowitz 1989). Although neither formulation examines specific forms of aggression, within the context of reactive aggression specifically, it is possible that those high on A/P who are likely particularly ambitious and driven are more likely to experience negative affect in the context of frustrations. These frustrations may, in turn, lead to an increased likelihood of exhibiting aggression in response to this negative affect. It will be important for future research to continue to examine potential explanations for this finding. For example, future studies may explicitly examine associations among A/P, negative affect, and various forms of aggression to more directly test the frustration-aggression explanation. Beyond the A/P findings, overall,



further research is needed to better characterize these interaction effects.

#### Race and Gender Differences in Associations Between DvC and Externalizing Behaviors

The current study employed a racially diverse sample of White and African-American participants to explicitly examine whether the associations between DvC components and externalizing behaviors differed as a function of race. As predicted, being African-American was significantly associated with higher rates of both reactive and proactive aggression. One potential explanation for these mean-level differences may be differing contextual factors common to each racial group (e.g., Massey and Denton 1993). In fact, previous studies have shown that neighborhood disadvantage (e.g., Fite et al. 2009) as well as negative life events (e.g., Fite et al. 2012)—contexts generally more common among African-American's—are significant unique predictors of both proactive and reactive aggression, respectively. However, associations between DvC components and externalizing outcomes did not differ by race. These findings extend earlier results based on less racially diverse samples and provide further evidence for the generalizability of the DvC-externalizing associations.

Partially consistent with previous studies on aggression (e.g., Connor et al. 2003; Teten Tharp et al. 2011), no gender differences were found for reactive aggression but men were found to exhibit significantly higher levels of proactive aggression. Further, in contrast to the extant alcohol use/abuse literature (e.g., Nolen-Hoeksema 2004), no mean level differences emerged with regard to alcohol problems. Additionally, further extending previous findings examining associations between components of DvC and externalizing-related behaviors, associations between DvC components and externalizing behaviors did not vary by gender. When considering these findings, however, it is important to note that both our current study and the previous report by Latzman and colleagues (2011) relied on university students. Consequently, the consistency in findings across studies despite differences in racial characteristics may be due, at least in part, to the student sample employed by both studies. Further, given that the vast majority of the sample used in the current study was female, the lack of gender differences found should be interpreted with caution. As such, it will be important for future investigations to further investigate the replicability of the DvC-externalizing associations reported here in a sample that is more heterogeneous in other important demographic characteristics.

#### Future Directions and Limitations

Due to the cross-sectional, correlational nature of our data, causal conclusions are not possible, so it is important for

future longitudinal work to examine prospectively the prediction of aggression and alcohol problems from lower order components of DvC. Although the effects of gender as a covariate and moderator were examined, the use of a predominantly female undergraduate sample may limit the generalizability of our findings to more diverse populations, including those that are less educated, have clinical levels of symptomatology, and are comprised of a greater proportion of male subjects. Nonetheless, the diverse nature of our sample (i.e., 51.9 % African-American) relative to the majority of samples reported in the literature represents a significant strength of the current study. Additionally, as noted earlier, it will be important for our findings to be replicated in future work utilizing more a broader range of diverse samples, including clinical samples. Further, it is important to note that this finding appears likely more a function of risky contextual factors more common among African Americans (Massey and Denton 1993), including neighborhood disadvantage and negative life events (Fite et al. 2009; Fite et al. 2012), rather than dispositional differences, per se. As such, it will be important for future research to examine contextual factors that may be underlying mean level racial differences.

We used an aggression instrument specifically designed to assess the heterogeneous nature of the aggression construct, but there may be other relevant aggression domains including relational or social aggression (see Tackett et al. 2009; Burt et al. 2012) and non-aggressive rule-breaking behavior (see Burt et al. 2011; Burt and Hopwood 2010) that we failed to assess that also may have differential relations with DvC components. Associations between the factor-analytically derived DvC components examined in the current study and these other aggression domains are largely unknown. It is possible that the current DvC framework would help to advance our understanding of these other aspects of the broad aggression construct. As such, it will be important, therefore, for future research to include a wider range of aggression measures. Furthermore, as the current investigation focused on alcohol problems specifically, the generalizability of our findings to other substances of abuse is unknown. It will be important for future work to include a more comprehensive assessment of substance use, including a wider range of substances including illicit drugs and other substances of abuse. Additionally, our findings were based exclusively on self-report measures of DvC, aggression and alcohol problems, which may inflate associations due to shared method variance. Furthermore, given significant theoretical links between self-report assessments of DvC and neuropsychological measures of disinhibition (Nigg 2000), future studies should examine how the latter relate to aggression and alcohol use variables. Along these same lines, the current study used retrospective self-report measures of aggression and alcohol use, rather than

laboratory-based samples of aggressive behavior (e.g. Seibert et al. 2010) and prospective indices of alcohol use (e.g. Heeb and Gmel 2005). It will be therefore important for future work to examine a broader range of indicators of aggression and alcohol use.

## Conclusions

Our results confirm the broad dimension of DvC as representing a general diathesis to the externalizing spectrum of behaviors with second-order components conferring more specific risks for particular behaviors within this spectrum. Further, the current findings confirm the generalizability of these associations to African-American participants, in addition to Whites as well as both male and female participants. These findings suggest both common and distinct associations between DvC and externalizing behaviors confirming the importance of focusing on lower-order DvC components in future research. Such examinations will further explicate differential DvC-related etiological mechanisms associated with various phenotypic expressions of the externalizing spectrum of behavior.

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