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REACTIVE AND PROACTIVE AGGRESSION IN ADOLESCENT MALES:

Examining Differential Outcomes 10 Years Later in Early Adulthood

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Abstract

There is limited knowledge about the unique relations between adolescent reactive and proactive aggression and later psychosocial adjustment in early adulthood. Accordingly, this study prospectively examined associations between adolescent (mean age = 16) reactive and proactive aggression and psychopathic features, antisocial behavior, negative emotionality, and substance use measured 10 years later in early adulthood (mean age = 26). Study questions were examined in a longitudinal sample of 335 adolescent males. Path analyses indicate that after controlling for the stability of the outcome and the overlap between the two subtypes of aggression, reactive aggression is uniquely associated with negative emotionality, specifically anxiety, in adulthood. In contrast, proactive aggression is uniquely associated with measures of adult psychopathic features and antisocial behavior in adulthood. Both reactive and proactive aggression uniquely predicted substance use in adulthood, but the substances varied by subtype of aggression. Implications for findings are discussed.

Keywords

proactive aggression; reactive aggression; longitudinal; psychopathy; internalizing problems

Research on child and adolescent aggression often distinguishes between reactive and proactive functions of aggression, with reactive aggression representing combative response to perceived threat and proactive aggression representing predatory attacks motivated by external reward (Card & Little, 2007; Dodge, 1991). Although some question the value in differentiating between reactive and proactive aggression due to their frequent co- occurrence (*r*s ranging from .41 to .83; e.g., Bushman & Anderson, 2001), a growing body of literature suggests that

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the two functions of aggression are differentially related to a host of behavioral outcomes (e.g., Card & Little, 2006; Merk, Orobio de Castro, Koops, & Matthys, 2005; Polman, Orobio de Castro, Koops, van Boxtel, & Merk, 2007). However, very little research has longitudinally examined the long-term outcomes of these dimensions of aggression into adulthood. Understanding the long-term developmental sequelae of these dimensions of aggression could aid in the development of targeted interventions. Accordingly, this study examined associations between adolescent reactive and proactive aggression and a diverse array of outcomes measured 10 years later in early adulthood.

Although statistically related (e.g., Little, Henrich, Jones, & Hawley, 2003), reactive and proactive aggression appear to be distinct dimensions of aggression (e.g., Fite, Colder, & Pelham, 2006; Poulin & Boivin, 2000) with different theoretical underpinnings. Reactive aggression is related to the frustration aggression hypothesis, which posits that aggression is an angry and hostile reaction to perceived threat (Card & Little, 2007). In contrast, proactive aggression is consistent with social learning theory, which suggests that aggression serves the purpose of obtaining a desired goal or object (Card & Little, 2007).

CROSS-SECTIONAL STUDIES ON REACTIVE/PROACTIVE AGGRESSION

Reactive aggression appears to be linked with negative emotionality in childhood and adolescence. Reactive, not proactive, aggression has been uniquely linked with increased levels of sadness, unhappiness, depression, and suicidal behavior (e.g., Card & Little, 2006; Day, Bream, & Pal, 1992; Fite, Stoppelbein, & Greening, 2009a; Miller & Lynam, 2006; Raine et al., 2006; Vitaro, Brendgen, & Tremblay, 2002). Although the specific mechanism that links reactive aggression to negative emotionality is not yet clear, it is speculated that social rejection may play a role in the relation between reactive aggression and negative emotions. Reactively aggressive individuals are at risk for social isolation (e.g., Day et al., 1992; Dodge & Coie, 1987; Dodge, Lochman, Harnish, Bates, & Pettit, 1997; Prinstein & Cillessen, 2003), and rejection and social isolation are conceptualized as stressful life events (e.g., Bierman, 2004), which may result in emotional distress for reactively aggressive individuals.

In contrast, there is literature suggesting that proactive aggression is associated with severe forms of antisocial behavior in childhood and adolescence, including delinquency (e.g., Coralijn, Orobio de Castro, & Koops, 2005; Fite, Colder, Lochman, & Wells, 2008a; Raine et al., 2006; Vitaro, Brendgen, & Barker, 2006). Moreover, proactive aggression has been linked to psychopathic traits (e.g., Barry et al., 2007; Cornell et al., 1996; Fite, Stoppelbein, & Greening, 2009a, 2009b; Marsee & Frick, 2007; Murrie, Cornell, Kaplan, McConville, & Levy-Elkon, 2004; Raine et al., 2006; Vitacco, Neumann, Caldwell, Leistico, & Van Rybroek, 2006). This research is consistent with models indicating that certain types of childhood aggression are associated with the development of severe forms of delinquency that persist into adulthood (Moffitt, 1993; Tolan, Guerra, & Kendall, 1995).

Although some evidence suggests that both reactive and proactive aggression are linked to early substance use, the underlying mechanisms for these associations appear to be different (Fite, Colder, Lochman, & Wells, 2008b, 2008c). Reactive aggression is impulsive in nature, and impulsivity has been associated with substance use (e.g., Acton, 2003; Moeller & Dougherty, 2002). Reactive aggression may also be associated with substance use for self-medicating and coping reasons due to the experience of negative emotions, consistent with research linking temperamental anger to alcohol use initiation (Pardini, Lochman, & Wells, 2004). In contrast, proactive aggression may be linked to substance use due to a developmental progression of antisocial behavior consistent with developmental models of risk for problem behavior, as proactive aggression has been found to be associated with delinquency and psychopathic features (Fite et al., 2008a; Fite et al., 2009a). Moreover, research suggests that

proactively aggressive individuals focus on the positive outcomes of aggressive behavior, while ignoring the potentially negative consequences of behavior (e.g., Dodge et al., 1997; Orobio de Castro, Merk, Koops, Veerman, & Bosch, 2005). It may be that proactively aggressive individuals similarly focus on the positive expectancies of other types of deviant behavior, including early substance use (e.g., Christiansen, Smith, Roehling, & Goldman, 1989; Killen et al., 1996). Thus, there is reason to believe that both reactive and proactive aggression may be associated with continued substance use into adulthood.

LONGITUDINAL STUDIES ON REACTIVE/PROACTIVE AGGRESSION

Although several cross-sectional studies have supported the uniqueness of reactive and proactive functions of aggression, studies examining longitudinal relations between these subtypes of aggression and long-term outcomes of adjustment into adulthood remain rare. However, there are at least two published studies using the same longitudinal sample that have examined relations between reactive and proactive aggression and adult adjustment (Pulkinnen, 1987, 1996). These studies found that proactive, not reactive, aggression is associated with antisocial outcomes in adulthood, specifically criminal behavior, smoking, and drinking. However, there were several methodological limitations associated with these studies. First, the results were based on an ad hoc measure of reactive and proactive aggression that had not been validated through factor analysis. Moreover, this measure failed to assess the goal-directed nature of proactive aggression and instead used items such as “attacking without reason” and “says nasty things to other children even if they had done nothing wrong.” In terms of content validity, these items seem more indicative of reactive aggression, as they describe seemingly purposeless attacks that may be driven by an over-reaction to perceived threat. In addition, these studies were conducted using a relatively small normative sample of boys and girls born in the late 1950s within central Finland. As a result, it is unclear if these findings are applicable to larger and more ethnically diverse samples within the United States, where the prevalence of violent behavior is much higher and the social issues facing families are dramatically different. Last, these studies did not examine several theoretically important outcomes in early adulthood including psychopathic features, feelings of depression, perceived stress, and illegal drug use.

THIS STUDY

To address these limitations, this study examined the association between a validated measure of reactive and proactive aggression administered at age 16 and several measures of adjustment in early adulthood (10 years after the assessment of aggression). Relations were examined among a relatively large, ethnically diverse sample of boys within the United States. The pertinent outcomes assessed included several measures of negative emotionality (i.e., depression, anxiety, perceived stress), antisocial behavior and personality features (i.e., psychopathic features, antisocial personality, delinquency, violence), and substance use (i.e., frequency of tobacco, alcohol, marijuana, and hard drugs). Consistent with prior cross-sectional research in childhood and adolescence, it was hypothesized that after controlling for the overlap between reactive and proactive aggression, reactive aggression would be uniquely associated with measures of negative emotionality whereas proactive aggression was expected to be uniquely associated with psychopathic features, antisocial personality, and delinquent behavior. In contrast, both reactive and proactive functions of aggression were expected to be associated with measures of substance use.

METHOD

PARTICIPANTS AND PROCEDURES

This study used data collected on the youngest cohort of boys in the Pittsburgh Youth Study (PYS). The cohort was initially selected from a list of names and addresses of all first-grade boys in the Pittsburgh public schools during 1987 to 1988. A total of 1,165 families was randomly selected from this list for participation in a screening assessment (84.6% agreement rate). As part of the screening assessment, information was collected on the boys' delinquent behavior using forms completed by primary caretakers, teachers, and the boys themselves. The top 30% of the most antisocial boys on the screening assessment (n = 256), as well as an approximately equal number of boys randomly selected from the remainder (n = 247), were selected for longitudinal follow-up. More than half of the sample was African American (55.7%), and the remaining boys were Caucasian (40.5%), Hispanic (0.2%), Asian (1.0%), and mixed ethnicity (2.6%). Further details of the sample selection, study characteristics, and participants can be found in Loeber, Farrington, Stouthamer-Loeber, and Van Kammen (1998).

The predictors of reactive and proactive aggression in this study were collected as part of a substudy on the neurocognitive basis of antisocial behavior at age 16 (for details, see Loeber, Farrington, Stouthamer-Loeber, & White, 2008; Raine et al., 2006). Participants came to a testing space at the university where neuropsychological and behavioral measures were interspersed throughout the test day to avoid fatigue and lack of motivation. There were 335 youth who participated in this substudy, which represents 66.6% of the original 503 boys in the youngest cohort of the PYS. The reasons for nonparticipation broke down as follows: 31 moved out of the area, 20 were incarcerated, 45 refused participation in the larger PYS, 35 refused the biosocial substudy, 27 repeatedly cancelled appointments, and 10 failed to decide on participation. Prior analyses indicated that participants in the substudy were not significantly different from nonparticipants on several measures administered at the initiation of the study (when participants were approximately age 7), including socioeconomic status, ethnicity, initial risk status, delinquency seriousness, and violence seriousness (Loeber et al., 2008; Raine et al., 2006).

The adult outcomes for this study were collected as part of the most recent follow-up of the youngest cohort of men in the PYS in young adulthood (age: M = 25.76, SD = 0.96), which was completed in February 2008. As part of this assessment, interviews were scheduled within the participants' homes or another private location that was convenient. Participants located outside of the state were interviewed by telephone. The interview included several measures of social, emotional, and behavioral functioning and lasted approximately 2.5 hours. Of the 503 original participants in the PYS, 85% participated in this follow-up assessment (N = 427). All procedures for both assessments were approved by the Institutional Review Board at the University of Pittsburgh.

The analyses in this study are based on the 335 participants who completed the Raine substudy. Of the 335 participants, the ethnicity was as follows: 133 Caucasian (39.7%), 191 African American (57.0%), 3 Asian (0.9%), and 8 mixed ethnicity (2.4%).

MEASURES

Predictors in Adolescence (age 16)

Reactive–proactive aggression questionnaire (Raine et al., 2006): Items for this self-reported measure were generated based on empirical and theoretical literature on reactive and proactive aggression (for details, see Raine et al., 2006). Items contained both verbal and physical forms of reactive and proactive aggressive behaviors and were written at a third-grade

reading level. Participants were asked to rate each item in terms of its frequency of occurrence using a 3-point scale (0 = *never* to 2 = *often*). The scale contains 12 items indexing proactive aggression (e.g., "Used force to get money or things from others") and 11 items measuring reactive aggression (e.g., "Hit others to defend yourself"). Factor analyses with child and adolescent samples have supported the two-factor conceptualization of the items (Baker, Raine, Liu, & Jacobson, 2008; Raine et al., 2006). In addition, evidence supporting the construct validity and reliability of the scales has been reported across several studies (Baker et al., 2008; Miller & Lynam, 2003; Raine et al., 2006). Their internal consistencies for the reactive (α = .84) and proactive (α = .85) aggression scales were good.

Child Psychopathy Scale–Revised (CPSr; Lynam et al., 2005): The self-report version of the CPSr was used to assess features of psychopathy in adolescents. The CPSr consists of 13 different 2- to 5-item subscales (41 items total) designed to measure psychopathic features such as manipulation, callousness, impulsiveness, and behavioral dyscontrol. Participants are asked to indicate whether or not the statements included in the measure are true of them by responding either No (0) or Yes (1). For each of the 13 subscales, the percentage of items endorsed is calculated and then all of the subscales are summed to create an adolescent psychopathy composite score. This measure has shown evidence of construct validity in previous studies (for a review, see Lynam et al., 2005). The internal consistency of the composite score in this sample was adequate (α = .72).

Youth Self-Report (YSR; Achenbach & Edelbrock, 1987): The YSR was used to assess features of anxiety and depression in youth. Participants were asked to rate how true certain statements were for them in the past year. An 11-item depression scale (e.g., "you cry a lot") and a 7-item anxiety scale (e.g., "you are nervous or tense") were constructed using select items from the YSR. Items that were endorsed as being "sometimes true" or "very true" were coded 1 and items rated as "never true" were coded 0. Items that made up each of the subscales were then summed to create a total anxiety and depression score. Adequate internal consistency was found for the depression scale (α = .72), whereas the anxiety scale (α = .55) exhibited relatively low internal consistency.

Substance Use Questionnaire (SUQ; Loeber et al., 1998): The SUQ was used to assess the number of days in the past year participants used cigarettes, alcohol, marijuana, and other hard drugs without a prescription (i.e., heroin, cocaine, crack, tranquilizers, pain killers, methamphetamine, barbiturates, PCP, inhalants, and other prescription drugs used illicitly). For each drug, participants were asked to report the number of days they had the substance in the past year ("How many days in the past year did you use marijuana?"). Frequency of hard drug use was calculated by summing together frequencies for all of the hard drugs listed above because of the low base rate of any one substance. Due to the low base rate and limited variability in the frequency of use of all the substances assessed at age 16, variables were dichotomized for analyses. Three items that assess the typical quantity of consumption of beer, wine, and hard liquor (e.g., "When drinking beer, how much do you usually drink?") were used to create a proxy measure of binge drinking. Youth who responded to any of the three items with consuming four or more drinks were coded as having engaged in binge drinking.

Self-Report of Delinquency (SRD; Elliott, Huizinga, & Ageton, 1985): The SRD was used to assess adolescent criminal behavior. For each act of delinquency included in the measure, participants were asked to report how many times they had engaged in the act within the past year. Two scales from this measure were used in the current investigation. First, violence in the past year was assessed using five items related to moderate to serious violent acts (e.g., attacking someone with the intention of seriously hurting/killing them, gang fights). Because there was a low base rate of violent behavior at age 16, the violence variable was dichotomized for analyses as the presence or absence of any violent act. A total delinquency variety scale

was also created by counting how many different violent and nonviolent delinquent acts the participant reported engaging in over the past year. This scale consisted of 25 different delinquent behaviors, including burglary, vandalism, carjacking, and drug dealing.

To control for precursors to antisocial personality disorder in adulthood, a conduct disorder (CD) symptom scale was created using 19 items from the SRD (e.g., "Have you used a weapon, force or strong-armed methods to get money or things from people?") that index 13 of the 15 symptoms of CD in the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.) (DSM-IV; American Psychiatric Association, 2000). This scale was augmented by five items from the YSR that were also consistent with CD symptoms (e.g., "You get into many fights"). A CD symptom was considered present if a behavior consistent with that symptom was endorsed by the participant on either the SRD or YSR. These binary CD symptoms were then summed to create a total CD symptom score. A version of this measure has shown evidence of predictive validity in a previous study (Pardini, White, & Stouthamer-Loeber, 2007). The internal consistency of the scale was modest in this sample (α = .61).

Outcomes in Early Adulthood (age 26)

Adult Self-Report (ASR; Achenbach & Rescorla, 2003): The ASR is the most recent revision of the 1997 edition of the Young Adult Self-Report (YASR) that includes some new items (Achenbach & Rescorla, 2003). Participants are asked to rate aspects of their emotional and behavioral functioning in terms of how well it describes them over the past 6 months (i.e., 0 = *not true*; 1 = *somewhat/sometimes true*; 2 = *very often true*). The measure provides DSM-oriented scales consisting of items that experts from 10 cultures identified as being very consistent with DSM-IV categories (Achenbach & Rescorla, 2003). The DSM-oriented scales used in this study included those measuring depressive problems (14 items; "I feel worthless or inferior"), anxiety problems (7 items; "I am nervous or tense"), and antisocial personality problems (20 items; "I get into many fights"). Evidence indicates that these scales have moderate to high levels of internal consistency and 1-week test–retest reliability in adults, and scores on these scales have been shown to significantly distinguish clinically referred and nonreferred adults (Achenbach & Rescorla, 2003). The internal consistencies for the depressive problems (α = .84), anxiety problems (α = .72), and antisocial personality problems (α = .85) scales were adequate to good in this sample.

Perceived Stress Scale (PSS; Loeber et al., 1998): The PSS was used to assess participants' perceptions of the amount of stress they have recently been under and their perceived ability to cope with problems (e.g., "Have you found that you could not cope with all of the things you had to do?"). The 14-item measure asks participants to rate the frequency with which they experienced the item over the past month using a 5-point scale (1 *never* to 5 *often*). Previous analyses have indicated that this measure has high internal consistency and evidence of predictive validity (Loeber et al., 1998). In this study, the internal consistency of this measure was good (α = .85).

Self-Report of Psychopathy–III (SRP-III; Paulhus, Hemphill, & Hare, in press): The SRP-III was designed as a self-report measure of adult psychopathic features analogous to the Psychopathy Checklist–Revised (Hare, 2003). Participants are asked to rate the extent to which they agree with various statements about themselves using a 5-point Likert-type scale (1 *disagree strongly* to 5 = *agree strongly*). This study used the three scales that assess the facets of psychopathy associated with an erratic lifestyle (e.g., "I've often done dangerous things just for the thrill of it"), interpersonal manipulation (e.g., "I think I could beat a lie detector"), and callous affect (e.g., "Most people are wimps"). Each scale consists of 16 items that are summed so that higher scores indicated increased levels of psychopathic features. Factor analysis has supported these scales as three correlated, yet distinct, factors in nonforensic adult samples

(Williams, Paulhus, & Hare, 2007). Moreover, the construct validity of the SRP-III in nonforensic samples has been supported by studies examining their association with related personality measures (Paulhus & Williams, 2002; Williams et al., 2007), measures of deviant and antisocial behavior (Nathanson, Paulhus, & Williams, 2006a, 2006b), and perseverative responding on the Iowa Gambling Task (Mahmut, Homewood, & Stevenson, 2008). The internal consistencies for the erratic lifestyle ($\alpha = .79$), interpersonal manipulation ($\alpha = .80$), and callous affect ($\alpha = .72$) scales were adequate.

Substance Use Questionnaire (Loeber et al., 1998): This instrument assessed the number of days in the past year participants used cigarettes, alcohol, marijuana, and other hard drugs without a prescription (i.e., heroin, cocaine, crack, tranquilizers, pain killers, methamphetamine, barbiturates, PCP, inhalants, and other prescription drugs used illicitly). For each drug, participants were asked to report the number of days they had used each substance in the past year ("How many days in the past year did you use alcohol?"). Frequency of hard drug use was calculated by summing together frequencies for all hard drugs listed above because of the low base rate of any one substance. These constructs were identical to those created using the same measure at age 16. However, this instrument also assessed the frequency of binge drinking by asking participants to report the number of days in the past year they consumed "5 or more drinks in 2 hours or less," which is consistent with the definition of binge drinking provided by the National Institute on Alcohol Abuse and Alcoholism (NIAAA, 2004).

Self-Report of Delinquency (Elliott et al., 1985): The SRD was used to assess criminal behavior in adulthood. For each act of delinquency, participants were first asked whether or not they had committed the act described within the past 5 years and were then asked to report how many times they had engaged in the acts within the past year. Two scales from this measure were used in this investigation, which were nearly identical to those assessed using the SRD at age 16. First, a frequency of violence in the past year was calculated by summing five items related to moderate to serious violent acts (e.g., attacking someone with the intention of seriously hurting/killing them, gang fights). A total delinquency variety scale was also created by counting how many different violent and nonviolent delinquent acts the participant reported engaging in over the past 5 years. This scale consisted of 25 different delinquent behaviors, including burglary, vandalism, carjacking, and drug dealing.

RESULTS

Associations between reactive and proactive aggression, antisocial behavior, negative emotions, and drug use were examined at age 16 and again longitudinally at age 26. More specific, bivariate correlations between variables and path models were estimated. In the path models, outcomes were regressed simultaneously onto measures of reactive and proactive aggression to examine unique associations between these forms of aggression and the outcomes. [1] Two path models were estimated: one that examined associations between reactive and proactive aggression and outcomes at age 16, and a longitudinal model in which reactive and proactive aggression assessed at age 16 predicted outcomes in adulthood (age 26). Race was included as a covariate in both path models because it was associated with several outcomes. In the longitudinal models predicting adult outcomes, early forms of the outcomes assessed at age 16 were included as covariates to control for the stability of these constructs over time. For example, paths from the delinquency, anxiety, depression, and substance use

[1]Multicollinearity is not typically a concern for correlations less than .90 (Tabachnick & Fidell, 2001). Nonetheless, diagnostic statistics were estimated, revealing a tolerance value of .55 and Variance Inflation Factor (VIF) value of 1.81 for the reactive and proactive aggression variables. Tolerance is a concern for values of <.1 and/or VIF values > 10 (Cohen, Cohen, West, & Aiken, 2003). Therefore, multicollinearity between reactive and proactive aggression was not a concern for this study.

scales measured at age 16 and the comparable outcomes measured in adulthood were included in the model. Conduct problems measured at age 16 was used as the stability covariate for antisocial personality, and the CPSr was used as the stability covariate for the psychopathy subscales at age 26. Because perceived stress was not assessed at age 16, the anxiety scale measured at this assessment was used as the stability covariate for the perceived stress at age 26.

All models were estimated using Mplus 5.2 statistical software (Muthen & Muthen, 2009). Full information maximum likelihood estimation was used to handle missing data. Fit indices used to evaluate the path models included χ^2, comparative fit index (CFI), and root mean square error of approximation (RMSEA). A model is considered a good fit when $\chi^2/2 < 2.0$, CFI > .95, and RMSEA < .08 (Bollen & Curren, 2006; Hu & Bentler, 1999; Tabachnick & Fidell, 2001). The age 16 path model did not produce model fit statistics due to the inclusion of both continuous and dichotomous outcome variables.

AGE 16 ANALYSES

Associations between reactive and proactive aggression, antisocial behavior, negative emotions, and substance use assessed at age 16 are reported in Table 1. Means and standard deviations of age 16 outcomes are also reported in Table 1. Reactive and proactive forms of aggression were both significantly correlated with all outcomes, with the exception of hard drugs. A path model in which age 16 outcomes were simultaneously regressed on reactive and proactive aggression and race indicated that reactive and proactive aggression were both uniquely associated with delinquency, psychopathy, and binge drinking. Whereas reactive aggression was uniquely associated with depression, anxiety, and alcohol use, proactive aggression was uniquely associated with violence, conduct problems, cigarette use, and marijuana use. The age 16 associations between reactive and proactive aggression and measures of psychopathy, delinquency, anxiety, and depression have previously been reported in Raine et al. (2006).

LONGITUDINAL ANALYSES

Correlations, means, and standard deviations of reactive and proactive aggression and adult outcome variables are reported in Table 2. Consistent with previous research (e.g., Fite & Colder, 2007), mean levels of reactive aggression were higher than mean levels of proactive aggression ($t = 24.63$, $p < .001$) and reactive and proactive aggression were highly correlated with one another ($r = .66$, $p < .001$). The outcomes, with the exception of frequency of alcohol use, were correlated with either reactive or proactive or both subtypes of aggression. Specifically, both subtypes of aggression were associated with the delinquency, psychopathy, depression, and anxiety scales. Whereas reactive aggression was uniquely associated with perceived stress, marijuana use, and hard drugs, proactive aggression was associated with violence, cigarette use, and binge drinking.

A path model in which age 26 outcomes were regressed on their age 16 comparable behaviors, reactive and proactive aggression scales, and race was then estimated (see Tables 3, 4, and 5). This model provided a good fit to the data, $\chi^2(140) = 187.7$, CFI = .97, RMSEA = .03. Results indicated that proactive aggression was uniquely positively associated with violence, delinquency, the interpersonal manipulation and callous affect psychopathy subscales, and antisocial personality problems (see Table 3), whereas the relation between reactive aggression and these outcomes was nonsignificant. In contrast, reactive aggression was uniquely positively associated with anxiety, whereas proactive aggression was unrelated to all negative emotions (see Table 4). Results for substance use outcomes (see Table 5) indicated that reactive aggression was uniquely associated with frequency of hard drug use and was marginally statistically associated with marijuana use. Although neither proactive nor reactive aggression

exhibited significant associations with frequency of alcohol or cigarette use, proactive aggression was uniquely associated with frequency of binge drinking.[2]

DISCUSSION

This study examined relations between adolescent reactive and proactive aggression and various domains of functioning assessed contemporaneously in adolescence as well as 10 years later in early adulthood (i.e., age 26). Both reactive aggression and proactive aggression were associated with many of these outcomes at the bivariate level. However, after controlling for the overlap between the two forms of aggression, reactive aggression was uniquely associated with indicators of negative emotionality, most consistently anxiety, whereas proactive aggression was uniquely associated with indicators of antisocial behavior, including violence and antisocial personality. Although both reactive and proactive functions of aggression were uniquely associated with substance use, the type of substance use differed among the aggression subtypes. Overall, the findings indicated that there are unique developmental outcomes of adolescent reactive and proactive aggression in adulthood and suggest the need for targeted interventions for adolescents exhibiting these two subtypes of aggression.

Reactive aggression was uniquely associated with indicators of negative emotionality (i.e., depression and anxiety) at age 16, which is consistent with previous cross-sectional research linking reactive aggression to negative emotions in childhood and adolescence (Card & Little, 2006; Fite et al., 2009a; Miller & Lynam, 2006; Raine et al., 2006). Moreover, these findings extend previous research by establishing a distinct link between age 16 reactive aggression and anxiety at age 26, even after controlling for the continuity of anxiety over time. It is interesting that reactive aggression was uniquely associated with depression cross-sectionally at age 16 and correlated with depression at age 26 but was not uniquely associated with depression at age 26 after controlling for the stability of depression. This suggests that reactive aggression may be associated with adolescent-onset forms of depression that persist into adulthood but not with increases in depressive problems from adolescence into adulthood. The link between reactive aggression and negative emotionality may be the result of experiencing peer rejection and social isolation (e.g., Dodge & Coie, 1987; Dodge et al., 1997; Prinstein & Cillessen, 2003). Reactive aggression may also be linked to internalizing behavior as a result of temperament characterized by poor emotion regulation, such as anger, sadness, and reactivity (Vitaro et al., 2002).

Reactive aggression was also uniquely associated with alcohol and binge drinking at age 16 and prospectively linked with substance use, specifically marijuana and other illicit drugs, at age 26. Reactive aggression is impulsive behavior, and impulsivity is a risk factor for substance use (e.g., Acton, 2003; Moeller & Dougherty, 2002). Moreover, the link between reactive aggression and substance use may be the result of experiencing negative emotions (e.g., Hussong & Hicks, 2003; Pardini et al., 2004). Consistent with this research, indicators of negative emotions and substance use measured in early adulthood were significantly correlated with one another in this study.

Note that reactive aggression was also uniquely associated with delinquency and psychopathy, but not with violence or conduct problems at age 16. Moreover, reactive aggression was not uniquely related to any antisocial outcomes at age 26. Consistent with Moffitt's (1993) distinction between life-course persistent and adolescent-limited antisocial behavior, it may be

[2]Race by aggression subtype interactions were examined to determine whether relations between reactive and proactive aggression and age 26 outcomes varied as a function of race. The only significant interaction found was for the relation between reactive aggression and any hard drugs (B −2.03, $p = .03$). For both races, reactive aggression was positively associated with frequency of hard drug use; however, this relation was stronger for Caucasian participants (B = 7.51, $p < .01$) than for minority participants (B = 1.02, $p = .03$).

that reactive aggression is associated with a less severe, adolescent-limited form of antisocial behavior.

In contrast to findings with reactive aggression, adolescent proactive aggression was consistently linked with increased levels of antisocial behavior and substance use in early adulthood. This is consistent with previous cross-sectional studies with children, adolescents, and adults (e.g., Barry et al., 2007; Cornell et al., 1996; Fite et al., 2008a; Fite et al., 2009a, 2009b; Raine et al., 2006). Proactive aggression was also uniquely associated with adult psychopathic characteristics, consistent with a larger literature showing a link between proactive aggression and callous and unemotional features of psychopathy in childhood and adolescence (Barry et al., 2007; Fite et al., 2009a, 2009b). The developmental progression of proactive aggression to more severe and persistent antisocial behavior is consistent with Moffitt's (1993) conceptualization that early-onset antisocial behavior is associated with poor long-term outcomes. These results indicate that adolescent proactive aggression seems to be a marker for an early-onset persistent form of antisocial behavior (Vitaro & Brendgen, 2005), given its link with antisocial behavior and psychopathy in adulthood. Proactive aggression was also uniquely associated with cigarette use, marijuana use, and binge drinking at age 16, and predictive of binge drinking at age 26. Proactively aggressive individuals may be prone to engage in substance use because they overemphasize the positive effects of substances and experience little anxiety when considering the negative consequences of substance use. Consistent with this notion, low fearfulness has been associated with substance use initiation and the development of alcohol abuse by early adulthood (Pardini et al., 2004; Pardini et al., 2007), and proactive aggression has been associated with blunted negative affect as well as increased sensation seeking (Raine et al., 2006).

LIMITATIONS AND CONCLUSIONS

Limitations of the study include the use of self-reported data for all study constructs. It would be useful for findings to be replicated using multiple informants (e.g., significant others). In addition, the PYS included only male participants, and therefore, results of this study may not generalize to females. In addition, a few measures had low to moderate internal consistencies, reducing the power to detect significant effects. As such, findings should be replicated using more internally consistent measures. It is also important to note that reactive and proactive aggression are not accounting for a large portion of the overall variance in the adult outcomes. However, it is remarkable that these subtypes of aggression are uniquely associated with outcomes 10 years later, even after controlling for the stability of these behaviors over time. Finally, it is important to keep in mind that causation cannot be inferred from prospective analyses.

Despite these limitations, the findings are consistent with a growing body of literature supporting the utility in distinguishing between reactive and proactive subtypes of aggression. Results suggest that adolescent reactive and proactive aggression are differentially associated with adult outcomes assessed 10 years later when controlling for the overlap between the constructs. Reactive aggression in adolescence appears to be a risk factor for negative emotionality into adulthood, specifically anxiety, whereas proactive aggression in adolescence appears to be a risk factor for antisocial outcomes and psychopathic features into adulthood. Although both types of aggression appear to be linked to substance use, reactive aggression seems to be a risk factor for illegal substances in adulthood whereas proactive aggression appears to be linked to risky and harmful use of alcohol in adulthood.

The results validate the need for targeted interventions aimed at adolescents exhibiting reactive and proactive aggression. Individuals who exhibit reactively aggressive behavior should receive treatments aimed at preventing the development of emotional problems, such as depression and anxiety. These interventions should teach reactively aggressive youth effective

ways to cope with negative emotions, as well as emphasize social skills that promote positive peer relationships as a way to buffer against the development of emotional problems. In contrast, adolescents who exhibit proactive aggressive behavior are a particularly important target for the prevention of more serious antisocial behavior. Problem-solving skills training that emphasizes the importance of accurately evaluating the positive and negative consequences of behaviors is likely to be an important component in interventions for proactively aggressive adolescence. Adolescents exhibiting reactive and proactive aggression would also benefit from intervention strategies designed to prevent substance use problems. However, the mechanisms behind the development of substance use problems may differ based on the type of aggression exhibited and may warrant different intervention strategies. Whereas intervention efforts will likely include a combination of strategies due to the frequent co-occurrence of proactive and reactive aggression, treatment effectiveness may be optimized by focusing on strategies that target the dominant subtype of aggression exhibited by an adolescent.

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TABLE 1

Bivariate Correlations and Standardized Path Coefficients of Associations Between Reactive and Proactive Aggression and Outcomes at Age 16

	Proactive Aggression		Reactive Aggression	
Outcomes at Age 16	**r**	**Path Estimate**	**r**	**Path Estimate**
Delinquency (*M* = 0.95; *SD* = 2.07)	.41*	.31*	.36*	.15*
Violence (*M* = 0.09; *SD* = 0.28)	.31*	.26*	.24*	.06
Psychopathy (*M* = 4.19; *SD* = 1.97)	.51*	.34*	.49*	.27*
Conduct problems (*M* = 0.57; *SD* = 1.03)	.40*	.36*	.31*	.08
Depression (*M* = 1.24; *SD* = 1.61)	.21*	−.03	.35*	.37*
Anxiety (*M* = 1.34; *SD* = 1.37)	.22*	.08	.27*	.22*
Cigarette (*M* = 0.27; *SD* = 0.45)	.20*	.27*	.13*	−.01
Alcohol (*M* = 0.40; *SD* = 0.49)	.19*	.13	.22*	.18*
Binge drinking (*M* = 0.18; *SD* = 0.38)	.21*	.16†	.22*	.19*
Marijuana (*M* = 0.27; *SD* = 0.15)	.26*	.21*	.22*	.12
Any hard drug (*M* = 0.01; *SD* = 0.12)	.03	−.06	.07	.30

† $p \leq .10$.

* $p \leq .05$.

TABLE 2

Correlations, Means, and Standard Deviations of Reactive and Proactive Aggression and Age 26 Outcomes

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1.	Race	–																
2.	RA	.08	–															
3.	PA	.13*	.66*	–														
4.	Viol	.11	.04	.13*	–													
5.	Del	.05	.17*	.20*	.23*	–												
6.	Man	.15*	.21*	.27*	.18*	.30*	–											
7.	Call	.16*	.17*	.31*	.21*	.31*	.64*	–										
8.	Errat	.00	.22*	.23*	.15*	.38*	.60*	.56*	–									
9.	Anti	.12*	.20*	.25*	.23*	.37*	.50*	.40*	.52*	–								
10.	Dep	.08	.18*	.12*	.06	.08	.32*	.19*	.27*	.64*	–							
11.	Anx	.08	.27*	.17*	.09	.17*	.26*	.10	.25*	.52*	.67*	–						
12.	Stres	.17*	.12*	.11	.04	.20*	.25*	.16*	.21*	.31*	.35*	.36*	–					
13.	Cig	.06	.04	.14*	.02	.13*	.13*	.20*	.28*	.19*	.09	.08	.22*	–				
14.	Mar	.25*	.12*	.08	.09	.19*	.20*	.23*	.22*	.25*	.23*	.21*	.17*	.21*	–			
15.	Alc	.13*	.04	.07	.17*	.07	.24*	.21*	.19*	.17*	.13*	.02	.05	.19*	.29*	–		
16.	Hard	–.14*	.17*	.08	–.02	.37*	.11*	.02	.19*	.23*	.13*	.07	.12*	.13*	.08	.00	–	
17.	Bing	.03	.09	.18*	.19*	.14*	.22*	.23*	.19*	.19*	.09	.01	.04	.20*	.13*	.51*	.01	–
M		1.60	7.13	2.78	.14	1.06	40.14	40.33	44.50	4.79	3.13	3.16	32.83	181.12	68.45	97.83	4.10	13.61
SD		.49	4.19	3.46	.84	1.99	8.70	7.37	9.01	5.11	3.97	2.56	7.49	174.18	129.79	123.82	26.34	39.30

Note. RA = reactive aggression; PA = proactive aggression; Viol = violence; Del = delinquency; Man = interpersonal manipulation; Call = callous affect; Errat = erratic lifestyle; Anti = antisocial personality; Dep = depressive symptoms; Anx = anxiety symptoms; Stres = stress; Cig = frequency of marijuana use; Alc = frequency of alcohol use; Hard = frequency of any hard drug; Bing = binge drinking.

*$p \leq .05$.

TABLE 3

Adolescent Reactive and Proactive Aggression Predicting Facets of Antisocial Behavior in Early Adulthood

	Delinquency	Violence	Interpersonal Manipulation	Callous Affect	Erratic Lifestyle	Antisocial Personality
	$R^2 = .04$	$R^2 = .04$	$R^2 = .10$	$R^2 = .12$	$R^2 = .07$	$R^2 = .08$
	Path Estimate	Path Estimate	Path Estimate	Path Estimate	Path Estimate	Path Estimate
Proactive aggression	.17*	.21*	.18*	.32*	.12	.22*
Reactive aggression	.07	−.08	.01	−.10	.07	.06

Note. Standardized path coefficients are reported. Race and proxies for the adult outcomes measured at age 16 were included as covariates in the model and are reflected in R^2 values.

*$p \leq .05$.

TABLE 4

Adolescent Reactive and Proactive Aggression Predicting Negative Emotionality in Early Adulthood

	Depression	Anxiety	Perceived Stress
	$R^2 = .08$	$R^2 = .10$	$R^2 = .08$
	Path Estimate	Path Estimate	Path Estimate
Proactive aggression	.01	−.04	.01
Reactive aggression	.09	.25*	.05

Note. Standardized path coefficients are reported. Race and proxies for the adult outcomes measured at age 16 were included as covariates in the model and are reflected in R^2 values.

*$p \leq .05$.

TABLE 5

Adolescent Reactive and Proactive Aggression Predicting Substance Use Outcomes in Early Adulthood

	Cigarette	Alcohol	Binge Drinking	Marijuana	Any Hard Drug
	R^2 = .17	R^2 = .03	R^2 = .04	R^2 = .08	R^2 = .09
	Path Estimate	Path Estimate	Path Estimate	Path Estimate	Path Estimate
Proactive aggression	.10	.05	.20*	−.02	−.05
Reactive aggression	−.09	−.02	−.06	.13†	.19*

Note. Standardized path coefficients are reported. Race and proxies for the adult outcomes measured at age 16 were included as covariates in the model and are reflected in R^2 values.

† $p \leq .10$.

* $p \leq .05$.