Published in final edited form as:
Aggress Behav. 2008 ; 34(5): 511–520. doi:10.1002/ab.20263.

Adolescent Aggression and Social Cognition in the Context of Personality: Impulsivity as a Moderator of Predictions from Social Information Processing

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Abstract

This study asked how individual differences in social cognition and personality interact in predicting later aggressive behavior. It was hypothesized that the relationship between immediate response evaluations in social information processing (SIP) and later aggressive behavior would be moderated by impulsivity. In particular, the immediate positive evaluations of aggressive responses would be more strongly related to later aggressive behavior for high-impulsive than for low-impulsive individuals, because high-impulsive children would be less likely to integrate peripheral information and consider long-term future consequences of their actions. Participants were 585 adolescents (52% male) and their mothers and teachers from the longitudinal Child Development Project. Structural equation modeling indicated that teacher-reported impulsivity at ages 11–13 moderated the association between adolescents' endorsement of aggressive responses in hypothetical, ambiguous situations and subsequent mother-reported aggressive behavior. Specifically, positive endorsement of aggressive responses at age 13 was significantly related to later aggressive behavior (age 14–17) for participants with high and medium levels of impulsivity, but this association was not significant for participants with low levels of impulsivity. This study provides evidence of personality variables as potential moderators of the link between SIP and behavior.

INTRODUCTION

Social information-processing (SIP) models attempt to account for individual differences in children's behavior by describing cognitive steps involved in processing information in a social situation. One SIP model is that of Dodge and colleagues [e.g., Crick and Dodge, 1994; Dodge, 1986]. The current version of this model includes six steps. The first step, encoding, refers to the child's awareness of and attention to the many external and internal cues encountered in a given social encounter. The second step, interpretation, involves placing the social encounter in a broader context, including self- and other-evaluation and attributions of intent. Step 3 is the clarification of the child's goals in the given situation (e.g., get my toy back, make a new friend, etc.). Step 4 is the generation of possible responses to the situation. Step 5 involves response evaluation and decision; this evaluation and choice of best response may be based on goals, results expected from a given response,

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and feelings of self-efficacy. The final step in the model is behavioral enactment of a chosen response.

SIP is usually measured using interviews and questionnaires about hypothetical situations, interviews about real social events, and self-report questionnaires [Crick and Dodge, 1994]. The variables most often measured are encoding, attributions, response generation, and evaluation of responses. Dodge and his colleagues [Dodge et al, 2002] used multidimensional latent-construct analysis to test the fit of a four-step model (attribution bias, goal setting, response generation, and response evaluation) in a subsample of the Fast Track [Conduct Problems Prevention Research Group, 1992] normative control group. They found that the four-construct model provided the best fit to the data, providing support for conceptualizing the SIP steps as distinct constructs. Problems in SIP are moderately stable over time [Dodge et al., 1995; Zelli et al., 1999], suggesting SIP steps may be conceptualized as acquired trait-like constructs.

More than 100 studies have shown that measures of SIP are significantly associated with behavior, particularly aggression [Dodge, 2003]. For example, correct encoding of socially relevant cues is associated with teacher and peer reports of behavioral competence in provocative situations with peers and authority figures, as well as with rejected-aggressive status [Dodge and Price, 1994; Dodge and Tomlin, 1987]. Accuracy of interpretation of intent cues has been associated with children's aggressive responses [e.g., physically or verbally hostile, or retaliatory destruction; Dodge et al., 1984], and a bias toward hostile attributions in ambiguous situations has been associated with rejected peer status [Dodge, 1980]. Generation of aggressive responses has been correlated with children's aggressive behavior [Dodge and Price, 1994; Rabiner et al., 1990]. Finally, anticipation of positive outcomes from hypothetical aggressive responses has been associated with peer reports of aggressive behavior [Perry et al., 1986], and children's approval or endorsement of aggressive responses has also been found to correlate with aggressive behavior [Astor, 1994], even when controlling for previous levels of externalizing behavior [Fontaine et al., 2002]. The majority of these findings hold true for many different measures of aggressive behavior, such as parent, teacher, and peer reports, behavioral observations, and police records, as well as for many different groups of children, such as boys and girls, European-Americans and African-Americans, and young children and adolescents [Dodge, 2003].

Although the relationship between SIP and behavior is well established, most reported associations are modest in size [e.g., Dodge and Price, 1994] and utilize contemporaneous data. Longitudinal studies that explore the association between SIP and behavior over time typically find effects of a lower magnitude, especially when controlling for earlier behavior. Most studies controlling for prior levels of aggressive behavior find that the combined SIP steps yield a significant, although small, increment in variance predicted [e.g., R^2 = .04, Fontaine et al., 2002; R^2 = .07, Weiss et al., 1992]. The generally modest relations leave open the possibility of moderator effects. Perhaps SIP indices are more closely linked to aggression for some groups of children than for others. Few studies have explored moderators of the association between individual SIP steps and behavior.

Dodge and Newman [1981] explored the role of speed of decision-making in the association between hostile attribution and aggressive group status in a sample of 81 elementary school boys classified as aggressive or nonaggressive based on teacher and peer reports. Participants listened to a story about a boy who may have committed a hostile act; in all stories, the boy's guilt was ambiguous. They were then allowed to listen to up to five audio testimonials by different "peers" of the "suspect" in order to gather enough evidence to make a decision about whether the boy committed the hostile act. Content of the testimonials was counterbalanced across participants. The number of testimonials sought

was taken as indicator of speed of decision-making, and the number of guilty decisions made was the indicator of hostile attribution. Dodge and Newman divided the participants into groups of quick and slow responders based on within-cell median splits on the number of testimonials heard. Boys in the aggressive, quick-responding group were more likely to make a decision of "guilty" than the pooled group of aggressive, slow responders and all nonaggressive participants. The authors present this as "empirical support for the hypothesis that aggressive boys who respond quickly will attribute hostile behaviors to others in unwarranted circumstances" and "aggressive boys who [do] not respond quickly [make] decisions that [are] not biased or different from those of non-aggressive boys" [Dodge and Newman, 1981].

Dodge and Newman [1981] presented their findings as support for an interaction between speed of processing and aggressive group status in predicting hostile attributions. However, their measure of speed of decision-making may have been confounded with such factors as interest in the task (i.e., boys who were not interested in participating may have requested fewer testimonials in an effort to finish earlier) or high demand characteristics (i.e., pro-social boys may have requested more testimonials in an effort to please the experimenter). While the Dodge and Newman study is an intriguing first step, explorations of speed of processing as a moderator of SIP steps should be explored further.

Another investigation of possible moderators of the SIP-behavior association was conducted by Cates and Shontz [1996], who suggested that the emphasis on emotion-free, rational cognition in the experimental situation may be an important factor in the moderate-to-weak associations between SIP measures and behavior. In a group of 62 third- and fourth-grade boys identified by their teachers as aggressive or nonaggressive, the authors explored the role of arousal (operationalized as time pressure) and group status in predicting hostile attributions. Hypothetical vignettes developed by Dodge [1980] were used to measure attribution. The interaction between aggression group and arousal approached significance ($p = .057$) in predicting hostile attributions to peers. Arousal condition was significant only for the aggressive group, such that time pressure was significantly associated with hostile attributions for aggressive boys but not for non-aggressive boys. Cates and Shontz [1996] proposed that a replication of these findings would suggest that aggressive boys are more likely to make hostile attributions when they are experiencing elevated levels of arousal or have a lack of time to generate other interpretations.

These previous investigations of possible moderators, which focused on speed of decision-making and arousal, have identified an important limitation in the common methods of measuring SIP patterns. Hypothetical vignettes provide minimal information and relatively simple responses. Characteristic ways of thinking about these situations may not always generalize to real-life situations because an arousing social situation unfolding in real-time requires fast identification of elements, processing of large amounts of information and, often, complex responses. As established in much previous research [e.g., Olson et al., 1990], children differ in their tendency to process information thoroughly before acting. Some children are prone to act without thinking, whereas others are more likely to pause and consider the unique elements of a social situation before acting. Additionally, the SIP measurement paradigm does not address the effect of social feedback once a response is put into action, which may alter a child's response in a real-life situation.

Impulsivity may be a personality variable of consequence to the SIP–behavior link. As an independent predictor, impulsivity is associated concurrently with verbal and physical aggression [Shapiro et al., 1988; Vigil-Colet and Codorniu-Raga, 2004] and number of arrests and crimes committed [Babinski et al., 1999], and is associated prospectively with delinquency [White et al., 1994]. In addition, as an interactive predictor, impulsivity has

been found to moderate the influence of social factors, such as affiliating with deviant peers [Goodnight et al., 2006] and neighborhood disadvantage [Lynam et al., 2000]. Differences in impulsivity need not necessarily covary with differences in social information processing. However, impulsivity may moderate the link between SIP problems and aggressive behavior.

Personality research characterizes impulsivity as the enduring tendency to act without thinking or to respond quickly to a given stimulus, without deliberation or evaluation of consequences [White et al., 1994]. This deficit in attention to future consequences suggests that the response evaluation step, which requires consideration of both immediate and long-term future consequences of an action or response, may be particularly influenced by impulsivity. In the context of SIP patterns, a child who often acts without considering the unique elements of a particular social situation may be more likely to rely on their "default" way of processing and responding. SIP patterns are measured by presenting simple vignettes in a laboratory setting, where responses and their immediate and future consequences are only hypothetical. However, real SIP is a continual process unfolding in a world with tangible consequences. When faced with a potentially conflictual situation in real life, children who are not impulsive are likely to consider the unique elements of the situation at hand and deliberate on the future consequences of their potential responses. Although they may have endorsed an aggressive hypothetical response in a laboratory task, they may recognize a nonaggressive response as being optimal in a particular real-life situation. However, impulsive children are less likely to integrate peripheral information and consider long-term future consequences of their actions in a particular situation, and by failing to do so, they may not recognize important differences between hypothetical and real responses. Furthermore, once an aggressive response has been put into action, nonimpulsive children may be more able to process immediate feedback and alter their response in real-time. However, once an impulsive child has enacted a response, they may not possess the effortful control skills necessary to reevaluate or change a response once it has been enacted [Newman and Wallace, 1993].

This Study

Using longitudinal data and multiple reporters, the current study asked whether personality moderates the association between the response evaluation step of the SIP model and aggressive behavior over time. Although other SIP steps may be influenced by impulsivity, we chose to focus on the response evaluation step because impulsivity is particularly likely to affect the link between a hypothetical response chosen on the basis of a set of expected consequences and a real-life response that may be modified during enactment on the basis of real-time feedback. We hypothesized that impulsivity would moderate the predictiveness of response evaluation, such that positive evaluation of aggressive responses would be more related to future behavior for high-impulsive than low-impulsive individuals. We expected that high-impulsive individuals would not consider future consequences of their actions in daily life and would have difficulty altering their behavior in response to ongoing feedback. Thus, their preferred response to a hypothetical provocative situation would match their responses in real-life situations. We expected that low-impulsive individuals would vary greatly in their preferred response from one situation to the next based on relevant peripheral details and would alter their behavior in response to ongoing feedback. Thus, SIP responses would be less likely to be translated directly into behaviors for these individuals. Impuisivity was reported by teachers, who observe the child in many social interactions with a variety of peers each school day. Additionally, we statistically controlled for earlier aggressive behavior so that we could test whether the interaction between personality and SIP predicts development of aggressive behavior above and beyond mere continuity of early behavior

patterns. Given differences between males and females in aggression, we included sex as a covariate in our models.

METHOD

Participants

Participants and their families were part of the Child Development Project [Dodge et al., 1990; Pettit et al., 1997], which initially recruited 585 families from Nashville and Knoxville, TN, and Bloomington, IN, as their children were entering kindergarten. At the time of enrollment in the study, 40 children were of age 4, 526 children were of age 5, and 19 children were of age 6. Eighty-one percent of the original sample was European-American, 17% African-American, and 2% other. Fifty-two percent of the original sample was male. Hollingshead [Unpublished Manuscript, 1979] socioeconomic status was calculated for the entire sample in year 1 of the study and was based on parental educational level and occupation. Hollingshead SES scores ranged from 8 to 66, with a mean of 39.5 (SD = 14.0). Informed consent was obtained from parents and assent was obtained from minors at each data collection.

Measures

Social information processing—At age 13, participants visited the laboratory to complete the annual interview. During this visit, they were presented with a series of vignettes that depicted an adolescent protagonist in a social interaction with a peer or adult that ended in an ambiguous provocation (e.g., you sit down at a lunch table with a group of kids, but they say “You can’t sit there”). Participants were asked to imagine themselves as the protagonist of each situation and were asked questions assessing SIP constructs following the presentation of each vignette. The assessment began with the presentation of six videotaped vignettes featuring adolescent actors. Three of the vignettes were gender-neutral and were shown to all participants; participants were also shown an additional three vignettes that depicted gender-specific situations (e.g., a boy asking a girl to dance at a party, a girl offering homework help to a boy she likes). Participants were then shown nine additional vignettes in the form of line drawings while the experimenter read a scripted verbal description of the drawn event.

Response evaluation was assessed by measuring endorsement of aggressive responses. Adolescents reported the likelihood that a hypothetical aggressive response would lead to a desired outcome, how they feel about themselves if they responded aggressively, and to what extent others would like them if they responded aggressively. Scores were standardized and averaged across vignettes to create a composite score (α = .83), where a higher score indicates a more positive evaluation of aggressive responses [see Burks et al., 1999, for more information on the SIP assessment]. Because some research suggests that SIP measures are more predictive of behavior in adolescence than in early childhood [Davis-Kean et al., 2007], we focused only on response evaluation as measured at age 13.

Impulsivity—We used teacher reports of classroom behavior on the Teacher Report Form [TRF; Achenbach, 1991] as a measure of impulsivity. We used reports from ages 11 through 13 in order to create a more stable estimate of impulsivity. On the basis of the method of White et al. [1994], we computed a Teacher Impulsivity Scale score by adding scores on seven TRF items (fails to finish things she/he starts; impulsive or acts without thinking; demands must be met immediately; talks out of turn; demands a lot of attention; disturbs other pupils; disrupts class discipline) on the basis of face validity. Items were added within each year and combined as observed factors for a latent impulsivity construct. This scale had good internal consistency (α = .93). White et al. [1994] found that a similar teacher-reported

impulsivity scale was significantly correlated to a modest to moderate degree with observations of motor restlessness and impatience [White et al., 1994], scores on the Eysenck Impulsiveness Scale [Eysenck et al., 1984], Trail Making Test forms A and B, time perception [White et al., 1994], and Newman's Card Playing Task [Newman et al., 1987] and Delay of Gratification [Newman et al., 1992].

Aggressive behavior—Aggressive behavior was measured annually from age 14 to age 17 by mother report on the aggression subscale of the Child Behavior Checklist [CBCL; Achenbach, 1991]. The aggressive subscale indexes interpersonal and physical aggression (e.g., cruel to others, fights, destroys others' things) and disruptive behavior (e.g., showing off, unusually loud). The CBCL Is empirically derived and has shown adequate levels of reliability and validity [Achenbach, 1991]. Subscale scores for each year served as indicators of an adolescent aggressive behavior latent factor. This aggressive behavior factor was the outcome variable in the structural equation model.

We also created an early aggressive behavior latent factor using CBCL aggression subscale scores from ages 8 through 10, the three years before the measurement of teacher-reported impulsivity, so that we could statistically control for earlier aggressive behavior. For both the early aggression and adolescent aggression constructs, we chose to use data from multiple time points in order to obtain a more stable estimate of behavior.

Missing data—Owing to missing data, sample sizes differ for each measure and range from 394 to 585 (see Table I for all descriptives). Of the 110 total contrasts, 10 (9%) reached a significance value of $P < .05$. On all 4 years of the adolescent aggression outcome measure, participants with missing data were likely to have a higher impulsivity score on at least one of the three measures of impulsivity than participants for whom adolescent aggression data were available. These differences indicate that data were not missing completely at random (MCAR) and that listwise deletion (complete cases analysis) would have caused the structural equation model to produce biased parameter estimates. Thus, full information maximum likelihood (FIML) estimation was used. FIML estimation produces unbiased estimates when data are missing at random (MAR). Although there is no definitive test of whether data are or are not MAR, FIML has been shown to produce valid estimates even when data are not MAR [Schafer and Graham, 2002].

Analyses

The hypothesized model was tested using structural equation modeling in the Mplus statistical program [Muthén and Muthén, 1998–2007] with a robust maximum likelihood estimator that adjusted fit indexes and standard errors for the biasing effects of nonnormality. The moderating effects of impulsivity were explored using latent moderated structural (LMS) equations, which allowed us to estimate continuous interaction effects between latent (impulsivity) and observed (response evaluation) variables. LMS, which also directly accounts for nonnormality introduced by the inclusion of interaction effects, has been shown to be unbiased and more efficient than other approaches to estimating latent interactions [Klein and Moosbrugger, 2000; Moosbrugger et al., 1997], However, the LMS approach does not provide conventional fit indices, thus the model fit cannot be evaluated independently. Instead, fit indices are computed for the main effects model excluding the interaction term. Evaluation of fit for the interaction model relative to the main effect model can then be extrapolated by observing the significance level of the interaction term in the interaction model.

RESULTS

We first tested the fit of the main effects model. This model included child sex, early aggression, impulsivity, and response evaluation as main effect predictors of adolescent aggression (see Fig. 1). In addition, sex was allowed to predict all the other predictors in the model, and early aggression, impulsivity, and response evaluation were allowed to covary with each other. The main effects model fit the data well: Satorra-Bentler χ^2 (46) = 51.00, p = .28, CFI = .997, RMSEA = .014. Adolescent aggression was significantly predicted by child sex, β = .14, P < .001, early aggression, β = .61, P < .001, and impulsivity, β = .32, P < .001, but was predicted by response evaluation only to a trend-degree, β = .07, p = .10. All path estimates are shown in Figure 1.

We then added the interaction between impulsivity and response evaluation to the model using the LMS modeling approach. The new model is shown in Figure 2 with the standardized estimated values for the main effects path coefficients and β representing the effect of response evaluation as moderated by impulsivity. This interaction effect was significant, P < .05, indicating that this model fits the data significantly better than the main effects model in Figure 1. The meaning of this moderating effect of impulsivity on the association between SIP response evaluation and adolescent aggressive behavior is illustrated by presenting the values of the path coefficient (β) from response evaluation to adolescent aggression for three levels of impulsivity (+1 SD, mean, −1 SD). Response evaluation was significantly associated with subsequent aggressive behavior for high-impulsive, β = .27, p = .02, and average-impulsive adolescents, β = .12, p = .04, but not for low-impulsive adolescents, β = −.03, p = .61, respectively. By calculating a region of significance, we determined that response evaluation was significantly positively associated with aggressive behavior for participants who scored higher than −0.02 SD below the mean on impulsivity, which included 42.6% of our sample. These differential effects of response evaluation at high, medium, and low levels of impulsivity are presented graphically in Figure 3.

DISCUSSION

Given the modest associations between SIP measures and aggressive behavior in previous literature, it is possible that SIP measures are more predictive of behavior for some groups of children than for others. The present study explored impulsivity as a possible moderator of the association between SIP measures and later aggressive behavior. As a main effect predictor, SIP response evaluation at age 13 predicted subsequent adolescent aggressive behavior only to a trend degree when controlling for the effects of impulsivity, child sex, and early aggressive behavior. We then asked whether this weak SIP–behavior association held for all groups of children or if impulsivity moderated the SIP–behavior link. When we included the interaction between response evaluation and impulsivity as a separate predictor of adolescent aggression, we found that response evaluation was significantly predictive of aggression for some participants. Specifically, response evaluation was positively predictive of adolescent aggression for high-impulsive and medium-impulsive adolescents, but was not significantly predictive for low-impulsive adolescents.

These results provide support for our hypothesis that personality characteristics can moderate the predictiveness of SIP measures. In the case of impulsivity, SIP as measured in a controlled laboratory setting was more predictive of general aggressive behavior for adolescents high in impulsivity. These impulsive adolescents may be less likely to take into account the specific details unique to each social situation they encounter and rather may be more likely to rely upon their default cognitive-processing patterns. High-impulsive adolescents who tend to have positive evaluation of aggression in hypothetical situations

appear to be more likely to translate that default-processing pattern into behavior than low-impulsive teens with similarly positive evaluation of aggressive responses. In contrast, evaluation of aggressive responses does not appear to be predictive of behavior for adolescents with low levels of impulsivity, perhaps because these individuals are more likely to tailor their behavioral responses to each unique social situation rather than relying upon a general pattern of response.

Interaction effects among personality variables such as impulsivity have become more prevalent in recent literature [e.g., Goodnight et al., 2006; Lynam et al, 2000] This study adds to this growing list and provides further support for the possibility of increasing predictiveness of cognitive measures by examining them in the context of personality factors. Interaction effects such as these demonstrate the importance of considering how risk factors at individual and social levels act within a systematic framework to predict changes in adjustment.

Strengths and Limitations

This study had several important strengths for exploring the moderating effects of impulsivity on SIP patterns. The longitudinal nature of the study, with multiple annual measures of aggressive behavior and impulsivity, lent itself well to exploring questions of predictiveness of SIP patterns over time by controlling prior levels of aggression. By obtaining ratings from mothers and teachers, we were able to decrease possible shared method variance. Additionally, structural equation modeling in Mplus allowed us to account for missing data in an unbiased fashion while exploring the statistical interaction between two continuous variables.

We are unable to present information on the divergent validity of our impulsivity measure with other, similar constructs. However, our measure of impulsivity is consistent with most conceptualizations of the construct as an enduring, stable trait, which is evidenced by the high correlations between years (*r*s ranged from .49 to .55). In addition, an impulsivity measure very similar to ours has been found to be associated with several other questionnaire and task-based measures of impulsivity (White et al., 1994), providing further support for the validity of our measure.

Although response evaluation and impulsivity were measured at least one year before adolescent aggression, the design of the study does not allow us to infer causation. It is possible that more positive evaluation of aggressive responses is correlated with an unmeasured variable that is also correlated with growth in aggression. Genetically informed designs with more stringent statistical controls would be required to determine with more confidence whether the association between evaluation of aggressive responses and aggressive behavior is spurious or reflects an environmentally mediated, potentially causal, effect.

Additionally, potential overlap between our measure of teacher impulsivity and the CBCL aggression measure may have influenced results. One item from our impulsivity scale (i.e., demands a lot of attention) is also included on the aggression scale, and two other items (talks too much, disobedient at school) overlapped somewhat with the content of the impulsivity items. To ensure that the findings were not influenced by item overlap, the structural equation models were tested again using recalculated aggression variables that excluded the three items just noted. Results from the revised models did not differ meaningfully from the original models in terms of model fit or parameter estimates, providing evidence that item overlap was not responsible for the associations involving impulsivity and aggression in the original models.

We chose the response evaluation step of the SIP model as the sole focus of this study, but we recognize the importance of exploring personality interactions for all steps of the model. Impulsivity may moderate the predictiveness of individual SIP steps differently, and additional personality constructs may prove to be influential for some steps but not others. These are separate questions that we hope to see addressed by future work. These mechanisms should also be explored at different developmental stages. Given recent research suggesting that SIP measures are more predictive of behavior in adolescence than in early childhood [Davis-Kean et al, 2007], we used measures of response evaluation from age 13 in this study. However, it is possible that personality factors may moderate the SIP-behavior link in early or middle childhood, too. We encourage the exploration of these questions using data from multiple ages and different data sets.

CONCLUSION

This study provides evidence for the role of moderating variables in improving the predictive ability of SIP patterns over time. We found that including impulsivity as a moderator of the SIP response evaluation step significantly improved prediction of later aggressive behavior. Response evaluation was more predictive of later behavior for high-impulsive than low-impulsive adolescents. Other personality-type characteristics could also moderate the link between SIP and aggressive behavior. For example, anxiety could strengthen the association between SIP and aggressive behavior by reducing the ability of individuals to recognize the subtle cues for punishment when considering possible responses to ambiguous social situations. The present findings encourage future research on personality moderators of SIP patterns' links to behavioral adjustment.

Acknowledgments

The Child Development Project has been funded by grants MH42498, MH56961, MH57024, and MH57095 from the National Institute of Mental Health and HD30572 from the National Institute of Child Health and Human Development. We are grateful to the parents, children, and teachers who participated in this research.

REFERENCES

Achenbach, TM. Integrative Guide for the 1991 CBCL 14–18, YSR, and TRF Profiles. Burlington, VT: University of Vermont, Department of Psychiatry; 1991.

Astor RA. Children's moral reasoning about family and peer violence: The role of provocation and retribution. Child Dev. 1994; 65:1054–1067.

Babinski LM, Hartsough CS, Lambert NM. Childhood conduct problems, hyperactivity–impulsivity, and inattention as predictors of adult criminal activity. J Child Psychol Psychiatry. 1999; 40:347–355. [PubMed: 10190336]

Burks VS, Laird RD, Dodge KA, Pettit GS, Bates JE. Knowledge structures, social information processing, and children's aggressive behavior. Soc Dev. 1999; 8:220–236. [PubMed: 20011226]

Cates DS, Shontz FC. The effects of time pressure on social cognitive problem-solving by aggressive and nonaggressive boys. Child Study J. 1996; 26:163–191.

Conduct Problems Prevention Research Group. A developmental and clinical model for the prevention of conduct disorders. Dev Psychopathol. 1992; 4:509–527.

Crick NR, Dodge KA. A review and reformulation of social information-processing mechanisms in children's social adjustment. Psychol Bull. 1994; 115:74–101.

Davis-Kean PE, Huesmann LR, Jager J, Collins WA, Bates JE, Lansford JE. Changes in the relation of self-efficacy beliefs and behaviors across development. Child Dev. 2007

Dodge KA. Social cognition and children's aggressive behavior. Child Dev. 1980; 51:162–170. [PubMed: 7363732]

Dodge, KA. A social information processing model of social competence in children. In: Perlmutter, M., editor. Minnesota Symposium on Child Psychology. Vol. Vol. 18.. Hillsdale, NJ: Erlbaum; 1986. p. 77-125.

Dodge, KA. Do social information-processing patterns mediate aggressive behavior?. In: Lahey, B.; Moffitt, T.; Caspi, A., editors. Causes of Conduct Disorder and Juvenile Delinquency. New York: Guilford Press; 2003. p. 254-274.

Dodge KA, Newman JP. Biased decision-making processes in aggressive boys. J Abnormal Psychol. 1981; 90:375–379.

Dodge KA, Price JM. On the relation between social information processing and socially competent behavior in early school-aged children. Child Dev. 1994; 65:1385–1397. [PubMed: 7982356]

Dodge KA, Tomlin AM. Utilization of self-schemas as a mechanism of interpretational bias in aggressive children. Soc Cogn. 1987; 5:280–300.

Dodge KA, Murphy RR, Buchsbaum K. The assessment of intention-cue detection skills in children: Implications for developmental psychopathology. Child Dev. 1984; 55:163–173. [PubMed: 6705618]

Dodge KA, Bates JE, Pettit GS. Mechanisms in the cycle of violence. Science. 1990; 250:1678–1683. [PubMed: 2270481]

Dodge KA, Pettit GS, Bates JE, Valente E. Social information-processing patterns partially mediate the effect of early parental abuse on later conduct problems. J Abnormal Psychol. 1995; 104:632–643.

Dodge KA, Laird R, Lochman JE, Zelli A. Conduct Problems Prevention Research Group. Multidimensional latent construct analysis of children's social information-processing patterns: Correlations with aggressive behavior problems. Psychol Assess. 2002; 14:60–73. [PubMed: 11911050]

Eysenck SBG, Easting G, Pearson PR. Age norms for impulsiveness, venturesomeness and empathy in children. Pers Individ Differences. 1984; 5:315–321.

Fontaine RG, Burks VS, Dodge KA. Response decision processes and externalizing behavior problems in adolescents. Dev Psychopathol. 2002; 14:107–122. [PubMed: 11893088]

Goodnight JA, Bates JE, Newman JP, Dodge KA, Pettit GS. The interactive influences of friend deviance and reward dominance on the development of externalizing behavior during middle adolescence. J Abnormal Child Psychol. 2006; 34:573–583.

Hollingshead, AB. Unpublished manuscript. New Haven, CT: Yale University; 1979. Four factor index of social position.

Klein A, Moosbrugger H. Maximum likelihood estimation of latent interaction effects with the LMS method. Psychometrika. 2000; 65:457–474.

Lynam DR, Caspi A, Moffit TE, Wikstrom PH, Loeber R, Novak S. The interaction between impulsivity and neighborhood context on offending: The effects of impulsivity are stronger in poorer neighborhoods. J Abnormal Psychol. 2000; 109:563–574.

Moosbregger H, Schermelleh-Engel K, Klein A. Methodological problems of estimating latent interaction effects. Methods Psychol Res. 1997; 2:95–111.

Newman JP, Wallace JF. Diverse pathways to deficient self-regulation: Implications for disinhibitory psychopathology in children. Clin Psychol Rev. 1993; 13:699–720.

Newman JP, Patterson CM, Kosson DS. Response perseveration in psychopaths. J Abnormal Psychol. 1987; 96:145–148.

Newman JP, Kosson DS, Patterson CM. Delay of gratification in psychopathic and nonpsychopathic offenders. J Abnormal Psychol. 1992; 101:630–636.

Olson SL, Bates JE, Bayles K. Early antecedents of childhood impulsivity: The role of parent-child interaction, cognitive competence, and temperament. J Abnormal Child Psychol. 1990; 18:317–334.

Perry DG, Perry LC, Rasmussen P. Cognitive social learning mediators of aggression. Child Dev. 1986; 57:700–711. [PubMed: 3720399]

Pettit GS, Bates JE, Dodge KA. Supportive parenting, ecological context, and children's adjustment: A seven-year longitudinal study. Child Dev. 1997; 68:908–923.

Rabiner DL, Lenhart L, Lochman JE. Automatic versus reflective social problem solving in relation to children's socio-metric status. Dev Psychol. 1990; 26:1010–1016.

Schafer JL, Graham JW. Missing data: Our view of the state of the art. Psychol Methods. 2002; 7:147–177. [PubMed: 12090408]

Shapiro SK, Quay HC, Hogan AE, Schwartz KP. Response perseveration and delayed responding in undersocialized aggressive conduct disorder. J Abnormal Psychol. 1988; 97:371–373.

Vigil-Colet A, Codorniu-Raga MJ. Aggression and inhibition deficits, the role of functional and dysfunctional impulsivity. Pers Individ Differences. 2004; 37:1431–1440.

Weiss B, Dodge KA, Bates JE, Pettit GS. Some consequences of early harsh discipline: Child aggression and a maladaptive social information processing style. Child Dev. 1992; 63:1321–1335. [PubMed: 1446555]

White JL, Moffitt TE, Caspi A, Bartusch DJ, Needles DJ, Stouthamer-Loeber M. Measuring impulsivity and examining its relationship to delinquency. J Abnormal Psychol. 1994; 103:192–205.

Zelli A, Dodge KA, Lochman JE, Laird RD. Conduct Problems Prevention Research Group. The distinction between beliefs legitimizing aggression and deviant processing of social cues: Testing measurement validity and the hypothesis that biased processing mediates the effects of beliefs on aggression. J Pers Soc Psychol. 1999; 77:150–166. [PubMed: 10434411]

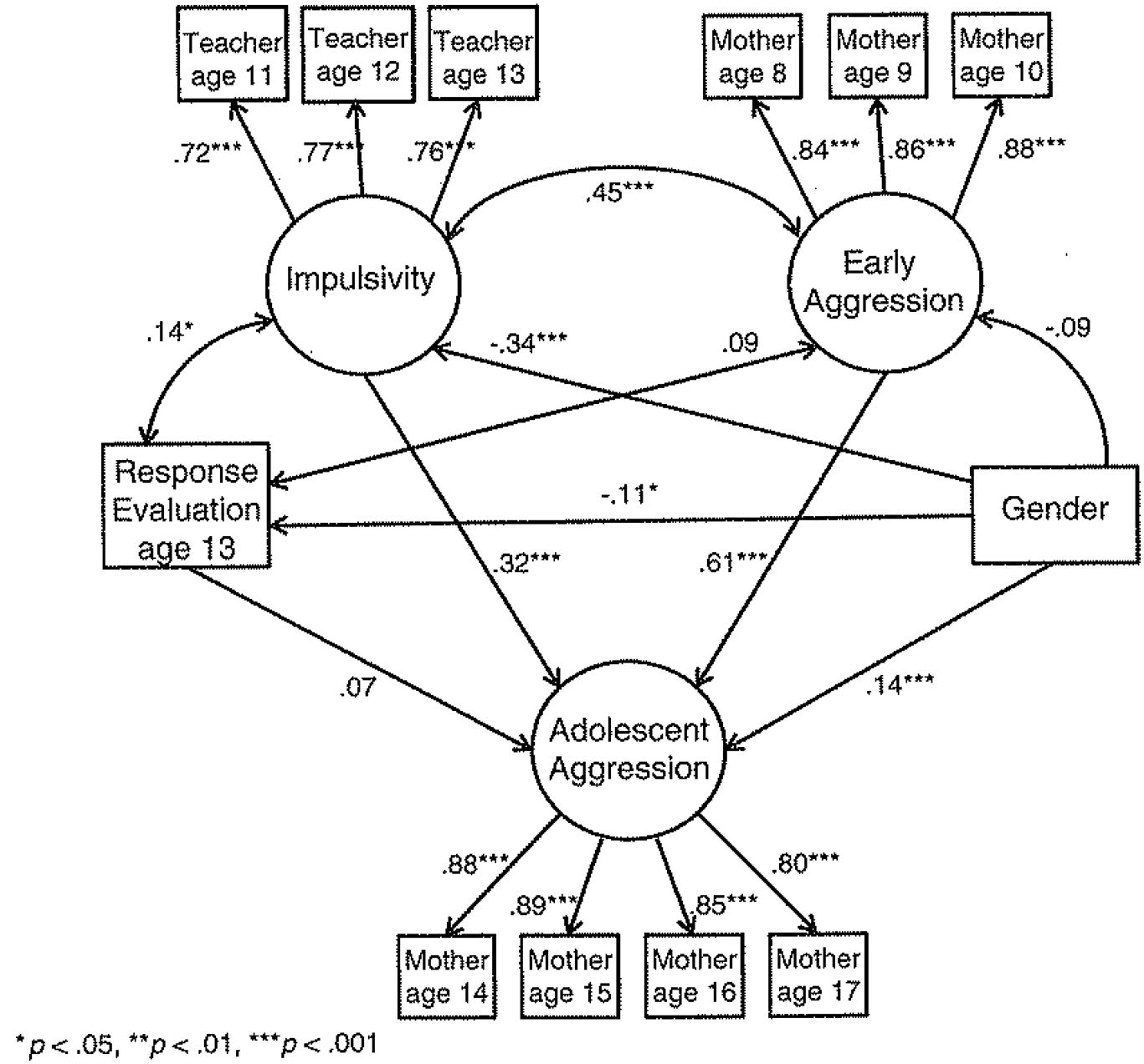

Fig. 1.

Structural equation model including main effect predictors of adolescent aggressive behavior; standardized path coefficients are reported. For gender, male was coded as 0, female as 1. The model fit the data well ($\chi^2(46) = 51.00$, $P = .28$, CFI = .997, RMSEA = .014).

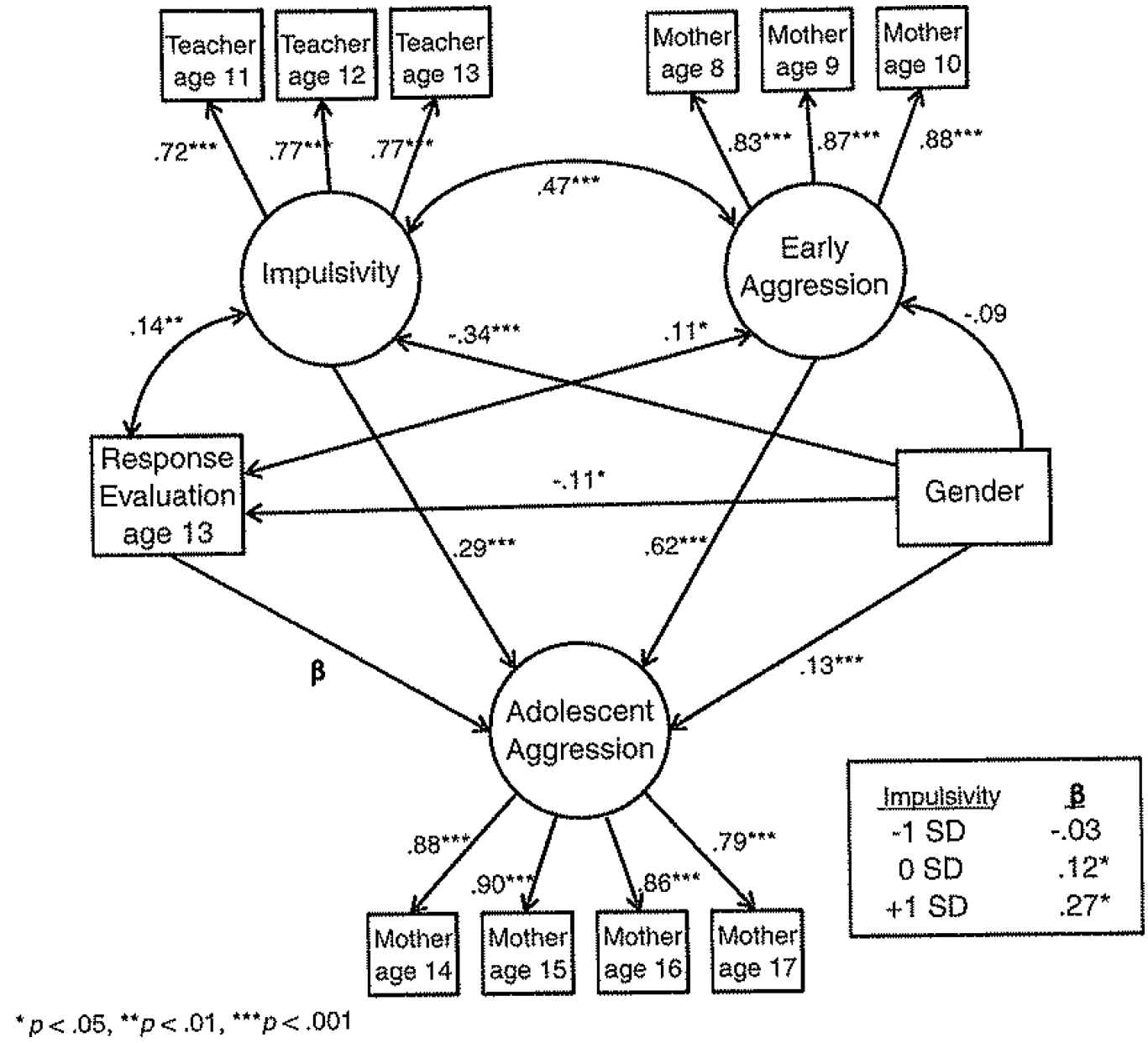

Fig. 2.

Structural equation model including main effects and interaction effect; standardized path coefficients are reported. For gender, male was coded as 0, female as 1. Beta (β) refers to the relationship between response evaluation and adolescent aggression at low (−1 SD), medium (the mean), and high levels (+1 SD) of impulsivity. The main effect of response evaluation is the value of β at the mean of impulsivity.

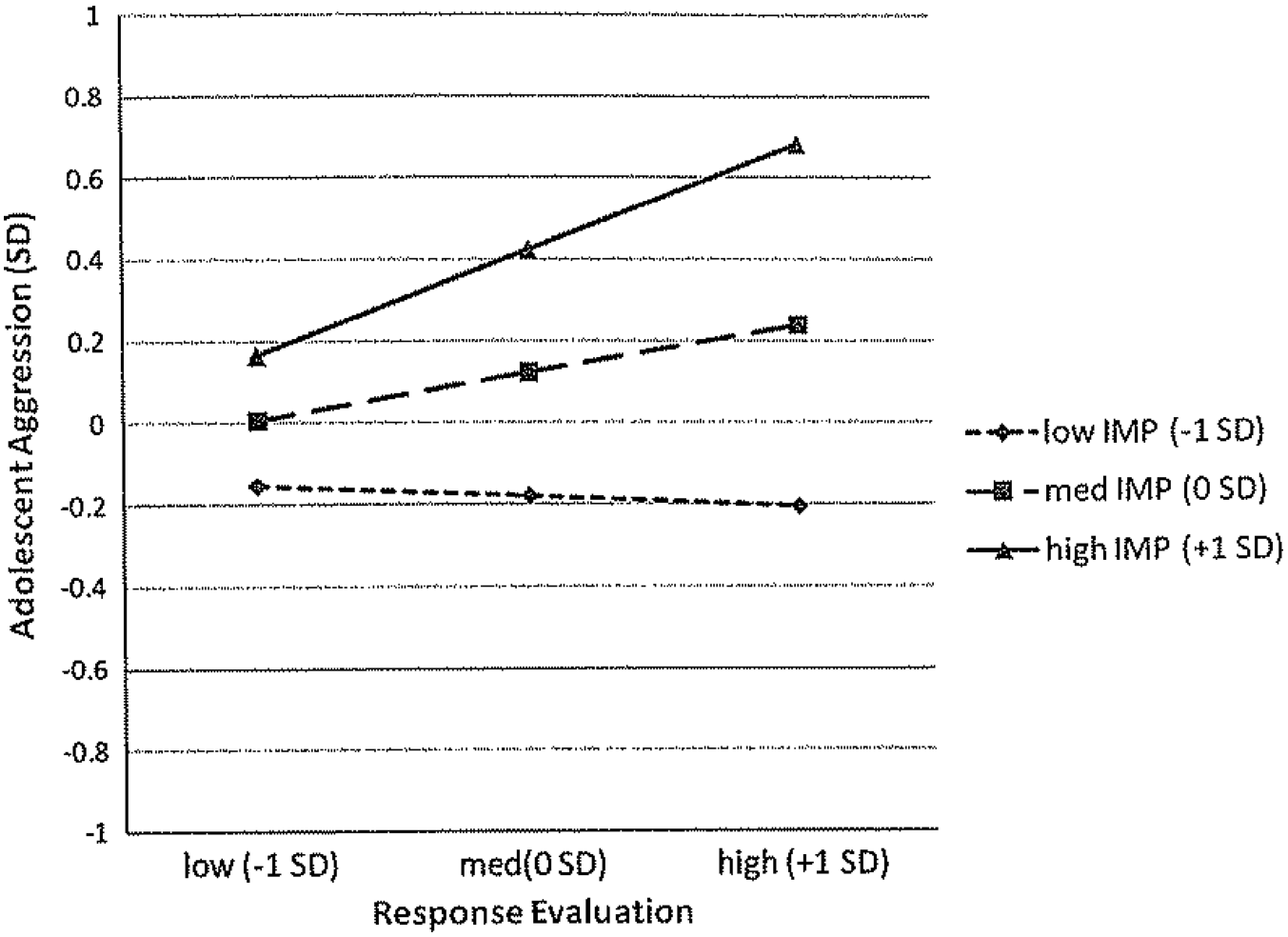

Fig. 3.
Effect of response evaluation on adolescent aggression as moderated by impulsivity (IMP).

TABLE I

Means, Standard Deviations, and Bivariate Correlations Between Variables

	M	SD	% missing	1	2	3	4	5	6	7	8	9	10	11
1. Child gender	.48	.50	0.0	–										
Early aggression														
2. Mother report, age 8	7.71	6.11	19.1	−.08	–									
3. Mother report, age 9	7.66	5.97	28.0	−.06	.74**	–								
4. Mother report, age 10	7.20	6.00	32.3	−.12*	.71**	.75**	–							
Impulsivity														
5. Teacher report, age 11	.39	.49	23.9	−.26**	.26**	.29**	.32**	–						
6. Teacher report, age 12	.40	.48	27.0	−.24**	.26**	.27**	.30**	.55**	–					
7. Teacher report, age 13	.43	.55	31.1	−.25**	.32**	.28**	.37**	.49**	.55**	–				
Social information processing														
8. Response evaluation	.00	.77	32.6	−.10*	.07	.04	.13*	.07	.17**	.14**	–			
Adolescent aggression														
9. Mother report, age 14	6.32	6.02	29.6	−.04	.62**	.53**	.62**	.30**	.40**	.42**	.14**	–		
10. Mother report, age 15	5.92	5.91	29.9	−.01	.56**	.51**	.59**	.30**	.40**	.36**	.11*	.81**	–	
11. Mother report, age 16	6.13	5.70	23.4	−.02	.56**	.54**	.58**	.32**	.34**	.41**	.11*	.74**	.77**	–
12. Mother report, age 17	5.09	5.44	26.5	.01	.51**	.50**	.55**	.29**	.33**	.33**	.18**	.70**	.70**	.75**

Significant at $P < .05$, two-tailed;

** significant at $P < .01$, two-tailed.