Emotion Processing Associated with Aggression in Early Adolescents: A Focus on Affective Theory of Mind

Meghan E. Clifford, Amanda J. Nguyen, and Catherine P. Bradshaw

School of Education and Human Development, University of Virginia

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Abstract

Social-emotional factors associated with youth aggression have largely been studied in the context of social information-processing models. The ability to accurately encode and appropriately interpret others' emotions has yet to be fully examined in the context of aggressive behavior, particularly during adolescence. Using cross-sectional data from a sample of 282 at-risk early adolescents, the present study examined associations between teacher-reported aggression and youth performance on a task assessing two components of affective theory of mind: emotion recognition and situational attribution. Results indicated that emotion recognition, but not situational attribution accuracy, was significantly associated with teacher-reported aggressive behavior. Over-recognizing anger and under-recognizing sadness were unique error patterns associated with aggression, and these associations remained significant after controlling for demographics and other key social information-processing variables. Findings suggest that difficulties with emotion processing play an important role in the social information-processing patterns observed in the context of youth aggression. Implications for preventive interventions for youth at risk of engaging in aggressive behavior are discussed.

Keywords: aggression, emotion recognition, affective theory of mind

Emotion Processing Associated with Aggression in Early Adolescents: A Focus on Affective Theory of Mind

Aggression encompasses a range of problematic behaviors and is one of the most common presenting problems of children referred for psychological services (Lochman et al., 2012; Vazsonyi et al., 2018). Youth aggression is associated with a host of adverse outcomes across the lifespan, including increased risk for peer rejection, depression and other psychopathology, early school withdrawal, substance abuse, and adult criminality (Dodge et al., 2006; Lochman et al., 2012; Vazsonyi et al., 2018). While interventions to address early behavior problems have been shown to be effective, understanding the mechanisms involved in the development of aggression in adolescence is critical to inform effective intervention for this population (Lemerise, 2010; Lochman et al., 2008; 2012).

Studies investigating the developmental pathway of aggression have identified social-emotional impairments across demographic groups, but the role of the foundational encoding abilities on which more complex social-emotional competencies depend is less well-understood (Lemerise, 2010; Orobio de Castro, 2004). In particular, difficulty with conceptualizing social situations is common among aggressive youth, but may be affected by problems recognizing or interpreting others emotions (García-Sancho et al., 2014; Gratz & Roemer 2004; Trentacosta & Fine, 2010). The current study sought to address some of these gaps in the extant literature by investigating emotion encoding and interpretation abilities in the context of youth aggression (Gutiérrez-Cobo et al., 2016; Schultz et al., 2004; Trentacosta & Fine, 2010).

Social Information-Processing and the Study of Aggression

Central to the study of aggression and social cognition is Crick and Dodge's (1994) social information-processing (SIP) model, which hypothesizes that social behavior is informed by the

way individuals conceptualize and respond to social information. Core steps in the SIP model include the interpretation of contextual cues, social goal formulation, and strategy selection (Crick & Dodge, 1994). The SIP model also acknowledges that this pathway is influenced by a set of more global and stable social cognitions that individuals hold about themselves, others, and the world based on prior experiences and the norms and conventions of the broader social context (Crick & Dodge, 1994). These social cognitions are considered the "database" of the SIP pathway and are believed to bidirectionally influence each step. Over time, individuals are more likely to engage in SIP patterns that are consistent with the core beliefs in their database (Zelli et al., 1999).

A variety of SIP distortions and biases are believed to play a role in aggressive behavior. For example, aggressive children typically exhibit maladaptive outcome expectations regarding aggression: specifically, by overestimating the extent to which aggression will result in a positive outcome (e.g., gaining respect, becoming dominant) and underestimating the extent to which it will result in a negative outcome (e.g., being punished, experiencing peer rejection) (Lochman et al., 2006; Orobio de Castro et al., 2005; Perry et al., 1986). Beliefs endorsing the legitimacy of retaliatory aggression are another key SIP construct found to longitudinally predict levels of aggression (Huesmann et al., 1992; Nash & Kim, 2007; Zelli et al., 1999). Research suggests that once children believe that retaliation is acceptable, these beliefs contribute to increasingly distorted SIP patterns that become difficult to interrupt or modify (Horsley et al., 2010).

Affective Theory of Mind: Emotion Recognition and Situational Attribution

Broadly, theory of mind refers to a set of skills involved in mental state deduction across both cognitive and affective domains (Sebastian et al., 2012). These abilities allow individuals to understand that social information is context-dependent and that the perspectives of individuals

differ from one another (Davidson et al., 2015; Mitchell & Phillips, 2015). *Affective theory of mind* was of particular interest to the present study, as it allows individuals to appropriately recognize and interpret others' emotions by attributing them to situational causes. Therefore, affective theory of mind requires both emotion recognition skills and the ability to interpret others' emotions based on situational context (Mitchell & Phillips, 2015; Olderbak & Wilhelm, 2017; Sebastian et al., 2012).

Emotion recognition skills allow for the identification of others' emotions by encoding the cues associated with a given emotion, such as facial expression (Hildebrandt et al., 2015; Schlegel et al., 2012). On its own, emotion recognition does not require one to interpret the emotion in context, but the development of more complex social-emotional competencies (e.g., emotion regulation) is dependent upon mastery of this foundational skill (Gratz & Roemer 2004). Since emotion recognition is one part of affective theory of mind, much of the social-emotional development literature does not differentiate between the two skillsets; however, evidence indicates that affective theory of mind is a more comprehensive construct, as it requires both emotion recognition skills and the higher-order cognitive skills involved in situational attribution, which are not involved in emotion recognition alone (Frith & Frith, 2008; Meinhardt-Injac et al., 2018).

Situational attribution includes the interpretation processing that occurs after others' emotions have been recognized, or encoded. This construct relies upon those higher-order cognitive skills that allow individuals to make attributions about others' emotions by integrating an awareness of situational factors with the emotion being expressed (Mitchell & Phillips, 2015). As a construct, situational attribution has yet to be assessed as a unique component of theory of mind, so its individual contribution to the development of aggressive behavior remains unknown.

By drawing upon the SIP model, we conceptualize emotion recognition as the encoding stage within an emotion-specific SIP pathway and situational attribution as the interpretation stage within this same pathway. Affective theory of mind, then, is the resulting understanding of others' emotions in context that results from these two stages.

Affective Theory of Mind and Aggression

Research on the association between affective theory of mind and aggression has been limited, although support for both direct and indirect associations between general theory of mind abilities (i.e., both cognitive and affective) and youth aggression has been documented (Austin et al., 2017; Olson et al., 2011). The literature on the association between youth aggression and affective theory of mind specifically among elementary school-aged children has been mixed: one study found a link between affective theory of mind and reactive but not proactive aggression, whereas another study found that it was associated with proactive but not reactive aggression (Austin et al., 2017; Gillespie et al., 2018). An additional study of kindergarten children found no significant direct association between aggression and theory of mind (Renouf et al., 2010). These contradictory findings and lack of consensus regarding the association between aggression and affective theory of mind highlight the need for additional research to determine whether affective theory of mind is uniquely associated with overt aggression among early adolescents.

Difficulties with recognizing others' emotions based on facial expressions have been linked with aggressive behavior in youth, but the implications of these difficulties have yet to be fully understood (Aspan et al., 2013; Bowen & Dixon, 2010; Leist & Dadds, 2009). Neurobiological research suggests that reactive aggression, or aggression that is in response to perceived provocation, is related to significant impairment in a child's capacity to identify

others' emotions signaling potential threat (i.e., fear and anger) compared to other emotions (Marsh & Blair, 2008; Tottenham & Sheridan, 2010; Schultz et al., 2004). However, studies investigating the association between reactive forms of aggressive behavior and emotion-specific recognition errors have largely yielded inconsistent results (Schwenck et al., 2014). Although it is clear that emotion recognition impairment is associated with aggression, it remains unclear whether this association extends broadly to all emotions or is specific to particular emotions, such as those that signal threat (Dawel et al., 2012).

Identifying specific emotion recognition error patterns within the context of aggression may provide insight into difficulties with encoding that potentially underlie many maladaptive SIP patterns. Erroneous over-recognition or heightened sensitivity to anger, as one example of an emotion recognition error, has been found to be a more significant predictor for initiation of substance use than risky decision making among adolescents; this highlights the link between emotion-specific encoding errors and poor behavioral outcomes (Ernst et al., 2010). Failure to recognize others' distress by erroneously identifying a sad or fearful face as angry may predispose a child to develop hostile attribution bias, a key correlate of reactive aggression in the SIP model (Lemerise, 2010; Coccaro et al., 2009; Hall, 2006). Clarifying common emotion recognition errors and challenges associated with aggression also has important implications for intervention, as emotion recognition training has been found to be efficacious among youth by contributing to significant reductions in aggressive behaviors (Castillo et al., 2013; Hubble et al., 2015; Penton-Voak et al., 2013).

The Present Study

The goal of the present study was to elucidate the nuances of the association between aggression and affective theory of mind by examining emotion recognition skills and situational

attribution accuracy as correlates of teacher-reported reactive and proactive overt forms of aggressive behavior. Additionally, we explored whether aggression is associated with emotion-specific errors across these skills in an effort to identify potential emotion-based encoding errors underlying the SIP distortions observed in youth aggression.

Our first hypothesis was that reduced ability to identify others' emotions (i.e. lower emotion recognition scores) and attribute these emotions to appropriate explanatory situations (i.e. lower situational attribution accuracy) would both serve as independent correlates of aggressive behavior (Bowen & Dixon, 2010; Olson et al., 2011). We included both abilities as distinct correlates of aggression to examine the added explanatory value of higher-order situational attribution involved in affective theory of mind (Mitchell & Phillips, 2015).

Based on findings from prior research, we further hypothesized that aggression would be significantly associated with the emotion-specific recognition errors of over-recognizing anger (Coccaro et al., 2009; Ernst et al., 2010; Penton-Voak et al., 2013) and under-recognizing fear (Bowen & Dixon, 2010; Marsh & Blair, 2008). We also examined the association between aggression and the under-recognition of sadness, although this was considered more of an exploratory research question as there is little prior research on the recognition of sadness in the context of aggression.

As emotion recognition and situational attribution are, in nature, closely tied to other SIP patterns, it was possible that any observed associations with aggression could be explained by the associations between aggression and other SIP distortions, such as endorsing retaliatory beliefs and holding outcome expectations of aggression (Lochman et al., 2012). Despite this link, our third hypothesis was that emotion recognition skills and situational attribution accuracy would account for significant additional variation in aggression scores even after controlling for

two related SIP distortions, retaliatory beliefs and outcome expectations.

Method

Participants

Data came from the cross-sectional assessment of 282 7th grade students from 20 Maryland middle schools participating in a randomized trial of Early Adolescent Coping Power (for details on the larger project, see Pas et al., 2020). Coping Power is a school-based preventative intervention developed to address early aggressive behavior problems through social-cognitive skill building (Lochman et al., 2008). While intervention effects were not within the scope of the present study, the purpose of the larger project was to evaluate the efficacy of an adapted version of Coping Power for 7th graders at risk of adverse behavioral and academic outcomes associated with aggression. Eligible students were those with teacher-rated aggression scores in the highest quartile among all students screened at each school. All of the schools were located in urban or urban-fringe communities in which a majority of students qualified for free and reduced priced meals.

Measures

Emotion Recognition and Situational Attribution

Emotion recognition skills and situational attribution accuracy were measured using a recently developed performance measure assessing affective theory of mind called the Faces Social-Emotional Task (Faces-SET; Schaefer, 2014). Like other emotion recognition performance tasks, this measure presented children with facial expressions and asked them to identify the target emotion (*"*What is the person feeling?*"*). Unlike other emotion recognition performance tasks, this measure also asked participants to select a situation that best explains the person's emotion ("Why might the person be feeling that way?"). Although originally developed

for young adult populations (i.e., college students), prior work with the Faces-SET has found it to correlate with antisocial behaviors better than self-report measures assessing various social-emotional competencies, such as empathy (Schaefer, 2014). By employing this performance-based methodology, this measure may be an improvement over prior approaches that may be subject to self-report bias.

The Faces-SET presents participants with 24 items consisting of either short video clips or still images of others' facial expressions and asks them to identify the emotion that the person is expressing (sadness, anger, fear, or no emotion) and select the situation that best explains the emotion. The "no emotion" response was always incorrect, as the subject was always expressing either anger, fear, or sadness. From these questions, primary outcome scores were calculated for emotion recognition and situational attribution, respectively. Emotion recognition scores directly reflect the raw number of correct items, ranging from 0-24. The emotion recognition scale had good reliability ($\alpha = .72$). Situational attribution scores were also calculated as the number of correct responses, ranging from 0 to 24. Responses were scored as correct if the situational explanation matched the emotion selected, even if the emotion recognition response was incorrect. This scoring system avoided counting a single emotion recognition error as an incorrect situational attribution response. When initial emotion recognition errors were controlled for, the situational attribution scale had satisfactory reliability ($\alpha = .60$).

Additionally, three specific emotion recognition error scores were calculated: anger over-recognition, fear under-recognition, and sadness under-recognition. These variables were selected for inclusion based on correlational analyses and supporting evidence from prior research. Anger over-recognition was defined as erroneous misattribution of anger to a non-angry facial expression. The fear and sadness under-recognition errors were defined as failure to

correctly identify fearful and sad facial expressions when they were presented, respectively. These under-recognition error scores were included as separate correlates from the over-recognition of anger because, while it was possible and likely for them to co-occur (e.g., misidentifying a fearful face as angry counts as both errors), it was also possible for the errors to occur independently of one another (e.g., misidentifying a fearful face as sad or no emotion counts as only one). Additionally, the anger over-recognition score alone did not provide information about whether particular emotions were more likely to be misidentified as anger. The 24 items were split evenly across the three emotions, so under-recognition error frequency scores ranged from 0-8 and over-recognition error frequency scores ranged from 0-16.

Aggressive Behavior

Aggression was assessed using the Behavior Assessment System for Children, teacher-report (BASC-2; Reynolds & Kamphaus, 2004). The BASC-2 assesses a wide range of childhood behaviors, including, but not limited to, hyperactivity, depression, anxiety, and aggression. The aggression subscale is comprised of nine items on the measure that assess overt physical and verbal forms of aggression regardless of provocation (i.e., items assess both proactive and reactive aggression). The BASC-2 has been validated and used extensively, and the aggression subscale reliably assesses levels of aggressive behavior in children (Reynolds & Kamphaus, 2004). T-scores were calculated for this measure, with higher scores indicating more aggression ($M = 50$, $T = 10$ for population norms). In the present study, internal reliability was very strong across the nine items on the aggression subscale ($\alpha = .86$).

Outcome Expectations

The Outcome Expectations Questionnaire (OEQ; Perry et al., 1986) was used to assess expectations about consequences of using aggression. Students were presented with a number of

hypothetical vignettes describing aggressive responses to perceived provocation from a peer. As directed on the OEQ, participants then answered questions about the likelihood of various consequences of using aggression. Higher outcome expectations scores indicate expectations that aggression will not result in positive outcomes and will result in negative outcomes. Scores were reverse-coded so that higher outcome expectations scores would indicate more favorable expectations of aggression. This measure has been previously validated and determines the degree to which children hold biased expectations about the outcomes following the use of aggression (Perry et al., 1986). Data from the present study indicated strong reliability for this scale (α = .82).

Retaliatory Beliefs

Students also read a series of global statements legitimizing aggression as a means of retaliation towards a peer and indicated the extent to which they agreed with each statement. This measure is an adapted version of the Normative Beliefs about Aggression Scale (Huesmann et al., 1992) and included the following five items on a four-point Likert scale from 1 *(strongly agree)* to 4 *(strongly disagree)*: (a) It is okay to hit someone if they hit me first; (b) I believe that revenge is a good thing; (c) If people do something to make me really mad, they deserve to be beaten-up; (d) It is okay to hit someone if they start a fight on my turf, like my school or neighborhood; (e) If someone bullies me, I bully back. Higher scores indicate stronger retaliatory beliefs that endorsed the use of aggression. The adapted version of this measure has been shown to have good psychometric properties (Bradshaw et al., 2009; 2013). Data from the present sample also demonstrated good reliability (α = .76).

Procedure

The secondary analyses of the present study were conducted using de-identified data collected as part of the Early Adolescent Coping Power study. Students were screened into the study during their 7th grade year by a classroom teacher using a checklist of teacher-reported behavior problems (Dodge & Coie, 1987). Study data were then collected at baseline (Time 1; beginning of 7th grade), post-intervention (Time 2; end of 7th grade), and follow-up (Time 3; end of 8th grade). Both teachers and students provided data at each wave of data collection. Teacher data included completion of the Behavior Assessment System for Children (BASC-2), Teacher Report (Reynolds & Kamphaus, 2004), typically completed by the student's Language Arts teacher. Also at each time point, students completed a self-report questionnaire that included outcome expectations and retaliatory beliefs measures (Bradshaw et al., 2013; Perry et al., 1986). Student data collection was completed at school in a group setting as administered by a member of the research team.

The Faces-SET task was added in Year 3 of the study. Once added to the assessment battery, students completed the Faces-SET task on Samsung Galaxy Tablets during the same group data collection session in which the questionnaires were administered by project staff. Because the Faces-SET task was added partway through the study, baseline task performance data was not available for all participants. For those who did not complete it at baseline, data for the current cross-sectional analysis was analyzed at the earliest time point for which students completed the Faces-SET task: 59% of the sample data was collected at Time 1, 33% at Time 2, and 8% at Time3. Given that data is included from both intervention and control participants, even with inclusion of Time 2 and 3 data for a portion of participants less than 20% of the sample had been exposed to the intervention at the point in which the currently used data was collected. Additionally, ANOVA tests indicated no significant differences by time point of data

collection or by participant age on the variables of interest, including emotion recognition score, situational attribution score, or aggression level. Response rates for teacher and student participants were over 95%. The Institutional Review Boards at the researchers' universities provided approval for the project.

Data Analysis

After conducting preliminary descriptive and correlational analyses, we conducted a series of step-wise multiple linear regression models in Stata 15 (StataCorp, 2017) to test our primary research questions. Model 1 included the total emotion recognition score and total situational attribution score as independent correlates of aggression. In model 2, the total emotion recognition score was replaced with three emotion-recognition errors on the Faces-SET task as independent correlates of aggression. Model 3 retained these specific emotion recognition errors while controlling for outcome expectations and retaliatory beliefs to examine the independent contribution of emotion recognition errors. This model was developed based on the known associations between aggressive behavior and social cognitions legitimizing aggression from previous research (Bradshaw et al., 2009; 2013). All regression models were adjusted for gender and race and used robust variance estimates to account for clustering at the school level. We excluded 24 cases with missing data from the regression analyses.

Results

Preliminary Analyses

Sample descriptive statistics are presented in Table 1. Of the total sample of 282 students, participants were mostly male (57%) and African American (73%), with a mean age of 11.97 years (*SD* = 1.32). The demographic variables of race and gender were controlled for during the data analysis process, as was school-level clustering. On the on the Faces-SET task, participants'

mean score was approximately 60% correct across the 24 items for both emotion recognition (*M* = 14.08, *SD* = 3.93) and situational attribution (*M* = 14.61, *SD* = 2.90). Results indicated that the average teacher-reported aggression T-score was approximately one standard deviation higher than the population based on normative data but was below the threshold considered to determine clinical significance (*M* = 62.4, *SD* = 12.51). Descriptive statistics indicated that for both outcome expectations and retaliatory beliefs, the sample on average tended to moderately endorse retaliatory beliefs and aggression-favoring outcome expectations (*M* = 2.39 and 2.61 out of 4, respectively*)*. Correlations between study variables are provided in Table 2.

Regression Analyses

Results from the series of step-wise, linear regression models are reported in Table 3. As hypothesized, the results from model 1 revealed that emotion recognition was significantly negatively associated with teacher-reported aggression after controlling for situational attribution score, gender, race, and school-wise clustering ($\beta = -.47$, $p \leq .05$). Based on the significant association between emotion recognition and aggression identified in model 1, specific errors on the emotion recognition scale were included as correlates of aggression (i.e., anger over-recognition, fear under-recognition, sadness under-recognition). Results from model 2 suggested that the erroneous over-recognition of anger was significantly associated with higher levels of teacher-reported aggressive behavior after controlling for other error types, situational attribution score, gender, race, and school-wise clustering ($\beta = 1.12$, $p \leq .01$). Under-recognition of sadness was also associated with higher levels of teacher-reported aggressive behavior after controlling for the same set of variables ($\beta = .43$, $p \leq .05$), whereas under-recognition of fear did not.

In model 3, after controlling for outcome expectations and retaliatory beliefs, erroneous over-recognition of anger continued to be significantly associated with higher levels of teacher-

reported aggression. Similarly, the positive association between teacher-reported aggression and the erroneous under-recognition of sadness remained significant after adding these SIP correlates. When controlling for all other study variables, only retaliatory beliefs were significantly associated with teacher-reported aggression ($\beta = 3.44$, $p \leq .01$); outcome expectations were unrelated to levels of aggressive behavior. The final model indicated that 11% of the variance in teacher-reported aggression could be accounted for by these emotion recognition errors as well as SIP correlates.

Discussion

The current study sought to examine the emotion processing correlates of youth aggression. We leveraged data from a sample of at-risk early adolescents to explore the hypothesized association between emotion recognition abilities, situational attribution accuracy, and teacher-reported overt aggression. Findings from the current study suggest that emotion recognition difficulties are significantly associated with teacher-reported aggressive behavior; this finding is largely consistent with past literature, which has noted problems identifying others' emotions among aggressive youth (Bowen & Dixon, 2010; Leist & Dadds, 2009; Marsh & Blair, 2008; Penton-Voak et al., 2013; Schwenck et al., 2014). The situational attribution score, however, was unrelated to aggression, despite our hypothesis that the ability to correctly attribute situational causes to emotions would be inversely associated with aggression. This finding was largely inconsistent with results from prior studies examining affective theory of mind development in the context of aggression more broadly (Olson et al., 2011; Trentacosta & Fine, 2010).

As hypothesized, over-recognition of anger errors were uniquely associated with aggression, which was consistent with prior findings (Ernst et al., 2010; Penton-Voak et al.,

2013). The under-recognition of sadness, and not the under-recognition of fear, was also uniquely associated with aggressive behavior, which was contrary to hypotheses developed based on models of neurobiological detection of threat (Bowen & Dixon, 2010; Hubble et al., 2015; Marsh & Blair, 2008). Despite using this threat-based model to inform hypotheses, other findings have been consistent with our results. For example, Schwenck and colleagues (2014) found that girls with conduct problems exhibited impaired recognition of sadness and intact recognition of fear. Emotion recognition error correlates remained significant after accounting for the effects of other SIP distortions; the increase in variance accounted for between model 2 (R^2 = .07) and model 3 (R^2 = .11) further indicates that emotion encoding abilities are conceptually distinct from other SIP variables and that their inclusion in the model was additive (Lemerise, 2010).

Difficulties with emotion recognition appear closely linked to the development of youth aggression. More focus on integrating emotion recognition training into future interventions targeting aggression is warranted, especially given preliminary findings supporting the efficacy of such training interventions for at-risk youth populations (Hubble et al., 2015; Penton-Voak et al., 2013). It is likely that early emotion recognition errors, particularly the over-identification of anger and under-identification of sadness, contribute to the difficulty conceptualizing social situations that characterizes youth aggression. This hypothesis is supported by prior research as well as our finding that the association between emotion recognition errors and aggression remained significant even after various SIP distortions were controlled for (Bowen & Dixon, 2010; Coccaro et al., 2009; Hall, 2006; Orobio de Castro et al., 2005; Schultz et al., 2004).

The over-recognition of anger is largely consistent with research on aggression as an adaptive neurobiological function within threat-based models: if threat levels are legitimately

high, it will be better for children to over-recognize anger and respond with aggression as a means of self-protection than fail to recognize an interpersonal threat and risk physical harm (Pollak & Tolley-Schell, 2003; Tottenham & Sheridan, 2010). Hypervigilance to threat can easily become overgeneralized, and when children detect and respond to threat that does not actually exist, it can result in inappropriate aggressive behavioral responses (Aspan et al., 2103). As such, the more frequently children are in a state of hypervigilance to threat, the more likely they are to develop problematically high levels of aggression (Pollak & Tolley-Schell, 2003; Tottenham & Sheridan, 2010). The pattern of under-recognizing sadness, as opposed to fear, has less clear neurobiological underpinnings but could reflect inattention to others' expressions of non-threatening distress. It is possible that becoming hypervigilant to detecting threat in the form of anger could limit the ability of children to differentiate between the different negative emotions of others. It may be more efficient to automatically assume anger and respond with aggression than to take the time to account for situational cues, decide whether the interpersonal threat is taking the form of anger or another negative emotion like sadness, and then differentiate behavioral responses accordingly.

Despite its hypothesized importance in the SIP model of social behavior, situational attribution accuracy was not a significant correlate of aggression in our study. Distinguishing between the emotion recognition component and situational attribution components of affective theory of mind may help to explain previous contradictory findings regarding its link to aggression (Austin et al., 2017; Sebastian et al., 2012). While we expected it to be significantly associated with teacher-reported aggression among early adolescents, a potential explanation for the lack significant association is that there is a negligible impact of additional interpretation-forming cognitive skills on social behavior above and beyond those that are involved in emotion

recognition only (see Schultz et al., 2004). Additionally, prior studies have found aggressive youth exhibit deficits in empathic responding but not the cognitive skills involved in understanding others emotions (Dvash & Shamay-Tsoory, 2014). Our results may reflect hypotheses developed from previous literature: that youth at risk for aggressive behavior can exhibit an intact cognitive understanding of the situational factors influencing others' emotions, but still struggle to process these emotions in an adaptive way (Winter et al., 2017). Future studies should consider additional social-emotional constructs with possible links to aggressive behavior, such as the youths' prosocial behavior as well as more complex and integrative abilities like emotion regulation (Gratz & Roemer, 2004; Renouf et al., 2010).

Strengths and Limitations

It is important to consider a number of strengths and limitations upon interpreting findings from the present study. A strength of our study is the use of a performance-based measure in assessing emotion recognition and situational attribution accuracy as two components of affective theory of mind, which helped to reduce the risk of reporting bias that is inherent in self-report measures. However, evidence supporting the broad application of this measure and its operationalization of these variables is also currently limited. As previously noted, the conceptual overlap between the constructs of emotion recognition and situational attribution, especially in light of findings from the current study, poses a challenge to future applicability of the Faces-SET measure. Findings of only moderate internal consistency across the situational attribution items, for example, suggest additional measurement refinement of scoring methodology may be needed. Although previous findings of correlations between performance on the Faces-SET task and antisocial behaviors support the validity of the measure, that prior work was conducted with young adults and may not generalize to early adolescent samples

(Schaefer, 2014). Use with middle-school students was a novel application of the task, which featured the faces of young adults. It is possible that there are significant differences between ability to encode the emotional expressions of adults compared to those of similar-aged peers. Additionally, we lacked access to socioeconomic data at the individual level and were thus only able to adjust for SES using school-level free- and reduced-meal eligibility data.

Limitations to the generalizability of our findings should also be noted. While the average aggression level of our sample was below the threshold for clinical significance, it was still significantly higher than that of a non-at-risk sample. The extent to which the current findings generalize to youth populations outside of the "at-risk" range (i.e., t-scores between 60 and 70) is unclear and should be examined in future research (Reynolds & Kamphaus, 2004). Finally, aggression levels and emotion recognition errors may both be significantly accounted for by various underlying causes, such as the inattention and impulsivity symptoms that characterize the diagnosis of ADHD, and these diagnostic criteria were not included in our analyses.

Despite various concerns with the Faces-SET measure and additional limitations, several strengths of the present study provide support for the validity of results. For one, the use of self-report data and associated bias was limited, which is unusual in the study of aggression and SIP. The significance of findings after controlling for other SIP distortions such as beliefs and expectations, closely linked to aggressive behavior within this framework, is another strength supporting the validity of findings (Lemerise, 2010). Additionally, both the demographic characteristics and the aggression levels of the sample enhance the generalizability of findings for underserved youth exhibiting moderate risk for aggression, a population who could benefit substantially from future intervention efforts.

Conclusions and Implications

This study contributed to the extant literature by elucidating the emotion processing correlates of youth aggression. Several important implications can be drawn from the present study: emotion recognition impairments were found to be independently associated with youth aggression. In particular, over-recognizing anger and under-recognizing sadness seem to be important emotion-specific error patterns and may serve as effective targets in future intervention efforts. These results indicate that situational attribution accuracy was not independently linked to aggression, as the association between the two may depend upon a number of related factors that were not captured within this task. Future research may benefit from the development of a more comprehensive performance measure of social-emotional functioning that builds from the components of the Faces-SET but incorporates additional social-emotional skillsets. In conclusion, difficulty recognizing others' emotions appears to be uniquely important in the context of youth aggression and should be considered along with other SIP distortions as part of a series of inter-related social-emotional difficulties associated with aggressive behavior.

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Table 1

Descriptive Statistics for Main Study Variables

	M	*SD*	α
Emotion Processing			
Emotion recognition	14.08	3.93	.72
Situational attribution	14.61	2.90	.60
Social Cognitions			
Outcome expectations	2.39	.60	.82
Retaliatory beliefs	2.61	.69	.76
Aggression (T-score)	62.40	12.51	.86

Table 2

Correlation Matrix with Main Study Variables

	ER	AOR1	FUR1	SUR1	SAA	AOR2	FUR2	SUR2	RB	OE	Gender	Race
Emotion Recognition (ER)												
Anger over-rec (AOR1)	-.34***											
Fear under-rec (FUR1)	-.71***	.16**										
Sadness under-rec (SUR1)	-.71***	.33***	.19**									
Situational Attribution Accuracy (SAA)	.45***	-.17**	-.32***	-.31***								
Anger over-rec (AOR2)	-.21***	.07	.23***	.11	-.62***							
Fear under-rec (FUR2)	-.21***	.07	.23***	.11	-.62***	1						
Sadness under-rec (SUR2)	-.42***	.16**	.17	.40***	-.67***	.09	.09					
Retaliatory Beliefs (RB)	.00	-.05	-.02	.01	-.05	.03	.03	.03				
Outcome Expectations (OE)	-.14*	-.03	.09	.04	-.18**	.13*	.13*	.10	.17**			
Gender	-.06	-.07	.07	-.04	-.01	.02	.02	.04	.04	.00		
Race	-.05	.07	.01	.03	-.14*	.07	.07	.08	-.04	.02	-.09	
Aggression	-.15**	.19***	.03	.22***	-.07	.06	.06	.03	.19***	.08	-.05	.01

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$.

Table 3

Correlates of Aggression in a Series of Step-Wise Linear Regression Models

	Model 1		Model 2		Model 3	
	b (se)	β	b (se)	β	b (se)	β
Emotion recognition score	-.48 (.23)	-.15*				
Error type:						
Anger over-recognition			1.20 (.54)	.14*	1.31(.54)	.15*
Fear under-recognition			-.04 (.13)	-.01	-.03 (.13)	-.01
Sadness under-recognition			.43* (.16)	.17**	.43 (.16)	.17**
Situational attribution accuracy	.00 (.29)	.00	.02 (.28)	.00	.12 (.28)	.03
Retaliatory beliefs					3.48 (1.06)	.19***
Outcome expectations					1.02 (1.23)	.05
R^2	.03		.07		.11	

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$.

Note. Gender and race are controlled for in all models. Standard error estimates (se) have been adjusted based on school cluster. Higher values indicate increased endorsement of retaliatory beliefs and more favorable outcome expectations of aggression.