LINKS AMONG DYSREGULATION IN EARLY CHILDHOOD, SOCIAL INFORMATION PROCESSING AT AGE 8, AND PEER RELATIONS AT AGE 9

by

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ABSTRACT

The goal of the current study was to examine relations between dysregulation in early childhood, social information processing at age eight, and peer relations at age nine. The sample included 93 Child Protective Services (CPS)-referred children. I hypothesized that dysregulation in early childhood would predict higher levels of maladaptive social information processing, and the expression of negative non-verbal behaviors with a same sex peer. I also hypothesized that social information processing would mediate the association between dysregulation in early childhood and non-verbal behaviors with peers. Dysregulation was assessed using the Disruptive Behavior Diagnostic Observation Schedule (DB-DOS), children's social information processing patterns were assessed using the Social Information Processing Application (SIP-AP), and peer relations was assessed through play groups with 3-4 same sex peers. The percentage of time children spent disengaged, breaking rules, and making eye contact with a partner was coded. Early childhood dysregulation was associated with aggressive goals, rule breaking with a same-sex peer during a frustrating task, and disengagement with a same sex peer during a planning task. Aggressive responses were associated with rule breaking with a same-sex peer during a frustration task. Social information processing did not mediate the association between dysregulation and rule breaking with peers. Results further our understanding of the problematic long-term outcomes associated with dysregulation in early childhood and maladaptive social information processing.

Chapter 1

INTRODUCTION

Children with strong regulatory capability manage their affect and behavior in emotionally arousing situations better than their dysregulated peers (Harris, Olthof, & Terwogt 1981). Having strong regulatory capabilities is beneficial during middle childhood when forming positive peer relationships is a critical developmental task (Webster-Stratton & Reid, 2004). Poor behavior regulation in childhood (e.g., disruptive behavior) can increase the likelihood of early childhood peer rejection (Snyder 2008), and lead to friendships with similarly disruptive peers (Powers & Bierman, 2013). Similar to poor regulatory skills, hostile attribution bias can also predict negative peer relations (Nakamichi, 2017; Waas, 1988). Hostile attribution bias occurs when children over-perceive hostility following ambiguous provocation from a peer (Dodge, 1980). However, few studies have examined associations among early childhood dysregulation, maladaptive social information processing and peer relations using a longitudinal design. The goal of the current study was to investigate links between dysregulation during early childhood, social information processing at age eight, and non-verbal behaviors during dyadic interactions with peers at age nine among a sample of Child Protective Services (CPS)-referred children.

Dysregulation

Emotion regulation refers to an individual's ability to cope effectively with provocative situations (Harris et al., 1981). Given that children can be provoked in the

presence of their peers, strong emotion regulation is helpful in the peer context. Indeed, the quality of children's relationships with peers is associated with an ability to appropriately regulate emotions (Cassidy, Parke, Butkovsky, & Braungart, 1992). Several studies have established links between emotion regulation and social competence. For example, teachers' ratings of 5-year old boys' ability to cope with negative emotions were positively correlated with the boys' social competence (Eisenberg, Fabes, Bernzweig, Karbon, & Poulin, 1993). In contrast, teachers' ratings of boys who acted out in an attempt to cope were negatively correlated with teachers' ratings of boys' popularity ("Does this child have a lot of friends?") (Eisenberg al., 1993). These findings have been replicated using a high risk sample as well; emotion dysregulation in early childhood was found to predict later peer rejection in a sample of boys from low income families (Trentacosta & Shaw, 2009).

Behavioral dysregulation, or the inability to appropriately regulate one's behavior within an emotionally challenging situation, can impact a child's peer interactions. In particular, children with disruptive behavior are more likely to be less popular, fight more, and experience more peer rejection than children who do not demonstrate disruptive behavior. For example, children aged 6 to 13 with diagnoses of conduct disorder were rated as least liked and as children who fight more by their peers than children who did not have diagnoses of conduct disorder (Strauss et al., 1988). These findings are not unique to clinical populations; children categorized as disruptive by their teachers are rejected more often than well-regulated peers, as measured by asking children to list the names of children they liked the least

(Bierman, Smoot, 1991). Moreover, children with behavioral problems not only fight more but use fewer positive social skills during dyadic play (e.g. apologize, share) than children without behavioral problems (Webster-Stratton & Lindsay, 1999). It is possible that both the addition of aggression and disruptive behavior, and the omission of positive social skills, contribute to the dysregulated child's rejection. Taken together, these studies suggest that early childhood dysregulation increases children's risk for peer rejection.

Social Information Processing

It is possible that dysregulation leads to the misinterpretation of social cues, and makes it more likely that children react with a behaviorally inappropriate response (Webster-Stratton & Lindsay, 1999). Indeed, social information processing has been linked with social competence (Dodge, Bates, Pettit, 1990). Social information processing is a cognitive model outlining the social cognitive steps children take in social situations before enacting a behavioral response (Crick & Dodge, 1994). The cognitive steps include the interpretation of social cues, the selection of goals, the formation of possible behavioral responses, and the evaluation of those responses (Crick & Dodge, 1994). Deficits in social information processing have been proposed as a possible mechanism for the development of problematic peer relations (Crick & Dodge, 1994; Orobio de Castro, Veerman, Koops, Bosch; Monshouwer, 2003) and deficits in each step are cumulatively damaging (Crick & Dodge, 1994).

Hostile cue interpretations. Hostile attribution bias, a social cognitive bias in

which someone over-perceives hostility when a peer's actions are ambiguous, consistently predicts violence and aggression with peers (Orobio de Castro et al., 2005). Hostile attributional bias occurs in the early stages of social interaction, when children interpret social cues. Hostile attribution bias may, in part, compromise a child's social status or competence; popular children are better able to accurately appraise the social intentions of other children than unpopular children (Dodge, Murphy, Buchsbaum 1984). In addition to interpreting social cues, there are other stages of social information processing, including selecting goals, generating responses, evaluating the efficacy and outcomes of those responses, and enacting a response (Crick & Dodge, 1994).

Aggressive goals. Directly after interpreting a social situation, children then select a goal or desired outcome (Crick & Dodge, 1994). Aggressive goals tend to revolve around hostility, revenge or control (Erdley & Asher, 1996). To the best of our knowledge, no study has examined associations between aggressive goals and observed nonverbal behavior in dyadic peer interactions. However, one study found that rejected boys were more likely to report aggressive goals than were peers of a positive social status (Asarnow & Callan 1985).

Aggressive responses. With their goal identified, children generate possible behavioral responses to achieve that goal (Crick & Dodge, 1994). To the best of our knowledge no study has investigated aggressive responses and observed nonverbal behaviors in dyadic peer interactions. However, one study found that socially rejected, aggressive-reactive, children endorse more aggressive responses than their socially

accepted peers to ambiguous situations (Dodge & Coie, 1987).

Aggressive response evaluation. Before enacting a behavioral response, children evaluate possible outcomes and consequences of the response (Crick & Dodge 1994). When children believe that aggressive responses lead to positive outcomes, they are more likely to act in aggressive ways (Crick & Ladd, 1990). To the best of our knowledge no study has looked at aggressive response evaluation and observed non-verbal behaviors in dyadic peer interactions.

Peer Relations

Peer relationships are important for development; children who have positive peer relationships have higher academic achievement test scores, are more motivated academically, and show higher levels of engagement in the classroom than children with negative peer relationships (Miller et al., 2017). Peer relations are also an important contributor to emotional health. Children who have negative peer relationships are more likely to have higher levels of internalizing and externalizing symptoms during adolescence than children with positive peer relationships (Sheppard, Giletta, & Prinstein, 2016). Additionally, popular children are more likely to have higher levels of self-confidence and report less loneliness than rejected children (Boivin & Bégin, 1989; Cassidy & Asher, 1992). Moreover, children with problematic peer relations are at increased risk for school dropout and criminal behavior (Parker & Asher 1987), whereas social competence predicts future high school graduation, stable employment in young adulthood, and is inversely correlated with the chance of arrest (Jones,

Greenberg, & Crowley, 2015).

The Current Study

While there is one body of literature linking maladaptive social information processing and negative peer relations and another body of literature linking poor emotion regulation and negative peer relations, to the best of our knowledge, no study has examined dysregulation in early childhood and social information processing at age eight as predictors of peer relations at age nine. Additionally, throughout the peer relations literature, peer relations and social functioning are most frequently measured through peer nominations, parent report, and teacher report.

The current study builds on previous research by using an observational approach to measure peer functioning. Specifically, the current study examined links between children's dysregulation in early childhood, social information processing at age eight, and observed nonverbal behaviors (i.e., eye contact, rule breaking, and disengagement) with peers at age nine. I hypothesized that dysregulation in early childhood would predict higher levels of maladaptive social information processing (e.g., hostile attributional bias) at age eight, higher levels of disengagement and rule breaking, and lower levels of eye contact with peers at age nine. In addition, I hypothesized that higher levels of maladaptive social information processing would predict higher levels of disengagement and rule breaking, and lower levels of eye contact with peers at age nine. I explored whether maladaptive social information processing (e.g., hostile attributional bias) mediates the relationship between

dysregulation in early childhood and nonverbal behavior with peers at age nine.

Chapter 2

METHODS

Participants

Participants included 93 children.

Demographic Characteristics of Children and Parents

Child Age (years; *M* & *SD)*	9.5 (.35)
Child Gender (% male)	54
Child Race	
African-American (%)	70
Caucasian (%)	9
Multiracial (%)	15
Other (%)	7
Child Ethnicity	
Non-Hispanic or Latino (%)	80
Education	
Less than High School Degree (%)	33
High School Degree or GED (%)	41
Some College (%)	13
Baccalaureate Degree (%)	2
Postgraduate Degree (%)	1
Household Income ($; *M* & *SD)*	21,943 & 16141
Did Not Report (%)	11

Procedure

Participants were recruited in infancy and participated in a longitudinal study evaluating the efficacy of a parenting intervention. Families were referred by Child Protective Services due to concerns for maltreatment. After participating in a consent visit in their home, they were randomized to receive the experimental intervention

Attachment and Biobehavioral Catch-up (n = 46) or the control intervention Developmental Education for Families (n = 53). After receiving the intervention, families participated in follow-up visits to assess various child and parent outcomes. For the purposes of this study, emotion and behavior regulation were assessed in early childhood. Social information processing was assessed at approximately age eight, and the expression of negative affect with peers was assessed at age nine.

Measures

Dysregulation in early childhood. To measure dysregulation, an observational procedure known as the Disruptive Behavior Diagnostic Observation Scale was used (DB-DOS; Wakschlag, et al., 2008a; Wakschlag, et al., 2008b). The DB-DOS is an approximately 50-minute semi-structured laboratory paradigm designed to elicit dysregulation in 36 month and 48 month old children. During the DB-DOS, there are two contexts: parent and examiner. The current study only draws upon data from the examiner context. During the DB-DOS, children are presented with increasingly frustrating tasks and have to regulate their emotions and behaviors. For example, children are asked to complete a puzzle. However, the puzzle is unsolvable because it is missing a piece. During another frustrating task, children are instructed to sit and color something for their parents while sitting directly in front of enticing toys. Across tasks, the examiner responds to the child's disruptive behavior. Specifically, the examiner shows ascending levels of support depending on the degree of the child's disruptive behavior. The bigger the disruption made by the child, the more support the examiner

offers. The examiner contexts are also further divided into 'Examiner Busy' and 'Examiner Present.' Examiners in the busy context generally provide minimal support, only respond to active bids and then encourage the child to resume work. In contrast, in the present context, the examiner is normally responsive and reactive, and matches the intensity and modality of the child's behavior.

Observational coding of behavior and emotion dysregulation. For emotion dysregulation, children were coded on six different emotion variables on a scale of 0-3 (0 - none, 1- low, 2 -moderate, 3 - high). The variables included: Intensity of irritable/angry behavior, predominance of angry behavior, ease of elicitation of angry behavior, rapid escalation of irritable behavior, difficulty recovering from angry behavior, and coping with frustration poorly. Codes for each variable were averaged to create an overall composite score for Anger Modulation. For behavior dysregulation, children were coded on 14 different behavior variables on the same 0-3 scale. The variables included: Defiance, passive non-compliance, predominance of noncompliance, rule breaking with an adult in the room, rule breaking with an adult out of the room, lack of admission with lying with an adult, lack of admission of lying without an adult, provocative behavior, behavioral inflexibility, destructiveness, directed aggression, verbal aggression, and spiteful behavior. All 14 were averaged to create a composite score for Behavior Dysregulation. Two coders coded 21% (n = 26) of videos for the 3-year-old follow-ups in the examiner contexts, and reliabilities were: examiner present emotion regulation r = .92; examiner present behavior regulation, r = .86; examiner busy emotion regulation, r = .85; examiner busy behavioral regulation, r

= .89. Additionally, two coders coded 22% (n = 31) of videos for the 4-year-old follow-ups in the examiner contexts, and reliabilities were: examiner present emotion regulation, r = .77; examiner present behavioral regulation, r = .87; examiner busy emotion regulation, r = .92; examiner busy behavioral regulation, r = .98.

In order to maximize sample size, and minimize the amount of statistical analyses, behavior regulation and anger modulation were collapsed across both time points to create one 'dysregulation' composite per child.

Social Information processing at age eight. When children were eight years old, their social information processing was assessed using the Social Information Processing Application (SIP-AP; Dodge et al., 1986). This is a standardized, computerized measure created to assess SIP cognitions. The SIP-AP consists of eight video vignettes that depict social situations. Each scenario has a negative outcome for the protagonist, but the intent behind the "perpetrator peer" is ambiguous. The vignettes depict different types of aggression, including physical aggression, relational aggression, covert aggression, and property destruction. After children watch each video, they answer 15 multiple choice questions. The first four questions measure hostile attributional bias. The first question explicitly measured hostile attributional bias (by asking, "Do you think he/she intended to be mean?"). The remaining three questions also investigated the participant's interpretation of the perpetrator peer's action, by asking how rejected, disrespected or angry it would make the child feel (i.e., "How disliked or rejected [disrespected, angry] would you feel if this happened to you?"). The child's scores ranged from 1 (no, definitely not mean; not at all disliked or rejected; not

at all disrespected; not at all angry) to 5 (yes, definitely mean; very very disliked or rejected; very very disrespected; very very angry). A Hostile Attributional Bias score was created for each child by averaging his or her responses for these four questions across the eight vignettes.

Two questions assessed children's aggressive goals, specifically revenge goals ("Would you want to get back at the boy/girl or get the boy/girl in trouble?) and dominance goals ("Would you want to make sure that the boy/girl knows that you are the boss and he/she can't push you around?"). Scores ranged from 1 (no, definitely not) to 5 (yes, definitely). An Aggressive Goals composite score was created for each child by averaging their responses for these two questions across the eight vignettes.

Next, three questions assessed children's aggressive responses, through overt aggression ("Would you push, hit, call names, or insult the boy/girl or try to hurt him/her in some other way?"), dominance ("Would you threaten the boy/girl, order him/her around, or let him/her know you are the boss in some other way?"), and relational aggression ("Would you talk about the boy/girl behind his/her back or try to get other kids to not play with him/her?"). Scores ranged from 1 (no, definitely not) to 5 (yes, definitely). An Aggressive Responses composite score was created for each child by averaging their responses for these three questions across the eight vignettes

Lastly, three other questions assessed children's aggressive response evaluations, specifically aggressive outcome expectancy ("If you get back at the boy/girl, would things turn out to be good or bad for you?"), self-efficacy ("How easy

or hard would it be for you to get back at the boy/girl?") and moral acceptability ("How right or wrong would it be to get back at the boy/girl?"). Scores ranged from 1 (very bad for me; very hard; definitely the wrong thing to do) to 5 (very good for me; very easy; definitely the right thing to do). An Aggressive Response Evaluations composite score was created for each child by averaging their responses for these three questions across the eight vignettes.

All social information processing composite variables demonstrated adequate reliability: hostile attribution bias composite $\alpha = .90$, aggressive goals composite $\alpha = .77$, aggressive responses composite $\alpha = .93$, and aggressive response evaluation composite $\alpha = .75$.

Peer relations at age nine. When children were nine years old, they participated in peer groups with 3-4 same-sex peers. The children in each group did not know each other and did not interact with one another before play groups. In dyads, children completed a series of six tasks in a "round robin" format. Child A and Child B completed a task together, while Child C and Child D were completing a task together. Then children switched partners, and Child A interacted with Child C while Child B interacted with Child D. In the last combination, Child A interacted with Child D while Child B interacted with Child C. Children were motivated to complete tasks to earn 30 tickets and earn a prize.

Each dyad completed two five-minute tasks. The first task each dyad was instructed to complete was developed to elicit frustration. The first set of dyads

attempted to unlock a plastic box with a bear inside of it, and these children were given a ring with hundreds of keys, none of which would unlock the box. The second set of dyads attempted to find a picture of a squirrel in a scrapbook which did not include the picture, and the third attempted to find a specific "smiley face" ball within a bin that didn't include the "smiley face" ball. After completing the frustration task, each dyad completed a positive, planning task. These tasks were designed to foster collaborative discussion, rather than to elicit frustration. For these tasks, children were asked to plan the perfect party, design the perfect school, and plan the perfect field trip.

Observational coding of non-verbal behavior. Children were video recorded during peer groups. Coding took place at a separate time than the interaction, and every second of each five-minute task was coded for emotion using Noldus The Observer XT software version 11. Three categories of non-verbal behavior were coded: engagement, eye contact and rule breaking. Disengagement was coded whenever the child blatantly disengaged from either the task or social interaction (e.g., child was not working on the task or speaking to partner). Rule-breaking was coded whenever the child engaged in disruptive behavior including but not limited to: throwing materials, turning off the lights, or trying to leave the room. Eye contact was coded whenever the child locked eyes with their peer during the task. For each non-verbal code, a variable was created for the frustration and planning tasks. Each variable represented the percent of time the child engaged in a certain non-verbal behavior (e.g., disengaging from the task or from their partner). Inter-rater agreement for the non-verbal coding was very strong; for disengagement and rule breaking, $k = .99$; for eye contact $k = .91$

Chapter 3

RESULTS

Preliminary analyses for the dysregulation, social information processing, and peer relations variables examined differences based on gender and intervention status. Additional preliminary analyses examined demographic statistics (child race, parental income and education) in relation to dysregulation, social information processing, and peer relations.

Primary analyses addressed four questions. First, I examined whether dysregulation in early childhood was significantly associated with social information processing at age eight. Next, I examined whether dysregulation in early childhood was significantly associated with non-verbal behavior with peers at age nine. I also examined whether social information processing was associated with non-verbal behavior with peers. Last, I examined whether social information processing mediated the relationship between dysregulation and non-verbal behavior.

Preliminary Analyses: Dysregulation

Two *t*-tests were conducted to examine gender differences and intervention differences in terms of dysregulation. There were no significant differences based on gender, such that boys ($M = 4.34$, $SD = 3.29$) did not significantly differ from girls ($M = 3.42$, $SD = 2.67$), $t(81) = 1.38$, $p = .17$. Additionally, there were no significant intervention differences such that children who received the DEF control intervention

(M= 3.88, SD = 3.26) did not significantly differ from those who received ABC in infancy (M = 3.96, SD = 2.77), $t(81) = .12$, $p = .91$.

To determine whether there was a main effect for race, a MANOVA was conducted. There was a main effect for race, $F(3, 79) = 3.67$ $p = .02$. Post hoc analyses revealed that multiracial children had higher dysregulation scores (M = 5.67 SD = 2.90) than Caucasian children (M =1.71, SD =4.53). Dysregulation did not differ based on child ethnicity (i.e., Hispanic vs. non-Hispanic) or level of parent education. Last, a correlation was run to determine if there was a significant relation between dysregulation scores and parental income, $r(83) = -.07$, $p = .60$; the correlation was not significant.

Preliminary Analyses: Social Information Processing

To determine whether there was a main effect for gender, a MANOVA was conducted. A significant effect for gender emerged only for aggressive goals, $F(1, 82) = 5.32$, $p = .02$, such that females reported higher aggressive goals (M = 3.08, SD = 1.01) than males (M = 2.61, SD =1.17). No differences emerged based on child race, child ethnicity, or parental education.

Social information processing variables and household income were examined as correlations; income was negatively associated with aggressive goals, $r(93) = -.24$, p =.05 and aggressive response evaluation, $r(93) = -.25$, $p = .04$. There were no other significant associations between income and social information processing.

Preliminary Analyses: Non-verbal Behaviors with Peers

Independent samples *t*-tests were conducted to test for gender differences and intervention differences in the three non-verbal behavior variables. Boys did not differ significantly from girls in terms of eye contact, rule breaking, or disengagement, in either the planning or frustration task. With regard to intervention differences, children who received the control intervention (M= 3.84, SD = 2.19) spent marginally less time maintaining eye contact with their peers during the frustration task than those who received ABC in infancy (M = 4.92, SD = 3.34), $t(81) = .1.88$, $p = .06$. No other significant intervention differences emerged.

To determine whether there was a main effect for race, a MANOVA was conducted. Post hoc analyses revealed that children identified by their parents as 'other' spent more time holding eye contact, $F(3, 95) = 3.90$ $p = .01$, (M = 42.6, SD = 13.87) than Caucasian children (M =18.2, SD =13.97) during the planning task. Despite a significant difference between groups, I am hesitant to interpret this finding due to the low number of Caucasian children in this sample (N = 8).

There was no significant difference between any of the other races in our sample and their scores across the three non-verbal behavior variables. No significant differences in nonverbal behaviors emerged based on child ethnicity or parental education. Nonverbal behaviors were also not associated with parental income.

Primary Analyses

Links between dysregulation and social information processing.

Associations between dysregulation in early childhood and the social information

processing variables were examined as correlations (Table 1). Early childhood dysregulation was significantly and positively correlated with aggressive responses, and marginally correlated with aggressive goals and aggressive response evaluation. That is, higher levels of dysregulation during early childhood significantly predicted higher levels of aggressive responses at age eight. Additionally, higher levels of dysregulation during early childhood marginally predicted both higher levels of aggressive goals, and higher levels of aggressive response evaluation.

Table 1. *Correlations between Early Childhood Dysregulation and Social Information Processing*

	1	**2**	**3**	**4**	**5**
1. Dysregulation Composite	-	0.01	0.2	.24*	0.19
2. Hostile Attribution Bias		-	.54**	.35**	.37**
3. Aggressive Goals			-	.73**	.39**
4. Aggressive Responses				-	.42**
5. Response Evaluations					-

*Note. *p < .05, **p < .01.*

Links between dysregulation and non-verbal behaviors with peers.

Associations between dysregulation in early childhood and non-verbal behavior during dyadic interactions at age nine were examined as correlations (Table 2). Early childhood dysregulation was significantly and positively correlated with the percent of time children spent rule breaking during the frustration task, and with the percent of time children spent disengaging from interaction during the planning task. That is, higher levels of dysregulation during early childhood significantly predicted more rule

breaking during the frustration task at age nine and more disengagement during the planning task at age nine than lower levels of dysregulation. There were no significant associations between dysregulation and the other non-verbal behavior variables.

Table 2. *Early Childhood Dysregulation and Non-verbal Behavior Correlation*

	1	2	3	4
1. Dysregulation Composite	-	.04	.10	.26*
2. Eye Contact	.09	.41**	-.14	.01
3. Disengagement	.33**	-.04	.07	.46**
4. Rule Breaking	.08	-.07	.26**	.14

Note. $*p < .05$, $**p < .01$. Correlations for frustration tasks in relation to the dysregulation composite depicted above the highlighted diagonal, and correlations for planning tasks in relation to the dysregulation composite depicted below the diagonal.

Links between social information processing and non-verbal behavior with peers. Associations between social information processing and non-verbal behavior during dyadic interactions at age nine were examined as correlations (Table 3). Higher levels of aggressive responses at age eight were significantly and positively correlated with rule breaking during the frustration task at age nine. That is, higher levels of aggressive responses at age eight significantly predicted more rule breaking during the frustration task at age nine than lower levels of aggressive responses. Additionally, higher levels of aggressive goals at age eight were positively and marginally correlated with rule breaking during the frustration task at age nine, $r(93) = .18$, $p = .08$. Similarly, higher levels of response evaluations at age eight were marginally correlated with rule breaking during the frustration task at age nine, $r(84) =$

.19, p =.07. There were no significant or marginal correlations between the social information processing variables at age eight and the other non-verbal behaviors during the planning task at age 9 (Table 4).

Table 3. *Correlations between Social Information Processing and Non-verbal Behavior during frustration tasks*

	1	**2**	**3**	**4**	**5**	**6**	**7**
1. Hostile Attribution Bias	-	.54**	.35**	.37**	-0.11	-0.07	0.15
2. Aggressive Goals		-	.73**	.39**	0.06	-0.02	0.18
3. Aggressive Responses			-	.42**	0.05	0.05	.26*
4. Response Evaluations				-	0	-0.13	0.19
5. Eye Contact (F)					-	-0.14	-0.01
6. Disengagement (F)						-	.46**
7. Rule Breaking (F)							-

*Note. *p < .05, **p < .01.*

Table 4. *Correlations between Social Information Processing and Non-verbal Behavior during planning tasks at age 9*

	1	2	3	4	5	6	7
1. Hostile Attribution Bias	-	.54**	.35**	.37**	-0.03	0.12	-0.02
2. Aggressive Goals		-	.73**	.39**	-0.06	0.08	-0.09
3. Aggressive Responses			-	.42**	0.02	0.08	0.02
4. Response Evaluations				-	0.012	0.05	-0.09
5. Eye Contact (P)					-	-0.04	-0.07
6. Disengagement (P)						-	.27**
7. Rule Breaking (P)							-

*Note. *p < .05, **p < .01.*

Does Social Information Processing Mediate Links between Dysregulation in Early Childhood and Rule Breaking during the Frustration Tasks?

When controlling for aggressive goals on the relationship between dysregulation and rule breaking during the frustration task, we find a partial correlation of $r = .14$, $p = .21$ This partial correlation is less than the zero-order correlation between dysregulation and rule breaking (Table 2). To test for significance of an indirect effect (in other words, whether or not the total effect of dysregulation on rule breaking is significantly reduced by the addition of aggressive goals as a mediator), the Sobel test was performed (entering unstandardized coefficients and standard errors from linear regression SPSS output) for a path (dysregulation to aggressive goals) and b path (aggressive goals to rule breaking) into the Sobel test

calculator on Kristopher Preacher's website. The result was non-significant, $t(84) = 1.1$, $p = .27$.

When controlling for aggressive responses on the relationship between dysregulation and rule breaking during the frustration task, we find a partial correlation of $r = .12$, $p = .29$. This partial correlation is smaller than the zero-order correlation between dysregulation and rule breaking. To test for significance of an indirect effect, the Sobel test was performed (entering unstandardized coefficients and standard errors from the linear regression SPSS output) for a path (dysregulation to aggressive responses) and b path (aggressive responses to rule breaking) into the Sobel test calculator on Kristopher Preacher's website. The result was non-significant, $t(84) = 1.7$, $p = .1$.

When controlling for aggressive response evaluations on the relationship between dysregulation and rule breaking during the frustration task, we find a partial correlation of $r = .12$, $p = .27$. This partial correlation is smaller than the zero-order correlation between dysregulation and rule breaking. To test for significance of an indirect effect, the Sobel test was performed (entering unstandardized coefficients and standard errors from the linear regression SPSS output) for a path (dysregulation to aggressive response evaluations) and b path (aggressive response evaluations to rule breaking) into the Sobel test calculator on Kristopher Preacher's website. The result was non-significant, $t(93) = 1.2$, $p = .23$.

Chapter 4

DISCUSSION

The current study examined the links between children's dysregulation in early childhood, social information processing at age eight, and children's behaviors with peers at age nine.

Links between Dysregulation and Social Information Processing

I hypothesized that dysregulation in early childhood would predict higher levels of hostile attributional bias, aggressive goals, aggressive responses, and aggressive response evaluation at age eight. Results from the current study partially supported my hypothesis; dysregulation in early childhood predicted the formation of more aggressive goals at eight, but it did not predict the other stages of social information processing. Specifically, there were no significant correlations between early childhood dysregulation and the hostile interpretation of an ambiguous action by a peer, the endorsement of aggressive responses, or the positive evaluation of aggressive responses at age eight.

To the best of our knowledge, no other study has examined dysregulation as a predictor for aggressive responses or aggressive response evaluation, but one study found a link between dysregulation and the hostile interpretation of ambiguous cues (Webster-Stratton & Lindsay, 1999). Although our findings were inconsistent with

regards to dysregulation and hostile attribution bias, the studies differed in several meaningful ways. For example, the study conducted by Webster-Stratton and Lindsay (1999) measured the two variables at the same time point, whereas the current study attempted to establish a predictive link between the two, over four years. Second, the children in the Webster-Stratton and Lindsay (1999) study had a diagnosis of either conduct problems or oppositional defiant disorder, whereas our sample consisted of children with subclinical levels of dysregulation. Considering the children in their sample required a clinical referral for their behavior, it is possible the link only holds for clinical levels of dysregulation and hostile attribution bias. These differences between the two samples could perhaps explain the incongruent findings.

Links Between Dysregulation and Non-Verbal Behaviors with Peers

I hypothesized that dysregulation in early childhood would be associated with higher levels of disengagement, rule breaking, and lower levels of eye contact with peers during frustration and planning tasks at age nine. Results partially supported my hypothesis. Dysregulation in early childhood predicted both rule breaking with a peer during a frustration task at age nine, and disengagement from a peer during the planning task. No other significant associations between dysregulation and non-verbal behavior emerged. For the purpose of this study, we operationalized negative peer relations as disengagement from, or rule breaking with a peer; with this in mind, the results of this study bolstered the link between dysregulation and poor social functioning in the current literature. Our findings are consistent with previous studies; children with maladaptive

coping strategies are less popular (Eisenberg et al., 1993), are liked less, (Cassidy et al., 1992) and utilize fewer positive social skills (Webster-Stratton & Lindsay, 1999) than their better-regulated peers.

Interestingly, the link between dysregulation and rule-breaking only emerged within the frustrating task. This could possibly be due to the planning task being designed to stimulate collaborative discussion between peers. That is, strong emotion regulation was likely not required (e.g., there was no disruptive response to suppress) during the planning task. In contrast, given the provocative nature of the frustrating task, it was likely to serve as a context in which children had greater difficulty regulating their behavior.

Additionally, dysregulation in early childhood did not significantly predict less eye contact with a peer at age nine as hypothesized. Although eye contact is associated with higher social functioning (Freeth, Foulsham, & Kingstone, 2013), it was the only positive non-verbal behavior measured. Eye contact may be an integral part of adaptive social skills, but it is probably not a strong enough contributor to be the sole measure of positive social skills. A future study might investigate eye contact alongside other positive social skills (e.g., sharing or apologizing).

Links Between Social Information Processing and Non-Verbal Behavior with Peers

I hypothesized that higher levels of hostile attribution bias, aggressive goals, aggressive responses, and aggressive response evaluation would be associated with

higher levels of disengagement and rule breaking, and lower levels of eye contact with peers at age nine. The results suggest that the endorsement of aggressive responses at age eight predicted rule breaking with a peer during the frustration task at age nine. No other stage of social information processing predicted negative peer relations. Again, the current study conceptualized negative peer relations as either disengagement from a peer, or rule breaking with a peer during a dyadic interaction. With this in mind, our findings are consistent with other studies on the topic, that boys who are rejected by their peers endorse more aggressive responses than boys who are not (Dodge & Coie 1987).

Most surprisingly, we found no significant link between hostile attribution bias and any of our nonverbal behaviors. This is inconsistent with prior literature linking hostile attribution bias and social functioning. For example, popular children are more likely to accurately assess social cues than their rejected peers (Dodge et al., 1984), and hostile interpretation of an ambiguous action consistently predicts aggression with peers (Orobio de Castro et al., 2005). More specifically, hostile attribution bias has even been shown to manifest during dyadic peer interaction (Coie et al., 1999; Hubbard et al., 2001). These findings suggest a link between hostile attributions and social functioning, but it is not one we could replicate. This could perhaps be explained through our somewhat unorthodox measurement of hostile attribution bias. The first question of our cue interpretation section of SIP-AP measured hostile attribution bias in a way that is consistent with previous studies (do you think the boy/girl intended to be mean?). However, our HAB composite score asked children three additional questions as well;

these questions measured how rejected, disrespected, or angry a child would feel in this situation. This difference in finding could be because we measure cue interpretation slightly differently from how it has been typically measured in prior research.

Does Social Information Processing Mediate Links Between Dysregulation in Early Childhood and Rule Breaking During the Frustration Tasks?

Despite finding links amongst dysregulation in early childhood, social information processing at age eight, and peer functioning at age nine, we did not find that any SIP stage mediated the link between dysregulation and peer functioning. That is, the total effect of dysregulation in early childhood on social functioning at age nine was not significantly reduced when controlling for any of the SIP stages. To the best of our knowledge, no other study has investigated whether or not any of the social information processes mediated early childhood dysregulation and middle childhood social functioning.

Strengths and Limitations

There were several strengths and limitations of this study. Contrary to other studies on the topic, we conceptualized negative peer relations as the expression of disengagement with a peer and rule breaking in the presence of a peer. This is a strength of the current study; dyadic peer interaction is more ecologically valid than typical measures of peer relations, because it measures social interaction behaviorally. Due to the logistical demands of behavioral measures, the majority of previous studies measured peer relations through sociometric nominations and parent or teacher report. To validate the use of non-verbal behavior, a future study might collect these reports of

these children, and correlate it with the non-verbal behavior scores we used.

The current study measured dysregulation behaviorally, using the DB-DOS (DB-DOS; Wakschlag, et al., 2008a; Wakschlag, et al., 2008b). This is a strength of the current study; similar to the measurement of peer relations, early childhood dysregulation is often measured using parent report and teacher report. While this offered us an objective assessment, we had to collapse across time points and variables to create one dysregulation composite per child. While this maximized our sample size and minimized the amount of statistical analyses needing to be run, it is possible that we might have found different results if we examined anger modulation and behavior regulation as separate variables.

Additionally, this study utilized a longitudinal design, allowing us to evaluate children's development at four time points from early childhood to middle childhood. This longitudinal design made our study unique, as no other study has examined early childhood dysregulation as a predictor of middle childhood social functioning. Further, it granted us the opportunity to investigate whether social information processing mediated the link between early dysregulation and later peer functioning. Third, our variables were measured in the context of a high risk sample.

Future Directions

There are multiple future directions to be explored based on the findings of this study. First, a future study may correlate the expression of non-verbal behavior with

more typical measures of peer relations (e.g., sociometric nominations, parent, and teacher report). Such a study could further validate the use of non-verbal behavior as a measure of social functioning. Relatedly, another study might investigate links among dysregulation, social information processing, and verbal expression during dyadic peer interactions. Lastly, our findings were only found in the context of a high risk sample. It's possible that children reared in a lower risk environment could be protected from the long term consequences of early dysregulation. For this reason, future research may investigate whether these findings can be replicated with a more diversified, lower risk sample.

Conclusions

The current study takes an important first step in identifying dysregulation in early childhood and maladaptive social information processing as predictors of poor social functioning in CPS-referred children. I found early childhood dysregulation to be a predictor of aggressive goal setting at age eight, and rule breaking with a same-sex peer at age nine. The current study builds on previous literature by using an observational measure of peer relations. Results highlight that early dysregulation predicts poor social functioning in middle childhood. Future studies might extend this research to predict the display of emotions, or positive social skills during dyadic interaction.

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