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# Social Information Processing, Emotions, and Aggression: Conceptual and Methodological Contributions of the Special Section Articles

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**Abstract** This discussion summarizes some of the key conceptual and methodological contributions of the four articles in this special section on social information processing (SIP) and aggression. One major contribution involves the new methodological tools these studies provide for future researchers. Eye-tracking and mood induction techniques will make it possible for SIP researchers to study attentional and emotion-related processes across the six SIP steps. In addition, the STEP-P instrument will open up the study of emotionally-charged aspects of preschoolers' early SIP. A second contribution is how these articles emphasize the dynamic interplay of emotional and cognitive processes in the emergence of children's and adolescents' aggressive tendencies. Finally, implicit developmental themes are raised by several of these studies. Discussion concludes with suggestions for future research, including a focus on the positive (i.e., non-disruptive) role of emotions, and on the connections between moral development and aggression.

**Keywords** Aggression · Social information processing · Emotions

> A psychologist walks past a bar one night and sees a man on his hands and knees under a lamp post. The psychologist asks, "Can I help you?" The slightly drunken man replies, "I'm looking for my keys." "Oh," says the psychologist "did you lose them here?" The man points to a dark alley, "No, I lost them over there, but the light is so much better here."

Crick and Dodge's seminal review (1994) of the social information processing (SIP) model has been cited more than 1,000 times in the psychological literature. And, not surprisingly, all of the articles in this special section on SIP and aggression both cite the Crick and Dodge article, and explicitly frame their hypotheses and methods in terms of the six separate SIP steps. What makes these four studies unique and important, however, is how they expand the SIP model well beyond these particular articles.

The following discussion of the individual and collective contributions of these studies begins with a very brief review of the SIP model, followed by capsule summaries of each study. Subsequent sections elaborate on three broad contributions, beginning with the one illustrated by the joke above. As a group, these articles direct their novel methodologies down the "darker," less explored, but essential topics within the SIP literature. Secondly, these articles systematically extend our understanding of how emotions and social cognition interact in those affectively intense moments when interactions become aggressive (Arsenio and Lemerise 2010; Lemerise and Arsenio 2000). Finally, the articles underscore the important, but little understood nature of developmental changes in children's and adolescents' SIP and aggressive tendencies.

## SIP Summary

Although the SIP model was described in several studies (Fig. 1), a simple example will provide a concrete framework for the remaining discussion. Imagine a child

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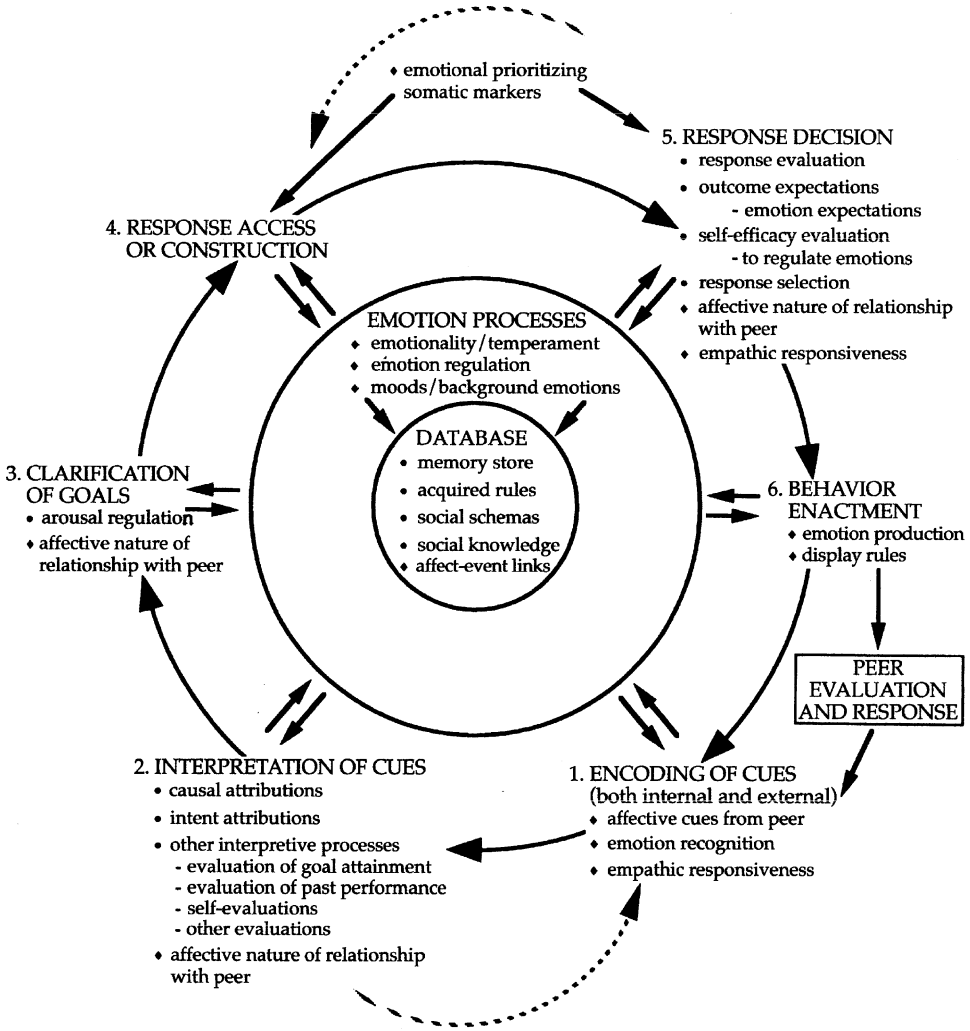


**Fig. 1** An integrated model of emotion processes and cognition in social information processing. Items marked with filled circles are from Crick and Dodge's model; those with filled diamonds represent emotion processes added to the model. From "An integrated model of emotion processes and cognition," E. Lemerise & W. Arsenio, *Child Development*, *71*, p. 113. Copyright 2000 by Wiley-Blackwell. Reprinted with permission

who gets hit by a ball while walking across a playground. The child has to figure out what happened (attention and encoding, step 1), and why it happened (interpretation: an accident or on purpose, step 2). Then the child has to decide on his or her goals (maybe to get even or to stay friendly with classmates, step 3). In steps 4 and 5, the child generates possible responses to the situation and evaluates them in terms of their anticipated outcomes, self-efficacy for enacting the behavior, etc., and finally (step 6) the selected response is enacted. For example, a child could decide a provocation was deliberate, deserves some retaliation (a threat, a punch, or at least a yell) and then decide on punching the other kid so that it does not happen again.

Of course events can be more or less complicated: a "provocation" might be clearly accidental or hostile rather than ambiguous. Or a child's behavior may not involve a provocation in the usual sense, as when 8-year-old steals a candy bar out of a classmate's lunch. Yet, as several of the articles below confirm, typically what happens in earlier SIP steps has an influence on subsequent SIP steps. For example, it is harder to have "relational goals" (step 3) towards a peer who, you decide, just threw a ball at you on purpose (step 2). The following brief summaries of the individual articles are ordered developmentally (i.e., by participants' age) with an additional focus on the specific SIP steps addressed in each.

## Schultz et al. (2010). 3–5-year-old Children; SIP Steps 2, 4, & 5: Cue Interpretation, Response Access, Response Decision

Schultz et al.s' study examines some of the earliest roots of the SIP model by creating a first of its kind, age-appropriate video assessment tool for preschoolers. The need for this instrument is obvious: as Schultz et al. note there has been a limited number of studies on the origins of SIP in children younger than 6 years old. Moreover, even fewer of these studies have used methods likely to capture the attention of young children. When emotion knowledge researchers, for example developed more contextualized, attention engaging material, they quickly recognized both the sophistication of

preschoolers' emotion knowledge and its clear connections with social competence (see, e.g., Denham 1998, for a review). The Schultz Test of Emotion Processing-Preliminary Version (STEP-P) has similar potential to open up the study of the emotionally-charged aspects of preschoolers' social information processing.

Schultz et al.s' article describes the process in going from 1,400 original videos to the final 62 videos, with their balance of male and female child actors from a number of racial/ethnic groups. The STEP-P and its three subscales make it possible to assess several steps of the SIP model. For example, the Emotions and Provocation subtests target preschoolers' understanding of the emotional states of event participants, as well as the likely intentions of provocateurs in situations involving negative outcomes for another child. By contrast, the Goal Acquisition subtest assesses situations in which children pursue both co-operative and aggressive goals, as well as situations in which children first pursue a co-operative goal but then, after being rebuffed, choose an aggressive goal.

The results of the Schultz et al. study provide early evidence of the sensitivity of the STEP-P. Compared to their peers, socially competent children were more likely to expect victims of provocation to feel angry and to judge aggression as both less morally acceptable and less effective in generating positive outcomes. In addition, disruptive children generated more aggressive responses to provocation, and disruptive boys were less likely to judge ambiguous provocations as accidental. More generally, the findings suggest that the STEP-P should be a powerful tool for examining the developmental roots of how SIP and emotion knowledge interact.

## Harper et al. (2010). 6–8-year-old Children; SIP Steps 3 & 5: Goal Clarification, Response Access and Decision

What effects do ongoing moods have on young children's goals and responses after being provoked by peers? Does being angry affect aggressive children's subsequent SIP more than that of non-aggressive children? Harper et al. use the long-standing mood induction technique in a unique and revealing way in their efforts to answer these questions. After gathering peer sociometric ratings from almost 500 1st–3rd graders, the second part of the study focused on the effects of induced moods on the social information processing of 3 groups of children: low accepted/aggressive, high accepted non-aggressive, and average non-aggressive. It is also worth noting that, given the central role of the mood induction in this research, the authors paid especially close attention to ensuring the fidelity and reliability of their mood induction procedure.

The study findings highlight both the overall effects of moods on children's SIP as well as the particular effects of angry moods on aggressive children. Anger led children, especially low-accepted aggressive ones, to focus more on instrumental than on relational goals. These findings make good theoretical sense: if anger often appears in the context of having one's goals blocked (Oatley et al. 2006), then pre-existing anger is subsequently likely to prime children towards removing perceived obstacles rather than developing friendly relations with peers. The additional finding that children's goal orientation was linked with their response to ambiguous provocation fits in with this larger pattern. Children who feel angry and thwarted will be both more likely to focus on instrumental goals and less likely to focus on non-hostile ways of removing these perceived obstacles.

Similarly, it is easy to imagine how angry or fearful moods could affect the earliest SIP steps (cue encoding and interpretation) in children's understanding of ambiguous situations (see, e.g., Dodge and Somberg 1987). As discussed more below, the mood induction approach used by Caverly et al. is an essential tool for addressed how cognition and emotions interact in the development of children's socially competent/incompetent behaviors (see Lemerise and Maulden 2010, for a review).

## Horsley et al. (2010). 10–13 year-old Children; SIP Steps 2 & 3: Cue Encoding, and Interpretation

These authors observe that although numerous studies have focused on steps 2–6 of the SIP model, very little is known about the first step, encoding. This gap is especially surprising given the emphasis on the active "on-line" nature of the SIP model, with its "direct link to performance in real time" (Crick and Dodge 1994, p. 77). If encoding goes wrong, Horsley et al. argue, all of the subsequent SIP steps will based on faulty and/or systematically biased information. But how can real-time encoding be assessed?

The authors' novel and creative solution to this problem is to use eye-tracking techniques to assess where, how long, and in what particular ways children look at a provocative social scene. Two groups of 10–13-year-old children (low and high aggressive) were presented with 10 3-frame stories and asked to identify with the recipient of either an accidental, hostile, or ambiguous peer provocation (2nd frame) that resulted in a negative outcome (e.g., a ruined painting in frame 3). In addition, the emotional expressions of provocateurs were varied in the 3rd frame. Non-hostile provocateurs were always sad, and hostile provocateurs were mean, but provocateurs in each of the 3 ambiguous conditions were either sad, neutral, or mean. In addition to tracking children's eye-movements (both first-pass and look-back times), participants were asked a number of questions to assess their hostile intent attributions.

The findings provided little support for the traditional cue-based, bottom-up model, in that more aggressive

children neither attended more to hostile cues nor less to non-hostile cues than less aggressive children. And, most strikingly, even though aggressive children looked *longer* at *non-hostile* cues, they still attributed more hostile intent to provocateurs. Collectively, these findings are interpreted in terms of a "top-down" model in which aggressive school-aged children form a hostile-intent schema which leads them to pay particular attention to schema inconsistent (non-hostile) cues. But why would longer looking times at non-hostile cues be related to less recall of these cues? At this point the authors acknowledge the speculative nature of their schema-driven explanation. In any case, Horsley et al., provide an invaluable new tool for SIP researchers attempts to understand real-time processing, while also raising important developmental questions about the origins of children's attribution schemas.

### Fontaine et al. (2010) 15–17-year-old Children; SIP Steps 2 & 5; Cue Interpretation & Response Decision

The findings of the Fontaine et al. study also underscore the need for a more explicit developmental model for understanding how different SIP steps contribute to children's and adolescents' social behavior. The authors summarizes previous research indicating that hostile attribution biases (Step 2) and response evaluations (step 5) make separate, incremental contributions to the prediction of *children's* aggressive tendencies. That is, SIP steps are less tightly connected (and sequentially related) in younger children than is sometimes appreciated. By contrast, Fontaine et al. argue, developmental improvements in adolescent's executive functioning increase the coherence of their response evaluations and decision (RED). The result is a pattern in which an adolescent's attribution judgments "lead to various endorsements of aggressive responsivity that, in mediational turn, affect his or her antisocial outputs" (p. 8, Fontaine at al. 2010).

Drawing on longitudinal data, this study examined the cue interpretations and response decisions of more than 500 adolescents. Participants' hostile attribution style (HAS) was assessed using both video and story vignettes of ambiguous provocation situations. For the response evaluation and decision judgments, adolescents were asked to imagine that they had responded aggressively to the ambiguous provocateur and then to judge the effectiveness, emotional consequences, and "goodness" of that behavior. A major finding was that adolescents' RED did, in fact, mediate the relation between HAS and current antisocial behavior, even after controlling for earlier conduct problems.

An important unanswered question is how these findings might be affected by the aggressive status of these adolescents. Other research (e.g., Arsenio et al. 2009) suggests that adolescents' "hot-headed" reactive aggressive tendencies are more closely related to early SIP step difficulties (especially cue interpretation), whereas more "cold-blooded" proactive aggressive tendencies are related to later SIP step biases (e.g., RED). Although none of the studies in this section addressed the reactive/proactive aggression distinction, the mediational findings of the Fontaine et al. study draw particular attention to this possible gap. It would be interesting to know, for example, whether adolescents' more reactive vs. proactive aggressive status acts to moderate some of the findings observed by Fontaine et al.

### Specific Study Contributions

*Methodological* Many good studies raise as many questions as they answer. These 4 articles, however, both raise questions and provide researchers with significant new methodological tools for answering a wide range of questions. Take, for example, Schultz et al.s' STEP-P instrument. There is an extensive literature on individual differences in preschoolers' emotion knowledge in relation to aggressive tendencies (e.g., Schultz et al. 2000) and overall social competence (Denham 1998). By contrast, very little is known about the details of preschoolers' SIP. By connecting emotion knowledge and SIP, the STEP-P should help to clarify why preschoolers often develop stable aggressive patterns (NICHD-EECRN 2004) well before the age typically studied by SIP researchers.The eye-tracking and mood induction techniques are also major contributions to the armamentarium available to SIP researchers. Eye-tracking techniques, for example, could be extended beyond the encoding steps. Imagine a story vignette in which one character pushes another child down and takes his or her candy bar (unprovoked instrumental aggression). Where does the aggressor look and for how long—the desirable candy bar or the clearly injured victim on the ground—and what does this tell us about this child's aggressive tendencies? Or take an ambiguous provocation, with the provoked child's friends smiling and playing on one side and a hostile looking provocateur on the other side of the vignette. Where does the participant look and how does this relate to his or her new goals and subsequent SIP reasoning? Clearly, the eye tracking methodology will allow SIP researchers to get an "on-line" sense of where children direct their attentional resources across a number of SIP steps.

Another potentially illuminating direction would involve a combination of mood induction and eye tracking techniques. Take, for example, the Horsley et al. study. Compared to other moods, would an angry mood induction exacerbate aggressive children's top-down extended focus on non-hostile cues? Alternatively, combining an angry

mood induction and aggressive tendencies might result in preemptive processing, that is, some aggressive children simply fail to attend to any environmental cues and immediately leap to different aggressive responses.

Eye-tracking and mood induction techniques are also important for the systematically exploring the early developmental roots of SIP-related reasoning assessed by the STEP-P. For example, how would induced moods affect preschoolers' interpretations of the affectively-salient situations used in the Emotions subtest of the STEP-P? Would young children simply attend less to the relevant cues or would they focus on certain potentially mood-congruent elements of a situation? Another issue raised by the STEP-P is how eye-tracking techniques could be adapted to videotaped rather than static story stimuli. Although the methodological issues in adapting eye tracking techniques for dynamic stimuli are formidable, similar adaptations have proved useful for clarifying social information processing deficits exhibited, for example, by autistic individuals (Gladwell 2005).

Fontaine et al.s' methodological focus on the more differentiated aspects of response evaluation and decision in adolescents also has important implications for future SIP studies. Given adolescents wider consideration of evaluative response features, as well as their growing emotion regulation abilities, it seems less likely that mood inductions would have overall effects on their attentional processes. It is less clear, however, whether this would apply to all adolescents, especially those characterized by more impulsive reactive forms of aggression.

*Emotions & Aggression* Although this special section explicitly focuses on aggression and social information processing, it is striking how much these articles also contribute to our understanding of emotional processes in SIP and aggression. Turning to the affective aspects of Fig. 1, the articles focus on: affective cues from peers (SIP step 1, e.g., the Shultz et al. and Horsley et al. studies); arousal regulation and affective influences on goals (step 3, Caverly et al.); emotional outcomes (step 5, Fontaine et al.), as well as the affective aspects of information in the data store (e.g., affect-event links, Schultz et al.). Within these more general contributions, it is important to distinguish between studies in which emotions provide essential *information* to inform subsequent SIP reasoning (e.g., the affective expressions of provocateurs in Horsley et al.) and when emotions play a very different role. In a seminal early debate on the primacy of cognition and affect (e.g. Lazarus 1984 vs. Zajonc 1984), Lazarus acknowledged that pre-existing moods/emotions can sometimes influence subsequent social reasoning even when there is no *intrinsic* relationship between the prior mood and the current event being appraised. This, of course, is precisely why Caverly et al. used mood induction in their study. Although there is some evidence that angry and/or negative dispositions may increase children's and adults' readiness to respond aggressively (see Horsley et al.), mood induction studies make it possible to assess these links experimentally (see Lemerise and Maulden 2010, for a related review).

The present studies, however, have little to say about a 3rd potential role for emotions in SIP; one that extends beyond emotions as information or as potential disruptors of subsequent SIP. At times pre-existing *positive* emotions can promote more focused and elaborated attempts to make sense of one's social environments (Fredrickson's "broaden-and-build" theory, e.g., Fredrickson et al. 2008). The inclusion of "affective relationships" at several SIP steps in Fig. 1 for example, includes the ways that friendship ties can sometimes motivate children to engage in more effortful processing when valued relationship are potentially at risk. This is one of several avenues for future research.

*Developmental Issues* A final, less obvious contribution of these studies is the attention they direct towards potential developmental changes in the connections between children's SIP and their aggressive tendencies. As described above, Fontaine et al. explicitly contrast their key finding—that the link between HAS and antisocial behavior in adolescents is fully mediated by RED—with previous findings that, in younger children, HAS and evaluation steps make separate contributions to antisocial behavior. Schultz et al.s' development of the STEP-P instrument also has a major developmental goal; to address the earliest connections that form among preschoolers' SIP, emotions, and aggressive tendencies.

Some of the other authors in this special section, including Lemerise and de Castro, have also addressed the need for more developmentally informed SIP research and theory. For example, de Castro (2010) recently provided an interesting developmental model that emphasizes the highly normative nature of very early aggression. In his view, the key question is how and why these early aggressive tendencies get "turned off" in most children, but not in the much smaller group that goes on to exhibit long-term aggressive patterns. Collectively, the present studies are part of a growing effort to address Crick and Dodge's earlier concern that "the role of development in social information processing is an issue that has not been well addressed to date" (1994, p. 79).

## Future Directions

Arsenio and Lemerise (2010) have argued that a full understanding of aggression requires a developmental psychopathology perspective. From this perspective, moral

development involves the normative developmental side of morality/immorality, whereas aggression involves the psychopathology of morality/immorality. In brief, to know what goes "wrong" in aggression requires knowing what typically goes "right" in most children's moral development.

Take, for example, a recent study (Arsenio et al. 2009) which found that adolescents' proactive aggression tendencies were connected with their expectation that aggression (e.g., stealing someone's jacket) would make victimizers feel happy because of the clear gains produced by these acts. At the same time, victims were expected to feel very negative emotions because of the overt unfairness of the victimization. The difficulties associated with proactive aggressive tendencies, then, had nothing to do with hostile attribution biases, misunderstanding victims' reactions, or misjudging the moral permissibility of the act. Instead, proactive aggression was related to a form of "moral disengagement" that is just beginning to get more attention in the aggression literature (e.g., Hyde et al. in press).

The SIP approach has been incredibly successful for understanding children's aggression and in guiding successful treatments for some children's behavior problems (see, e.g., Powell et al. 2010, for a review). At the same time, there is a growing awareness that a core feature of aggression—children's willingness to inflict intentional harm on others—is perceived as a highly affectively-arousing moral issue *by other children* (in addition to adults). Any understanding of aggression that does not address this moral element will be developmentally incomplete. In addition, however, it is essential to avoid misunderstanding this moral element by focusing on just proximal behaviors (e.g., children's "moral failings") rather than on the distal developmental, economic, and cultural forces that can sometimes alter children's typical moral trajectories.

## References


Arsenio, W., & Lemerise, E. (2010). *Emotions, aggression, and moral development: Bridging development and psychopathology.* Washington: American Psychological Association.

Arsenio, W., Adams, E., & Gold, J. (2009). Social information processing, moral reasoning, and emotion attributions: Relations with adolescents' reactive and proactive aggression. *Child Development, 80*, 1739–1755.

Crick, N., & Dodge, K. (1994). A review and reformulation of social information-processing mechanisms in children's social adjustment. *Psychological Bulletin, 115*(1), 74–101.

Denham, S. (1998). *Emotional development in young children*. New York: Guilford.

de Castro, B. O. (2010). Rage, revenge, and precious pride: Emotions in information processing by children with aggressive behavior problems. In W. Arsenio & E. Lemerise (Eds.), *Emotions, aggression, and moral development: Bridging development and psychopathology.* Washington: American Psychological Association.

Dodge, K., & Somberg, D. (1987). Hostile attribution biases among aggressive boys are exacerbated under conditions of threat to the self. *Child Development, 58*, 213–224.

Fontaine, R., Tanha, M., Yang, C., Dodge, K., Bates, J., & Pettit, G. (2010). Does response evaluation and decision (RED) mediate the relation between hostile attributional style and antisocial behavior in adolescence? *Journal of Abnormal Child Psychology.* doi:10.1007/s10802-010-9397-y.

Fredrickson, B., Cohn, M., Coffey, K., Pek, J., & Finkel, S. (2008). Open hearts build lives: positive emotions induced through loving-kindness meditation, build consequential personal resource. *Journal of Personality and Social Psychology, 95*(5), 1045–1063.

Gladwell, M. (2005). *Blink: The power of thinking without thinking*. New York: Little, Brown, and Company.

Harper, B., Lemerise, E., & Caverly, S. (2010). The effect of induced mood on children's social information processing: Goal clarification and response decision. *Journal of Abnormal Child Psychology.*

Horsley, T., de Castro, B. O., & Van der Schoot, M. (2010). In the eye of the beholder: Eye-tracking assessment of social information processing in aggressive behavior. *Journal of Abnormal Child Psychology.*

Hyde, L., Shaw, D., & Moilanen, K, (in press). Developmental precursors of moral disengagement and the role of moral disengagement in the development of antisocial behavior. *Journal of Abnormal Child Psychology.*

Lazarus, R. (1984). On the primacy of cognition. *American Psychologist, 39*, 124–129.

Lemerise, E., & Arsenio, W. (2000). An integrated model of emotion processes and cognition in social information processing. *Child Development, 71*, 107–118.

Lemerise, E., & Maulden, J. (2010). Emotions and social information processing: Implication for understanding aggressive (and non-aggressive children). In W. Arsenio & E. Lemerise (Eds.), *Emotions, aggression, and moral development: Bridging development and psychopathology.* Washington: American Psychological Association.

NICHD Early Child Care Research Network. (2004). Trajectories of physical aggression from toddlerhood to middle childhood. *Monographs of the Society for Research in Child Development. 69(4, Serial No. 278).*

Oatley, K., Keltner, D., & Jenkins, J. (2006). *Understanding emotions* (2nd ed.). Malden: Blackwell.

Powell, N., Lochman, J., Boxmeyer, C., Barry, T., & Young, L. (2010). The Coping Power Program for anger and aggression in children: Targeting arousal and cognition. In W. Arsenio & E. Lemerise (Eds.), *Emotions, aggression, and moral development: Bridging development and psychopathology.* Washington: American Psychological Association.

Schultz, D., Izard, C., & Ackerman, B. (2000). Children's anger attribution bias: Relations to family environment and social adjustment. *Social Development, 9*, 284–301.

Schultz, D., Ambike, A., Logie, S. K., Bohner, K. E., Stapleton, L. M., VanderWalde, H., et al. (2010). Assessment of social information processing in early childhood. *Journal of Abnormal Child Psychology.*

Zajonc, R. (1984). On the primacy of affect. *American Psychologist, 39*, 117–123.