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Translational science in action: Hostile attributional style and the development of aggressive behavior problems

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Abstract

A model of the development of hostile attributional style and its role in children's aggressive behavior is proposed, based on the translation of basic science in ethology, neuroscience, social psychology, personality psychology, and developmental psychology. Theory and findings from these domains are reviewed and synthesized in the proposed model, which posits that (a) aggressive behavior and hostile attributions are universal human characteristics, (b) socialization leads to the development of benign attributions, (c) individual differences in attributional style account for differences in aggressive behavior, and (d) interventions to change attributions have the potential to alter antisocial development. Challenges for future research are described.

The problem of antisocial crime has been estimated to cost American society over one trillion dollars per year (Anderson, 1999). Chronically antisocial individuals cost society between 1.6 and 2.2 million dollars each over the life span (Cohen, 1998). As youth, they are called seriously emotionally disturbed in the education system, juvenile delinquents in the justice system, and conduct disordered in the mental health system. About 7% of males qualify as conduct disordered in psychiatric nosology (Dodge, Coie, & Lynam, 2006). Their antisocial behavior is regarded as highly stable across long periods of life, and they are notoriously difficult to treat effectively. In the search for solutions regarding an understanding of etiology of chronic antisocial behavior and novel methods for intervention and prevention, the practice field has turned to the basic sciences, including ethology, neuroscience, social psychology, personality, and developmental psychology. The translation of these sciences to the treatment of these children is captured in the tenets of developmental psychopathology.

This article concerns one concept that has grown out of translational science: hostile attributional bias. Consider the hypothetical 12-year-old boy walking down the middle-school hallway. A peer runs down the hallway, knocking him over and spilling his books on the floor. Peers laugh. How does the boy respond? Does he interpret the incident as disrespect and a threat to his reputation for strength and toughness and respond aggressively, or does he interpret the act benignly and walk away? Every child has this kind of experience, and the child's attribution and response are crucial to his or her well-being, self-respect, and reputation for strength. As Nisbett and Cohen (1996, p. xv) noted, "In many of the world's cultures, social status, economic well-being, and life itself are linked

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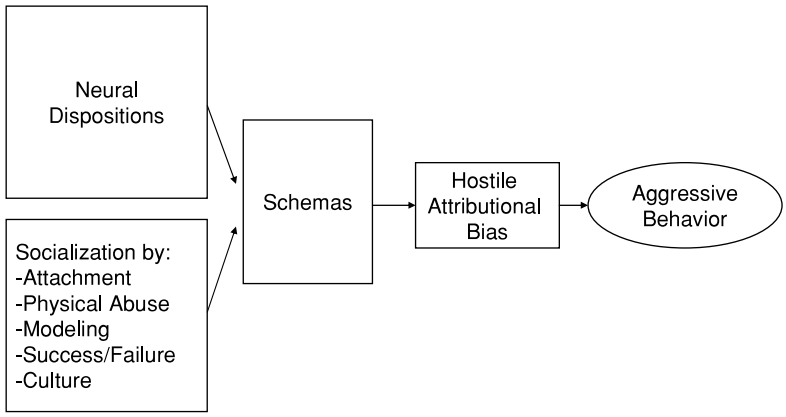


Figure 1. The model of the development of hostile attributional biases.

to such a reputation." A central thesis of this article is that individual differences in aggressive behavior occur as a function of characteristic styles of attributing hostile intent (or not) to others' provocative behavior.

Over the past 25 years, over 100 studies have identified reliable correlations between the attribution that a peer provocateur has acted with hostile intent and a behavioral response of aggression in that instance and between individual differences in the general tendency to make hostile attributions about peers' intentions and individual differences in the tendency to behave aggressively. This body of research has become part of a consensus model of how chronic conduct problems develop and are maintained (Conduct Problems Prevention Research Group [CPPRG], 1992; Dodge & Pettit, 2003), and it has influenced the creation of interventions to reduce or prevent aggressive behavior (e.g., Hudley & Graham, 1993). Even so, numerous questions remain: How do hostile attributional biases develop, what role do they play in personality, and what cognitive mechanisms drive them? More thorough answers to these questions can be found in the translation of current basic science knowledge, which is the goal of this article.

A Proposed Model

Translational science suggests the new model depicted in Figure 1. The model's familiar premise is depicted at the right, with the assertion that reactive aggressive behavior occurs as a function of making a hostile attribution that the self has been threatened. A new assertion is that hostile attibutional biases are universally acquired in early life, but *benign* attributional style is learned by most children. Thus, hostile attributional style is a failure to learn to make benign attributions. It is proposed that aggressive behavior occurs in all human beings at an early age, and what is ordinarily learned is the inhibition of aggressive responses to provocation. Second, it is proposed that as young children develop the capacity to infer intent in others during the toddler years, they first develop the assumption that threatening provocations by others are associated with hostile intent by others (a bias to match intent with outcome). What is ordinarily learned in development is that attribution that some provocations are *not* hostile (a benign attribution bias). Next, it is proposed that some children fail to develop a stable pattern of inferring benign intent in response to nonhostile and ambiguous provocations in particular situations, and instead, continue to match intent with outcome, called hostile attributional style. This pattern becomes a personality-like characteristic that endures across time and guides behavior. The failure to develop benign attributional style and instead to develop chronic hostile attributional style occurs as a function of both individual differences in neurotransmitter-mediated capacity to respond impulsively and life expe-

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riences with traumatic threat to the self and a lack of life experiences with secure attachments with protective adults. These factors cumulate and interact to lead to hostile schemas that are stored in memory. During social interactions, these schemas lead to a pattern of interpreting others' intent as threatening and hostile. Although future life experiences might alter these patterns, the pattern itself operates in a self-fulfilling prophecy to be self-reinforcing, thus increasing its stability across the life span.

Based on basic science knowledge and the findings that have accumulated from empirical tests in translation of this knowledge, specific assertions are proposed as follows:

1. Human reactive aggressive behavior is universal and begins in the first year of life as a response to goal thwarting, conflict, and restraint. Thus, a basic task of life is to learn to behave nonaggressively.
2. Matching of an act that causes a negative outcome for the self with the cognitive attribution that the intent of the actor must be consistent with the outcome (i.e., hostile) is universal, and the tendency to attribute benign intent in bad-outcome circumstances begins with cognitive development of theory of mind in the third year of life. A basic task of social interaction is to learn to identify cues that signal that the actor has acted benignly rather than malevolently; such an attribution mitigates the tendency to retaliate with angry aggression.
3. Not all children develop a consistent pattern of identifying mitigating cues and attributing benign intent to others' behavior. Under person-specific circumstances, some children continue a pattern of stable hostile attributional bias. Components of hostile attributional bias include a tendency to blame others for one's negative outcomes and not to blame the self. Self-esteem can be low or high, and is not correlated with this tendency.
4. Individual differences in the tendency to attribute benign versus hostile intent are a function of hostile and benign schemas stored in memory. Attributional tendencies mediate the effect of schemas on behavior.
5. Schemas grow out of experiences in early life and mediate the effect of these experiences on behavior. The experiences that nurture a benign attributional style might include:
   a. A secure attachment relationship with a primary caregiver, or warmth between caregiver and infant, in which trust and mutual exchange are fostered.
   b. Modeling of benign attributions by valued adults or peers.
   c. Success in important tasks.
   d. Rearing in a culture that values cooperation and the whole community.

   The experiences that foster a hostile attributional style might include:
   a. Physical abuse.
   b. Modeling of hostile attributions by adults and peers.
   c. Failure in important life tasks.
   d. Rearing in a culture that values self-defense, personal honor, and retaliation.
6. Although stable attributional style predicts general tendencies in behavior, the specific response in a given circumstance also depends on other aspects of neural responding (such as neurologically mediated tendencies to respond impulsively), social information processing (such as response accessing and decision making), and other intrapersonal and interpersonal features of the situation (such as fatigue, mood, ambient threat, and external contingencies).
7. Not all children who display a stable hostile attributional style become chronically aggressive. Other outcomes are possible, including depression, anxiety, somatic symptoms, and other stress reactions. The kind of aggressive outcome that is associated with this tendency is reactive anger and social failure rather than instrumental success as in bullying.
8. It is possible to prevent hostile attribution biases by engineering an early rearing environment to include features that nurture benign attribution tendencies. Once a stable hostile attribution biases has developed, forces operate to continue this pattern across development, but intervention may

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be able to alter this tendency. It is possible that such intervention provides a compensating cognitive response that overrides but does not eliminate the initial hostile attribution tendency.

The current article is intended to provide the rationale for this formulation, and is organized as follows. First, the phenomenon of hostile attributional bias in aggressive persons will be reviewed briefly. Next, knowledge from the basic sciences relevant to hostile attributional bias and aggressive behavior will be synthesized, including knowledge from ethology, neuroscience, social psychology, personality psychology, and developmental psychology. After each review, a translation to aggressive children will be provided. Next, intervention studies based on this phenomenon will be reviewed, with implications for prevention and intervention practice. Finally, the article will conclude with a list of unanswered questions for the future research field.

Hostile Attributional Bias and Aggressive Behavior

For many years, scholars and clinicians have noticed that some aggressive acts follow from a provocation by another. The tendency to retaliate when one has been intentionally and maliciously provoked seems to be a human inclination. Dodge (1980) used a social psychological experimental design to test the hypothesis that aggressive boys would respond to ambiguous provocations *as if* the provocateur had acted with hostile intent. He asked aggressive and nonaggressive third and fifth grade boys to participate in a structure-building contest. Midway through the contest, a peer competitor (who was actually the experimenter's confederate) destroyed the boy's building, through actions that had been experimentally manipulated as hostile, benign, or ambiguous. Both aggressive and nonaggressive boys responded to the hostile peer with retaliatory aggression and to the benign peer with restraint, supporting the initial hypothesis that retaliation follows intentional and malicious provocation rather than benign frustration. In response to the ambiguously intended peer, however, the aggressive boys responded as if the peer had been hostile, whereas the nonaggressive boys responded as if the peer had been benign. That is, the aggressive boys retaliated aggressively, and the nonaggressive boys withheld any retaliation. It appeared that the boys had made attributions about the peer's intent, and had responded accordingly. In a second experiment, Dodge presented the boys with hypothetical vignettes, in which the boys imagined being provoked by a peer who had acted ambiguously. Aggressive boys were more likely to say that the peer had acted with hostile intent than were nonaggressive boys, and this difference accounted for most of the differences between the groups in their statements of how they would retaliate toward the peer.

Nasby, Hayden, and dePaulo (1980) coined the term "hostile attributional bias" to describe the tendency of aggressive youth to attribute hostile intent to others. In their study of aggressive adolescent boys in residential mental health treatment, the stimuli were facial expressions of others depicted in photos. Aggressive youth were more likely to attribute hostile intent to the person in the photo than were matched control youth. Since then, over 100 studies have documented this phenomenon in aggressive youth and adults from a wide variety of populations, and a meta-analysis (de Castro, Veerman, Koops, Bosch, & Monshouwer, 2002) has revealed a robust phenomenon with a strong mean effect size. In community populations, the finding has been reported among: rejected-aggressive elementary school boys (Guerra & Slaby, 1990; Lochman, 1987; Sancilio, Plumert, & Hartup, 1989; Waas, 1988), and girls (Feldman & Dodge, 1987), European American aggressive children (Dell Fitzgerald & Asher, 1987), African American children (Graham & Hudley, 1994), Latino children (Graham, Hudley, & Williams, 1992), Dutch children (Comodeca & Goossens, 2004), and aggressive junior high school youth (Dodge & Tomlin, 1987).

The finding has also been reported in clinical populations, including aggressive children being treated in child guidance clinics (MacBrayer, Milich, & Hundley, 2003), hyperactive–aggressive youth in a child psy-

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chiatric population (Milich & Dodge, 1984), aggressive adolescents in a maximum security prison (Dodge, Price, et al., 1990), and violent incarcerated offenders (Slaby & Guerra, 1988).

The finding has been reported using several different methods of assessing hostile attributions. Verbal responses to hypothetical vignettes using cartoon or oral stimuli have been assessed by most of the investigators named above. Responses to survey items with multiple-choice response options were assessed by Dell Fitzgerald and Asher (1987). Dodge, Pettit, McClaskey, and Brown (1986) reported a similar effect using videorecorded provocation stimuli that were more affectively engaging than cartoon stimuli. Steinberg and Dodge (1983) presented aggressive and nonaggressive children with an actual provocation that was contrived by an experimenter and solicited children's online attributions about a peer during a "real" block-building contest during which the peer ambiguously destroyed the child's building. In this real situation, nonaggressive boys and girls attributed hostile intent to the peer 14% of the time, whereas aggressive boys and girls attributed hostile intent 61% of the time.

Hostile attributional biases have also been identified in aggressive adult populations. Barefoot, Dodge, Peterson, Dahlstrom, and Williams (1989) scored 12 items from the Minnesota Multiphasic Personality Inventory to identify a reliable scale of hostile attributional tendency in a sample of 128 law students in 1955. This scale was significantly correlated with self-reported hostile behavior in this sample. Furthermore, the combined hostile attribution and hostile behavior scale significantly predicted later mortality: those persons scoring high in hostility were over four times as likely to die by age 50 than those persons scoring low in hostility. MacBrayer et al. (2003) found that mothers who demonstrated a hostile attributional bias toward others were likely to report aggressive behavior toward others, including their own children. Nix et al. (1999) found that mothers' hostile attributional tendencies about their child predicted their own harsh discipline strategies with that child, as evaluated by their husbands and objective home observers.

Although hostile attributional biases are most strongly evident in response to ambiguous provocation stimuli, several studies have found that aggressive children also make errors in interpretation of peers' intentions when the cues are clear. Hartup (1974) and Selman (1976) had postulated that developmental lags in acquiring skills of social role taking and perspective taking might lead to inaccurate attributions that could eventuate in aggressive behavior. Chandler, Greenspan, and Barenboim (1974) had found initial support for a general deficit in perspective taking among aggressive boys. However, the subsequent evidence suggests, in contrast, that the errors by aggressive children are restricted to overattributing hostile intent when the actual intent is benign. When the provocateur's intent is actually hostile, aggressive children are *more accurate* than nonaggressive children at recognizing this intent. Dodge, Murphy, and Buchsbaum (1984) translated paradigms from cognitive psychology to create an intention-cue discrimination task, in which children were presented with three videorecorded provocation story stimuli that were similar in leading to a negative outcome for the child but which differed in the provocateur's intent (as hostile, prosocial, accidental, benign, or merely present). The child's task was to discriminate among the stimuli by multiple choice or to identify each intent in words. The authors found that aggressive–rejected children were relatively less accurate at discriminating peer intent cues, but only when the cues actually depicted benign and prosocial intentions; in these cases, the rejected–aggressive children inaccurately identified these intentions as hostile. Furthermore, when the actual intention was hostile, the rejected–aggressive children were highly accurate. Dodge and Somberg (1987) replicated this pattern of intention-cue detection inaccuracy among aggressive boys.

A good deal of scientific effort has gone into testing the causal direction of the correlation between hostile attributional bias and aggressive behavior. The skeptical interpretation is that attributions are epiphenomena with no causal influence over behavior. Three kinds of studies have addressed this problem. First, several studies have controlled for variables

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that might predict both attribution tendencies and aggressive behavior. The correlation cannot be accounted for by general information-processing deficits or impulsivity (Waldman, 1996), by general skills at discriminating stimuli (Dodge et al., 1984), or by verbal intelligence (Dodge, Price, et al., 1990).

Second, longitudinal evidence has accumulated to support the hypothesis that a hostile attributional tendency contributes to the growth of aggressive behavior over time. Dodge, Bates, and Pettit (1990) found that hostile attributional biases assessed in the Child Development Project (CDP) sample of 585 boys and girls in the summer after preschool predicted children's directly observed aggressive acts later in kindergarten. Weiss, Dodge, Bates, and Pettit (1992) followed the same sample over time and statistically controlled for a child's aggressive behavior at home during the preschool years (as assessed by mothers) as well as the harsh discipline that a child received during that era. Both of these factors were known predictors of later aggressive behavior and might account for the correlation between attribution tendencies and behavior. They found that even with these controls in place, hostile attributional biases predicted aggressive behavior in kindergarten, as assessed by teachers, peers, and direct observers. Dodge, Pettit, Bates, and Valente (1995) found that this pattern continued through the end of Grade 3 and again in Grade 4.

Third, the final kind of evidence is the clinical intervention experiment, which will be reviewed later in this article. This body of research supports the hypothesis that hostile attribution tendencies contribute to growth in aggressive behavior over time. Reciprocal effects are also likely, in that aggressive behavior problems can lead a child to develop hostile attribution tendencies.

Translation From Basic Science

Translational science has contributed a great deal to the discovery of the hostile attributional bias phenomenon and to answer to questions about the kind of aggressive behavior that is implicated, the mechanisms of the attribution process, the role of this pattern in personality, how the pattern develops, and its clinical implications. The translations have come from ethology, neuroscience, social psychology, personality, and developmental psychology.

Ethology

Basic research. Theories of human aggression have fallen into one of two camps. Social learning theory (Bandura, 1973) stipulates that aggressive behave is an acquired instrumental act that is controlled over time by its consequences. It is learned behavior that is closely governed by rules. In contrast, the frustration–aggression model (Dollard, Doob, Miller, Mowrer, & Sears, 1939) proposes that aggression is an automatic hostile reaction to perceived frustration. The key element is hostility. Indeed, "(a)ggression and hostility are synonymous terms" (Berkowitz, 1963, p. xii). The emphasis of this theory is on the antecedents of the aggressive reaction, particularly goal blocking, heightened anger, threat, and frustrated expectations. Even though Bandura acknowledged the aversive instigative mechanisms of some aggressive behaviors, he emphasized the goal directedness and proactive features of aggression. He noted, "theories generally give disproportionate attention to aversively motivated aggression . . . (I)ncentives also constitute important impellors of action. A great deal of aggression is prompted by its anticipated benefits. Here, the instigator is the pull of expected success, rather than the push of aversive treatment" (Bandura, 1973, p. 57).

Notwithstanding his human political misguidedness, the ethologist Lorenz (1966) provided a resolution to this debate by meticulously describing the different aggressive behaviors that are naturally displayed by a wide range of species, from fish to primates. He identified numerous kinds of aggression but focused on the major distinction between cold-blooded predation and frenzied anger. The former is a nonemotional behavior that is clearly aimed at a specific goal or outcome, such as food, territory, or dominance. Slow, deliberate planning is evident, and, although the act itself may be vicious, the preparation indicates forethought. The latter behavior, in contrast,

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is an outburst of anger that appears to be a defensive reaction to goal blocking, provocation, threat, or frustration. For Lorenz (1966), this reactive anger is more violent, less controlled, and less predictable. Other ethologists have also distinguished between instrumental (proactive) aggression and hostile (reactive) aggression and have identified unique psychobiological mechanisms for each behavior (Moyer, 1976; Scott, 1972). It appears that hostile reactive aggression is universal in primates and must be "unlearned" or controlled through development; in contrast, instrumental aggression may be universal in some species but is more likely acquired through reinforcement.

Boyce and Ellis (2005) have integrated the ethological, evolutionary, and psychobiological literatures to articulate a more general theory of reactivity to environmental threats and stressors, of which personal provocation is a particular kind. In their general model, humans have adaptively evolved to respond to environmental endangerment with an integrated system of biological sensitivity to context that include increases in heart rate, metabolic mobilization of cellular nutrients, and "augmenting vigilance to threats and dangers" (p. 272). Hostile attributional bias may be considered a cognitive component of this system of reactivity. Although generally adaptive, this system becomes maladaptive when the response fails to extinguish after the actual environmental threat has dissipated. The cognitive recognition that a provocation is *not* threatening is crucial to the extinction of the stress response. Most children learn to make these cognitive responses during the first 4 years of life, but some children do not. Ellis, Essex, and Boyce (2005) found in a study of 249 children that very stressful early environments produce chronic heightened reactivity to later stimuli, suggesting a developmental origin for hostile attributional bias to be discussed later in this article.

Both ethologists and psychobiologists emphasize the difference between unemotional instrumental behavior and reactivity. Crucial to this distinction are the different cognitive mechanisms that have been articulated by ethologists when describing these behaviors. The key cognitive aspect of proactive aggression is the expectation that reward will follow. The key aspect of reactive aggression is the response to threat, or, rather, the perception that one is under threat; hence, the term used is retaliatory aggression. Lorenz (1966) noted that sometimes a fish will display what appears to be self-defensive retaliatory aggression even though the instigation is not real. Sudden movement in the water might inspire a self-defensive aggressive response, even though the movement was random. Lorenz speculated that the sensory-perceptual apparatus of the fish "interpreted" the movement as threatening.

Lorenz identified self-defensive aggression as a core behavioral characteristic of virtually every species. Furthermore, he noted that retaliatory aggression in response to threat often moves well beyond the defense of self to destruction of a threatening opponent. Hartup and deWit (1974) summarized the primate studies that indicate that rough-and-rumble play among young primate peers is the primary context for the occurrence of angry reactive aggressive behavior, when some aspect of the play triggers a defensive response. Thus, the contribution of ethology has been to identify a type of aggressive behavior that is an emotionally frenzied self-defensive and retaliatory response to the perception of threat.

Translational research. The distinction between reactive and proactive aggression has been discussed as types of behavior in young adults (Buss, 1966; Feshbach, 1970) and in children (Hartup, 1974; Rule, 1974), but only recently has the distinction been directly observed in children. Price and Dodge (1989) developed a coding scheme to distinguish these behaviors in direct observations of 70 5- and 6-year-old boys on school playgrounds. They found support for the discriminant validity of these behaviors and identified different social contexts that are associated with different probabilities of occurrence of each type. Rough play was the primary context for reactive aggression. Further, they found that individual differences in reactive aggression were correlated with lower play ratings from peers, whereas instrumental use of aggression was not negatively valued by young peers.

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Other studies have found that hostile attributional biases are associated with reactive, but not proactive, aggressive behavior, despite the fact that these two aggressive behaviors are positively correlated with each other. Dodge and Coie (1987) identified groups of reactively aggressive, proactively aggressive, combined aggressive, and nonaggressive first- and third-grade African American boys and presented them with a measure of intention-cue detection like that used by Dodge et al. (1984) but adapted with new race-specific stimuli. The two reactively aggressive groups displayed less accuracy at detecting peers' benign intentions, and instead, overinterpreted hostile intent. When the peer's intent was actually hostile, they were highly accurate. When the peer's intent was ambiguous, the reactively aggressive groups were more likely than the other groups to attribute hostile intent. Furthermore, direct observations of these boys in peer interactions indicated that the number of errors of presumed hostility on the laboratory task predicted a boy's rate of overreactive aggression, but not proactive aggression.

Crick and Dodge (1996) replicated the correlation between hostile attributional biases and reactive, but not proactive, aggressive behavior in a sample of 624 9- to 12-year-old boys and girls. Graham and Juvonen (1998) found that hostile attributional biases were correlated with retaliatory aggression among middle scholars, and may have their origin in previous experiences of being victimized by peers. Schwartz et al. (1998) found that hostile attributional biases among 66 8-year-old African American boys predicted acts of reactive aggression but not proactive aggression or dominance as directly observed during contrived peer group interactions. Dodge, Lochman, Harnish, Bates, and Pettit (1997) found that reactively aggressive, but not proactively aggressive, third-grade children displayed higher scores for encoding inaccuracy of peer intent stimuli. An important feature of this finding is that they statistically controlled for teacher-rated attention problems and impulsivity, thus eliminating an alternate hypothesis to explain this pattern. Finally, Dodge, Price, Bachorowski, and Newman (1990) presented 128 adolescent boys in a maximum security prison with videorecorded stimuli and found that hostile attributional biases were positively correlated with the number of interpersonally violent crimes committed (as rated from official records), undersocialized conduct disorder, and the reactive aggression subscale of the Revised Problem Behavior Checklist, but not with the number of nonviolent crimes, socialized conduct disorder, or the proactive aggression subscale. Furthermore, this pattern of findings held even when intelligence, socioeconomic status, and ethnicity were controlled statistically.

Neuroscience

Basic research. Recent advances in functional magnetic resonance imaging (fMRI) have enabled basic scientists to identify the brain regions that are implicated in various types of aggressive behavior. This work sheds light on the cognitive mechanisms in retaliatory aggression. The amygdala has been well documented as the site for the much of emotion processing and aggressive behavior, but only recently has it also been implicated as the site for the detection of threat, and the processing of the source and meaning of threatening stimuli. Adams, Gordon, Baird, Ambady, and Kleck (2003) presented clearly threatening and ambiguously threatening facial stimuli to adults while measuring amygdala responses through fMRI. They found that left amygdala responses varied significantly between these stimuli, with greater signal intensity change occurring during the harder "work" of interpreting the ambiguous stimulus.

Other fMRI studies have revealed that the paralimbic cortex and other limbic regions associated with the midbrain dopamine system are implicated in impulsive, immediate-reward behavioral decisions such as retaliation, whereas frontoparietal activity is associated with reasoned behavioral choices such as restraint from impulsive aggression (McClure, Laibson, Loewenstein, & Cohen, 2004). The authors interpret this finding as suggesting that "human behavior is often governed by a competition between lower level, automatic processes that may reflect evolutionary adaptation

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to particular environments, and the more recently evolved, uniquely human capacity for abstract, domain-general reasoning and future planning" (p. 506).

De Quervain et al. (2004) used positron emission tomography to examine brain regions associated with aggressive revenge during a contrived laboratory game among adults. What they found is extraordinary. They found that the dorsal striatum is activated in anticipated satisfaction from punishing wrongdoers, a region that is also activated during anticipation of monetary gains and pleasant tastes. Thus, humans do not require extrinsic rewards for retaliatory aggressive behavior; merely engaging in revengeful aggression brings pleasure to the brain, even when it brings other extrinsic costs (Knutson, 2004). The tendency to engage in retaliation brings its own reward and is deeply rooted in the evolution of the brain.

Given that the amygdala is an "older" brain region than the frontal cortex in evolutionary terms, the tendency to make hostile interpretations of experienced negative outcomes may be an "older" phenomenon than the "newer" capacity to distinguish hostile from nonhostile intent in others. The capacity to understand that others may be acting benignly is crucial for social cooperation and may be associated with the development of civilization.

Translational research. What is intriguing about this work is that retaliatory and justified aggression are core human behaviors, with long evolutionary histories and deep-rooted neural mechanisms. It is the development of higher order brain structures that enable humans to discern when this behavior is justified and when one should refrain from inappropriate aggressive retaliation. The mechanisms of this restraint are still to be discovered, but they probably involve the frontal cortex and its executive control, capacity for complex thinking, and delay of gratification. This work suggests that humans may be born with the aggressive retaliatory response in their repertoire and may acquire the capacity to inhibit that response during the course of development.

Social psychology: Principles of attribution theory

Basic research. Whereas ethology identified the link between threatening stimuli and retaliatory aggressive responses, it was social psychology that articulated the human tendency to infer cause to the events around oneself, the mediating role of the attribution process in the link between external events and personal behavioral responses, and the conditions under which different kinds of attributions are made. These processes concern psychological epistemology (Jones et al., 1971). Heider (1958) created "naive" psychology, which describes how humans act as lay scientists in making attributions of intention and inferring cause. Social psychologists conducted numerous studies following this formulation, to understand the rules that humans follow in inferring cause and then responding behaviorally, Epstein and Taylor (1967) completed an important study to demonstrate that retaliatory aggressive behavior occurs as a direct function of the conditions leading to a victim's attribution of hostile intent by a provocateur, which were experimentally manipulated. Further, the retaliation occurred as a function of the degree to which the victim actually attributed hostile intent.

Kelley (1971) and Jones and Davis (1965) are credited with the basic tenets of attribution theory, which are that

1. human beings have evolved to be motivated to assign a cause for important behaviors displayed by the self and others;
2. the assignment of causes follows systematic rules; and
3. the attribution of cause has important consequences for subsequent affect and behavioral responses.

The first of these tenets is hardly disprovable, but its importance has been supported by the testing of attributional hypotheses in a wide variety of domains ranging from depression to aggression.

The second tenet has been tested by laboratory experiments that led to the articulation of numerous rules of how causal attributions

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are reached. Individuals use logical principles when making attributions about others' intentions, such as *covariation* (the tendency to attribute an outcome to a cause with which it covaries), *distinctiveness* (the tendency to increase confidence in an attribution to the extent that other plausible causes are eliminated), and *personalism* (the tendency to attribute hostile intent if the actor had not behaved in this manner to anyone except the self). Kelley (1971) proposed that humans act like good scientists in making causal attributions. In making "correspondent inferences," they consider covariation over time, examine possible discounting factors, and question the constancy of a relation. Specifically regarding provocation stimuli in which the cause of a frustration is at issue, Pastore (1952) found that arbitrary frustrations, in which a plausible alternative explanation cannot be identified, are more likely to be attributed to hostile intentional behavior by the frustrator than are nonarbitrary frustrations for which plausible alternate causal explanations are obvious. Plausible alternate factors include a widely recognized physical cause for the frustration, a compelling institutional rule that must have guided the frustrator, or even mental illness in the frustrator. Jones and Davis (1965) proposed that the perceiver may even consider his or her own responsibility for the provocation: "If the perceiver believes he has done something to earn attack, insult, or rejection, he will presumably be less inclined to appraise his attacker negatively than if the attack was unreasonable or arbitrary" (p. 249).

Jones and Davis (1965) proposed that high *hedonic relevance*, or motivational significance, will increase an individual's likelihood of making correspondent inferences about an act. So, if a child suffers a provocation in a very important realm (such as peer status, disrespect, or relationship threat), the child will be more likely to attribute hostile intent to the peer provocateur than if the provocation occurred in an unimportant realm.

The third tenet is that the factors that determine the perceived cause of a stimulus also influence the perceiver's behavioral affect and response to the event. Indeed, aggressive behavior is a more likely response when the provocation is intentional than accidental (Rule & Duker, 1973) and foreseeable than unforeseeable (Dyck & Rule, 1978). Costanzo, Grumet, and Brehm (1974) found that aggression is a more likely response when the provocation was experimentally manipulated to be freely chosen than constrained, and Darley, Klossen, and Zanna (1978) found that pairing the provocation with a mitigating circumstance reduced the likelihood of aggressive retaliation.

Translational research. Basing his hypotheses on attribution theory in social psychology, Dodge (1980) found that when a child made an attribution that a peer acted with hostile intent, the probability that the child would respond with retaliatory aggression was .60, whereas when the same child made an attribution that the peer had acted benignly (as in an accident), the probability of an aggressive response was .24. Although the attribution that a peer provocateur has acted with hostile intent is the most obvious inference that could lead to retaliatory aggression and the attribution that a peer acted accidentally is the most obvious inference that could lead to restraint from retaliation, in practice, persons learn to make a wide variety of attributions about others. Attributions that have been associated with responsibility, culpability, and therefore meriting retaliation or sanction, include the inference that a peer acted with willful neglect of the self, that a peer paid insufficient attention to the self, that a peer placed her or his own perspective above that of the self, that a peer failed to plan ahead to see the potential consequences of his or her actions, and that a peer acted irresponsibly (e.g., by drinking, getting out of control) in a way that led indirectly to the self's harm. These inferences of "indirect responsibility" are similar to many of the principles that guide legal responsibility and justify legal means of retaliation in both criminal and civil court (Dodge, 1991). The principle seems to be that if the peer's actions lead to the self's harm, the peer is, by default, culpable unless a plausible mitigating explanation is identified. Thus, inferring nonhostile intent may take more cognitive "work" and be more developmentally advanced than inferring hostility. This point has important implications

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for differences in attributional tendencies due to age, cognitive capacity, and temporary incapacitation due to fatigue or stress, which will be discussed later.

Social psychology: Nonrational attributions

Basic research. Among the most important contributions of social psychology is that the "systematic" rules followed in making causal attributions include some universal nonrational tendencies that provide a window into the problematic behavior of some youth. Petty, Wegener, and Fabrigar (1997) have summarized the variety of processes that lead to biased conclusions, ranging from objective-inadequate information reasons to personal-motivational reasons. These biases are universal, and overcoming these biases takes more cognitive "work" and, presumably, greater cognitive development and emotional control.

The objective–cognitive bases for these tendencies begin with the simple fact that the array of possible information to use in making a causal attribution in any instance is overwhelming, especially during ongoing interaction when inferences must be made online in real time, leading humans to adopt heuristic shorthand rules in reaching conclusions. Tversky and Kahneman (1973) identified the "availability" heuristic as a common rule to make inferences quickly. Other heuristics include "salience" and "accessibility," in which more recent information is weighted more heavily (Petty et al., 1997).

In most cases, heuristics provide efficient ways of reaching accurate conclusions, but in some cases, the use of heuristics leads to clearly nonrational and inaccurate judgments. For example, Jones and Nisbett (1971) reported a series of laboratory experiments to demonstrate the *fundamental attribution error* that "there is a pervasive tendency for actors to attribute their actions to situational requirements, whereas observers tend to attribute the same action to stable personal dispositions" (p. 80). The different attributions are due to differences in the salience of stimuli to the different parties during information processing. Applied to attribution of a provocation by a peer, the bias is that victims will tend to attribute dispositional volition (that is, hostile intent) to the provocateur, whereas the provocateur will tend to identify situational causes for the same behavior. The result is a recipe for a conflict between parties having different perspectives on the same event.

Pepitone and Sherberg (1957) identified another nonrational attributional tendency, "a general cognitive tendency to match motives with acts" (p. 761). This tendency was discovered in experiments in which participants were asked to play games in which they were to bargain with opponents, who were secretly constrained in their options. After the game, participants regularly *under*estimated the degree to which opponents had been externally constrained and *over*estimated the degree to which opponents had acted willfully. Their explanations alluded to the behavior displayed by the opponent, ignoring the possibility of constraint. This tendency has been found to be enhanced even more when the opponent gains rather than loses from a constrained action.

Another nonrational tendency is *parsimony*, which is the tendency to accept as sufficient the first cause that becomes salient, leading to termination of information search processes that might reveal a more accurate explanation (Simon, 1967). Yet another nonrational bias is the tendency to *weight negative information more strongly* than positive information (Kanouse & Hanson, 1971). Kogan and Wallach (1967) presented hypothetical life dilemmas to laboratory participants and found that "the deterrence value of costs for failure exceeds the attraction value of gains from success in affective risk-taking" (p. 133). This concept forms the basis of prospect theory (i.e., "losses loom larger than gains"), which earned Kahneman and Tversky the Nobel Prize (Kahneman & Tversky, 1982). Why might this tendency have developed in humans? First, negativity stands in contrast to a predominantly positive world, and thus may have greater salience by its uniqueness. Second, a single instance of negativity may signal danger and threat to survival, whereas a single instance of positivity rarely is essential to survival. Thus, negativity and vigilance to nega-

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tive stimuli may be evolutionarily adaptive. Third, in judging a complex stimulus, a negative component of the stimulus may "trump" or "preempt" (Costanzo & Dix, 1983) subsequent processing and may be a simpler strategy in cognitive computation than weighing both positive and negative cues equally.

On the favorable end of the continuum, Zajonc (1965) has identified the *mere exposure* effect to become more favorable toward a stimulus merely based on frequency of previous contact. Thus, strangers will be attributed more hostile intent than will friends (Dodge, 1980). This tendency is exacerbated if the initial exposure led to a favorable judgment and outcome, which then is repeated over time through self-affirming cognitive processes that have been called a *halo effect*.

At the same time that social psychologists were articulating attribution theory, cognitive psychologists were describing how individuals make judgments and decisions (Dawes, 1964; Simon, 1957). Kahneman and Tversky (1973) described several heuristics that individuals use to make judgments when presented with too much information, notably *representativeness* and *availability*. The former is the tendency to classify a stimulus as belonging to a particular category when the stimulus has features that are similar to the features of members of the category. For example, a child might have a cognitive construct in memory of "mean peers," which includes male gender, large size, and unfamiliarity as features. Upon confronting a new peer, the child might be biased toward inferring that the peer is a member of the mean peer group simply because he has these characteristics, that is, they are representative. The availability heuristic is the tendency to make a judgment consistent with a category simply because that category has been used frequently in the recent past. So, a child who has been the object of frequent hostile provocations in a given week may be likely to attribute hostile intent to peers in future circumstances simply because that category is highly available.

These heuristics have developed in the human species because they lead to accurate decisions and effective behavior in most circumstances. However, they can also lead to erroneous judgments and poor decisions. As an example, Kahneman and Tversky (1973) found that the representativeness heuristic leads to ignoring base rates when making classification judgments. The availability heuristic describes the tendency to overestimate the actual likelihood of events that have been reported in the media (Slovic, Fischoff, & Lichtenstein, 1979).

Another major process in biased attribution is motivational. Dissonance theory (Festinger, 1957) proposes that inconsistency in elements in one's cognitive system produces dissonance, which is reduced through elimination of disconsonant elements. Individuals thus display *confirmation biases*, in which they engage in attributional processes that are biased toward confirming preexisting schemas or hypotheses despite contradictory evidence (Darley & Fazio, 1980; Ross, 1977). The confirmation occurs through discounting of contradictory cues and overweighting of supporting cues (Gurwitz & Dodge, 1975). In cases in which an action by another produces a negative outcome for the self, any information that is inconsistent with the negative outcome (such as a benign intent cue) is more cognitively complex, and is likely to be discounted unless highly compelling.

In addition to these general factors, situational factors have been found to affect the attribution made about a cause. For example, a perceiver's mood state has been shown in numerous studies to affect the perceiver's causal attributions, mostly in a direction that is consistent with the mood state (Wegener & Petty, 1996). Thus, a perceiver who is in a hostile mood or agitated state is more likely to attribute hostile intent to a provocateur than is a perceiver in a benign mood state (Mayer & Hanson, 1995). Both direct effects of mood-congruent attributional tendencies and indirect effects through mood effects on vigilance, search, and cognitive load have been proposed to describe this effect (Petty et al.,1997).

Translational research. Based on the social psychological finding that attributional biases are more likely to occur in contexts of emotional importance, MacBrayer et al. (2003) found that provocations that strike at a child's

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relationships are more likely to be attributed to hostile intent than are provocations that involve overt physical contact. Other factors, such the prior behavior of the actor and the relationship between the actor and the perceiver, also have an impact (Clore, Schwarz, & Conway, 1994). Dodge (1980) found that children are much more likely to attribute hostile intent to peers who have a reputation for aggressiveness than to nonaggressive peers. Children are more likely to discount provocations that are initiated by acquaintances than by unfamiliar peers, except when the acquaintance is a reputed aggressive child (Steinberg & Dodge, 1983).

The context of the interaction with a peer also has an impact, as the salience heuristic of attribution theory would suggest. Lochman and Dodge (1998) experimentally manipulated the context as competitive versus cooperative, and fond that competitive contexts elicited more hostile attributions than did cooperative contexts. Interestingly, nonaggressive children were able to shift attributional tendencies to match the new context as the context shifted, whereas aggressive children were unable to shift out of a competitive context and hostile attribution tendency into a cooperative context with a nonhostile attribution tendency. Thus, situational constraints may interact with individual differences to lead to particularly vexing circumstances for aggressive children.

Based on the social psychological observation that attributions involving the self are especially prone to biases, Dodge and Frame (1982) found that hostile attributional biases by aggressive children are restricted to circumstances in which the self is the object of the provocation. When children are asked to imagine peer A provoking peer B, no hostile attributional bias tendencies by aggressive children were found. This finding is important because it suggests that the phenomenon is truly related to the interpersonal context and not to a cognitive bias to attribute behavior to intentional action.

The importance and specificity of the interpersonal context was examined by Hubbard, Dodge, Cillessen, Coie, and Schwartz (2001), who observed 11 groups of six boys interact with each other in contrived peer groups on a daily basis for 5 consecutive days. In between play sessions, boys responded to hypothetical provocations involving each of their peer group members. The Social Relations Model by the social psychologist Kenny (1994) predicts that both behavior and social cognitions will be modeled more accurately at the dyadic level than the individual difference level. Using Kenny's variance-partitioning procedure for round-robin data, Hubbard et al. (2001) found that the behaving child accounted for 9% of the variance, the peer partner accounted for 6% of the variance, and the dyadic relationship accounted for 16% of the variance in reactive aggressive behavior that was directly observed in play sessions. Likewise, in terms of hostile attributions made by children, the actor accounted for 19% of the variance, the peer provocateur accounted for 8% of the variance, and the dyadic relationship accounted for 21% of the variance. Finally, a mixed-model regression analysis revealed that reactive aggressive behavior was significantly predicted from hostile attributional biases at the dyadic level. A full model of the relation between hostile attributions and reactive aggression would include individual difference features of the child (i.e., aggressive children make more hostile attributions), the peer (i.e., children make more hostile attributions about known aggressive peers than nonaggressive peers), and the dyadic relationships (that is, certain relationship contexts are especially volatile).

Yet another influence is the social context of anxiety and threat, separate from the stimulus. Attribution theory predicts that hostile attributions are more likely to be made under ambient conditions of threat, due to salience. Dodge and Somberg (1987) experimentally manipulated these conditions by exposing children to fictitious peers who were supposedly in a room next door. These peers led the child to believe that they would, or would not, threaten the child in future interactions. Immediately afterward, the child attended to the experimenter's hypothetical videorecorded stimuli and made attributional judgments about peer provocateurs. The condition of threat to the self had a significant impact on reducing the accuracy of children's intent inferences

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and increasing hostile attributional biases, but only among aggressive children. Nonaggressive children were relatively immune to this situational context, whereas it had a discernible impact on furthering the biases of aggressive children.

Personality psychology: Trait theory and social–cognitive processes

Basic research. The contributions of social psychology describe and explain the cognitive processes that are implicated in hostile attributions and individual acts of aggression, but they do not help us understand how chronic and stable patterns of aggressive personalities are related to these processes. Traditional personality psychologists (e.g., Goldberg, 1993; McCrae & Costa, 1997) who have studied such "traits" have espoused a view that runs counter to the notions that personality characteristics develop, change, and dynamically interact with the social environment. Instead, their view is that static, biologically driven characteristics present at birth drive all individual differences in behavior. Such a notion would not allow for the hypothesis that hostile attributional biases develop and guide behavior; instead, it would dismiss these biases as epiphenomena that are more parsimoniously explained by an underlying hostility trait that causes both attributional biases and aggressive behavior. Contemporary personality has evolved an alternative perspective, however, that supports and amplifies the model being proposed here.

The social–cognitive theory of personality (Cervone & Shoda, 1999) is based in the formulations by Mischel (1999) and Bandura (1999) that personality coherence is guided not by traits but rather by situation-specific processes of social cognition. Instead of exogenous traits causing behavior in all situations, patterns of stable cognitive processing guide behavior in specific situations. Because these cognitive patterns are stable, behavior patterns become stable and coherent "from the bottom up" rather than from the top down. It is stable cognitive processes that lead us to infer stable personality traits, rather than the other way around. Zelli and Dodge (1999) cite an analogy to behavioral traits of cities. They note that cities are described in personality terms, such as bawdy (New Orleans), rude (New York), and flaky (San Francisco). However, it is erroneous to conclude that the trait causes the city and its people to act as they do; rather, microprocesses must operate to lead people to behave in particular ways, and the coherence of the behavior patterns lead to higher order inferences about the cities' traits. The traits are a descriptor rather than a cause; the processes provide the causal engine.

So, too, it is with human personality. The major units of personality coherence are cognitive structures and processes. Coherence develops because individuals organize their memories for past events in the form of internal mental representations that make sense and tell a story about how the world operates (Higgins, 1990; Stromquist & Strauman, 1992). These memories have been called knowledge structures (Cervone & Shoda, 1999), schemas (Kelley, 1971; Wyer, 1981), heuristics (Kahneman & Tversky, 1973), scripts (Huesmann, 1988), stereotypes (Mackie & Hamilton, 1993), stories or narratives (Shank & Abelson, 1995), and working models (Bowlby, 1973, 1980, 1982). These schemas efficiently summarize past experiences, although they necessarily leave out details and include biases. These latent cognitive structures guide the processing of future information, including attributions that one makes about future events. Schemas develop as an efficient organizing frame to store memories of past events (Cantor & Kihlstrom, 1982; Markus, 1977). Children who develop hostile schemas, through whatever means, are likely to use these schemas to perceive and interpret future stimuli through a process of perceptual readiness (Hochberg, 1970). Prior exposure to a biased set of events may lead an individual to become perceptually ready to interpret future events in ways that are consistent with the past events, through selective vigilance to certain cues and selective recall of schemas that are consistent with those cues. Snyder, Tanke, and Berscheid (1977) found that selective recall of past events or schemas can shape attributions that are made about current stimuli.

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Translational research. The work in social–cognitive theories of personality suggests that aggressive children have may hostile schemas that are stored in memory. Burks, Dodge, Price, and Laird (1999) administered a version of the Children's Social Constructs Assessment (CSCA; Stromquist & Strauman, 1992) to 259 children followed longitudinally. In the CSCA, children are asked to speak open-endedly about peers whom they like and dislike, and transcribed responses are later scored for the kinds of constructs that had been invoked. The CSCA scores accounted for 26% of future externalizing problem scores and predicted growth in these scores even when past externalizing behavior had been statistically controlled. Burks, Laird, Dodge, Pettit, and Bates (1999) adapted two instruments, the Sentence Completion Task and the Assessment of Schema Typicality, to measure schemas in a sample of 585 eighth-grade children, and found that hostile schemas strongly predicted later externalizing problems, with a path coefficient of .59. Zelli, Dodge, Lochman, Laird, and CPPRG (1999) assessed normative beliefs about aggressive behavior in a sample of 387 elementary school children and found that they predicted teacher, parent, and self-ratings of aggressive behavior. Thus, measured in several different ways, hostile schemas robustly correlate with aggressive behavior and predict growth in aggressive behavior across development.

Another major proposition of social–cognitive personality theory is that patterns of social cognition are situation specific. Dodge, Laird, Lochman, Zelli, and CPPRG (2002) utilized confirmatory factor analysis to conclude that measures of hostile attributions are, indeed, organized within types of situations; that is, measures within peer group entry situations cohere more tightly with each other than with measures in peer provocation situations, and vice versa. Furthermore, a measure of social knowledge structures (in this case, positive and negative emotion understanding) predicted these hostile attributions, and hostile attributions mediated the effect of knowledge structures on aggressive behavior.

Following from the work that links hostile schemas to attributional processes, Zelli et al. (1999) hypothesized that attributional processes would mediate the effect of hostile schemas on children's aggressive behavior. They assessed hostile beliefs in Grade 2, attributional processes in Grade 4, and aggressive behavior in Grade 5 in a sample of 300 children and found support for this hypothesis. Attributional processes accounted for about 50% of the effect of hostile beliefs on later aggression.

How do hostile schemas affect attributional processes? Dodge and Newman (1981) presented aggressive and nonaggressive boys with a variety of social cues about a hypothetical provocation that they imagined to be directed toward them. Selective recall of hostile cues over benign cues predicted a hostile attribution about the provocateur. Furthermore, rapid responding without regarding to the full array of available cues predicted a hostile attribution, but only among the aggressive group of boys, who presumably called on biased schemas about hostile peers to make their inferences.

One consequence of acquiring self-schemas that involve peers directing threatening stimuli to the self is heightened focus on the self. Individuals who hold schemas about being threatened will become focused on threats to the self. In turn, self-focused attention is likely to lead an individual to react quickly and aggressively to provocations, even before waiting to determine whether the provocation is hostile or benign. Indeed, Fenigstein (1979) found that individuals who are high in self-focused attention are more likely to respond negatively to an ambiguous rejection by a peer than are individuals who are low in self-focused attention. Dodge and Tomlin (1987) translated these principles into the hypotheses that aggressive children would be more likely than nonaggressive children to focus on and utilize self-schemas in response to ambiguous provocations (rather than objective information in the stimulus array) and that utilization of self-schemas would predict hostile attributional responses. When aggressive and nonaggressive children were presented cues surrounding ambiguous provocations, both hypotheses were supported.

Yet another process that follows from the acquisition of a hostile schema is resistance to

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new information that would contradict the schema (Cantor & Kihlstrom, 1981). Lochman and Dodge (1998) presented aggressive and nonaggressive children with actual dyadic discussion tasks and then experimentally manipulated hostile and benign peer-intent information to change across time. Consistent with the hypothesis, once information was presented that confirmed a hostile schema, aggressive children were resistant to new information that would force a change of interpretation. Nonaggressive children were more flexible in response to changing cues.

Costanzo and Dix (1983) identified the process of making overly quick and biased attributions in response to specific cues as *preemptive processing*. In this circumstance, the individual abandons rational processes of examining information objectively and responds "automatically" with predetermined and inaccurate attributions and behaviors. Lochman, Lampron, and Rabiner (1989) and Rabiner, Lenhart, and Lochman (1990) found that aggressive children engage in such preemptive processes in social problem-solving situations that require rapid responding, and Dodge and Somberg (1987) found that experimentally manipulated ambient threat triggers preemptive processing by aggressive children.

Developmental psychology

Basic research. Although personality psychology has provided the theory that accounts for cross-time stability in hostile attributional biases and aggressive behavior, it is developmental psychology that has provided the basis for understanding when and how these patterns develop in childhood.

Reviews by Hay (2005) and Lemerise and Dodge (2000) reveal that aggressive behavior is universal in human beings, and begins early in life. Recognizable signs of the capacity for anger appear in the first year of life. Resistance and protest in response to being thwarted predate retaliation, but all occur in the first year. Consistent with the thesis that retaliatory aggression requires relatively little cognitive processing, the onset of retaliatory aggression occurs in the first few years of life, before cognitive development of attributional processes.

It appears that the capacity to infer intent develops in the third and fourth years of life (Schult, 2002; Wellman, Phillips, & Rodriquez, 2000), when children begin to develop a theory of mind (Flavell & Miller, 1998). Nonetheless, the press to match the outcome of an act with the intent of the actor remains strong for the next several years. Understanding that a peer's act that leads to a negative outcome for oneself (e.g., knocking over one's building blocks) might be nonintentional and benign is a more complicated cognitive endeavor than simply matching the outcome to the intent (e.g., negative outcome means negative intent). Björkqvist and Österman (2001) found that 7-year-old children are more able to distinguish act and actor than are 4-year-olds. Following from this developmental work, Dodge and Newman (1981) found that the tendency to infer hostile intent in response to an ambiguous provocation decreases across these years. Dodge and Price (1994) found that this tendency is largely accounted for by advances in cognitive skills of encoding relevant cues and accurately recognizing others' intent in stimulus circumstances of certain intent.

Early adolescence brings another stage of cognitive development when contemplation of alternatives and thinking about hypothetical possibilities grows with the transition to formal operations (Neimark, 1982). This period thus represents an opportune time for intervention to alter patterns of attributional biases.

Translational research. The development of individual differences in attributional styles is a function of more than cognitive maturation and inherent neuropsychological deficits. Deficits such as impulsivity and cognitive limits on the ability to examine alternatives have been found to correlate only weakly with hostile attributional tendencies, although it is plausible that they could interact with life experiences, much in the way that genetic risk factors interact with adverse life experiences to produce conduct disorder (Caspi et al., 2002). The model proposed here suggests that the key to understanding individual differences in attributional patterns is understand-

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ing the acquisition of the tendency to attribute *benign* intent given a provocation stimulus and adverse personal outcome. How children acquire this uniquely human pattern has been informed by developmental psychology.

Several principles in socialization contributed by developmental psychology undergird the proposed model. First, in general, early influences have greater impact than later influences. The primacy of the first several years of life was emphasized by the National Academy of Sciences study, *From Neurons to Neighborhoods* (Shonkoff & Phillips, 2000), based on the discovery that neural development is rapid and ongoing in these years. Experiences in these years also tend to shape which later environments are experienced; that is, children begin to self-select their environments, and thus restrict their later experiences. Therefore, the impact of the early years is felt both directly in shaping social–cognitive patterns but also indirectly in narrowing the future stimulus field. Second, social information processing patterns become more differentiated across situations as the child gets older (Werner, 1948). As a result, behavior becomes more situation specific and thus more complex with advancing age. Third, change in attributions and behavior patterns remains possible across development, but change involves layering new response patterns on top of the former patterns. It is not clear that early patterns are ever truly lost.

Five mechanisms in socialization have been proposed for the development of benign (versus hostile) attributional biases. The first mechanism is social learning through imitation of models who overtly display benign or hostile attributional tendencies in their interactions with children. MacBrayer et al. (2003) presented evidence that children's attributional bias patterns are similar to those of their mothers. Consistent with social learning evidence, they found that this transmission process is stronger within gender than across gender. Nix et al. (1999), in turn, found that mothers' hostile attributional biases predicted their own harsh discipline behavior toward their child, which mediated the child's growth in externalizing behavior problems. Given that aggressive children are more likely to display hostile attributional biases when a provocation is directed personally rather than toward a third peer, the social learning of attributional biases probably follows from personal rather than observed experiences. Thus, social learning of cognitive styles through modeling has preliminary support.

The second mechanism in socialization is acquired perceptual readiness based on the accumulation of past experiences. Processes of selective attention and heuristic categorization of stimuli are shaped by early experience (Posner & Rothbart, 2005). Children who repeatedly experience parents' prosocial behavior toward them may become perceptually ready (Bruner, 1957) to attribute positive intent to others in new situations, to discount discrepant information that would favor a hostile attribution, and to attend selectively to informational cues that are consistent with a growing schema of others as benign. Likewise, children who experience physical abuse in the first several years of life may become likely to become hypervigilant to future cues that indicate threat. Indeed, experiments in developmental psychopathology indicate that physically abused children attend selectively to hostile cues (Pollak & Tolley-Schell, 2003). Longitudinal studies indicate that they display hostile attributional biases in response to hypothetical provocations by peers (Dodge et al., 1990).

The third mechanism is facilitation of prosocial working models through a secure attachment relationship with one's caregiver (Bowlby, 1973, 1988). Bretherton (1999) asserted that early attachment relationships influence later social information processing patterns, including attributions of others' intent, and that insecure early attachment relationships could distort later processing. Cassidy, Kirsh, Scolton, and Parke (1996) found that young children with histories of insecure attachment later held defensive representations of peer relationships. Ziv, Oppenheim, and Sagi-Schwartz (2004) presented hypothetical mother–child interaction stories to children with varying attachment histories, and found that children with a history of insecure attachment were more likely than children with a secure attachment history to

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interpret the mother's behavior as indicating anger or insensitivity.

The fourth mechanism derives from social psychology as much as developmental psychology, and is based on studies indicating that ambient positive mood and recent task success foster attributions of prosocial intent, through both direct effects on mood-congruent attributional tendencies and indirect effects on selective attention to mood-congruent cues (Petty et al., 1997). Thus, it is posited that recurrent social, academic, and life success will be associated with the later tendency to attribute benign intent to others, and that recurrent social, academic, and life failure will be associated with later hostile attributional biases. Longitudinal evidence supports the relation between early peer social failure and later attributional tendencies (Dodge et al., 2003) and between peer victimization and later hostile attributions (Graham & Juvonen, 1998).

The fifth mechanism derives from a series of ingenious social psychological experiments in cultural studies by Nisbett and Cohen (1996). They sought to understand why the American South has much larger rates of violence than the North. They hypothesized that culture affects social–cognitive responding and aggressive behavior by placing relative value on disrespect, honor, and the sense of threat to one's personal integrity. A culture that highly values personal honor will encourage hostile attributions in response to personal threats and provocations. They provide evidence that the American South is characterized by these values, in contrast with the North. In laboratory experiments, the authors had confederates provoke southern and northern college students by bumping into them and calling them profanities (in an adult version of the same experimental manipulations in the aforementioned studies with aggressive and nonaggressive children). Over 80% of southerners responded to this provocation with anger toward the provocateur, in contrast with less than 40% of northerners. After this provocation, when presented with a hypothetical scenario depicting insult, 75% of southerners answered with an aggressive response, in contrast with 41% of northerners. Physiological measures collected at the same time indicated that southerners responded to the provocation with higher increases in cortisol and testosterone than northerners. In yet another experiment in which participants were provoked or not, southerners were more likely than northerners to attribute malevolent intent to the provocateur and to believe that the provocateur thought of the participants as "wimpy." The authors conclude that a major cause of southern males' violence is the "sense of threat to one of his most valued possessions, namely, his reputation for strength and toughness" (p. xv).

Interventions to Alter Attributional Style

Five intervention experiments provide perhaps the most direct tests of the hostile attributional bias hypothesis. These studies demonstrate that hostile attributional biases can be altered, that change in attributional biases mediates change in behavioral outcomes, but that change is difficult to achieve. Guerra and Slaby (1990) were the first to report a successful intervention targeted toward changing adolescent aggressive offenders' causal thinking and attributional patterns. Compared with randomly assigned controls, youths who had been assigned to intervention later reported lower hostile attributional bias scores and modest aggressive behavior change. Similarly, the CPPRG (2002a) reported positive effects of the multicomponent Fast Track intervention on reductions in hostile attributional biases among high-risk third graders who had been randomly assigned to receive intervention or not; furthermore, the effects on hostile attributional biases mediated positive effects of intervention on association with deviant peers in Grades 4 and 5 (CPPRG, 2002b). Although promising, both of these interventions also targeted other aspects of social cognition, including social problem solving and decision making; thus, positive outcomes might have accrued from these interventions rather than attributional changes.

Hudley and Graham (1993) focused specifically on changing hostile attributional biases in their sample of African American elementary school-aged aggressive boys. They devel-

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oped and implemented a 12-session cognitive intervention designed to help boys more accurately identify others' intentions, to presume benign intent when the portrayed intent is ambiguous, and to link nonaggressive behavioral responses to benign intent attributions. A random-assignment experiment contrasted this intervention to a control group that received training in nonsocial problem solving skills. Following intervention, relative to controls, boys assigned to intervention displayed lower hostile attributional bias scores in response to hypothetical provocations as well as to an actual peer provocation that was engineered during a laboratory task. Furthermore, they received lower teacher ratings for reactive aggressive behavior. No changes were evident in school office referrals for discipline, however. The authors acknowledged that their intervention included both attribution retraining and behavioral training elements, and they encouraged future studies to compare interventions that focused on one or the other components.

A recent intervention experiment by Sukhodolsky, Golub, Stone, and Orban (2005) distinguished these two components. Participants were 7- to 11-year-old boys with anger problems. One intervention focused on attribution retraining (but also cognitive restructuring), whereas a second intervention focused on modeling, behavioral rehearsal, and coping skills. Evaluations after 10 weeks of intervention indicated that only the attribution retraining intervention resulted in lowered scores for hostile attributional bias, using the same interview procedure as reported by Dodge (1980). Thus, specific focus on attribution retraining can lead to reductions in attributional biases.

Finally, Bugental et al. (2002) reported an intervention targeted toward mothers who were at risk of making hostile attributions about their infants and engaging in physical abuse. Their cognitive intervention focused on helping women understand that infants are not capable of behaving with hostile intent. Compared with randomly assigned controls, women assigned to intervention did indeed display lower hostile attributional bias scores after intervention.

These findings encourage further development and implementation of attributional retraining interventions, although the magnitude of impact, especially on ecologically significant outcomes, may be considered modest. Clinicians understand how difficult it is to produce enduring changes in hostile attributions and aggressive behavior patterns that have developed across many years.

Basic research

A return to basic science may provide an understanding of the limits that are plausible in intervention. A landmark basic-science social psychological study by Devine (1989) provides explanations for the difficulty in intervening to change hostile attributional styles. Consider hostile attributions to be stereotypes that an individual holds about others. Devine's studies of efforts to change stereotypes in the laboratory indicate that they are governed by automatic processing. Controlled processing can alter cognitive responses, but the process involves first an automatic stereotyped response, which is then suppressed and overridden by a nonstereotyped response (Monteith, Sherman, & Devine, 1998). Stereotypes thus have a strong and lasting imprint on the individual, one that can be suppressed and overridden but which seems more difficult to extinguish altogether.

Translational research

The translation to clinical interventions implies two hypotheses. First, efforts to intervene are likely to be more successful if initiated early in development, before "stereotypes" by aggressive children about their social world are imprinted too strongly. Second, interventions with aggressive youth who have already developed strong hostile attributional biases may require efforts to help these youth suppress hostile attributional responses, and instead, to override them with newly acquired alternate responses, such as a benign attribution. What is needed in further studies is assessment of whether the intervention-induced changes in hostile attributional bias scores and aggressive behavior occur through a process of overriding initial hostile attributions or genuine change in initial attributional processes.

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Questions for Future Research

The translation science research process often moves from basic science to practice. First, scientific knowledge accumulates in a domain of science, including understanding of methods, rules of evidence, empirical findings, and synthesis into theory. Next, this knowledge is translated into a hypothesis that has clinical, practical, or policy utility. This hypothesis is then tested in the real-world domain and is accepted, rejected, or modified. The most promising concepts may become adopted at scale level and part of standard practice. This model assumes that the information flow is from science to practice; however, testing hypotheses in practice often informs the basic science. The relationship is symbiotic and mutually beneficial. For example, it was the difficulty in changing stereotypes in real practice that led social psychologist Devine (1989) to seek a basic-science understanding of stereotype change.

The first question for future research thus addresses the way that basic scientific theory must be modified given the testing of translation questions regarding hostile attribution bias. Most notably, "real-world" testing has highlighted the importance of context in understanding hostile attributions. Cultural context alters the disposition to infer hostile intent. The context of the relationship between the provocateur and the self strongly alters the attribution process. Basic science has bowed to the exceptions that context demands, but has not yet articulated a strong theory of context.

Second, the translational model proposed here integrates basic science knowledge across several disciplines, but basic science itself has not fully integrated these domains. For example, social psychological theories of attribution have not yet incorporated the rapidly growing science of biological emotion regulation, including individual differences in delay of gratification and impulsivity. The temporal relations between cognitive attributions and psychophysiological responses in the autonomic nervous system still are not well understood: does an attribution cause changes in heart rate or vice versa?

Third, although intervention programs that focus explicitly on changing attributional styles show promise, it is not clear that this approach will prove to be the most cost-effective way to prevent or alter children's aggressive behavior. These interventions are costly. They show modest success, and social psychological theories of reactance and stigma suggest that they could well exacerbate hostile attributional styles if not implemented carefully. Attributional styles develop through lifelong experiences; prevention scientists, practitioners, and public policy makers might well broaden their reach to consider systematic efforts to change children's lifelong experiences, including those of physical maltreatment, parent–child relationships, peer culture, and media exposure. Could public school policies regarding peer mediation and conflict resolution alter children's hostile attributional styles? Do policies such as the Family Medical Leave Act and State Children's Health Insurance Programs alter children's experience sufficiently to exert an effect on their attributional styles? Finally, one might ponder the effect of the United Nations Children's Bill of Rights or presidential actions in Iraq on children's hostile attributional tendencies. The possibilities are many.

References

Adams, R. B., Jr., Gordon, H. L., Baird, A. A., Ambady, N., & Kleck, R. E. (2003). Effects of gaze on amygdala sensitivity to anger and fear faces. *Science*, *300*, 1536.

Anderson, D. A. (1999). The aggregate burden of crime. *Journal of Law and Economics*, *42*, 611–642.

Bandura, A. (1973). *Aggression: A social learning analysis*. Englewood Cliffs, NJ: Prentice–Hall.

Bandura, A. (1999). Moral disengagement in the perpetration of inhumanities. *Personality and Social Psychology Review*, *3*, 193–209.

Barefoot, J. C., Dodge, K. A., Peterson, B. L., Dahlstrom, W. G., & Williams, R. B., Jr. (1989). The Cook–Medley hostility scale: Item content and ability to predict survival. *Psychosomatic Medicine*, *51*, 46–57.

Berkowitz, L. (1963). *Aggression: A social psychological analysis*. New York: McGraw–Hill.

Björkqvist, K., & Österman, K. (2001). At what age do children learn to discriminate between act and actor? *Perceptual and Motor Skills*, *92*, 171–176.

Bowlby, J. (1973). *Attachment and loss: Vol. 2. Separation*. New York: Basic Books.

https://doi.org/10.1017/S0954579406060391 Published online by Cambridge University Press

Bowlby, J. (1980). *Attachment and loss: Vol. 3. Loss*. New York: Basic Books.
Bowlby, J. (1982). *Attachment and loss: Vol. 1. Attachment* (2nd ed.). New York: Basic Books.
Bowlby, J. (1988). *A secure base: Clinical applications of attachment theory*. London: Tavistock/Routledge.
Boyce, W. T., & Ellis, B. J. (2005). Biological sensitivity to context: I. An evolutionary–developmental theory of the origins and functions of stress reactivity. *Development and Psychopathology*, *17*, 271–301.
Bretherton, I. (1999). Updating the "internal working model" construct: Some reflections. *Attachment and Human Development*, *3*, 343–357.
Bruner, J. S. (1957). On perceptual readiness. *Psychological Review*, *64*, 123–152.
Bugental, D. B., Ellerson, P. C., Lin, E. K., Rainey, B., Kokotovic, A., & O'Hara, N. (2002). A cognitive approach to child abuse prevention. *Journal of Family Psychology*, *16*, 243–258.
Burks, V. S., Dodge, K. A., Price, J. M., & Laird, R. D. (1999). Internal representational models of peers: Implications for the development of problematic behavior. *Developmental Psychology*, *35*, 802–810.
Burks, V. S., Laird, R. D., Dodge, K. A., Pettit, G. S., & Bates, J. E. (1999). Knowledge structures, social information processing, and children's aggressive behavior. *Social Development*, *8*, 220–236.
Buss, A. H. (1966). Instrumentality of aggression, feedback, and frustration as determinants of physical aggression. *Journal of Personality and Social Psychology*, *3*, 153–162.
Cantor, N., & Kihlstrom, J. F. (Eds.). (1981). *Personality, cognition, and social interaction*. Hillsdale, NJ: Erlbaum.
Cantor, N., & Kihlstrom, J. F. (1982). Cognitive and social processes in personality. In G. T. Wilson & C. Franks (Eds.), *Contemporary behavior therapy* (pp. 142–201). New York: Guilford Press.
Caspi, A., McClay, J., Moffitt, T. E., Mill, J., Martin, J., Craig, I. W., et al. (2002). Role of genotype in the cycle of violence in maltreated children. *Science*, *297*, 851–854.
Cassidy, J., Kirsh, S. J., Scolton, K., & Parke, R. D. (1996). Attachment and representations of peer relationships. *Developmental Psychology*, *32*, 892–904.
Cervone, D., & Shoda, Y. (1999). *The coherence of personality: Social–cognitive bases of consistency, variability, and organization*. New York: Guilford Press.
Chandler, M. J., Greenspan, S., & Barenboim, C. (1974). Assessment and training of role-taking and referential communication skills in institutionalized emotionally disturbed children. *Developmental Psychology*, *10*, 546–553.
Clore, G. L., Schwarz, N. S., & Conway, M. (1994). Affective causes and consequences of social information processing. In R. S. Wyer, Jr., & T. K. Srull (Eds.), *Handbook of social cognition: Vol. 1. Basic processes* (pp. 323–477). Hillsdale, NJ: Erlbaum.
Cohen, M. A. (1998). The monetary value of saving a high-risk youth. *Journal of Quantitative Criminology*, *14*, 5–33.
Comodeca, M., & Goossens, F. A. (2004). Aggression, social cognitions, anger and sadness in bullies and victims. *Development and Psychopathology*, *14*, 186–197.
Conduct Problems Prevention Research Group. (1992). A developmental and clinical model for the prevention of conduct disorders: The FAST Track Program. *Development and Psychopathology*, *4*, 509–527.
Conduct Problems Prevention Research Group. (2002a). Evaluation of the first three years of the Fast Track Prevention Trial with children at high risk for adolescent conduct problems. *Journal of Abnormal Child Psychology*, *30*, 19–35.
Conduct Problems Prevention Research Group. (2002b). Using the Fast Track Randomized Prevention Trial to test the early starter model of the development of serious conduct problems. *Development and Psychopathology*, *14*, 927–945.
Costanzo, P. R., & Dix, T. H. (1983). Beyond the information processed: Socialization in the development of attributional processes. In E. T. Higgins, N. N. Ruble, & W. W. Hartup (Eds.), *Social cognition and social development: A sociocultural perspective* (pp. 63–81). Cambridge: Cambridge University Press.
Costanzo, P. R., Grumet, J. F., & Brehm, S. S. (1974). The effects of choice and source of constraint on children's attributions of preference. *Journal of Experimental Social Psychology*, *10*, 352–364.
Crick, N. R., & Dodge, K. A. (1996). Social information-processing mechanisms in reactive and proactive aggression. *Child Development*, *67*, 993–1002.
Darley, J. M., & Fazio, R. H. (1980). Expectancy confirmation processes arising in the social interaction sequence. *American Psychologist*, *35*, 867–881.
Darley, J. M., Klossen, E. C., & Zanna, M. P. (1978). Intentions and their contexts in the moral judgments of children and adults. *Child Development*, *49*, 66–74.
Dawes, R. M. (1964). Social selection based on multidimensional criteria. *Journal of Abnormal and Social Psychology*, *68*, 104–109.
De Castro, B. O., Veerman, J. W., Koops, W., Bosch, J. D., & Monshouwer, H. J. (2002). Hostile attribution of intent and aggressive behavior: A meta-analysis. *Child Development*, *73*, 916–934.
De Quervain, D. J.-F., Fischbacher, U., Treyer, V., Schellhammer, M., Schnyder, U., Buck, A., et al. (2004). The neural basis of altruistic punishment. *Science*, *305*, 1254–1258.
Dell Fitzgerald, P., & Asher, S. R. (1987). *Aggressive-rejected children's attributional biases about liked and disliked peers*. Paper presented at the 95th Annual Convention of the American Psychological Association, New York.
Devine, P. G. (1989). Stereotypes and prejudice: Their automatic and controlled components. *Journal of Personality and Social Psychology*, *56*, 5–18.
Dodge, K. A. (1980). Social cognition and children's aggressive behavior. *Child Development*, *51*, 162–170.
Dodge, K. A. (1991). The structure and function of reactive and proactive aggression. In D. J. Pepler & K. H. Rubin (Eds.), *The development and treatment of childhood aggression* (pp. 201–218). Hillsdale, NJ: Erlbaum.
Dodge, K. A., Bates, J. E., & Pettit, G. S. (1990). Mechanisms in the cycle of violence. *Science*, *250*, 1678–1683.
Dodge, K. A., & Coie, J. D. (1987). Social-information-processing factors in reactive and proactive aggression in children's peer groups. *Journal of Personality and Social Psychology*, *53*, 1146–1158.
Dodge, K. A., Coie, J. D., & Lynam, D. (2006). Aggression and antisocial behavior in youth. In W. Damon (Series Ed.) & N. Eisenberg (Vol. Ed.), *Handbook of child psychology: Vol. 3. Social, emotional, and*

https://doi.org/10.1017/S0954579406060391 Published online by Cambridge University Press

personality development (6th ed., pp. 719–788). New York: Wiley.
Dodge, K. A., & Frame, C. L. (1982). Social cognitive biases and deficits in aggressive boys. *Child Development*, *53*, 620–635.
Dodge, K. A., Laird, R., Lochman, J. E., Zelli, A., & CPPRG. (2002). Multidimensional latent-construct analysis of children's social information processing patterns: Correlations with aggressive behavior problems. *Psychological Assessment*, *14*, 60–73.
Dodge, K. A., Lansford, J. E., Burks, V. S., Bates, J. E., Pettit, G. S., Fontaine, R., et al. (2003). Peer rejection and social information-processing factors in the development of aggressive behavior problems in children. *Child Development*, *74*, 374–393.
Dodge, K. A., Lochman, J. E., Harnish, J. D., Bates, J. E., & Pettit, G. S. (1997). Reactive and proactive aggression in school children and psychiatrically impaired chronically assaultive youth. *Journal of Abnormal Psychology*, *106*, 37–51.
Dodge, K. A., Murphy, R. R., & Buchsbaum, K. (1984). The assessment of intention-cue detection skills in children: Implications for developmental psychopathology. *Child Development*, *55*, 163–173.
Dodge, K. A., & Newman, J. P. (1981). Biased decision-making processes in aggressive boys. *Journal of Abnormal Psychology*, *90*, 375–379.
Dodge, K. A., & Pettit, G. S. (2003). A biopsychosocial model of the development of chronic conduct problems in adolescence. *Developmental Psychology*, *39*, 349–371.
Dodge, K. A., Pettit, G. S., Bates, J. E., & Valente, E. (1995). Social information-processing patterns partially mediate the effect of early physical abuse on later conduct problems. *Journal of Abnormal Psychology*, *104*, 632–643.
Dodge, K. A., Pettit, G. S., McClaskey, C. L., & Brown, M. (1986). Social competence in children. *Monographs of the Society for Research in Child Development*, *51*(Serial No. 213).
Dodge, K. A., & Price, J. M. (1994). On the relation between social information processing and socially competent behavior in early school-aged children. *Child Development*, *65*, 1385–1397.
Dodge, K. A., Price, J. M., Bachorowski, J. A., & Newman, J. P. (1990). Hostile attributional biases in severely aggressive adolescents. *Journal of Abnormal Psychology*, *99*, 385–392.
Dodge, K. A., & Somberg, D. R. (1987). Hostile attributional biases among aggressive boys are exacerbated under conditions of threats to the self. *Child Development*, *58*, 213–224.
Dodge, K. A., & Tomlin, A. (1987). Cue utilization as a mechanism of attributional bias in aggressive children. *Social Cognition*, *5*, 280–300.
Dollard, J., Doob, L. W., Miller, N. E., Mowrer, O. H., & Sears, R. R. (1939). *Frustration and aggression*. New Haven, CT: Yale University Press.
Dyck, R. J., & Rule, B. G. (1978). Effect of retaliation on causal attributions concerning attack. *Journal of Personality and Social Psychology*, *36*, 521–529.
Ellis, B. J., Essex, M. J., & Boyce, W. T. (2005). Biological sensitivity to context: II. Empirical explorations of an evolutionary-developmental theory. *Development and Psychopathology*, *17*, 303–328.
Epstein, S., & Taylor, S.P. (1967). Instigation to aggression as a function of degree of defeat and perceived aggressive intent of the opponent. *Journal of Personality*, *35*, 265–289.
Feldman, E., & Dodge, K. A. (1987). Social information processing and sociometric status: Sex, age, and situational effects. *Journal of Abnormal Child Psychology*, *15*, 211–227.
Fenigstein, A. (1979). Self-consciousness, self-attention, and social interaction. *Journal of Personality and Social Psychology*, *37*, 75–86.
Feshbach, S. (1970). Aggression. In P. H. Mussen (Ed.), *Carmichael's manual of child psychology* (pp. 159–259). New York: Wiley.
Festinger, L. (1957). *A theory of cognitive dissonance*. Evanston, IL: Row Peterson.
Flavell, J. H., & Miller, P. H. (1998). Social cognition. In *Handbook of child psychology* (pp. 851–898). New York: Wiley.
Goldberg, L. R. (1993). The structure of phenotypic personality traits. *American Psychologist*, *48*, 26–34.
Graham, S., & Hudley, C. (1994). Attributions of aggressive and nonaggressive African-American male early adolescents: A study of construct accessibility. *Developmental Psychology*, *30*, 365–373.
Graham, S., Hudley, C., & Williams, E. (1992). Attributional and emotional determinants of aggression among African-American and Latino young adolescents. *Developmental Psychology*, *28*, 731–740.
Graham, S., & Juvonen, J. (1998). Self-blame and peer victimization in middle school: An attributional analysis. *Developmental Psychology*, *34*, 587–599.
Guerra, N. G., & Slaby, R. G. (1990). Cognitive mediators of aggression in adolescent offenders: 2. Intervention. *Developmental Psychology*, *26*, 269–277.
Gurwitz, S. B., & Dodge, K. A. (1975). Adults' evaluations of a child as a function of sex of adult and sex of child. *Journal of Personality and Social Psychology*, *32*, 822–828.
Hartup, W. W. (1974). Aggression in childhood: Developmental perspectives. *American Psychologist*, *29*, 336–341.
Hartup, W. W., & deWit, J. (1974). The development of aggression: Problems and perspectives. In J. DeWit & W. W. Hartup (Eds.), *Determinants and origins of aggressive behavior* (pp. 595–615). The Hague: Mouton.
Hay, D. F. (2005). The beginnings of aggression in infancy. In R. E. Tremblay, W. W. Hartup, & J. Archer (Eds.), *Developmental origins of aggression* (pp. 107–132). New York: Guilford Press.
Heider, F. (1958). *The psychology of interpersonal relations*. New York: Wiley.
Higgins, E. T. (1990). Personality, social psychology, and person–situation relations: Standards and knowledge activation as a common language. In L. A. Pervin (Ed.), *Handbook of personality: Theory and research* (pp. 301–338). New York: Guilford Press.
Hochberg, J. (1970). Attention, organization, and consciousness. In D. I. Mustofsky (Ed.), *Attention: Contemporary theory and analysis* (pp. 99–124). New York: Appleton–Century–Crofts.
Hubbard, J. A., Dodge, K. A., Cillessen, A. H., Coie, J. D., & Schwartz, D. (2001). The dyadic nature of social information processing in boys' reactive and proactive aggression. *Journal of Personality and Social Psychology*, *80*, 268–280.
Hudley, C. A., & Graham, S. (1993). An attributional intervention to reduce peer-directed aggression among

https://doi.org/10.1017/S0954579406060391 Published online by Cambridge University Press

African-American boys. *Child Development*, *64*, 124–138.
Huesmann, L. R. (1988). An information-processing model for the development of aggression. *Aggressive Behavior*, *14*, 13–24.
Jones, E. E., & Davis, K. E. (1965). From acts to dispositions: The attribution process in person perception. *Advanced Experimental Social Psychology*, *2*, 219–276.
Jones, E. E., & Nisbett, R. E. (1971). The actor and the observer: Divergent perceptions of the causes of behavior. In E. E. Jones, D. E. Kanouse, H. H. Kelley, R.E. Nisbett, S. Valins, & B. Weiner (Eds.), *Attribution: Perceiving the causes of behavior* (pp. 79–94). Morristown, NJ: General Learning Press.
Jones, E. E., Kanouse, D. E., Kelley, H. H., Nisbett, R. E., Valins, S., & Weiner, B. (Eds.). (1971). *Attribution: Perceiving the causes of behavior*. Morristown, NJ: General Learning Press.
Kahneman, D., & Tversky, A. (1973). On the psychology of prediction. *Psychological Review*, *80*, 237–251.
Kahneman, D., & Tversky, A. (1982). The simulation heuristic. In D. Kahneman, P. Slovic, & A. Tversky (Eds.), *Judgment under uncertainty: Heuristics and biases*. New York: Cambridge University Press.
Kanouse, D. E., & Hanson, L.R. (1971). Negativity in evaluations. In E. E. Jones, D. E. Kanouse, H. H. Kelley, R. E. Nisbett, S. Valins, & B. Weiner (Eds.), *Attribution: Perceiving the causes of behavior* (pp. 47–62). Morristown, NJ: General Learning Press.
Kelley, H. H. (1971). Attribution in social interaction. In E. E. Jones & H. H. Kelley (Eds.), *Causal schemata and the attribution process*. Morristown, NJ: General Learning Press.
Kenny, D. A. (1994). *Interpersonal perception: A social relations analysis*. New York: Guilford Press.
Knutson, B. (2004). Sweet revenge? *Science*, *305*, 1246–1247.
Kogan, N., & Wallach, M. (1967). Risk taking as a function of the situation, the person, and the group. *New Directions in Psychology, III*. New York: Holt, Rinehart, & Winston.
Lemerise, E. A., & Dodge, K. A. (2000). The development of anger and hostile interactions. In M. Lewis & J. M. Haviland-Jones (Eds.), *Handbook of emotions* (2nd ed., pp. 594–606). New York: Guilford Press.
Lochman, J. E. (1987). Self- and peer perceptions and attributional biases of aggressive and nonaggressive boys in dyadic interactions. *Journal of Consulting and Clinical Psychology*, *55*, 404–410.
Lochman, J. E., & Dodge, K. A. (1998). Distorted perceptions in dyadic interactions of aggressive and nonaggressive boys: Effects of prior expectations, context, and boys' age. *Development and Psychopathology*, *10*, 495–512.
Lochman, J. E., Lampron, L. B., & Rabiner, D. L. (1989). Format and salience effects in the social problem-solving of aggressive and nonaggressive boys. *Journal of Clinical Child Psychology*, *18*, 230–236.
Lorenz, K. (1966). *On aggression*. New York: Harcourt.
MacBrayer, E. K., Milich, R., & Hundley, M. (2003). Attributional biases in aggressive children and their mothers. *Journal of Abnormal Psychology*, *112*, 698–708.
Mackie, D. M., & Hamilton, D. L. (Eds.). (1993). *Affect, cognition, and stereotyping: Interactive processes in group perception*. New York: Academic Press.
Markus, H. (1977). Self-schemata and processing of information about the self. *Journal of Personality and Social Psychology*, *35*, 63–78.
Mayer, J. D., & Hanson, E. (1995). Mood-congruent judgment over time. *Personality and Social Psychology Bulletin*, *21*, 237–244.
McClure, S. M., Laibson, D. I., Loewenstein, G., & Cohen, J. D. (2004). Separate neural systems value immediate and delayed monetary rewards. *Science*, *306*, 503–507.
McCrae, R. R., & Costa, P. T., Jr. (1997). Personality trait structure as a human universal. *American Psychologist*, *52*, 509–516.
Milich, R., & Dodge, K. A. (1984). Social information processing in child psychiatric populations. *Journal of Abnormal Child Psychology*, *12*, 471–489.
Mischel, W. (1999). Personality coherence and dispositions in a cognitive–affective personality system (CAPS) approach. In D. Cervone & Y. Shoda (Eds.), *The coherence of personality: Social–cognitive bases of consistency, variability, and organization* (pp. 37–60). New York: Guilford Press.
Monteith, M. J., Sherman, J., & Devine, P. G. (1998). Suppression as a stereotype control strategy. *Personality and Social Psychology Review*, *2*, 63–82.
Moyer, K. (1976). *The psychobiology of aggression*. New York: Harper & Row.
Nasby, W., Hayden, B., & DePaulo, B. M. (1980). Attributional bias among aggressive boys to interpret unambiguous social stimuli as displays of hostility. *Journal of Abnormal Psychology*, *89*, 459–468.
Neimark, E. D. (1982). Adolescent thought: Transitions to formal operations. In B. B. Wolman & G. Stricker (Eds.), *Handbook of developmental psychology* (pp. 486–502). Englewood Cliffs, NJ: Prentice–Hall.
Nisbett, R. E., & Cohen, D. (1996). *Culture of honor: The psychology of violence in the South*. Boulder, CO: Westview Press.
Nix, R. L., Pinderhughes, E. E., Dodge, K. A., Bates, J. E., Pettit, G. S., & McFadyen-Ketchum, S. A. (1999). The relation between mothers' hostile attribution tendencies and children's externalizing behavior problems: The mediating role of mothers' harsh discipline practices. *Child Development*, *70*, 896–909.
Pastore, N. (1952). The role of arbitrariness in the frustration–aggression relation. *Journal of Abnormal and Social Psychology*, *47*, 728–731.
Pepitone, A., & Sherberg, J. (1957). Intentionality, responsibility, and interpersonal attraction. *Journal of Personality*, *25*, 757–766.
Petty, R. E., Wegener, D. T., & Fabrigar, L. R. (1997). Attitudes and attitude change. *Annual Review of Psychology*, *48*, 609–647.
Pollak, S. D., & Tolley-Schell, S. A. (2003). Selective attention to facial emotion in physically abused children. *Journal of Abnormal Psychology*, *112*, 323–338.
Posner, M. I., & Rothbart, M. K. (2005). Influencing brain networks: Implications for education. *Trends in Cognitive Science*, *9*, 99–103.
Price, J. M., & Dodge, K. A. (1989). Reactive and proactive aggression in childhood: Relations to peer status and social context dimensions. *Journal of Abnormal Child Psychology*, *17*, 455–471.
Rabiner, D. L., Lenhart, L., & Lochman, J. E. (1990). Automatic versus reflective social problem solving in relation to children's sociometric status. *Developmental Psychology*, *26*, 1010–1016.

https://doi.org/10.1017/S0954579406060391 Published online by Cambridge University Press

Ross, L. (1977). The intuitive psychologist and his shortcomings: Distortions in the attribution process. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 10, pp. 174–214). Orlando: Academic Press.

Rule, B. G. (1974). The hostile and instrumental functions of human aggression. In W. W. Hartup & J. deWit (Eds.), *Determinants and origins of aggressive behaviors*. The Hague: Mouton.

Rule, B. G., & Duker, P. (1973). The effects of intentions and consequences on children's evaluations of aggression. *Journal of Personality and Social Psychology*, *27*, 184–189.

Sancilio, F. M., Plumert, J. M., & Hartup, W. W. (1989). Friendship and aggressiveness as determinants of conflict outcomes in middle childhood. *Developmental Psychology*, *25*, 812–819.

Schult, C. A. (2002). Children's understanding of the distinction between intentions and desires. *Child Development*, *73*, 1727–1747.

Schwartz, D., Dodge, K. A., Coie, J. D., Hubbard, J. A., Cillessen, A. H., Lemerise, E. A., et al. (1998). Social–cognitive and behavioral correlates of aggression and victimization in boys' play groups. *Journal of Abnormal Child Psychology*, *26*, 431–440.

Scott, J. P. (1972). Hostility and aggression. In B. Wolman (Ed.), *Handbook of genetic psychology*. Englewood Cliffs, NJ: Prentice–Hall.

Selman, R. L. (1976). Toward a structural analysis of developing interpersonal relations concepts: Research with normal and disturbed preadolescent boys. In A. D. Pick (Ed.), *Minnesota Symposium on Child Psychology* (Vol. 10). Minneapolis, MN: University of Minnesota Press.

Shank, R. C., & Abelson, R. P. (1995). Knowledge and memory: The real story. In R. S. Wyer (Ed.), *Knowledge and memory: The real story. Advances in Social Cognition* (Vol. 8, pp. 1–85). Hillsdale, NJ: Erlbaum.

Shonkoff, J. P., & Phillips, D. A. (Eds.). (2000). *From neurons to neighborhoods: The science of early childhood development*. Washington, DC: National Academy Press.

Simon, H. A. (1957). *Models of man*. New York: Wiley.

Simon, H. A. (1967). Motivational and emotional controls of cognition. *Psychological Review*, *74*, 29–39.

Slaby, R. G., & Guerra, N. G. (1988). Cognitive mediators of aggression in adolescent offenders: 1. Assessment. *Developmental Psychology*, *24*, 580–588.

Slovic, P., Fischoff, B., & Lichtenstein, S. (1979). Rating the risks. *Environment*, *21*, 14–39.

Snyder, M., Tanke, E. D., & Berscheid, E. (1977). Social perception and interpersonal behavior: On the self-fulfilling nature of social stereotypes. *Journal of Personality and Social Psychology*, *35*, 656–666.

Steinberg, M. D., & Dodge, K. A. (1983). Attributional bias in aggressive adolescent boys and girls. *Journal of Social and Clinical Psychology*, *1*, 312–321.

Stromquist, V. J., & Strauman, T. J. (1992). Children's social constructs: II. Nature, assessment, and association with adaptive and maladaptive behavior. *Social Cognition*, *9*, 330–358.

Sukhodolsky, D. G., Golub, A., Stone, E. C., & Orban, L. (2005). Dismantling anger control training for children: A randomized pilot study of social problem-solving versus social skills training components. *Behavior Therapy*, *36*, 15–23.

Tversky, A., & Kahneman, D. (1973). Availability: A heuristic for judging frequency and probability. *Cognitive Psychology*, *5*, 207–232.

Waas, G. A. (1988). Social attributional biases of peer-rejected and aggressive children. *Child Development*, *59*, 969–992.

Waldman, I. D. (1996). Aggressive boys' hostile perceptual and response biases: The role of attention in impulsivity. *Child Development*, *67*, 1015–1033.

Wegener, D. T., & Petty, R. E. (1996). Effects of mood on persuasion processes: Enhancing, reducing, and biasing scrutiny of attitude-relevant information. In L. L. Martin & A. Tesser (Eds.), *Striving and feeling: Interactions between goals and affect* (pp. 329–362). Mahwah, NJ: Erlbaum.

Weiss, B., Dodge, K. A., Bates, J. E., & Pettit, G. S. (1992). Some consequences of early harsh discipline: Child aggression and a maladaptive social information processing style. *Child Development*, *63*, 1321–1335.

Wellman, H. H., Phillips, A. T., & Rodriquez, T. (2000). Young children's understanding of perceptions, desire, and emotion. *Child Development*, *71*, 895–912.

Werner, H. (1948). *Comparative psychology of mental development*. Chicago: Follett.

Wyer, R. S. (1981). An information-processing perspective on social attribution. In J. H. Harvey, W. Ickes, & R. F. Kidd (Eds.), *New directions in attribution research* (Vol. 3). Hillsdale, NJ: Erlbaum.

Zajonc, R. (1965). Social facilitation. *Science*, *149*, 269–274.

Zelli, A., & Dodge, K. A. (1999). Personality development from the bottom up. In D. Cervone & Y. Shoda (Eds.), *The coherence of personality: Social–cognitive bases of personality consistency, variability, and organization* (pp. 94–126). New York: Guilford Press.

Zelli, A., Dodge, K. A., Lochman, J. E., Laird, R. D., & Conduct Problems Prevention Research Group. (1999). The distinction between beliefs legitimizing aggression and deviant processing of social cues: Testing measurement validity and the hypothesis that biased processing mediates the effects of beliefs on aggression. *Journal of Personality and Social Psychology*, *77*, 150–166.

Ziv, Y., Oppenheim, D., & Sagi-Schwartz, A. (2004). Social information processing in middle childhood: Relations to infant–mother attachment. *Attachment and Human Development*, *6*, 327–348.

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