

A Cognitive-Ecological Model of Aggression

Une théorie cognitivo-écologique du comportement agressif

*Nancy G. Guerra**
*L. Rowell Huesmann***

Abstract

In this paper, we present a cognitive-ecological model for understanding the development of aggressive behavior. The model emphasizes the role of cognitive processes that serve as guides for behavior, how they are learned over time and across contexts, and how they influence responding across these contexts. The model begins with the recognition that aggression has adaptive and maladaptive functions, and that individuals have innate evolved cognitive processes related to aggression. We identify the important cognitions that are related to aggressive behavior, and we identify the important mechanisms by which contexts influence these cognitions, including observational learning, reinforcement, and normative standards. According to our model, context, cognition, and behavior are tied together in mutually interacting processes. We also show how this model leads to productive insights for the process of intervening to prevent the development of aggressive and antisocial behavior in youth.

Résumé

Dans cet article, nous présentons un modèle cognitif-écologique du comportement agressif et de son développement. Ce modèle souligne le rôle des processus cognitifs qui orientent le comportement et explicite à la fois leur mode de développement dans le temps et selon les contextes et leurs influences dans ces mêmes contextes. Le point de départ du modèle est la reconnaissance de la nature tantôt fonctionnelle tantôt dysfonctionnelle de l'agression au plan de l'adaptation et du caractère inné de certains des processus qui la fonde. Nous identifions les cognitions importantes en rapport avec les comportements agressifs et les mécanismes par lesquels le contexte influence ces cognitions, parmi eux l'apprentissage vicariant, les renforcements et les standards normatifs. Selon notre modèle, contexte, cognition et comportement interagissent les uns avec les autres. Nous montrons enfin que ce modèle offre certains « insights » pour la compréhension des processus d'intervention susceptibles d'empêcher le développement des comportements agressifs et antisociaux chez les jeunes.

*University of California at Riverside.

**University of Michigan.

Research on aggression has often focused on a single factor or set of factors in a particular context or setting that increase the likelihood of aggressive responding. In part, this is because the study of aggression has attracted a diverse set of researchers from a range of disciplines including biology, psychiatry, sociology, public health, criminology, and public policy. As a result of these diverse disciplinary perspectives, there is now a long list of predictors of aggression, including genetic predispositions (Cloninger & Gottesman, 1987), attention difficulties (Moffitt, 1990), hormonal levels (Olweus, Mattsson, Schalling, & Low, 1988), peer difficulties (Coie & Dodge, 1997), poor parenting (Patterson, 1995), and environmental poverty and stress (Guerra, Huesmann, Tolan, Eron, & Van Acker, 1995), to name a few. Still, no one causal factor by itself explains more than a small portion of individual differences in aggression. Efforts to prevent aggression or violence in children and adults that focus on a single causal mechanism also tend to have minimal long-term effects (Tolan & Guerra, 1994). In addition to studying features of individuals and contexts that increase risk for aggression, it is important to develop theoretical models that allow us to link together these findings and to understand the mechanisms by which aggressive behavior develops, is sustained, and can be prevented.

In this paper, we present a *cognitive-ecological model of aggressive behavior*. This approach emphasizes the role of *cognitive processes* that develop, in part, as a result of the interrelationship between *individuals and their environments* over time. These cognitive processes shape the representation, processing, and communication of information in social settings. Cognitive processes do not *cause* behavior, but they serve as mediating mechanisms that connect biological, environmental, and situational inputs to behavioral responses. They are learned across multiple contexts and, in turn, influence responding across these contexts. We use the term “ecological” to denote the nested contexts that constitute an individual's developmental environment. Context, in this framework, refers to the social settings of development that provide a stage where social interactions occur, offer a normative or regulatory structure that includes costs and benefits of distinct courses of action, and contain opportunities for different types of social interactions.

Of course, a model that emphasizes the role of cognitive processes as guides for behavior across multiple contexts can be applied to all human social behavior, ranging from morally-justified actions (Guerra, Nucci, & Huesmann, 1994) to violent criminal offending (Slaby & Guerra, 1988). Indeed, one of the most prominent shifts in developmental and social psychology over the last few decades has been the emergence of social-cognitive models of development and behavior (Bandura, 1986; Dodge & Crick, 1994). However, our focus here is on the cognitive and contextual bases of *aggressive behavior*. We define aggressive behavior broadly as *intentional actions that cause physical or psychological harm to others*. Although it may be useful in some instances to distinguish between different forms of aggression (e.g., indirect, physical, verbal) or different types of aggression (e.g., hostile vs. instrumental, proactive vs. reactive, impulsive vs. premeditated), there is often a good deal of overlap or blurriness across categories (Bushman & Anderson, 2001). In a similar fashion, an examination of cognitive processes underlying aggression leads to a realization that many of the same mechanisms (albeit in varying degrees) are involved in different types of aggression (Huesmann, 1998). For instance, "proactive" or seemingly unprovoked aggression may actually represent a delayed or displaced "reaction" to a previously aversive event.

Our naming of our model as cognitive-ecological should not signify that we consider emotional reactions to be unimportant in the etiology of aggressive behavior. To the contrary, the strongest proximal predictor of hostile, reactive aggression may well be extreme rage. However, emotional reactions are also inevitably linked to cognitions. We do not deny the innate primacy of certain emotional reactions, but we agree with Berkowitz (1993) that, as the child grows up, emotional reactions are moderated by cognitions, and cognitions are moderated by emotional reactions. Situations stimulate both emotions and cognitions, and the two become associated. Encoded cognitions are linked to emotional reactions, and activation of one activates the other. Behaviors have both cognitive and emotional consequences, and the two become linked.

We build on these general conclusions about the psychology of social behavior and aggression to describe more specific ele-

ments of our cognitive-ecological model. We begin by acknowledging the adaptive and maladaptive functions of aggression in particular contexts and the role that evolution has played in preparing the human cognitive system for making decisions about aggression. We propose that a well-developed cognitive system is also an evolved mechanism that helps us select between aggressive and non-aggressive responses in different situations. We then turn to a more detailed discussion of the specific patterns of cognitive organization and information processing related to aggression, how they are learned across time and contexts, and how they mediate behavior. Finally, we discuss some implications of the cognitive-ecological model for preventing aggressive behavior.

The Adaptive Functions of Aggression

Humans (as well as every vertebrate species) are born with the capacity to elicit aggressive responses as well as the capacity to inhibit and control such responses. As historical and cross-cultural records demonstrate, our evolutionary history is laced with examples of aggression and violence. Such violence is not restricted to early historical periods or certain cultural groups. Rather, aggression is one of many mechanisms that have evolved to help individuals cope with problems of survival and reproduction. For example, humans appear to possess a degree of “preparedness” for aggression whereby certain stimuli are more easily connected to affective and behavioral responses, such as the frustration-anger-aggression link (Berkowitz, 1993). This does not mean that we possess rigid or invariant aggressive “instincts,” but rather the capacity to use aggression for particular adaptive problems confronted in particular contexts. This capacity appears to be evident from a very early age.

For instance, studies have found that infants as young as four months display angry facial expressions, even before any overt aggressive behaviors are noticeable (Stenberg & Campos, 1990). Shortly after, toddlers use aggression to take things from others such as toys and territory (Campbell, 1993). In some cases, this behavior progresses to the bullying of older children and adolescents, where demands are made for lunch money, jackets, and

other prized items (Olweus, 1991). Aggression is also used in a pre-emptive fashion to deter future attacks. Aggressive retaliation has been documented in children as young as one year of age (Caplan, Vespo, Pederson, & Hay, 1991). Retaliation seems to serve a distinct purpose in sending a message to others that their aggressive acts will not go unpunished. Victims who are unwilling to retaliate generally are more likely to be targeted for future aggression. Another example can be found in the use of aggression to establish dominance hierarchies (Wrangham & Peterson, 1996). Studies have shown that "rough and tumble" play emerges in childhood, serving to differentiate children, build affiliations, and establish social hierarchies (Humphreys & Smith, 1987).

However, aggression left unchecked can also significantly compromise survival. Thus, it is not surprising that humans have also evolved strong inhibitory mechanisms that allow them to suppress aggression when necessary (as well as other competing needs such as affiliation or belonging, e.g., Baumeister & Leary, 1995). Even the most extremely aggressive individuals are not aggressive all of the time and in all situations. Otherwise put, aggression is always an optional strategy. As demonstrated in previous studies, the ability to control aggression is also evident from a very young age. For example, in an interesting study of preschool children, Besevegis and Lore (1983) found that children who played together without a teacher in the room were actually less aggressive than children who played together when the teacher was present. It seems that children learn at an early age that risk of counterattack is higher when no adult is present, so they must make a greater effort to regulate their own aggressive behavior.

Given that our evolutionary birth certificate appears to include an innate capacity both to aggress and to inhibit aggression, how do we learn to navigate this apparent paradox? It is clear that our survival depends not only on our ability to be aggressive and to control our aggression, but also on our ability to determine which strategy should prevail under which specific conditions. Perhaps what differentiates us most clearly from nonhuman species is our ability to navigate the complexities of circumstance and to adjust our behavior quickly to the demands of the situation. Our ability to engage in elaborate cognitive processes such

as interpretation of cues, generation of responses, and evaluation of consequences can be seen as an evolved mechanism that helps us solve the adaptive problem of choosing between multiple possible courses of action.

This perspective is consistent with recent evolutionary theory that emphasizes the importance of “calibration” of response systems (such as aggression) to match the needs and demands of the environment (Malamuth & Heilmann, 1998). However, modern evolutionary theory also suggests that contexts can also vary greatly in terms of the adaptive value of aggression. As Buss and Schackelford (1997, p. 612) point out, “In principle, the mechanisms producing aggression could remain dormant for the entire life of an individual, if the relevant contexts are not encountered.”

An evolutionary perspective on aggression is relevant to the cognitive-ecological model because it highlights the importance of evolved internal mechanisms that serve as guides for behavior *and* the role of contexts in eliciting or inhibiting aggressive actions. The cognitive-ecological model also suggests that contexts influence the development of internal mechanisms and internal mechanisms influence the impact of contextual factors. In this fashion, although aggression is a highly plastic behavioral strategy, both internal mechanisms and contextual influences can contribute to its development and continuity over time. One of the most robust findings in the literature on aggression is a high degree of continuity of aggression from childhood into adulthood. This continuity occurs across all levels of aggression—less aggressive children are likely to be less aggressive adults, and more aggressive children are likely to be more aggressive adults (Huesmann & Moise, 1998). According to the cognitive-ecological model, this continuity is due, in part, to the development of an increasingly organized cognitive system that reflects patterns of processing and cognitions conducive to aggressive behavior.

The Cognitive Underpinnings of Aggressive Behavior

Our focus on the cognitive mechanisms underlying aggressive behavior does not in any way negate the causal influence of a host of other causal factors. These range from differences in tem-

perament, hormones, arousal level, and executive functioning to differences in neural processes and brain structures (e.g., Niehoff, 1999). We focus on cognitive mechanisms, however, because many of these predisposing factors influence aggression, at least in part, by virtue of their influence on cognitive processes and structures. In other words, predisposing factors may make the emergence of specific patterns of cognition conducive to aggression more likely. Similarly, their influence can often be neutralized through the development of compensatory cognitive mechanisms, such as cognitive self-regulation to control impulsivity.

Consider the child with a low arousal level, a biological marker for violence risk (Raine, 1993). The child with low arousal is also less likely to experience negative emotional reactions in response to victim suffering. He or she may learn from observation that aggression results in suffering in others, but observing others' suffering does not result in any negative consequences for self. Hence, cognitive appraisal of outcome expectancies for aggression would be something like, "If I use aggression, others suffer, it doesn't bother me" rather than, "If I use aggression, others suffer, and I feel bad." The biological marker has both a direct influence on aggression via minimization of a potential inhibitory mechanism as well as by fostering the development of cognitive appraisals and expectancies supporting aggression.

What are the precise cognitive underpinnings of aggression? In recent years, most theorists writing about aggression have included at least some reference to underlying cognitions. Further, a number of integrative social cognitive models of aggression have been proposed (e.g., Anderson & Bushman, 2002; Bandura, 1986; Crick & Dodge, 1994; Huesmann, 1998). Although these models differ in terms of focus and scope, they all rely heavily on cognitive information processing theory, emphasizing both information-processing skills (i.e., the process of thought) and social knowledge (i.e., the content of thought). They draw on empirical knowledge of cognition and behavior to articulate components of a cognitive system. These include *memory structures* that represent a complex network of nodes and links representing cognitive concepts and emotions, *knowledge structures* that represent sets of concepts that are strongly inter-

connected, and an *executive program* that assumes an overall management function for the system. The system processes inputs of social stimuli, searches memory for relevant information, and generates outputs accordingly (see Huesmann, 1998 for a more detailed description of information-processing principles applied to social cognition).

A number of core cognitive processes have been linked to aggression. They can be discussed under two broad categories: (1) encoding and interpretation of cues, both internal and external; and (2) response search, evaluation, and decision, followed by enactment. In simple terms, behavior reflects an understanding of what happened and why, and an assessment of response options and how to proceed. These processes are affected by individual factors (such as impulsivity, arousal), situational factors (such as aversive stimuli), and contextual factors (such as community norms for behavior). They are also influenced by and influence the memory structures or “data base” that individuals develop over time. This data base includes a variety of schemas or knowledge structures about a concept, its attributes, and its relations to other concepts. Further, cognitive processes can occur in a *controlled* manner under certain circumstances (such as novel situations or situations that require or permit conscious and deliberate planning) or they can occur in an *automatic* manner with little demand on cognitive resources or executive processes (Schneider & Shiffrin, 1977). As individuals develop characteristic styles of responding across a restricted range of increasingly familiar contexts, these processes become more automatic. Both cognitive processes and schemas are learned over time and influence aggressive behavior.

Encoding and Interpretation of Cues

Everyday interactions contain a potentially paralyzing array of social cues. To decrease the information processing workload, we learn to attend selectively to certain cues and not to others. Cues that receive little attention are unlikely to influence cognitive processing or behavior compared to cues that are more salient. There are clearly differences in cue salience depending on personal, situational, or contextual factors. For example, individual factors such as hyperactivity may interfere with this selective attention process

making it more difficult to sort out relevant from irrelevant cues. Situational stimuli (such as presence of a weapon) may exert a priming effect whereby aggression-relevant cues become more salient (Anderson, Benjamin, & Bartholow, 1998). Contextual factors may also influence the brain's alarm system so that certain cues are more salient. For example, children who are exposed to violence, danger, or abuse during the early years often develop a hypervigilance to stress and a tendency to be overly sensitive to threat cues (Pynoos, Steinberg, & Ornitz, 1977).

How cues are encoded influences the developing cognitive system, and the cognitive system, in turn, influences subsequent encoding of cues. For instance, acquired self-schemas may contribute to differential salience of self-relevant cues. An individual who is schematic for "tough and aggressive," i.e., this description is a central part of his or her self view, is more likely to attend to cues that provide opportunities to respond aggressively or to cues that potentially threaten this self view, particularly if it is unstable (Baumeister, Smart, & Boden, 1996). Socialization across multiple contexts also involves transmission of beliefs about which cues should receive more attention. For instance, parents who overemphasize "stranger danger" should be more likely to have children who notice strangers across a range of social situations.

In addition to differences in salience of social cues, social perception and behavior are also affected by differences in how individuals interpret these cues. Most social cues are open to a range of attributions regarding causality or intent. Indeed, it is quite difficult to infer another person's intent because it requires access to the other person's private thoughts. For this reason, individuals develop shortcuts for attributing intent. Stereotypes linking membership in specific categories designated as more or less aggressive may be applied. For young children, this may involve simple categories such as gender, with actions by boys being seen as more intentionally harmful than actions by girls. For older children and adults, categories such as ethnicity and physical attractiveness may enter into judgments of harmdoing. For example, Duncan (1976) found that White participants viewing movie clips judged aggression by a Black person as more intentional and harmful than aggression by a White person.

Another shortcut, perhaps resulting from increased exposure to aggression and hostility, is a tendency to infer hostile intent when intent information is unclear. One of the most robust findings in the developmental literature on aggression is the tendency of aggressive children to attribute hostile intent to others under ambiguous circumstances (Dodge, 1980, 1986; Graham & Hudley, 1994; Slaby & Guerra, 1998). As children get older, this may come to increasingly reflect a hostile world schema, whereby individuals perceive hostility everywhere (e.g., Gerbner & Gross, 1980). For instance, Dill, Anderson, Anderson, and Deuser (1997) found that aggressive college students perceive more aggression in observed dyadic interactions and expect others to behave more aggressively. Thus, not only is aggression linked to hostile intent attributions, but it is also linked to a world view where hostility is a central component of social interactions.

Response Search, Evaluation, and Decision

As discussed previously, both evolutionary psychology and developmental research suggest that aggression and inhibition of aggression are part of our innate behavioral response repertoire. What we learn over time and across contexts is when, where, and how to select an aggressive or non-aggressive (i.e., inhibiting aggression) response. A range of individual factors may increase the likelihood that a child uses aggressive responses across different situations. For instance, a child who is physically strong may find it easy to grab things from others and meet with little resistance. Because aggressive responses are easy, rewarded, and likely to be repeated, they are also more likely to be encoded within the child's possible behavioral repertoire. To the extent that aggression is also rewarded in other ways (e.g., with peer approval) and/or is regularly observed in multiple contexts (e.g., playmates, family, media portrayals), it is also more likely to be integrated into the memory network. Further, a pattern of similar responses may lead to related self-schema (e.g., I am an aggressive person), and aggressive self-schema may lead to increased salience of aggressive responses.

With development, children's response repertoire both expands and becomes more organized according to rules of social interaction. One important type of social interaction rule involves

response-outcome expectancies. Not only is behavior governed, in part, by its consequences, it is also governed by our beliefs about likely consequences. Because aggression is likely to be a rather effective strategy for certain outcomes, such as instrumental rewards, social status, and prevention of future aggression, it is easy to encode response-outcome expectancies supporting aggression. Studies of children and adolescents have found that aggressive children are more likely to believe that aggression results in positive outcomes such as tangible rewards and social status (Perry, Perry, & Rasmussen, 1986; Guerra & Slaby, 1990). Of course, aggression also results in negative outcomes such as punishment, suffering of others, and social sanctions. Some individuals may misperceive the likely consequences and others may simply attach less significance to certain consequences, for instance, low arousal individuals who seem to be less sensitive to the suffering of others. Children also learn that the consequences of aggression vary according to the target and context – hitting one's father during dinner is likely to result in more severe and aversive consequences than hitting a weaker classmate on the playground.

Another type of rule for social interaction reflects one's personal standards for acceptable behavior. Applying this to aggression, we have examined the development and impact of an individual's normative beliefs about aggression, defined as one's perception of the appropriateness of aggression in particular settings. Normative beliefs about aggression emerge from observation of one's own level of aggressiveness, observing the behavior of influential models, and direct instruction across different contexts (Guerra *et al.*, 1995; Huesmann & Guerra, 1997). They begin to emerge as stable constructs around age 7 or 8, consistent with children's increasing participation in games with rules (Piaget, 1969). As children get older, they also become more predictive of subsequent aggression (Huesmann & Guerra, 1997). Normative beliefs serve to facilitate encoding of a particular response within an individual's repertoire (i.e., if I believe it is acceptable, I can encode it as a possible response for me) or prevent encoding (i.e., if I believe it is not acceptable, I can observe such behavior, but not encode it as a possible response for me).

Scripts and Aggressive Behavior

We have discussed how knowledge structures, such as self-schema, can influence information processing by making certain cues or responses more salient. Schema and actions are seen as interconnected in a feedback loop whereby schema influence interpretation and responses that, in turn, lead to changes in schema. Our cognitive-ecological model of aggression emphasizes the role of event schema, or scripts, in guiding behavior. A script is a schema that links together many simpler schemas that represent expected events and actions. It includes both declarative and procedural knowledge about “if-then” events. Scripts serve to organize an individual's understanding of a given situation, including preferred responses and likely consequences. Scripts also help simplify the cognitive workload by serving as guides for behavior (Huesmann, 1998).

As children get older, they acquire a broader range of scripts for behavior. Given that scripts serve to simplify the cognitive workload, in many cases a particular scripted response becomes dominant or automatic. More aggressive people presumably have more dominant and automatic aggressive scripts. In other words, they have a more extensive, well-connected network of social scripts involving aggression encoded in memory and a less well-connected network of non-aggressive scripts or scripts for inhibition of aggression.

Clearly, a variety of individual factors can predispose a child toward particular styles of cognitive processing or toward encoding and rehearsal of more aggressive scripts. At one level, simple practice of scripted aggressive responses, whether through cognitive rehearsal or actual behavior, is likely to more firmly encode aggression in the cognitive network and link it with other previously encoded knowledge. However, our cognitive-ecological model also stresses the importance of contextual influences on the learning, acquisition, and utilization of aggressive scripts. Aggressive scripts are learned and reinforced within specific social contexts that provide opportunities to observe aggression and rewards for such behavior, and are utilized in contexts where such behaviors have some normative value. Using the analogy of the restaurant script, we would not learn to look at the menu, tell the waitperson what we wanted to eat, and wait patiently for our

food if no one else in the restaurant did this and/or if our food never arrived.

Contextual Influences on Aggressive Behavior

There is an extensive literature examining the various contextual influences on aggression. Our goal here is not to restate this literature, but rather to highlight those aspects of context related to aggression that should influence the development and activation of aggressive cognitions and behaviors. We focus on three mechanisms of influence – observational learning, reinforcement, and normative standards. We briefly discuss how these operate across different socialization contexts including peers, families, and neighborhoods.

Observational learning

Observational learning of aggression involves the acquisition of specific behaviors, scripts, schemas, expectancies, or beliefs that promote aggression from observing aggression. For example, children who witness violence at home are more likely to become aggressive and violent (Widom, 1989), even when such aggression is directed at the child as a form of punishment for misbehavior (Strauss, 2000). It is important to distinguish these learning processes from the shorter term priming processes through which observation of violence can increase aggressive behavior in the short run. Priming is the "automatic" process through which spreading activation in the brain's neural network from the locus representing an external observed stimulus excites another brain node representing aggressive cognitions or behaviors (Bargh, Chen, & Burrows, 1996; Berkowitz, 1993). These excited nodes then are more likely to influence behavior. The external stimulus can be inherently aggressive, e.g., the sight of a gun (Berkowitz & LePage, 1967), or something neutral like a radio that has simply been nearby when an violent act was observed (Josephson, 1987). A provocation that follows *priming* stimulus is more likely to stimulate aggression as a result of the priming. While this effect is short-lived, the primed script, schema, or belief may have been acquired long ago and may have been acquired in a completely different context.

The power of observational learning to mold behaviors including aggression has been recognized for a long time (Bandura, 1974; 1986). However, several recent developments have led to an increase in the emphasis on observational learning as a key factor in the socialization of children and in the learning of behaviors such as aggression. One important development has been an emerging realization that observational learning in its simplest form, imitation, is an innately programmed process in humans and perhaps other primates as well. Imitation begins in early infancy (Meltzoff & Moore, 1977; 2000), and very young children imitate almost any specific behaviors they see. Imitation is not a learned process; it is innate and undoubtedly evolved because it is adaptive. There also has been an increasing understanding of the neurophysiological basis of imitation and observational learning. So-called "mirror" neurons have been identified (Gallese, Fadiga, Fogassi, & Rizzolatti, 1996; Iacoboni *et al.*, 1999) that fire when either an action is observed. Researcher in neural networking and robotics have proceeded to attempt to develop models for automata that can imitate on the basis of such research.

Another important development involves the extension of observational learning theory to the acquisition of all kinds of social cognitions and not just simple behaviors (e.g., Huesmann, 1997). The human observer is not a passive observer but an active information processor who makes inferences about what is behind what is observed. These inferences include conclusions about the kind of world we live in, the kinds of people who inhabit the world, the beliefs these people must hold, and the scripts these people are following. Individuals must also frequently make sense of diverse observations and interpretations, many of which do not provide a consistent interpretation or guide for action. For instance, parents often hit their children as punishment for hitting others, while telling them "don't hit anyone." Further, what is observed in different contexts (e.g. peers, family) may also vary in salience. For instance, during adolescence, the salience of the peer group increases. Thus, observational learning is not always a straightforward "see-do" process, but requires active processing and interpretation of events across multiple contexts.

Reinforcement

Contexts also vary in the extent to which they provide reinforcement for aggression. As mentioned previously, aggression is both maladaptive and adaptive in certain contexts. In some contexts and for some individuals, aggressive scripts and behaviors lead to reinforcement more often than not, and thus are quite difficult to prevent or change, particularly if the reinforcement contingencies in the specific context remain constant.

For example, considerable attention has focused on documenting and understanding the high rates of violence found in inner-city communities in the United States (e.g., McCord, 1997). At a very simple level, it is clear that aggression and violence provide a means to attain a range of material and social rewards where few other means are easily available. These rewards can be quite wide-ranging, including material goods, status, protection, and power (Fagan & Wilkinson, 1998). Within these communities, smaller groups may also exert powerful contextual influences via the reward structure provided for aggression and violence. For example, as a social context, gangs provide ample opportunities for violence because there is very low external control, status is valued and restricted to those willing to fight for it, violent expression of grievances is rewarded, group affiliations are paramount, and cultural values emphasize a tough masculine ideal (Oliver, 1994).

Normative Standards

In addition to observation and reinforcement influences, some socialization contexts during certain developmental periods provide a well-organized system of shared understanding about common action sequences and their consequences. One of the most robust findings in the literature on adolescent aggression and delinquency is that antisocial and violent peers tend to gravitate towards one and other. Aggressive youth associate with other aggressive youth and this stimulates more aggression. Contexts where aggressive behavior comes to dominate social interactions, such as in typical gang behaviors, come to shape normative definitions, expected behaviors, and costs and benefits of aggression. In some sense, gang life provides individuals with well-articulated scripts that are frequently rehearsed and govern almost every aspect of social behavior.

Community norms and expectations also provide a stage for development of context-specific scripts. For example, aggressive “street codes” have evolved in some inner city communities, especially among youth, that define a specific set of procedural scripts for handling social interactions and interpersonal conflicts (Anderson, 1994). In communities with high levels of violence and fear, these codes dominate much of street life. To the extent that real danger exists, individuals who navigate the streets must be prepared for potentially threatening or dangerous situations where quick responses are needed. For this reason, scripted behaviors that are automatic are also more adaptive. Danger also creates a high degree of uncertainty or unpredictability. Because this increases the cognitive workload, people living under these conditions might be expected to more readily embrace a set of clear procedural guidelines that increase predictability. When aggressive and violent procedural scripts dominate street life, there is also little opportunity to observe or practice alternative scripts. Over time, the array of aggressive scripts and schemas can become linked together in a memory network by a “hostility” node, and can be primed by other aggressive ideas or cues, such as guns, which seem to abound in certain contexts (Huesmann, 1998).

Individuals with easily primed and interconnected aggressive scripts may also seek out normative contexts where these scripts can play out, a type of “niche-picking” (Scarr & McCartney, 1983). Otherwise put, if individuals' scripts for social behaviors typically involve some type of aggression, they cannot utilize these scripts in social settings that do not call for aggression. This is consistent with the observation that much of gang violence is actually carried out between members of the same gang (a type of “practice” aggression) rather than between rival gangs. It also follows that for violent individuals with few non-aggressive scripts, prisons can provide another stage for well-rehearsed and automatic responses.

Implication for Prevention and Intervention

The cognitive-ecological model of aggression emphasizes the learning of aggressive cognitions and cognitive processes over

time and across contexts. Individual, situational, and contextual influences can increase the likelihood that an aggressive cognitive style will develop, and an aggressive cognitive style can increase the likelihood that aggressive behavior will follow. Over time, this can contribute to patterns of thinking and behaviors that foster characteristic or habitual aggression. These behaviors will be more likely in contexts where aggressive behavior has some type of adaptive value, and can be further maintained and strengthened in these contexts. Indeed, to the extent that such behavior becomes automatic or “scripted,” it is likely that individuals will seek out and be most comfortable in contexts that provide opportunities for aggressive interactions.

A cognitive-ecological model also provides a useful perspective for thinking about prevention and intervention strategies. Both cognitions and contexts are among the most malleable risk factors for aggression. Several recent reviews of aggression and violence prevention efforts have noted the relative success of cognitive-behavioral and social information processing programs, particularly for children and adolescents (e.g., Guerra, 1998). Programs directed at changing cognitions are also more appropriate for schools and other educational settings. There are a number of social development and violence prevention curricula that emphasize children's cognitions (e.g., Guerra & Slaby, 1990). Contexts can also be examined in terms of how they contribute to children's emerging cognitions, such as normative beliefs about aggression. A particular emphasis in the prevention field has been on creating normative climates so that aggression, bullying, and violence are seen as “not acceptable” (e.g., Olweus, 1994).

In our own recent work, we have applied the cognitive-ecological model to the design, implementation, and evaluation of a large-scale preventive effort with inner city and urban elementary school children (Guerra *et al.*, 1995). Details of this study and preliminary outcomes are described elsewhere (Metropolitan Area Child Study (MACS), 2002). The cognitive-ecological model and the findings of this study support three important lessons for the design of preventive interventions: (1) programs should begin early in development; (2) efforts must address multiple aspects of social cognition and multiple contexts, with a focus on

how contextual influences shape cognitions and behavior; and (3) interventions must be appropriate for real-world settings individuals encounter and emphasize development and practice of appropriate, non-aggressive scripts.

Timing of Intervention

The dictum “earlier is better” was clearly supported in both our longitudinal and intervention findings. Children's cognitions were highly unstable until the later elementary school years. Similarly, efforts to change children's cognitions and behaviors using a cognitive-behavioral approach were only successful during the early elementary school years (MACS, 2002). It appears that young children are still developing an organized system of beliefs and social information-processing skills; hence, they are reasonably malleable. During the later elementary years, a “crystallization” process ensues, with the emergence of more elaborate and stable knowledge structures. These knowledge structures reflect both individual propensities and accumulated life experiences across different contexts.

Of course, this crystallization process is just that—a process. The formation of knowledge structures does not begin at age 5 nor end at age 10. The cognitive system is always malleable and influenced by personal and environmental characteristics over time. From an intervention perspective, it is important to describe potential mechanisms of influence at different points in development that represent the “best bets” for preventive efforts. For instance, during the early elementary school years, aggressive behavior has been shown to predict children's cognitions even though cognitions do not predict aggressive behavior (Huesmann & Guerra, 1997). This suggests that early efforts, including those for infants and toddlers, should focus on prevention of aggressive behaviors. These behaviors are learned primarily in family and day care/preschool contexts. A number of preschool parent-child interventions have been evaluated and have shown that engaging parents in children's positive development and enhancing caregivers' capacity to help children develop appropriate behaviors predicts gains in social competence and reductions in aggressive behavior (Webster-Stratton, 1998).

Prevention programs for older children, adolescents, and adults should increasingly address cognitive processes and structures, with a simultaneous focus on how these develop across multiple contexts. For instance, in another study looking at the effects of community violence exposure on elementary school aged children's cognition and behavior, we found that violence exposure had a significant effect in increasing subsequent aggression, normative beliefs about aggression, and fantasizing about aggression in both boys and girls. Although exposure to violence predicted subsequent aggressive behavior both in grades 1-3 and grades 4-6, the effects on social cognition were only evident in the later grades. The effect of violence exposure on aggression in the later grades was also partially mediated by its effect on social cognition, particularly normative beliefs (Guerra, Huesmann, & Spindler, 2003).

As would also be predicted from the cognitive-ecological model, the magnitude of effects for aggression and violence prevention programs decreases during adolescence and beyond, with reported mean effect sizes of about .2 (Tremblay & Craig, 1995). Presumably, cognitions supporting aggression are more stable, and more aggressive adolescents operate in more aggressive contexts (e.g., peer groups, gangs). However, interventions directing at changing cognitions can still be effective. For example, Guerra and Slaby (1990) conducted a controlled evaluation study of a cognitive-behavioral intervention with juveniles incarcerated for violent crimes. A major emphasis was on changing beliefs about the legitimacy of aggression; changes in these normative beliefs occurred in the intervention group, and these changes predicted decreases in subsequent aggressive behavior.

The Importance of Multi-Component, Multi-Context Programs

One can ask whether prevention programs should be narrowly defined to target discrete skills or should be broad-based and extend across multiple contexts. Short-term programs focused on a single skill (e.g., cognitive self control, perspective taking) can provide more intensive training and are easier to evaluate. However, evidence suggests that most of these programs produce short-term effects on aggression at best (for a review, see

Tolan & Guerra, 1994). As we have discussed, just as there are multiple causes of aggression, there are also multiple cognitive processes implicated in the learning and maintenance of aggressive behavior. The challenge is to develop integrated interventions that impact these cognitions simultaneously. Interventions should address attention to cues in order to minimize attention to hostile cues (unless real danger is present) and increase attention to non-hostile cues. They should also address cue interpretation, particularly hostile attributional biases, normative beliefs about aggression, response-outcome expectancies, and generation and practice of non-aggressive responses, including rehearsal of non-aggressive scripts.

However, as we have discussed, cognitions are learned across multiple contexts, primarily through observational learning and reinforcement. If contextual supports for aggression remain unchanged, it will be more difficult to change a person's cognitions. One reason why prevention of serious adolescent gang violence is so difficult is because the reward structure for such activities remains relatively unchanged, and there are often few alternate options for achieving those rewards. An inner city teenage boy who has to choose between taking a small paper bag across the street for \$200 or taking three buses to work at minimum wage needs a compelling reason to take the three buses. It is also difficult to teach children that aggression is not acceptable if they see it in their schools, families, and communities on a daily basis. Hence, an important strategy for preventing aggression is to reduce both its prevalence and rewards in relevant contexts.

Again, in our cognitive-ecological intervention program we compared programs that engaged classrooms, teachers, peers, and families. The only significant effects on prevention of aggression was for the full intervention condition (i.e., directed at all of the above-mentioned contexts). Interestingly, the peer group intervention that brought together aggressive children to reinforce non-aggressive cognitions and practice non-aggressive social skills and behaviors, had a negative affect on children's aggression, particularly for the moderately aggressive group (MACS, 2002). Although we were trying to encourage normative beliefs against aggression and other non-aggressive skills, beliefs, and behaviors, it seems that grouping together aggressive children

provided a context where aggression was regularly supported and reinforced, at least by the aggressive peers.

Promoting Real-World, Non-aggressive Scripts

Perhaps one of the reasons that prevention programs for adolescents and adults are less successful than programs for children is that they fail to address the real contexts in which violence arises, including the contribution of arousal, bystanders, or problems related to long-standing personal or group rivalries. These conditions are exacerbated in dangerous, high violence neighborhoods, where there is little room for reflective decision-making, and problems must be solved on the spot. Many programs do not consider the embeddedness of disputants in peer networks where one's reputation carries enormous weight (Anderson, 1994). Hence, it is important for interventions to be tailored to the dynamics of contexts and the specific situations that provoke aggression.

In addition to incorporating real-world experiences in situations modeled, it is important to recognize that daily social interactions provide relatively few opportunities for the type of reflective decision-making that is encouraged through consideration of hypothetical scenarios. Rather, social interactions are largely automatic, particularly under conditions of threat or danger. This suggests that interventions should emphasize the learning of scripts that promote inhibition of aggression (when provoked) through realistic means that also acknowledge potential benefits and costs of such strategies. When people can match strategies to the demands of the contexts they must navigate and rehearse these strategies, it is more likely they will be encoded in memory and enacted.

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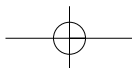
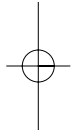
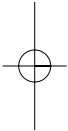


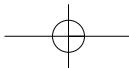
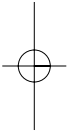
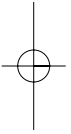
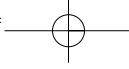
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The aggressive participants who had been given serotonin, however, showed significantly reduced aggression levels during the game. Participants who reported having engaged in a lot of aggressive behaviors (right panel) showed more aggressive responses in a competitive game than did those who reported being less aggressive (left panel). The aggression levels for the more aggressive participants increased over the course of the experiment for those who did not take a dosage of serotonin but aggression did not significantly increase for those who had taken serotonin. Data are from Berman et al. (2009). Children exposed to aggressive models will reproduce aggressive acts that resemble the models. Children exposed to non-aggressive models will reproduce less aggressive acts. Children will imitate the behaviour of a same-sex model more than a model of the opposite sex. Boys will be more predisposed towards imitating aggression than girls. Lack of ecological validity: The experiment was conducted in a laboratory, not a natural environment. This means the situation was not very realistic (one child and one adult, a random room, limited interaction). Snapshot: This study is an example of snapshot results. Transmission of Aggression Through Imitation of Aggressive Models. *Journal of Abnormal and Social Psychology*. 63(3): 575-582. Abstract This paper considers neurocognitive models of aggression and relates them to explanations of the antisocial personality disorders. Two forms of aggression are distinguished: reactive aggression elicited in response to frustration/threat and goal directed, instrumental aggression. It is argued that different forms of neurocognitive model are necessary to explain the emergence of these different forms of aggression. Blair RJR. A cognitive developmental approach to morality: Investigating the psychopath. *Cognition* 1995;57:1-29. In the aggressive model condition, children watched the model perform a number of aggressive acts towards the bobo doll. Aggressive acts included punching, kicking and pommelling the doll on the head with a mallet. On the other hand, children in the nonaggressive model condition watched a model calmly assemble tinker toys, completely ignoring the bobo doll. Putting cognitive neoassociation theory, social learning theory, social role theory and the general aggression model together in a cultural sense, predictions and explanations of cross-cultural aggression can be made. Aggression will be more common in cultures where people who experience an aversive event then experience aggression as a result of their beliefs, values and past experiences. Cognitive ecology is the study of cognitive phenomena within social and natural contexts. It is an integrative perspective drawing from aspects of ecological psychology, cognitive science, evolutionary ecology and anthropology. Notions of domain-specific modules in the brain and the cognitive biases they create are central to understanding the enacted nature of cognition within a cognitive ecological framework. This means that cognitive mechanisms not only shape the characteristics of thought, but