

# An Information Processing Model for the Development of Aggression

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A theory is presented to account for the development of habitual aggressive behavior during early childhood. It is argued that the aggressive child is one who has acquired aggressive scripts to guide behavior early in life. Once established these scripts become resistant to change and may even persist into adulthood. Aggressive scripts are acquired and maintained through both observational and enactive learning processes. These processes interact with each other as actual aggressive behavior engenders conditions under which the observation of aggressive behavior is more likely and creates conditions that provoke rather than inhibit aggression. The cumulative result is a network of cognitive scripts for social behavior emphasizing aggressive responding. A number of intervening variables may play a role in this cycle, and among the more important would seem to be popularity and academic achievement. Once encoded, the scripts for aggressive behavior may be elicited through a general activation of memory or by specific cues to which the person is exposed. Some of the most potent cues should be those present when the script was encoded, though any aggressive cue may trigger the retrieval of an aggressive script. Thus, observed violence not only provides scripts for future behavior but also triggers the recall of existing aggressive scripts. If these scripts are rehearsed, their recall in the future will be more likely. If undampened, this cumulative learning process can build enduring schemas for aggressive behavior that persist into adulthood.

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**Key words:** scripts, cues, observational learning, media violence, rehearsal

## INTRODUCTION

No one factor by itself or single psychological process should be expected to explain aggressive behavior in humans. Like many other pathologies, it is most likely to appear when numerous predisposing and precipitating factors co-occur with environmental conditions conducive to aggressive behavior. Neurological, hormonal, or

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other physiological abnormalities stemming from genetic, perinatal, traumatic, or other causes undoubtedly play a role in many cases. However, the presence of environmental, familial, and cognitive characteristics that promote the learning and emission of aggressive behavior probably account for the greatest portion of the variation in aggression both across individuals and across situations. The conditions most conducive to the learning of aggression seem to be those in which the child has many opportunities to observe aggression, in which the child is reinforced for his or her own aggression, and in which the child is the object of aggression. Nevertheless, in such situations only some children become seriously aggressive. Severe antisocial, aggressive behavior seems to occur most often when there is a convergence of a number of these factors during a child's development, but no single factor by itself seems capable of explaining more than a small portion of the individual variation in aggression. Indeed, it has been rare in studies of aggressive behavior to find any factor (other than previous aggression) that correlates much above .40 with aggression.

### **CHILDHOOD AGGRESSION AND ADULT CRIMINALITY**

Despite the considerable evidence that severe antisocial behavior is multiply determined and is greatly affected by environmental conditions, there is accumulating evidence that each individual develops a characteristic level of aggressiveness in childhood and that this aggressiveness remains relatively stable across time and situations into adulthood [Huesmann et al., 1984]. This does not mean that situational factors are unimportant. Certain circumstances make aggression more likely for anyone, and at different ages different forms of aggression become more likely. The stability is a stability of relative position in the population. The more aggressive child very likely becomes the more aggressive adult. In his review of 16 separate studies with lags ranging from 6 months to 21 years, Olweus (1979) reported disattenuated stability coefficients ranging from .36 for Kagan and Moss's (1962) study of 36 5-year-olds who were followed for 18 years to .95 for his own (1977) study of 85 13-year-olds followed for 1 year. More recently, in a study of 632 children followed from age 8 to age 30 years, Huesmann et al. (1984) estimated the stability of aggression to be about .46 over that period. Furthermore, in that study aggression at age 8 predicted number and seriousness of criminal convictions by age 30.

### **LEARNING TO BEHAVE AGGRESSIVELY**

How does a developing child learn aggressive habits that will persist perhaps throughout his or her entire life? A number of different learning theories have been proposed over the past three decades by Bandura (1973), Berkowitz (1974, 1984), Eron et al. [1971], and others. More recently Dodge [1980] and Huesmann [1982, 1986; Huesmann and Eron, 1984] have introduced learning models based heavily on recent thinking in cognitive psychology. The theories have differed in terms of exactly what is learned—specific behaviors, cue-behavior connections, attitudes, perceptual biases, response biases, scripts, or programs for behavior. In all cases though, learning is hypothesized to occur both as a result of one's own behavior (enactive learning) and as a result of viewing others behave (observational learning). Under certain conditions, for example, a child's exposure to others behaving aggressively will increase the chances that a child will respond to frustration and victimization with aggression. The transformation of the child's initial aggressive behavior into

habitual aggressive behavior, however, may depend as much on the responses of the child's environment to the aggression, the continuance of precipitating factors, and the convergence of other causal factors as on the initial exposure to violence.

It is hypothesized that the developing child's learning processes (both enactive and observational) and the developing child's response generating processes are influenced by the child's cognitive capacities and information processing procedures. Therefore, to understand the development of habitual (learned) aggressive behavior, one needs to examine the operation of the child's information processing system in the presence of the environmental and characteristic factors that promote aggressive behavior.

In the remainder of this article I intend to present the outline of an information processing model to explain the development of habitual aggressive behavior during childhood. In doing this I will draw heavily from both recent thinking in cognitive psychology and the theorizing of other aggression researchers. I do not pretend that this model is supported by data to the exclusion of other models or that this model is complete. I would hope, however, that it would serve as a stimulus for future research and theorizing. Let me begin by outlining the information processing perspective on social behavior that underlies the proposed model.

**THE CONTROL OF SOCIAL BEHAVIOR**

Social behavior is controlled to a great extent by programs for behavior that have been learned during a person's early development. These programs can be described as cognitive scripts that are stored in a person's memory and are used as guides for behavior and social problem solving. A script suggests what events are to happen in the environment, how the person should behave in response to these events, and what the likely outcome of those behaviors would be. The cognitive processes within which scripts are utilized to guide a child's behavior are diagrammed in Figure 1.

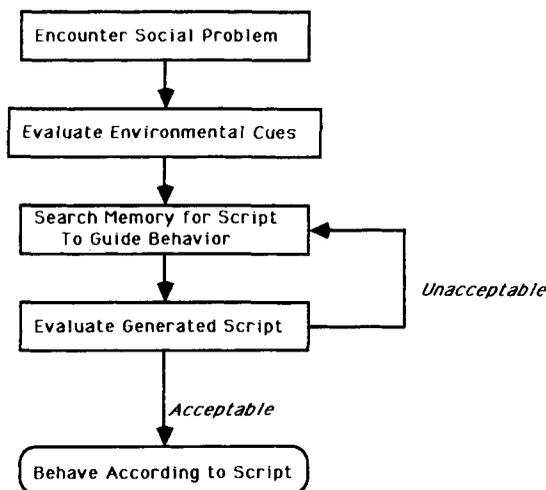


Fig. 1. Decision-making processes at the moment of behavior according to the script model.

One can see within this model that there are three possible loci at which individual differences can influence behavior. The objective situation is defined by the social problem and the environmental cues. However, the interpretation of those cues may vary from child to child and may depend on a child's previous learning history. A child who interprets the environment as more hostile may behave more aggressively, for example. Second, the contents of memory and the characteristics of the process used to search memory for a script may make aggressive behavior more or less likely. Generally, less direct, more subtle approaches to solving social problems may require greater search. Third, the child evaluates each script that is retrieved to determine if the suggested behaviors are socially appropriate and likely to achieve the desired goal. However, different children may evaluate the same script quite differently. Let us now look at this decision process in more detail.

### **HOW SCRIPTS ARE RETRIEVED FROM MEMORY**

In Figure 2 the hypothesized decision process for a child faced with a social problem is diagrammed. To begin with, a child enters any social interaction with a preexisting emotional state. The state consists of both a physiological arousal component and a cognitive component. This emotional state is determined to some extent by physiological predispositions that may be relatively stable, e.g., neuroanatomy, or relatively transient, e.g., dietary factors. The cognitive component of the emotional state will be influenced heavily by the child's past reinforcement history and the attributions the child has made about those reinforcements. For example, a child exposed repeatedly to frustrating situations who attributes the goal blocking to the actions of other individuals may enter a social interaction in an aroused state with hostile feelings toward others. Recent environmental stimuli may also directly trigger conditioned emotional reactions and may cue the retrieval of cognitions that define the current emotional state. For example, to a child the sight of an "enemy" may provoke both instantaneous arousal and the recall of thoughts about the "enemy" that give meaning to the aroused state as anger.

Because emotional states may persist for some time, a child may enter a social interaction in an emotional state that is unrelated to the current situational cues. Nevertheless, that emotional state may influence both which cues the child attends to and how the child evaluates the cues to which he or she does attend. A highly aroused, angry child may focus on just a few highly salient cues and ignore others that convey equally important information about the social situation. Then the angry child's evaluation of these cues may be biased toward perceiving hostility when none is present. In any case, one outcome of the child's evaluation of the current cues would usually be a revised emotional state. This current emotional state coupled with both the objective properties of the current stimulus situation and the evaluative cognitions cued by the stimulus situation determines which scripts for behavior will be retrieved from memory.

Not all scripts that occur to the child, i.e., are retrieved, will be employed, however. Before acting out the script, the child reevaluates the appropriateness of the script in light of existing internalized social norms and examines the likely consequences. There may be great individual differences in the extent of this evaluation. Some children may not have the cognitive capacity to engage in a thorough evaluation. Even among children with similar capacities, differing reinforcement histories and differing perceptions of social norms may lead to quite different evaluations [Hues-

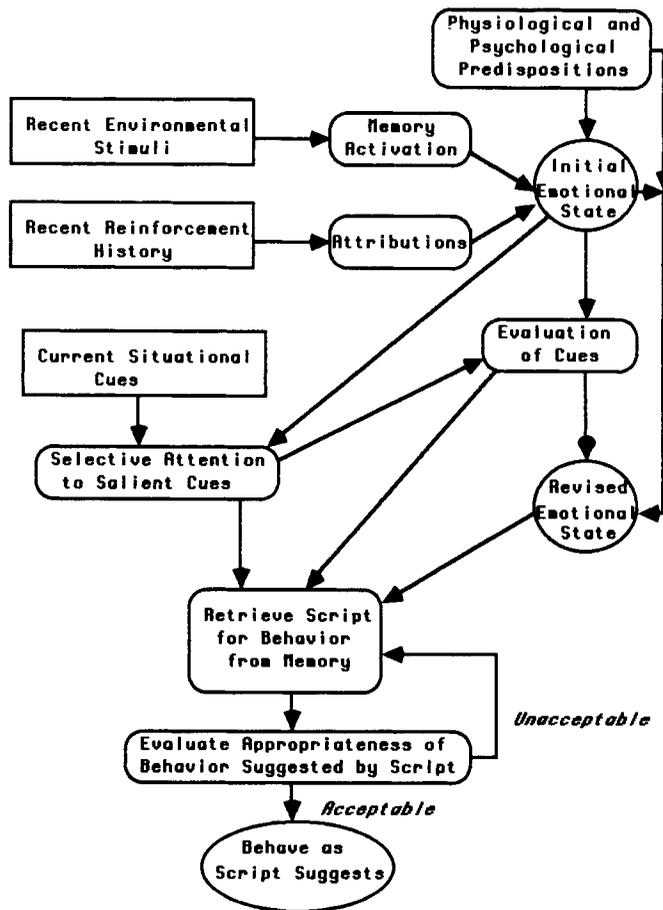


Fig. 2. How scripts are retrieved from memory.

mann and Bachrach, 1985]. The evaluation process will be discussed in more detail below in the section on learning scripts. The role of evaluation at the time of behavior is one of testing scripts and forcing the continued generation of scripts for behavior until an acceptable one is retrieved.

### ENCODING AND REHEARSAL OF SCRIPTS

So far we have examined how existing scripts may be accessed and used to guide behavior, and how certain individual and environmental factors could promote the use of aggressive scripts. Within this framework an habitually aggressive child is one who regularly retrieves and employs scripts for social behavior that emphasize aggressive responding. We have noted a number of factors that might promote the retrieval and utilization of aggressive scripts. It may be, for example, that the cues present in the environment trigger the recall only of aggressive scripts. However, the regular retrieval and use of aggressive scripts would suggest above all that a large number of aggressive scripts has been stored in memory. Thus, we must examine the process through which scripts are learned.

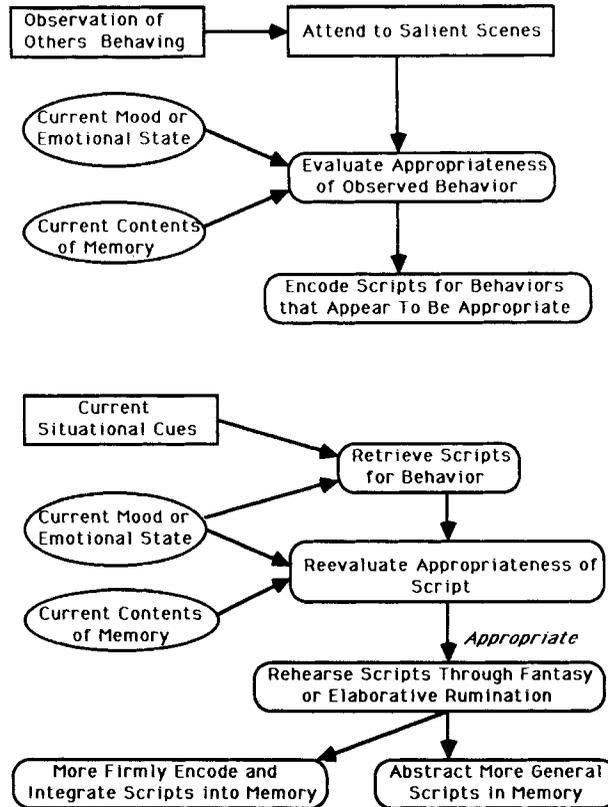


Fig. 3. Encoding and rehearsal of scripts for behavior.

It is hypothesized that scripts are stored in memory in much the same way as are programs and strategies for intellectual behavior—through a two-component process involving an initial encoding of observed behaviors followed by repeated rehearsals. These processes are diagrammed in Figure 3. By encoding I mean the “formation of a representation of an external stimulus in the memory system” [Kintsch, 1977, p. 485]. A script may be closely associated with specific cues in the encoding context or may be an abstraction unconnected to specific cues. To encode an observed sequence of behaviors as a script, a child must first attend to the sequence. Thus, scripts with particularly salient cues for the child are more likely to be encoded. However, many observed sequences might never be encoded because the child perceives them as inappropriate. Here, again, the child’s current emotional state and current memory contents may exert some influence. When highly aroused and angry, for example, children may view a physically active sequence of behaviors as more appropriate than they would otherwise. A young boy who can only recall seeing aggressive behaviors is more likely to accept a newly observed aggressive behavior than is a boy whose mind is filled with memories of prosocial solutions.

To maintain a script in memory, a child would probably need to rehearse it from time to time. The rehearsal may take several different forms from simple recall of the original scene, to fantasizing about it, to play acting. The more elaborative, ruminative type of rehearsal characteristic of children’s fantasizing is likely to generate

greater connectedness for the script, thereby increasing its accessibility in memory. Also, through such elaborative rehearsal the child may abstract higher-order scripts representing more general strategies for behavior than the ones initially stored. Of course, rehearsal also provides another opportunity for reevaluation of any script. It may be that some scripts initially accepted as appropriate (under specific emotional and memory states) may be judged as inappropriate during rehearsal.

In order for a script to influence future behavior, it not only must be encoded and maintained in memory, it must be retrieved and utilized when the child faces a social problem. Thus, for example, a script would be much more likely to be utilized if the same specific cues were present in the environment at retrieval time as were present at encoding time.

### **EVALUATING SCRIPTS FOR SOCIAL BEHAVIOR**

I have argued that a child's evaluation of the "appropriateness" of a script plays an important role in determining which scripts are stored in memory, in determining which scripts are retrieved and utilized, and in determining which scripts continue to be utilized. It is hypothesized that these evaluations of potential scripts for behavior comprise three related components. First, the child needs to be able to predict the consequences of utilizing such a script. Children may differ in their capacities to think about the future and in their concern with the future. Generally, the more a child focuses on immediate consequences and the less the child is concerned with the future, the more palatable an aggressive solution to a social problem may seem. Children may also misperceive the likely consequences of an aggressive act because of a biased reinforcement history or a biased exposure to scenes of others behaving aggressively. A second evaluation component is the extent to which a child judges himself or herself capable of executing the script. A child with a low perceived self-efficacy for prosocial behaviors may turn to aggressive scripts by default. But perhaps the most important component of a script's evaluation is the extent to which it is perceived as congruent with the child's self-regulating internal standards. Scripts that violate the social norms that a child has internalized are unlikely to be encoded. A child with weak or nonexistent internalized prohibitions against aggression or who believes that everyone behaves aggressively is much more likely to encode new aggressive scripts for behavior. The problem is that, as Bandura [1986, p. 21] says, "Forceful actions arising from erroneous beliefs often create social effects that confirm the misbeliefs." The aggressive boy's belief that everyone behaves aggressively is likely to be confirmed by the behavior of those around him, especially as his own aggressive actions incite aggression in others.

### **ENACTIVE LEARNING**

As mentioned above, the transformation of a child's initial aggressive behavior into habitual aggressive behavior may depend as much on the responses of the child's environment to the child's aggression as on other causal factors. One of the puzzling aspects of habitual aggressive behavior is why it persists in the face of so many apparently negative consequences. Within the current information processing model enactive learning is conceptualized as indicated in Figure 4.

From the examination of this diagram one can see that there are four major ways in which aggressive behavior might perpetuate itself even in the face of objectively

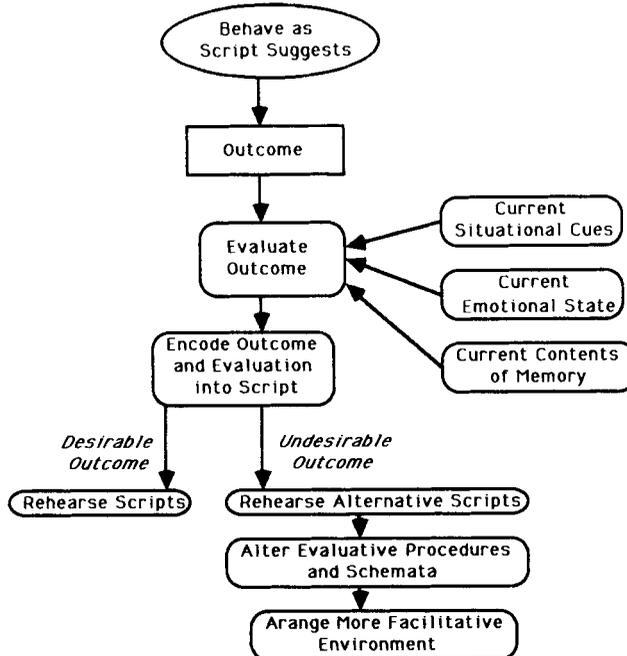


Fig. 4. Enactive learning of scripts for social behavior.

negative consequences: 1) false evaluation of the outcome, 2) inability to generate any alternative scripts, 3) alternation of evaluative schema to make aggression more palatable, and 4) arranging the environment so aggression is more acceptable.

Children might misperceive the consequences of their actions either because they focus on the wrong dimension of feedback or because they do not look far enough ahead. For example, a boy who knocks another child down in order to grab a ball that he wants may focus on the immediate fact that he has obtained the ball and not attend to the longer-term social ostracization that follows his act. By the time such ostracization becomes salient, the precipitating act may be removed so far in time that no connection can be made. However, even the child who perceives the immediate negative consequences of an aggressive act may fail to learn alternative scripts. Generally, prosocial solutions to social problems are less direct and more complex than aggressive solutions. If a child cannot think of any such solutions, as might be the case with a child of low intellectual competence, the child may have no alternative to a direct aggressive solution.

For the more intellectually able boy, another possibility exists, however, in addition to learning a new script. Rather than change his aggressive behaviors, which perhaps provide immediate gratification on some dimensions, the boy alters his internal self-regulatory standards to provide less negative feedback. One way to accomplish such a change is by incorporating some of the readily available aphorisms about aggression into one's regulatory schemata. The boy who is told he is bad because he pushed others out of the way may shrug his shoulders and think, "Nice guys finish last." The boy who shoves a child who bumped into him may think, "An eye for an eye." Internalized norms against aggression may also be reduced when many others are observed behaving aggressively, either in person or in the media.

Finally, a child may mitigate society's negative reinforcements for aggressive behavior by choosing environments in which aggression is more acceptable. Thus, the more aggressive boy may spend more time interacting with other aggressive children who accept his behaviors as a way of life. Not only do such social networks provide a child with an environment in which aggression is not discouraged, such social networks promote the internalization of social norms favoring aggression.

Within this framework, what causes one child to learn more aggressive scripts than another? One possibility is that enactive learning plays the primary role. The aggressive child has tried various social strategies, and only the aggressive ones have resulted in positive reinforcement. These strategies, therefore, have been rehearsed most and are the most readily accessible. Certainly, if a specific aggressive response is reinforced, the script that suggested that response is more likely to be retrieved and to be employed in the future. Furthermore, the effect of the reinforcement may generalize to scripts that are abstractions of the specific script, promoting a generalized disinhibition of aggression. The boy who solves a social problem successfully by hitting will be more likely in the future not just to hit, but to kick, punch, or push. Nevertheless, it is difficult to believe that the complex scripts for social behavior that children rapidly acquire are the result of random emission and selective reinforcement. The laboratory evidence suggests that, on the contrary, scripts for social behavior are often encoded from patterns of behaviors observed in others. Just as a boy may encode a motor program for throwing a football from observing others throw, a boy may encode a script for hitting those who victimize him from observing others hit those who victimize them.

According to this model, children are constantly observing others, encoding what they see that seems salient, and integrating these observations into encoded scripts for behavior. Not every aggressive behavior they observe is encoded or stimulates the encoding of an aggressive script. Not every aggressive script is retained or remains accessible for long. The more salient an observed aggressive scene is to the child initially, and the more the child ruminates upon, fantasizes about, and rehearses the observed scene, the more likely it is that an aggressive script based on that scene is recalled and followed in a social problem-solving situation. The more the aggressive scene is consistent with the scripts for behavior that the child has already acquired, the more easily it is integrated into memory. The more the aggressive scene is perceived as realistic and the more the child can identify with an aggressive actor in the scene, the more salient the scene seems to the child. The child constructs scripts for behavior that have subjective utility as potential strategies for social problem solving. Aggressive acts perceived as unreal and performed by actors with whom the child cannot identify do not fulfil this requirement.

The likelihood that a child will access a script for specific aggressive behaviors is certainly dependent on how many relevant cues are present in the environment at recall time. Theoretically, the most important cues are characteristics of the environment (even seemingly irrelevant ones) that are identical with those present when the script was encoded. However, other cues for general aggressive behavior (e.g., guns) may also trigger the recall of specific scripts for aggressive behavior even if they were not associated with the scene at encoding. Finally, a generalized disinhibition of aggression could occur when a child forms a general aggressive behavior script on the basis of his or her observation of numerous scenes of specific aggressive behaviors. If the aggressive script becomes associated with successful social problem

solving, new aggressive behaviors may emerge that are unrelated to the original observed behaviors.

### **CUMULATIVE AND IMMEDIATE EFFECTS OF OBSERVED VIOLENCE**

It seems clear from numerous laboratory and field studies that there is a positive relation between a child's observation of others behaving aggressively and the child behaving aggressively. The current information processing model explains this relation both as the result of a cumulative learning process and a cueing process at the moment of behavior. Through the cumulative learning process a child's observation of violence eventually leads to the child employing more aggressive scripts for behavior. In accord with such a cumulative model, most longitudinal field data seem to indicate that the relation between earlier violence viewing and later aggression becomes larger as the lag between measurement periods increases [Eron et al., 1972; Huesmann et al., 1984; Milavsky et al., 1982].

Whereas exposure to violence seems to exert a cumulative long-term effect on children by providing examples of aggressive scripts, it also seems to exert short-term effects on adults and children by cueing the retrieval of already-learned aggressive scripts. Though they both increase aggressiveness, the two effects are quite different psychologically. One represents an acquisition process, and the other represents a retrieval process. The same intervening variable might play quite different roles in the two processes. For example, one would expect younger children to be more susceptible to acquiring new aggressive scripts, while older children would have a greater repertoire of aggressive scripts that might be triggered by a nonspecific cue. In fact, the highest correlations between habitual violence viewing and habitual aggression do seem to be obtained for children under 11 years, but immediate aggression in response to media violence has been displayed even by adults [Geen and Thomas, 1986].

### **INTERVENING VARIABLES IN THE LINK BETWEEN AGGRESSION AND THE OBSERVATION OF VIOLENCE**

One might ask whether the process I have described in this paper is initiated by the child's behaving aggressively or by the child's observing others behaving aggressively. The answer may be different for different children. As described above, a violent scene both provides examples of new aggressive scripts to be acquired and cues the use of existing specific or general aggressive scripts. Either way, aggressive behavior is increased. But, of course, the aggressive behavior has consequences. One of the major consequences of a child's behaving aggressively is that the child becomes more likely to see new scenes of violence in his or her environment. Other consequences stem from the response of the child's environment to aggression and from the effects of aggression on a number of intervening variables linked to both observation of violence and aggression. Two such variables seem to play particularly important roles in perpetuating aggressive responding. These are the child's popularity and the child's intellectual achievement.

Intellectual achievement and popularity seem to contribute to a reciprocal process through which aggressive behavior perpetuates itself. In a few situations, aggressive behaviors may be reinforced with desirable outcomes, making their future occurrence

more likely. More often, however, the consequences of aggressive behavior will not be positive. Furthermore, as the aggressive behavior becomes habitual, it quite probably will begin to interfere with the child's social and academic success. The more aggressive child becomes the less popular child and the poorer academic achiever in school. For many children these negative consequences, coupled with appropriate parent and teacher intervention, lead to the inhibition of aggressive responding. Aggressive scripts are replaced by prosocial scripts. For some children, however, the negative consequences may serve to stimulate further aggression. These children's academic and social failures become frustrators, instigating more aggressive responses. In addition, these children, who are less successful in school and less popular, may withdraw from their unpleasant social interactions rather than learn different scripts to make the interactions more pleasant. Some may be able to obtain the satisfactions vicariously that they are denied in their academic and social life by observing others behaving aggressively. Such vicarious rewards in no way reduce aggression; rather, because they reinforce the observation of aggression, these vicarious rewards may in the long run increase aggression.

Empirical data from longitudinal studies [Huesmann and Eron, 1986] demonstrate that more aggressive children are less popular, less intellectually able, watch more media violence, identify more with violent characters, and believe that the violence they observe reflects real life. All these conditions promote the learning of new aggressive scripts and the reinforcement of old ones. Since these children's intellectual capacities are more limited, the easy aggressive solutions they observe may be incorporated more readily than prosocial scripts into their memory. Their own differing standards may isolate them from their peers. The violence they observe may reassure them that their own behavior is appropriate or may teach them new coercive techniques, which they then attempt to use in their interactions with others. The cycle continues with aggression, academic failure, social failure, violence viewing, and fantasizing about aggression mutually facilitating each other.

While the proposed model emphasizes the role of the child's cognitive processes, the role of the parents cannot be ignored. Parents may provide critical input into both the enactive and observational learning processes. Parents can intervene to reinforce differentially their children's aggressive and prosocial responses, to moderate their children's exposure to aggressive scripts, and to convince their children that the violent solutions to social problems that they are observing or utilizing are not realistic. Such interventions would reduce the likelihood that the children would encode the aggressive scripts they see or utilize the aggressive scripts that are encoded. Equally important, parents can intervene to help their children learn prosocial scripts that will compete with aggressive scripts as guides for behavior.

## **SUMMARY**

A theory is presented to account for the development of habitual aggressive behavior during early childhood. It is argued that the aggressive child is one who has acquired aggressive scripts to guide behavior early in life. Once established, these scripts become resistant to change and may even persist into adulthood. Aggressive scripts are acquired and maintained through both observational and enactive learning processes. These processes interact with each other as actual aggressive behavior engenders conditions under which the observation of aggressive behavior is more

likely and creates conditions that provoke rather than inhibit aggression. The cumulative result is a network of cognitive scripts for social behavior emphasizing aggressive responding. A number of intervening variables may play a role in this cycle, and among the more important would seem to be popularity and academic achievement. Once encoded, the scripts for aggressive behavior may be elicited through a general activation of memory or by specific cues to which the person is exposed. Some of the most potent cues should be those present when the script was encoded, though any aggressive cue may trigger the retrieval of an aggressive script. Thus, observed violence not only provides scripts for future behavior but also triggers the recall of existing aggressive scripts. If these scripts are rehearsed, their recall in the future will be more likely. If undampened, this cumulative learning process can build enduring schemas for aggressive behavior that persist into adulthood.

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