VIOLENT OFFENDERS

UNDERSTANDING AND ASSESSMENT

EDITED BY

CHRISTINA A. PIETZ

CURTIS A. MATTSON

OXFORD

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SECTION I

Overview and Correlates of Violence

1

Psychological Perspectives of Violence

MELANIE SCHETTLER HETO ■

Historically, violence has been an area of considerable interest among psychologists of all camps. Likely as a function of the degree of responsibility that has been placed on the profession to explain and eliminate violence, each orientation of psychology has sought to apply its own tenets to an understanding of such conduct. In cases where a theory has fallen short, a new one has attempted to fill the gaps. The field of psychology has posited innumerable theories, models, and perspectives regarding violence, some with significant empirical support. While there may be no unifying paradigm with which to compare or contrast these perspectives from one another, it does become apparent that the same variables are presented time and time again, although with great variance in the emphasis they are given for their role in violence. For this reason it is likely that models presented within the last 20 years appear to be taking on a more integrated approach to conceptualizing and researching violence. The following chapter, without attempt to analyze or evaluate, offers a glimpse of the variety of psychological viewpoints as they relate to violent offending, whether they have been treated as major or minor to the field. This compilation is by no means exhaustive, but it hopefully contributes to continued generation of thought and understanding of violent behavior.

PSYCHOANALYTIC AND PSYCHODYNAMIC THEORIES OF VIOLENCE

Psychoanalytic and psychodynamic theories of violence are based on understanding how one's past impacts present thoughts, behaviors, and feelings, whether consciously or unconsciously. Therefore, violent behavior is believed to be driven by a person's mental representation of himself or herself or others, by entrenched wishes and motivations, by defensive reactions to trauma or loss, by a learned style for relating to others, or by an affective state.

Freud's psychoanalytic theories described aggression primarily as a function of repressed anger and a subsequent cathartic reaction to that anger. Catharsis

is the release or unblocking of negative feelings, which allows for tension reduction. Research has found evidence that anger is at the root of aggressive behavior (Anderson & Bushman, 2002), that the degree of anger is related to the level of aggression, and that an expression of aggression can reduce anger and further aggression (Konečni, 1975). However, nonaggressive acts were also found to decrease anger and subsequent aggression, as well as produce longer term relief (Dollard, Doob, Miller, Mowrer, & Sears, 1939; Konečni, 1975). This remains a commonly held belief in dynamic therapy, and many therapeutic interventions have targeted anger reduction via nonaggressive expression of denied or repressed anger, so as to allow an individual to have diminished need to discharge it.

Freud's later theories emphasized the role of the superego in the inhibition of aggressive impulses. Freud thought that the superego was responsible for the conscience and developed out of the child's vying for his or her parents' affection and ultimately identifying with them both through internalizing parental values and standards (Freud, 1923). Theorists and researchers since then have continued to study such a mechanism's role in the development of morals and values. The father in particular has been held accountable by psychoanalysts for his offspring's potential for violence. Object relations theorists, specifically, believe that without a present attuned parental figure, there can be no internalization of a sophisticated object that provides a model for how to relate to others. As a consequence, violence is relied on as such a method for relating, as it is innate and has not been replaced by higher order defenses in the fatherless child (Bion, 1970; Perelberg, 1999; Winnicott, 1971).

In this way, analytic psychologists also tend to think in terms of the defenses that a person employs to protect himself or herself from ego fracture. The defenses are often qualified in terms of their primitiveness or sophistication. More mature defenses, such as repression, displacement, isolation, intellectualization, or regression, assist an individual in coping with stress without violating the boundaries of reality or social convention. More primitive defenses are necessary when the ego is more fragile. These include projection, splitting, projective identification, denial, and acting out. These defenses are employed to keep emotions altogether warded off from consciousness. As such, they are often acted out, turned into some other feeling, or placed onto someone else. In violent individuals, there is found to be a lack of higher order defenses and an inability to inhibit aggressive urges (Hyatt-Williams, 1998). Similarly, another way for an individual to disown his or her feelings is to identify with the aggressor (A. Freud, 1936/1966). Here, one can escape vulnerability by internalizing the aggression and becoming the source of the menace.

Object relations, more generally, maintained Freud's drive theory and emphasized two primary inborn human drives, libido and aggression, under which all emotions are classified. The experiences that an infant has with primary objects (others) determine how emotions are experienced and developed. Both biological and environmental sources can contribute to the experience of affect, including, for example, cognitive deficits and trauma. According to Kernberg (1992), rage is the primary affect of aggression and is classified with other negative feelings, such as hate, envy, and irritability. In contrast, the libido's primary affect is elation and is categorized with other positive and gratifying feelings. Because an infant is innately driven to seek gratification, such as when feeling close to a loved object, he or she is similarly averse to the pain or frustration caused by separation from that

object. Rage follows pain or frustration, and so the source of that pain or frustration is sought to be removed. Violence can enter here as a way to remove the source of rage. Or, when the source of both gratification and rage are the same, such as in the case of an abusive caregiver, Kernberg suggests the two opposing drives come together. The merging of these opposing drives can lead to the characterological disturbance of sadistic pleasure.

John Bowlby (1965) developed his attachment theory out of his study of object relations. He held that prolonged maternal deprivation during early developmental years "stands foremost among the causes of delinquent character development" (p. 41). He believed the deprivation of sustained early attachment led to an "affectionless character" (p. 57). The circumstances that produce such a character, he deemed, included poor opportunity for close attachment in the first 3 years, separation for a period of several months, or changes from one "mother figure" to another.

Bowlby's work has been the source of much continued investigation and empirical support. His construction of the concept of internal working models (IWMs) as unconscious maps of the self and others, which are created through an infant's early caregiving relationships, has been reinforced by sound biological research (Bowlby, 1973, 1980, 1988; Fonagy, Target, Gergely, Allen, & Bateman, 2003). Throughout life, IWMs help one decipher one's own and others' emotional states, serve as a guide to relationship and social experiences, and aid in the process of self-understanding (Bowlby, 1988).

Fonagy and his colleagues have continued to research attachment theory and the concept of an IWM and biological correlates (Fonagy et al., 2003). According to him and his colleagues, the development of mentalization, the ability to understand one's own and others' mental states, is the process that creates IWMs. Mentalization is taught via the attuned and accurately reflected responses of a caregiver, which allows for an individual to become a secure adult (Fonagy et al., 2003). A nonpathological individual with strong mentalization capabilities can regulate his or her emotions, be empathic, and reflect on others' mental states and respond accordingly. As caregivers' behavioral and affective signals are repeated over time, they become expectations in children's minds (Lyons-Ruth & Jacobvitz, 1999). Children learn to behave in novel situations according to the responses they have received in the past. Secure relationships between infants and parents heighten children's receptiveness to their caregivers' socialization incentives. In turn, secure children grow to expect supportive, satisfying interactions with others. When secure children become adults, they carry out relationships in a manner that fosters an environment in which their partners respond according to their positive expectations. Alternatively, the IWMs of insecurely attached children are characterized by distrust and hostility. These children, and later as adults, predict that others will respond to them with negativity, and so behave in a manner that elicits aggression (Fonagy et al., 2003).

Likewise, de Zulueta's (2001) research on trauma and loss provided a similar model to understand aggression. She explained that angry expressions from a baby are intended to reinstate closeness and communicate a need. Loss, enduring disregard for, or abuse of a child's need for connection can promote pathological aggression. Gilligan (1996) supported the notion that violence emerged out of abuse in the early parental relationships in his study of violent inmates. He proposed that rage developed as a response to the shame and humiliation of

childhood maltreatment, rejection, or neglect. Indeed, disorganized attachment, a particularly strong form of insecure attachment, is correlated with aggressive behavior (Shaw & Vondra, 1995).

Meloy (2006) also understands violence as pathology of attachment. An individual who has developed maladaptive behaviors may become violent in an attempt to approach or distance oneself from another in order to meet his or her attachment needs. Meloy classifies violence based on whether it is intended for self-preservation or for predation. When violence is in response to fear or anger, and is intended to protect oneself from harm, Meloy called it *affective* violence. When it is not in response to a feeling, but is planned, he considers it to be *predatory* violence. Affective violence is characterized by arousal of the autonomic nervous system; is in response to a perceived threat (internal or external); and is unplanned, reactive, and often impulsive. Predatory violence is meditated and without emotion.

SOCIAL THEORIES ON VIOLENCE

Commonly referred to as the Yale group, Dollard et al. (1939) launched the frustration-aggression model by declaring that aggression is invariably a consequence of frustration. Frustration was defined as the state produced by the interference of the attainment of a goal. When frustration does not lead to aggression, it is thought that some obstacle will prevent the outcome of the aggression or that the predicted consequences to the aggression outweigh the benefits. Additionally, interruptions of the aggressive act were believed to further strengthen the aggression. The model explained that the nature and degree of the aggression are correspondent to how directly the target is related to the frustration. In addition, aggressive acts can be modified or displaced if there is a threat of punishment to the aggressor.

Berkowitz (2008) furthered the study of the frustration-aggression hypothesis. His neoassociationist theory places the responsibility for aggression on negative affect, as opposed to just frustration, and on the automaticity of the behavior, which he asserts can override any available cognition. These uncontrolled and largely unconscious processes create links between constructs in a bonding fashion, which can make associations readily available once a construct is activated. In this way, a situation can produce an uncomfortable, and therefore hostile, reaction simply via the association of a given situation to a social setting that is linked to an original negative experience. The hostile reaction that follows is meant to restore balance, control, or security. Anger is elicited, as opposed to sadness, when the situation is perceived as one that can be changed and the distressing feeling ameliorated (Frijda, 1988).

Berkowitz (2008) explains most violent or aggressive social phenomena with this model. For example, hostility toward minorities is explained by the unconscious activation of stereotypes. Hostile associations are primed, often by media violence, leading one to become aggressive in an ambiguous situation if qualities of the immediate situation have been previously associated with an angering event.

Bandura's (1973) social learning theory of aggression states that individuals can learn from observing others' actions and not be reinforced only by external rewards or aspects of the environment but also by internal states, such as pride, satisfaction,

or gratification. Thus, Bandera believed that the principles of conditioning also apply when observing others' learning sequences. In this way, one does not have to persist through a lifetime of trial-and-error learning but can predict consequences and rewards. Observing parents, family members, or television characters; hearing stories or explanations; and gaining information in other ways can produce learning. Social learning was thought by Bandura to be most effective within one's family, subculture, and through television. Findings that children from violent families or communities have higher incidences of violence support the notion of social learning.

Unsurprisingly then, unlike behaviorists, Bandura placed a high value on the cognitive aspects of learning, arguing that learning does not always have to lead to a change in behavior. One has to attend to, retain, be capable of reproducing, and be motivated to attempt a new behavior—as there must be the expectation that it will be reinforced in some way. Social learning theory takes into account one's varied observations, as well as the different ways in which the observation was made, in terms of quantity, rate, or its qualities. The observation then is analyzed based on one's values and the types of incentives or consequences sought (Bandura, 1977).

Bandura and Walters (1959) also explained that while frustration as a result of deprivation of needs "produces an aggression motive," the acts of aggression are modeled and reinforced by the parent. For example, when parents use aggressive punishment, they are modeling the use of aggression for their children. Parents may do this by passively not discouraging such conduct, by behaving aggressively themselves, or by encouraging aggression, for example, by supporting it as self-defense. Likewise, he acknowledged that the lack of modeling an appropriate reaction to frustration, in terms of too little discipline, was equally instrumental in producing frustration and aggressive acts.

Novaco's social behavioral theory explains violent aggression in terms of its functions: *core survival value functions* and *extended social system value functions* (Novaco, 1994). Survival functions include violence for purposes of defense or necessary acquisition of resources. Social system value functions are social-context factors that may influence violence even if they are not directly apparent, such as for social bonding, social ordering and regulation, and expressions of justice, goodness or badness, freedom, or entertainment. Anger, then, is an emotion that can sense threat and mobilize an individual to regulate his or her short- and long-term social needs (Novaco, 1994). Anger is shaped by environment and rooted in one's historical adaptation to environmental demands. Therefore, one may have a higher or lower than normal threshold for the level of threat perceived. The aggressive reaction will be congruent with the degree of threat perceived. Anger regulation is the indicated intervention, so that one can more accurately assess the degree of threat in a given situation and respond with the appropriate level of aggression (Novaco, 1997).

Huesmann (1988) based his script theory or social cognitive information processing model for aggression on the notion that aggressive experiences form patternistic sequences and outcomes in people's minds, to which they return to understand later situations and base their behaviors. Repeated situations and well-rehearsed scripts can produce highly automatized discernments of and reactions to novel situations and people. Scripts are developed via implicit and explicit

social reinforcement and punishment, coupled with childhood social learning and experiences. Multiple offshoots of this model are discussed in a later section on integrated models of aggression.

DEVELOPMENTAL PATHS OF VIOLENCE

Developmental theory of aggression finds that "changes in crime and violence are related to age in an orderly way" (Thornberry, 1997, p. 1). Patterns have emerged in the literature that suggested aggressive behavior may fall into one of several independent trajectories, such as lifelong or adolescence limited (Moffitt, 1993). Life-course antisocial individuals are regarded as having psychopathology, and they engage in antisocial conduct at every stage of life. Adolescents with antisocial behavior make up a much larger percentage of those individuals who display violent conduct during their lives. They are thought to be mimicking the life-course antisocial style and reaping some of the rewards before adult maturity kicks in and eclipses those rewards (Moffitt, 2004). Adolescent-limited aggressors show a brief period in their lives of antisocial conduct and generally do not exhibit any such behaviors during childhood or adulthood. Even during adolescence, these youth are inconsistent in their use of antisocial behaviors across contexts and time periods (Moffitt, 1993).

There are also generally predictable patterns that have emerged within these trajectories. For example, there is a progression from less to more serious types of offenses, and such behaviors often begin with impulsive, but not illegal acts. Delinquent conduct during the teenage years may earn some peer approval in a way that it does not when older (Conger & Simons, 1997). The majority of children and adolescents who display criminal behavior stop doing so by early adulthood (Morizot & Le Blanc, 2007). This change in conduct away from aggressive or criminal behavior is generally explained developmentally with one of two concepts: self-control and social control. The self-control perspective posits that as individuals age, they gain greater self-control and are more inhibited (Gottfredson & Hirschi, 1990). The social control model, on the other hand, emphasizes that increased involvement in conventional social roles decreases the likelihood for criminal involvement (Sampson & Laub, 1993).

Kohlberg's stages of moral development (Kohlberg, 1976) were born out of Piaget's stages of moral judgment (Piaget, 1948). He thought the maturation of morality is on a path of progressive cognitive-developmental stages, beginning from an earlier egocentric focus, then to conventional approval seeking, and lastly to early and later stages of conscience development. He believed delinquents to have arrested prior to the existence of an early conscience. It is the social environment that engages the child at various levels of reasoning about morality, challenging him or her to take on new views as his or her intelligence grows.

Agnew's general strain theory (Agnew & Broidy, 1997) states that negative relationships produce negative affect, such as anger, and that crime can alleviate the tension produced by that anger. Crime becomes a lifestyle for individuals who rely on such methods of tension reduction. Aggressive behavior reinvents the cycle, for their behavior pushes others away, prevents them from learning to problem-solve more appropriately, and immerses them further in socially

aversive environments. Here, the individual re-creates the negative relationships that produced the negative affect from which he or she initially sought relief, perpetuating the aggressive response.

Sampson and Laub (1993) emphasized the "cumulative disadvantages" that are consequences of criminal behavior and which are believed to force an individual to resort back to aggression. Because the typical sources of social control (school, family, and peers) are powerful deterrents to using violence and are likely to ostracize someone who behaves in that way, an aggressive individual will lose important resources and communities. The authors agreed with Patterson's metaphor of a "cascade" effect of antisocial behavior as a progressive set of reactions to stages of behavior problems (Patterson, 1993). Matsueda and Heimer (1997) instead advocate a symbolic interactionist developmental approach, in which the labeling of an individual as aggressive leads to an internalization of that label, and the associated privileges, thereby perpetuating the aggressive conduct.

PERSONALITY PERSPECTIVES: TRAITS OR DISPOSITIONS OF VIOLENT INDIVIDUALS

The Big Five personality traits (extraversion, agreeableness, conscientiousness, neuroticism, openness), developed by McCrae and Costa (1987), have been applied to aggressive individuals. Agreeableness, in particular, has been found to negatively correlate with individuals who have histories of aggression and violence (Gleason, Jensen-Campbell, & Richardson 2004; Heaven, 1996). Conscientiousness is also negatively related to aggression (Sharpe & Desai, 2001). Together, these two factors, which are associated with disinhibition, are considered a core personality trait central to aggressive individuals. Interpersonal aggression, general externalizing behaviors, and destruction have been related to the personality construct of callousness (Krueger et al., 2002). Other researchers have found callous-unemotional traits are related to conduct problems in children. Furthermore, sensation-seeking behavior, low fearfulness, and low behavioral inhibition are also characteristic of aggressive individuals (Frick & Morris, 2004).

BEHAVIORAL UNDERSTANDING OF VIOLENCE

Behavioral psychologists, as in the estimation of B. F. Skinner (1990), find that the emotional or internal factors pertaining to one's conduct are too unpredictable and variable to be studied. Instead, they find it more scientific to study behaviors within the context of measurable environmental influences. These environmental influences determine one's thoughts, feelings, and actions. Where natural selection explains society-wide behaviorism, operant conditioning explains individual behaviors. In this way, the short-term consequences of aggression present rewards for the aggressor. The immediate gratification of defeating one's opponent and earning the associated winnings is more powerful than the consequences, which are rarely presented immediately following the behavior and thus appear indirect rather than directly related. Bullying, for example, allows one to intimidate a victim into complying with demands, resulting in stolen money or property. A child

who throws himself on the ground, kicking and screaming, often gains his parents' attention. The prizes, such as the parents' attention, reinforce the behavior as effective and to be relied upon in the future.

Eysenck and Eysenck (1978) and Eysenck and Gudjonsson (1989) found that individuals who commit criminal and violent behavior are deficient in the emotional reaction (commonly thought of as the conscience), which is learned through classical conditioning. He argues that the construct of the conscience is developed out of learning emotional responses to behaviors. An example, which studies have imitated in a variety of ways, is the scolding that a parent may give a child after an inappropriate action which causes the child to feel uncomfortable. When such an emotional response pattern is poorly conditioned, an individual is more inclined toward antisocial conduct. Specifically, Eysenck (1987) found that antisocial individuals showed low conditioning responses after trials of pairings of conditioned with unconditioned stimuli. Specifically, he found that individuals classified as psychopaths showed poorer conditioning and less anticipatory responding, meaning that they do not show learning reactions or anticipate consequences as others do.

Furthermore, whereas relief from fear and avoidance of punishment are generally reinforcers for individuals to not engage in aggressive or criminal conduct, this is not the case with antisocial individuals. In operant conditioning studies in which individuals are taught a mental puzzle and certain responses were punished or rewarded, Lykken (1957) found that psychopaths learned the pattern as well as others, but they continued to select responses that would knowingly result in punishment (i.e., an electric shock), indicating a decreased sensitivity to punishment. Conversely, there are multiple corresponding findings that antisocial individuals have increased sensitivity to rewards over punishments and are therefore more motivated to seek rewards that are sufficiently arousing to Scerbo et al. (1990). Taken together, such findings indicate that the learning curve for antisocial individuals may be steeper, as they are slower to show conditioning; but when sufficiently rewarded, consistent with their higher arousal level, they attend and learn as well as others (Raine, 1993).

COGNITIVE AND COGNITIVE-BEHAVIORAL MODELS OF VIOLENCE

Cognitive-behavioral theorists agree with pure behaviorists for the most part, but they also find that one's cognitive appraisal of the environment is a key ingredient to the aggressive response. They emphasize that the way in which one reads an environmental trigger plays a significant role in the level of aggression that is expressed (Kassinove & Tafrate, 2006). One's cognitive framework for interpreting triggers is determined by cultural and subcultural experiences as well as previously modeled behaviors. The expression of one's appraisal of the situation, therefore, results in a particular outcome that reinforces the behavior. For example, aggression may be a family's primary method for interacting with one another, leading a child to choose such conduct in a corresponding situation.

The schema model of aggression (Mann & Beech, 2003) explains that developmental experiences lead to an emergence of dysfunctional beliefs, which creates problematic cognitive appraisals of later situations. As in general schema theory,

categorical assumptions lead to distorted reflections of social situations. In sexual offenders, the authors found the persistent use of primary schemas of seeing the self as persistently the victim, feeling generally aggrieved, and endorsing entitled beliefs. In addition, they tended to have particular beliefs about control and maintained a generalized disrespect for certain categories of women. Based on these schemas, social situations have to be distorted to comply with such broad-reaching molds.

Ward (2000) extended the concept of schemas to allow for explanation for how they are developed. He theorized that a series of interactions with the environment contributed to developing, testing, and retesting *implicit theories* about people and the world. He believes that one's implicit theories manifest in particular classifications for different types of violence. In his study of sex offenders, for example, he found that abusers maintained overarching beliefs about children as sexual beings, that some individuals are entitled over others, and that the world is a dangerous place in which individuals are subject to predetermined uncontrollable forces. The offenders in his study also believed that types of harm are qualitatively different, and therefore less harmful, than other types. For example, they may say that not using force means that a sexual offense was less harmful to the victim.

BIOLOGICAL UNDERPINNINGS AND ENVIRONMENTAL CORRELATES IN VIOLENT OFFENDERS

The frontal lobe of the brain is probably the most implicated region of the brain across studies in violent individuals. The frontal lobe is generally understood to play a role in inhibiting and controlling emotions and behavior, decision making, problem solving, and abstract reasoning. Emotional awareness and the regulation of feelings are also found to take place in the frontal lobe, as is the planning of one's behavioral responses to those emotions (Davidson, Putnam, & Larson, 2000). Self-control has been repeatedly found to be situated in the prefrontal cortex (Banfeild, Wyland, Macrea, Munte, & Heatherton, 2004). Furthermore, aggression is often found to be a symptom associated with brain lesions in the medial prefrontal cortex (Grafman et al., 1996). Another difference in brain structure between individuals characterized for their aggression is a decrease in the amount of gray matter in the prefrontal cortex (Raine, Lencz, Bihrle, LaCassse, & Colletti, 2000). Gray matter is generally thought to be responsible for transmitting sensory and motor information.

In a similar study, a positron emission tomography (PET) scan revealed that in a group of individuals charged with murder, compared to a control sample, there was less activity in the prefrontal and parietal (primary sensory and abstraction) areas, more activity in the occipital (primary vision) areas, and no difference in their temporal areas (primarily language, emotion, and memory; Raine, Buchsbaum, & La Casse, 1997). These violent offenders also had imbalances in activity between the right and left sides of the amygdala (emotional center), the hippocampus (memory), and the thalamus (alertness, arousal, consciousness), as compared to the controls (Raine et al., 1997). Lesion studies also find involvement of the amygdala and the prefrontal cortex in violence (Seigal & Mirsky, 1990). One study found that the reward center of the brain was activated during certain retaliatory aggressive acts,

suggesting that some pleasure is drawn from the act (Krämer, Jansma, Tempelmann, & Munte, 2007).

In meta-analyses, Ortiz and Raine (2004) and Lorber (2004) found that low resting heart rate is significantly related to antisocial, criminal, and violent behavior. The strength of the findings led Raine (2002) to name resting heart rate as likely the best biological correlate of antisocial behavior. The interaction of these biological variables with particular environmental variables creates greater effect sizes for the likelihood of aggression. Such psychosocial variables include ineffective parenting (Oxford, Cavell, & Hughes, 2003), low socioeconomic status, poor parental relationships, or having a teen mother (Farrington, 1997).

Based on twin and adoption studies, it is widely supported that there is a genetic influence on aggression, while environmental factors are key to shaping the genetic development of these qualities (Rhee & Waldman, 2002). Environmental factors known to have a strong relation with violence and antisocial conduct include poverty (Leventhal & Brooks-Gunn, 2000); unemployment, divorce, and low income (Beyers, Bates, Pettit, & Dodge, 2003); childhood domestic violence (Fergusson & Horwood, 1998); childhood physical abuse and corporal punishment (Farrington & Hawkins, 1991; Gershoff, 2002); and peer rejection (Dodge & Pettit, 2003).

INTEGRATED THEORIES OF VIOLENCE

Adriane Raine's sociobiological evolutionary model (1993) described criminal and aggressive conduct as psychopathology that, like most other mental disorders, has a prescribed number of classifying characteristics that occur on a continuum. In this way, crime serves both an individual and social purpose and is buttressed by heritable influences and biological bases. Suggesting a genetic and environmental interaction, there is a higher incidence of aggression and crime when these variables are taken together. Raine argues for the additive nature of environmental factors to account for variations in behaviors. He cites twin and adoption studies to make a case for a genetic influence on antisocial behavior as well as neuroscientific similarities in offenders, which include reduced serotonin, an increased behavioral activity system and an underactive behavioral inhibition system, affective instability, frontal lobe abnormalities, and temporal and limbic dysfunction.

In 1994, Goldstein wrote that the focus in understanding aggression should be on interaction of the person with the environment. He emphasized the social/environmental context of aggression, which can be thought of as opportunity. With his theory of "probabilism," he states that the environment alone does not encourage a behavior but that it reciprocally interacts with a person to propose and reinforce a behavior. He stated that all related individuals contribute to aggressive behavior, criminal and victim alike, together setting the stage for such acts to occur (Goldstein, 1994). He finds support in social identity theory, group conflict theory, and information processing theory to explain the social environmental interaction effect for inducing and sustaining violence.

In a social information-processing model of aggression, Dodge (1990) expound on the steps of information processing that one takes to arrive at a decision about the use of aggression. This problem-solving model begins with encoding and interpreting a situation, in which cues taken in are different for every individual and can vary

depending on recent and past experiences, values, and fears. Then, there is a process of searching for response alternatives, making a response decision, and enacting the response. Problems with the process, as in individuals who are persistently aggressive, are thought to lie in these people taking in less information to understand the situation and interpreting cues with a more hostile slant (Dodge, 1980; Dodge & Newman, 1981). In addition, aggressive individuals brainstorm fewer alternatives (Richard & Dodge, 1982) and choose more passive or more aggressive responses than may be effective (Dodge, 1986). Dodge (1990) has also described distinctive styles of aggression, used by individuals for different problem-solving purposes. Proactive aggressors use aggression to meet an instrumental need, while reactive aggressors respond to situations in an angry fashion. Those cues form a mental representation used to interpret the other person's intentions. This process is thought to be generally unconscious and often highly automatized. Furthermore, emotional weight can cause an individual to bypass an aggressive response or environmental stimuli, and the model is additive in that experiences continue to shape one's processing (Dodge, 2011).

Anderson and Bushman (2002) developed a multidimensional model (general aggression model) that attempts to account for how one's experiences, cognition, emotions, and arousal interact with a variety of situational variables to produce aggression. The model builds on the concept of knowledge structures (i.e., schemas or scripts; see Huesmann, 1988), which are encoded with certain affective flavors and used to interpret novel situations. Once highly automatized, reactions to events that may resemble in any way one's knowledge structure may or may not actually be relevant to the situation. The model also takes into account the situational (such as media violence, heat, pain, provocation) and personality-based factors (i.e., narcissism, being of the male sex, hostile beliefs) that come into play to produce aggression to influence a person's interpretation of all of the above.

I^3 theory (Slotter & Finkel, 2011) is another contemporary integrated model of aggression that accounts for multiple elements that contribute to aggression. Their formula explains how the interaction of instigating triggers, impelling forces, and inhibiting forces generates violence. Instigating triggers occur in the first stage and create the environment that primes an individual to act aggressively. Such triggers may be direct provocation, rejection, or an obstacle to a goal. Forces that may impel aggression may be evolutionary or cultural, personal, relational, or situational. The third stage includes inhibitory forces, which are those that deter an individual from choosing to aggress. When impelling forces overpower inhibitory ones, aggression is the result. When inhibitory forces prevail, aggression is avoided.

CONCLUSION

> To know that we know what we know, and to know that we do not know what we do not know, that is true knowledge.
>
> —Nicolaus Copernicus

The literature review herein illustrates that psychology has made significant advances in understanding, researching, and operationalizing violent behavior. Predominant risk and protective factors have largely been established, and models

for the conversion of those factors into violent behaviors have been set forth and investigated. As with most areas of psychological study, it appears that the answer to the question regarding the determinants of violent offending lies not in one variable but in the interaction of many. The advances in psychology's knowledge about the variables involved in violence, then, are compounded by the field's ever-growing capacity for integrating complementary lines of thinking among what may have historically been competing theories. While the field remains limited in forming definitive causes or predictions of violence, its strengths lie in the sheer volume of researchers dedicated to furthering the advances of our psychological ancestors. Nonetheless, we can be certain that what we do not know is still greater than what we know. But through tireless examination, challenge, and re-examination, we can be move toward a greater understanding of the great variable: human behavior.

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2

Antisocial Behavior Among Children in Poverty

Understanding Environmental Effects in Daily Life

MICHAEL A. RUSSELL AND CANDICE L. ODGERS ■

Children who grow up in poverty are more likely to engage in antisocial behavior—such as aggression, rule-breaking behavior, and delinquency—than children who grow up in better-off circumstances (see reviews by Bradley & Corwyn, 2002; Brooks-Gunn & Duncan, 1997; McLoyd, 1998). The strength and consistency of this relationship have led many to question whether poverty *causes* antisocial development in children, or whether the relationship is better explained by preexisting characteristics shared among children and families who live in poverty (e.g., family history of aggression, personality features, or genetic liability; see Jaffee, Strait, & Odgers, 2012 for a discussion). Answering this question is important for a number of reasons. First, childhood poverty has been shown to predict antisocial behavior at multiple points in the life course. Children from low socioeconomic status (SES) backgrounds are more likely to show chronic aggression during the first 4 years of life (Tremblay et al., 2004), are more likely to engage in serious crime and violence during adolescence (Bjerk, 2007; Elliott & Ageton, 1980; Jarjoura, Triplett, & Brinker, 2002), and are more likely to continue their involvement in antisocial behavior as adults (Fergusson & Horwood, 2002; Lahey et al., 2006; Odgers et al., 2008). Second, child and adolescent antisocial behavior is known to predict a broad range of poor adult outcomes, including physical health problems (Odgers et al., 2007), broad spectrum psychiatric disorder (Kim-Cohen et al., 2003), economic/occupational difficulties (Moffitt, Caspi, Harrington, & Milne, 2002; Odgers et al., 2008), and involvement in crime and violence (Farrington, 1989; Moffitt, Caspi, Rutter, & Silva, 2001; Theobald & Farrington, 2012). Third, the societal costs associated with antisocial behavior are staggering, as estimates place the aggregate burden of crime in the United States between $1 and $2 trillion *per year* (Anderson, 1999; Ludwig, 2006, 2010).

Taken together, this evidence makes it clear that childhood poverty is a powerful risk factor for the development of antisocial behavior, an important and pressing societal problem. But how does living in poverty increase children's risk for

developing antisocial behavior? Theory and research suggest that poverty may be bad for children because low-income youth are embedded in home, school, and neighborhood environments where they are chronically exposed to stressful events in daily life. These stressors include harsh parenting, family turmoil, exposure to violence, low-quality living conditions, and family chaos, to name just a few (Evans, 2004). Exposure to chronic stressors in everyday life results in prolonged activation of the stress response systems, which is thought to impair children's development of self-regulation abilities (e.g., attention and impulse control, delay of gratification, and working memory; Blair & Raver, 2012; Evans & Kim, 2013). Additionally, chronic exposure to aggressive, hostile, or coercive "role" models may train children to engage in aggression themselves via social modeling processes (Patterson, 1982; Patterson, Reid, & Dishion, 1992).

As such, the environment of childhood poverty—particularly the quality of children's everyday experiences—may be a principal source of risk for antisocial development. However, it is challenging to examine the causal effects of poverty on children's antisocial development because obtaining accurate "fly-on-the-wall" measurements of everyday events has been difficult with traditional assessment methods. Thus, there is little evidence on which of these events is most prominent in low-income children's daily lives, which types of stressful events have the most deleterious effects "in the moment," and which children may be the most susceptible to the effects of daily stressors. Given the structural barriers to lifting children out of impoverished conditions, it is imperative that researchers begin to identify factors that could protect children from the adverse effects of poverty-related daily stressors. By doing so, these efforts could have a reasonable shot at improving low-income children's life chances. In this chapter, we discuss how mobile technology can be leveraged to help us characterize the environments of children[1] in poverty and to better understand the effects that these environments may have on the development of antisocial behavior. Because mobile technologies (such as smartphones, tablets, and iPads) provide researchers with enhanced capabilities for assessing social and physical environments, mood, self-regulation, and behavior as people live their everyday lives, these tools seem naturally suited to studying how exposure to relatively minor, yet meaningful stressors in everyday life may increase risk for antisocial behavior among children in poverty.

The chapter is organized into the following sections. In the first section, we discuss the concept of "environment" in children's development and follow with a review of evidence for how the environment of childhood poverty may lead to antisocial behavior problems in children. We focus primarily on the social environment, as the majority of environmental conditions associated with both poverty and antisocial behavior are social in nature (e.g., parental conflict, low parental support, deviant peer affiliation, exposure to violence; cf. Dodge, Coie, & Lynam, 2006; Evans, 2004). Next, we discuss how mobile technologies may help researchers meet the challenges of measuring children's everyday environments and understanding the effects of these environments for children's antisocial behavior. Then, given that not all children exposed to negative environments will develop antisocial behavior, we discuss theory and research suggesting that some children may be more sensitive to their environmental surroundings than others, such that they are at greatest risk when environments are bad but at lowest risk

when environments are good (Ellis, Boyce, Belsky, Bakermans-Kranenburg, & van Ijzendoorn, 2011). We conclude with a discussion of future research directions that emerge from our review.

WHAT IS THE ENVIRONMENT OF CHILDHOOD POVERTY?

Imagine a child living in poverty. His home feels crowded; he has little privacy and he feels as though family members are always intruding into his space. His parents are exhausted and short tempered from working long hours, leading to frequent bouts of conflict at home. His school is underfunded and understaffed; his teachers seem constantly stressed and overburdened. He feels pressured to do bad things—like smoking and stealing—by kids at his school. He feels unsafe in his neighborhood, as high levels of crime and disorder characterize the streets surrounding his home. Continuous exposure to these stressful conditions takes its toll over time, as he struggles to keep his focus at school, soothe his seemingly constant anxiety and irritation amid the chaos at home and on the streets, and somehow plan for a future that becomes increasingly uncertain with each passing year.

As this vignette illustrates, the daily lives of children in poverty, are in a word, stressful. Not only do low-income children experience a greater number of major stressful life events (such as parental divorce or residential instability; Attar, Guerra, & Tolan, 1994; Gad & Johnson, 1980; Pryor-Brown, Cowen, Hightower, & Lotyczewski, 1986), but their everyday lives are simply more risky. Their homes, schools, and neighborhoods are more chaotic, unsafe, and conflictual than those of children from middle- to upper-class backgrounds (Evans, 2004). Their daily lives are more likely to be characterized by greater levels of family turmoil, exposure to violence, harsh parenting, low levels of social support, and crowded, chaotic living conditions compared to children who are not poor (Evans, Gonnella, Marcynyszyn, Gentile, & Salpekar, 2005; Grant et al., 2003; Repetti, Taylor, & Seeman, 2002). While an impressive body of research shows that major stressful life events have profound effects on health and antisocial behavior (see, e.g., Attar et al., 1994; Danese et al., 2009; Felitti et al., 1998; Whitfield, Anda, Dube, & Felitti, 2003), evidence from adults suggests that chronic, accumulating exposure to more "mundane" hassles or stressors in everyday life may have effects that are just as strong, if not *stronger* (Almeida, 2005; Kanner, Coyne, Schaefer, & Lazarus, 1981; see review by Odgers & Jaffee, 2013). When combined with evidence that exposure to negative social conditions explains *over 50%* of poverty's effect on child antisocial behavior (Dodge, Pettit, & Bates, 1994), it seems likely that the everyday environment may be a principal source of risk for antisocial behavior in low-income children, as well as an important target for interventions.

HOW CAN WE BETTER CHARACTERIZE AND UNDERSTAND ENVIRONMENTAL EFFECTS?

To obtain a better understanding of how everyday environments affect low-income children's development, it is necessary to start with a clear definition of what is meant by the environment. To this end, it is helpful to consider two complementary

perspectives of what environment is. The first invokes the concept of environment as a *context* that consists of the structural and social characteristics of a person's surroundings. The environment-as-context perspective often serves a descriptive function, enhancing knowledge on environment by characterizing the specific exposures faced by individuals across different types of environmental settings, as well as how these exposures are associated with intellectual, behavioral, and physical outcomes. For example, studies that document the characteristics of low-income households (i.e., number of books on the shelf, cleanliness of the home; Bradley, Corwyn, McAdoo, & Coll, 2001), the specific types of daily stressors experienced by adolescents in poverty (Evans, Vermeylen, Barash, Lefkowitz, & Hutt, 2009) or the levels of aircraft noise in metropolitan neighborhoods (Cohen, Krantz, Evans, Stokols, & Kelly, 1981; Haines, Stansfeld, Head, & Job, 2002) provide a better understanding of environment as context.

The second perspective invokes the concept of the environment as a *causal agent*. The environment-as-agent perspective is rooted in behavioral genetics and developmental psychology, and it focuses on determining the causal (read "nongenetic") effects of both measured and unmeasured environmental factors. Studies in this tradition aim to understand whether environments have any effects when children's genes or genetically influenced characteristics are effectively held constant, through natural experiments, twin or adoption designs, and randomized controlled interventions (Moffitt, 2005; Rutter, 2005). This is important to do because prior to Bell's (1968) seminal argument on how children affect their environments (rather than the reverse), few studies had tested the hypothesis that children's genetically influenced characteristics could in truth be the causal agents behind what appeared to be environmental effects. This was followed by convincing arguments, buttressed by behavioral genetic research, that the effect of parental rearing environments was essentially null; children's genetically influenced characteristics were believed to elicit or otherwise account for much of the observed parental rearing effects (Harris, 1995; Scarr, 1992). More recent evidence has shown that parental environments do have potentially causal effects on children's development after all (e.g., Caspi et al., 2004; Jaffee, Caspi, Moffitt, & Taylor, 2004), but the lesson learned here is that in order to determine with any confidence that an effect is environmentally driven, one must first address—and at least partially rule out—preexisting characteristics of children and families that may serve as the primary source of the association between an environmental risk factor and children's behavior (Moffitt, 2005; Rutter, 2005; Rutter, Pickles, Murray, & Eaves, 2001).

DOES POVERTY HAVE AN ENVIRONMENTAL EFFECT ON CHILDREN'S ANTISOCIAL BEHAVIOR?

Jaffee, Strait, and Odgers (2012) reviewed evidence from experimental and quasi-experimental studies that could facilitate causal inferences—including natural experiments, randomized controlled intervention trials, and twin/adoption studies—and found evidence that poverty has effects on children's antisocial behavior that are above and beyond genetic liability or other preexisting child and family characteristics. One of the studies they reviewed was a natural experiment that occurred during an ongoing longitudinal study of the development of psychiatric

illness in children (Costello, Compton, Keeler, & Angold, 2003). Four years after the start of the study, a casino opened on a Native American reservation and provided all families in the study with a recurring income supplement that increased in value each year. For some of these families (14%), the income supplements moved them out of poverty, whereas 53% of families remained in poverty despite the supplements and 32% were never poor. Children in families who moved out of poverty showed significant decreases in antisocial behavior during the 4 years following the casino opening. The reduction was so pronounced that, after 4 years of income supplements, children whose families moved out of poverty had levels of antisocial behavior resembling those of the youth who were never poor. Conversely, American Indian children whose families remained poor despite the income supplements did not decrease their antisocial behavior. Because income supplements were delivered to an entire community of Native American families, this study provides a strong natural control for any preexisting characteristics of children and families that may confound the relationship between family income and children's antisocial behavior. As such, this study provides strong evidence that poverty plays a potentially causal role in the development of children's antisocial behavior.

Other studies reviewed by Jaffee and colleagues (2012) relied on quasi-experimental methods to identify whether poverty has environmental effects on children's antisocial behavior. For example, Strohschein (2005), in a study that compared children to themselves across time, showed that children engaged in more antisocial behavior when family income decreased and less antisocial behavior when family income increased. Because this study compares each child's antisocial behavior to that of himself or herself at different points in time, it provides evidence that the effect of poverty on antisocial behavior cannot be explained by factors that remain unchanged, such as sex, ethnicity, and genetic makeup (Allison, 2005). In another quasi-experimental study of over 2,000 twin pairs (50% of twin pairs were monozygotic), Caspi, Taylor, Moffitt, and Plomin (2000) showed that children in socioeconomically deprived neighborhoods had greater emotional and behavioral problems than children living in relatively advantaged neighborhoods, and that neighborhood deprivation had effects on children that were above and beyond the effects of genetic liability—thus evincing an environmentally mediated effect.

HOW POVERTY AFFECTS CHILDREN: THE ROLE OF EVERYDAY EXPERIENCE

Taken together, the aforementioned studies provide evidence that the effect of poverty on children's antisocial behavior is partly explained by environmental factors. These studies have answered the question of *whether* the environment of poverty affects children's antisocial behavior—the next step, therefore, is to determine *how*. In many of the explanations for how poverty affects children's antisocial behavior, the everyday environment takes center stage. In their *risky families model*, Repetti et al. (2002) suggest that everyday family interactions characterized as cold, unsupportive, and neglectful represent an important pathway through which poverty can affect child and adolescent well-being. Similarly, Hertzman and Boyce (2010, p. 331) argue that it is the "mundane, rather than [the] exceptional, exposures" that often have the largest effects by altering children's developmental pathways and leaving

lasting imprints on adult outcomes. Predictions such as these have been borne out in studies of adults, which have shown that everyday stressors or "hassles" have stronger effects on physical and mental health than major stressful life events (Almeida, 2005; DeLongis, Coyne, Dakof, Folkman, & Lazarus, 1982). Through their frequent, pervasive, and chronic nature, the effects of daily environmental conditions accumulate with continued exposure, sometimes leading to profound and long-lasting effects on well-being.

A striking example comes from the work of Hart and Risley (1995), who conducted monthly observational visits with 42 families, starting when children were 7–9 months old and ending at 3 years of age. In observed interactions with their parents, children from professional families (high SES) heard an average of 2,153 words an hour, whereas children from working-class families heard 1,251 and children from welfare families heard 616. This difference in language exposure was not inconsequential. By approximately age 3, children from professional families had a vocabulary of around 1,100 words, whereas children from welfare families had less than half; that is, a vocabulary of around 500 words. From their data, Hart and Risley estimated that each year, children in professional families hear 11 million words, whereas children in welfare families hear 3 million. One can clearly see that as the years go by, the gap in language exposure between high- and low-SES children will increase exponentially. Extrapolating to age 4, Hart and Risley estimated that children from welfare families will have heard *32 million* fewer words than children from professional families, which they dubbed *the 30 million word gap* (see Hart & Risley, 2003, p. 8). This ever-increasing gap in language exposure may be expected to produce an ever-increasing gap in cumulative vocabulary and, with it, a substantial decrease in life chances for low-SES children.

The work of Hart and Risley (1995) provides a compelling example of how children's everyday conditions can produce meaningful differences in their developmental outcomes. The accumulating nature of everyday environmental exposures (exposure to language in the Hart and Risley study) may be expected to create ever-widening gaps in academic, behavioral, and physical outcomes for children across socioeconomic strata. In the same way that differential exposure to language led to ever-increasing vocabulary differences among children, it is likely that differential exposure to *stressful events* may produce ever-widening differences in antisocial behavior between low- and high-SES children and thus suggest one reason why antisocial behavior problems are so much more common in low-income youth. The multiple stressors indigenous to poverty, and the reactions these stressors evoke, are central to numerous models describing how poverty affects children's development (McLoyd, 2011). Two prominent examples include family stress (Conger et al., 1992; Elder, 1974) and cumulative stress models (Evans, Kim, Ting, Tesher, & Shannis, 2007), both of which emphasize the damaging effects of repeated stressor exposure and the frequent psychological and physiological reactivity that results. We describe the relevance of these perspectives for low-income children's antisocial behavioral development next.

The Family Stress Model

The family stress model suggests that economic hardship increases children's risk for emotional and behavioral problems by increasing tension, conflict, and hostility in

the daily interactions of parents and children. Stress associated with life in poverty compromises parents' ability to respond supportively to their children and often results in more harsh and punitive parenting and family conflict (Bradley et al., 2001; McLoyd, 2011). High levels of family conflict, tension, and hostility increase children's risk for antisocial behavior because the home effectively becomes a training ground in which aggressive, angry, and hostile behavior is modeled, learned, reinforced, and further elaborated (Patterson, 1982; Patterson et al., 1992). The family stress model was originally informed by the classic work of Elder and colleagues (Elder, 1974; Elder, van Nguyen, & Caspi, 1985) following children of the Great Depression. Elder and his colleagues showed that economic hardship had negative effects on parents (primarily fathers), making them more rejecting, indifferent, and less supportive, which in turn had downstream negative effects on children's socioemotional development. Studies since have shown that negative parenting mediates the relationship between economic hardship and children's externalizing or antisocial behavior (Conger, Ge, Elder, Lorenz, & Simons, 1994; Grant et al., 2003).

The Cumulative Stress Model

The cumulative stress model suggests that frequent stressor exposure and prolonged stress reactivity play a key role in the development of socioemotional and behavioral difficulties among children in poverty. This view has been most strongly associated with the work of Gary Evans, who emphasizes the role of poverty-related stress in fostering difficulties in children's self-regulation and in promoting *allostatic load* (Evans & English, 2002; Evans et al., 2007), a physiological marker of wear and tear on bodily systems stemming from frequent activation of the stress response (McEwen, 1998; McEwen & Lasley, 2002). In a study of 8- to 10-year olds, Evans and English (2002) showed that low-income children experience a multitude of environmental stressors, including physical stressors such as higher levels of crowding, noise, and poorer housing quality, as well as psychosocial stressors, including greater levels of family turmoil, family separation, and exposure to violence. For each of the stressors in this study, a child was classified as *exposed* if his or her score was greater than one standard deviation above the sample mean (with the exception of violence, for which any exposure was considered stressful). Not only was exposure to each of these stressors more common in the lives of low- versus middle-income children, but low-income children were also more likely to be exposed to multiple stressors in their lifetime. In fact, 54% of low-income children in the study were exposed to three or more of these stressors in their lifetimes, whereas this was true for only 14% of middle-income children. Multiple-stressor exposure predicted poor psychological outcomes such as impaired self-regulation and poor mental health (including higher conduct problems), as well as poor physiological outcomes such as higher resting blood pressure and higher overnight urinary stress hormone levels (cortisol and epinephrine). Moreover, multiple stressor exposure was shown to mediate the relationship between poverty and children's psychological and physiological outcomes, supporting the idea that exposure to multiple, accumulating stressors may be an important pathway through which poverty increases children's risk for poor psychological outcomes such as antisocial behavior.

NEXT STEPS: CAN MOBILE TECHNOLOGIES HELP IDENTIFY ENVIRONMENTAL EFFECTS ON ANTISOCIAL BEHAVIOR?

Based on this evidence, it seems clear that highly stressful everyday environments play an important role in the development of antisocial behavior for low-income children. A promising strategy for improving the lives of low-income children may be to gain a better understanding of how stressful everyday environments affect low-income children's day-to-day adjustment and risk for antisocial behavior. In doing so, researchers could identify specific environmental factors likely to play a causal role in promoting low-income children's antisocial behavior and thereby inform prevention and intervention efforts aimed at reducing their effects.

However, obtaining accurate and comprehensive measures of children's everyday environments remains a persistent methodological challenge. Although observational studies (e.g., Hart & Risley, 1995; Patterson, 1982; Patterson et al., 1992) provide enormous depth of observation and objectivity in measurement, they cannot well capture the *range* of exposures that a child has in a given day because observers cannot follow the child everywhere he or she goes. Moreover, observational methods by their nature are restricted to measuring observables (i.e., emotional expression, instances of behavior) and may not be well suited toward measuring internal states such as affect and self-regulation, both of which (a) constitute important dimensions of how one reacts to experience and (b) may serve as momentary markers for emotional and behavioral problems or disorders (Larson, Richards, Raffaelli, Ham, & Jewell, 1990; Silk, Steinberg, & Morris, 2003; Whalen, Jamner, Henker, & Delfino, 2001).

Diary methods, also known as experience sampling methodologies (ESMs; Csikszentmihalyi, Larson, & Prescott, 1977) or ecological momentary assessment (EMA; Shiffman, Stone, & Hufford, 2008) strategies, may help researchers better meet the challenge of measuring everyday environments and their effects. Diary methods are assessment strategies that use pagers, handheld computers (Palm pilots), cellular phones, tablets such as the iPad, or paper-and-pencil entries to obtain repeated self-reports on individuals' contexts, social interactions, affect, motivations, self-regulation, and behavior at the tempo of daily life (Bolger, Davis, & Rafaeli, 2003). Because they allow near real-time measurement in people's natural environments, diary measures provide high levels of ecological validity and permit comprehensive reports of context, experience, and well-being. Moreover, diary methods have been effectively used across a wide range of age groups, demonstrating feasibility among children as young as 8 years (Whalen et al., 2009) to adults of oldest old age (Keller-Cohen, Fiori, Toler, & Bybee, 2006). As such, they may be fruitfully applied to measuring relationships between everyday environment and antisocial behavior among low-income children.

Of course, diary methods are not without their limitations. First, these methods often rely solely on self-reports of both exposure and outcome, which may create shared method variance and artificially inflate associations between study variables. Second, the low frequency of severely aggressive or antisocial behaviors may make it difficult to observe environmental effects in daily life. However, researchers may limit assessments to conceptually related but less severe antisocial behaviors, such as bullying, lying, stealing, or vandalism, which are more likely to occur with

sufficient frequency at the daily level. Third, because the intensive assessment procedures may become burdensome for children and adolescents, researchers may benefit from designing incentive strategies to keep youth engaged and responsive to diary assessments, especially if the assessments are particularly frequent or the duration of diary data collection is long (see Conner Christensen, Barrett, Bliss-Moreau, Lebo, & Kaschub, 2003 for an excellent review of these and other practical considerations inherent in diary research).

Despite these limitations, however, we believe that diary methods have unique features to contribute to the study of environmental effects on low-income children's antisocial behavior and, as discussed later in this chapter, we believe these methods may be especially promising when combined with the enhanced technological features of mobile phones and other newly emerging technologies. Next, we discuss three potential contributions that diary methods may make in this area. First, by assessing experiences close to when they occur, diary methods allow researchers to better measure the *environment as experienced*, rather than the environment *as remembered*. Second, diary methods allow researchers to appreciate that every child is different. Through repeated measurement of experiences *within* a person, diary methods allow us to appreciate (and measure) the specific constellation of experiences, emotions, behaviors, as well as the unique interrelations between these constructs, *for each child*. Third, the intensive within-person measurement of diary measures allows examinations of within-person processes that may help identify environmental effects. We discuss each of these features in more detail next.

Feature 1: Diary Methods Can Measure the Environment As Experienced, Rather Than As Remembered

The first feature offered by diary methods is the ability to measure the environment *as it is experienced*, because reports of environmental exposures can be obtained within minutes to hours of when the child experiences them. This type of assessment differs from the more typical mode of measurement, which focuses on the *environment as remembered*. Here participants are asked to recall "how much," "how often," or "whether" specific things have happened over a longer time frame, often over the past 6–12 months. The environment-as-remembered measurement strategy is less than ideal if the goal is to accurately measure the routine environmental conditions of a person's daily life. This is because routine experiences are not as easily recalled over long time spans as are unusual events, leaving retrospective reports of daily events more susceptible to heuristic biases that may reduce reporting accuracy (Bradburn, Rips, & Shevell, 1987; Shiffman et al., 2008). This evidence suggests that as time passes, individuals may be increasingly likely to misremember or even forget routine stressful occurrences, leaving researchers with an incomplete understanding of how frequent and impairing these routine stressors can be. Other factors such as the participant's mood at the time of assessment can also affect the accuracy of recall (Shiffman et al., 2008). Diary methods may help researchers to minimize (but not eliminate) retrospective recall biases by shortening the window of recall to minutes or hours, a strategy that has been empirically shown to produce more accurate self-reports (see, e.g., Shiffman, 2009).

One example among low-income children is provided by Evans et al. (2009). Evans and his colleagues used experience sampling methodology (ESM) to obtain hourly reports of daily hassles—minor stressors in everyday life—among both low- and middle-income rural adolescents. The hourly assessment strategy stands in marked contrast to prior research on children's self-reported stressful events, which has typically relied on recall periods ranging from a month to a year (see, e.g., Attar et al., 1994; Compas, Davis, Forsythe, & Wagner, 1987; Kanner, Feldman, Weinberger, & Ford, 1987; Shahar, Henrich, Reiner, & Little, 2003), and because of this, it was able to provide an unprecedented look at the frequency, domain, and content of the daily events that characterize the everyday lives of low- versus middle-income adolescents. For example, Evans and colleagues corroborated prior research findings (e.g., Attar et al., 1994; Gad & Johnson, 1980; Pryor-Brown et al., 1986) by showing that low-income adolescents experienced a greater number of stressful events compared to middle-income adolescents. However, Evans and colleagues provided a more nuanced picture by showing that the source of this difference was primarily in the family context, as negative social interactions (e.g., nagging and activity prohibition from parents), chaotic living conditions, and lack of privacy at home were especially salient stressors for adolescents living in poverty, whereas low- and middle-income adolescents experienced a similar number of stressors in both school and peer domains. In short, the hourly assessment strategy used in this study was able to provide a richer picture of adolescents' daily contexts than had been achieved before, and it allowed for a better understanding of both the similarities and the differences in the daily experiences of low- versus middle-income youths.

In addition to momentary self-reports, the experienced environment can also be measured more objectively through the recording (photo, video, and voice) and global positioning system (GPS) capabilities of the latest generation of mobile devices (i.e., smartphones and tablets). Using these objective features allows researchers to get closer to measuring the *exposome*: the full catalog of an individual's environmental exposures (Borrell, 2011). For example, voice and photo capture on mobile phones is being used to more objectively obtain dietary information from individuals in their everyday lives (see the Food Intake Visual and voice Recognizer or FIVR; Weiss, Stumbo, & Divakaran, 2010). Similarly, mobile phones' photo and video capture capabilities could be used to document the daily contexts and activities of children living in poverty. For example, as part of their daily assessments, youth could be asked to take pictures of "where they are right now" in addition to providing self-reported information about what they are doing. These images could be directly uploaded to the researchers' data files, circumventing privacy and confidentiality concerns. These photos could be coded on dimensions such as disorder (e.g., messiness of the home, quality of housing, vandalism present) and dangerousness (e.g., observer impressions of safety in the home, school, or neighborhood; see Odgers, Caspi, Bates, Sampson, & Moffitt, 2012 for an example of such coding using images from Google Street View). Combined with daily self-reports, these in-the-field photos of contexts could help researchers obtain a richer picture of the types of contexts that children in poverty actually experience in their daily lives.

Similarly, GPS now comes standard on the majority of mobile technologies, and it can provide researchers with another means of acquiring objective measures of children's experienced environments. Using GPS, researchers can get a glimpse

of the locations in which children spend their time, as well as the distances they travel in a given day around central locations (such as homes or schools). Wiehe and colleagues (2008) provided evidence that GPS-enabled mobile phones can accurately measure the travel patterns of adolescents in daily life, while at the same time allowing researchers to collect self-reports of adolescents' daily activities. Combined with objective information about the neighborhoods children frequent, researchers could derive a measure of each child's exposure to disordered or dangerous contexts over the course of a day.

Feature 2: Diary Methods Allow Us to Relax the Assumption That Everyone Is the Same

Diary methods allow us to avoid what Conner, Barrett, Tugade, and Tennen (2007) have called the *nomothetic fallacy*: "assuming what is true for the 'average' person is also true for each and every person" (p. 81). The term *nomothetic* was first used by the philosopher Wilhelm Windelband (1894/1998), who broadly dichotomized academic disciplines into (a) those that sought to identify general laws and principles (e.g., natural sciences such as biology) and (b) those that focused on understanding the peculiarities and idiosyncrasies of specific individuals, events, or time periods (e.g., humanities such as history). The former he called *nomothetic*; the latter, *idiographic*. In his book *Personality: A Psychological Interpretation*, Gordon Allport (1937) introduced Windelband's dichotomy to psychologists. Allport suggested that with its nearly exclusive focus on discovering general laws that could apply to everyone, psychology was too entrenched in nomothetic inquiry and should make a greater effort to integrate idiographic inquiry (i.e., case studies or biographies of individual people) into its methodological armamentarium. His argument was that by relying primarily on nomothetic methods to obtain general laws about people, what psychologists were getting in their results described a "hypothetical average" person that in one sense represented everyone and yet in another sense represented no one.

Allport's urging for idiographic inquiry is highly relevant to research on how poverty-related stress influences children's development, because the majority of research in this area has been nomothetic in nature. Nomothetic designs are essentially between-subjects designs, seeking to uncover natural laws about how, for example, poverty-related stress increases risk for antisocial behavior among *all* low-income children. These studies sample large numbers of people, assess them on static measures, and calculate correlations. Thus, nomothetic designs can tell us that among a large sample of children living in poverty, those with higher-than-average daily stressor exposure also typically have higher-than-average levels of antisocial behavior. These designs *cannot* tell us, however, that stress and antisocial behavior are related *within* a person over time. That is, a finding that children with higher-than-average stressor exposure tend to have higher-than-average antisocial behavior (a *between-person effect*) is not the same as a finding that children are more likely to engage in antisocial behavior compared to themselves on high- versus low-stress days (a *within-person effect*; see Bolger & Laurenceau, 2013; Curran & Bauer, 2011; Nesselroade & Ram, 2004 for further discussion of between- versus within-person variability and effects).

In fact, for most psychological processes, between- and within-person effects are likely to be independent, a fact that can be supported on both conceptual and empirical grounds (Bolger & Laurenceau, 2013; Hoffman & Stawski, 2009; Molenaar, 2004; Nezlek, 2001). At a conceptual level, between- and within-person effects are separate entities that most likely result from separate causal processes (Molenaar, 2004; Molenaar & Campbell, 2009). Take aggression as an example. Aggression can vary both between people (in terms of how aggressive each person is on average) and within a person over time (in terms of how much each person's aggression varies day by day). The causal processes explaining between-child differences in children's average levels of aggression are not likely to be the same as those explaining within-child differences in aggression from one day to the next. Why is this so? For one thing, stable factors that differ only between people, such as sex, ethnicity, family history, and genetic makeup, cannot logically explain why a single child was more aggressive on Monday than he was on Tuesday (a within-person effect; see Allison, 2005; Bolger & Laurenceau, 2013). For another, it is seems highly unlikely that a single negative event (such as an argument with a friend) could explain why a child shows a higher mean level of aggression than his peers, whereas this single negative event could easily explain why a single child was more aggressive on one day versus another. At an empirical level, the size, direction, and significance of between- versus within-person effects routinely differ and may even suggest opposite conclusions (see Bolger & Laurenceau, 2013; Nezlek, 2001).

The conceptual and empirical independence of between- and within-person effects makes it clear that we need designs capable of capturing both. Through intensive measurement of children in their natural environments, diary methods represent a "modern idiographic approach" (Conner, Tennen, Fleeson, & Barrett, 2009, p. 292), allowing researchers to better understand both the constellation of environmental exposures as well as the specific environment–behavior relationships that together determine where and with whom each individual child is most like likely to display antisocial or aggressive behavior. These methods are not strictly idiographic, however; aggregating these person-specific results to the group level allows researchers to draw valid group-level inferences that are directly informed by in-depth person-level information (see Nesselroade & Molenaar, 1999, for an example). As such, diary methods allow researchers to answer Allport's call to idiographic arms while still allowing researchers to draw nomothetic inferences. Next, we discuss how diary methods may be applied to study both environments and environmental effects on low-income children's antisocial behavior, in a way that is sensitive to the idiosyncracies of each individual child.

The Structure of Exposure

Although children in poverty, on average, are more likely to experience stressors of all types compared to children not in poverty, each child in poverty is likely to experience his or her own unique constellation of stressors in daily life. For example, some children in low-income circumstances may face stressors that predominantly relate to chaos in their home environments. Others may face stressors relating primarily to neighborhood safety, family conflict, or school bullying. Still others will confront an array of stressors that elude researchers' a priori attempts to neatly categorize them. Combining the intensive time-series measurement of diary studies with empirically driven statistical clustering techniques (i.e., factor

and latent class analysis) offers new ways forward for measuring the specific constellation of stressor experiences that characterize each child's daily life.

Cross-sectional research by Seidman et al. (1999) provides an empirical foundation for identifying the constellation of stress exposures unique to each child. Using survey responses, Seidman and colleagues (1999) applied empirical clustering techniques (k-means and hierarchical clustering methods, see Hartigan, 1975; Rapkin & Luke, 1993) to identify different constellations of family and peer social interactions among adolescents in poverty. In both family and peer domains, they identified six clusters of social experience in family and peer groups. Example clusters from the family domain included *dysfunctional* (high hassles, low support, low involvement), *hassling* (high hassles, near average support and involvement), and *enmeshing* (high hassles, low support, high involvement); examples from the peer domain included *rejecting* (high hassles, low acceptance, low involvement and support), *entangling* (high hassles, high involvement and support), and *antisocial-engaging* (high antisocial peer values, high involvement and support). Importantly, membership in these clusters was associated with antisocial behavior in adolescents. In the family domain, adolescents in either the dysfunctional, hassling, or enmeshing clusters showed the highest levels of antisocial behavior. In the peer domain, adolescents in the antisocial-engaging cluster showed the most antisocial behavior.

The clusters identified by Seidman and colleagues (1999) are a grouping of youths who share similar experiences on average. They are not, however, a clustering of *experiences* within each youth. The difference is subtle but important. Empirical clustering of at the *group level* provides the profile, constellation, or factor structure of experiences that best explains the regularities of experiential reports for a group of individuals. It does *not* provide the specific constellation of experiences unique to each *person*. Instead, it takes what may be called a top-down approach, assuming that the group-level solution explains the regularities of experience for each group member. In contrast, by collecting repeated measurements of experience from each person, researchers can employ a *bottom-up* approach, obtaining a profile of experiences unique to each child in the study and then generalizing to the group level by identifying individuals who share similar profiles of experiences. Mapping the regularities of experience for each child in poverty would lead researchers to identify natural clusters of children who can be empirically shown (rather than assumed) to have the same constellation of experiences, and it would lead to stronger group-level inferences regarding the specific constellation of experiences that an actual child in poverty might encounter (see Molenaar & Campbell, 2009; Nesselroade & Molenaar, 1999; Nesselroade & Ram, 2004 for discussion).

The usefulness of the person-based approach has been clearly shown in the emotion literature. For example, in a 90-day diary study, Barrett (1998) obtained university students' reports on their positive and negative emotions three times a day (morning, afternoon, and evening). She then factor analyzed each person's multiple emotion reports separately (a method known as P-technique factor analysis; see Cattell, Cattell, & Rhymer, 1947) and found that some individuals tended to report "clustered" emotional experiences. In other words, when these individuals reported happiness, they were also more likely to report other positive emotions such as joy and cheerfulness *at the same time* (the same was true for negative emotions). Others, however, showed greater differentiation in their real-time emotional

reports, such that reports of happiness were less likely to be temporally coupled with other positive emotions (same for negatives as well). These results differ from those obtained using more traditional factor analytic approaches (R-technique; see Cattell, 1952), which would provide information regarding whether a person who reports more happiness on average also reports more joy on average—not whether people experience these emotions at the same time. From this more person-centered approach, Barrett (1998) concluded that a single theory of emotion is unlikely to apply to everyone, as people differed substantially in the complexity of their moment-to-moment (rather than average) emotional experiences. Another study (Carstensen, Pasupathi, Mayr, & Nesselroade, 2000) showed that some adults had a greater tendency to report positive and negative emotions simultaneously in their daily lives than others (which they termed *poignancy*), and that the tendency to experience mixed emotional states was higher among older versus younger adults (age range of the study was 19 to 94 years). Importantly, the type of information gained in the Barrett (1998) and Carstensen et al. (2000) studies can only be obtained through intensive within-person measurement, such as what diary methods can offer (Conner et al., 2009). A similar approach could be fruitfully applied to obtain a more idiosyncratic understanding of the environmental experiences that characterize a day in the life of a child living in poverty.

Environment-Behavior Signatures

Suppose we find two children who are equal in age, gender, and ethnicity, both of whom have spent their entire lives living in impoverished homes and communities. Suppose we observe these children further and find that they both show high levels of antisocial behavior relative to their same-age peers. Given their similarities, should we assume that these children engage in antisocial behavior for the same reasons and in the same situations? According to personality theorists Walter Mischel and Yuichi Shoda (1995), the answer to this question is "no." It has been clearly shown that even between people who engage in similar levels of behavior on average (such as aggression), there will be important differences between them in terms of *where, with whom*, and *in which situations* each person will engage in aggression.

A classic example comes from a summer treatment camp study of children with self-regulatory and aggressive behavior problems (Shoda, Mischel, & Wright, 1994). Over 6 weeks, these children's behaviors were observed and recorded across a variety of situations. Shoda and colleagues found that children's levels of aggression were not constant across situations, as trait theories of personality would predict. Instead, children's aggression varied greatly across situations. However, Shoda and colleagues found that some situations reliably predicted aggression for some children, but not for others. In other words, some children may reliably show aggression when teased by peers but show no such aggression when scolded by adults. Other children may show the reverse pattern, engaging in aggression when scolded by adults but not when teased by peers. The significance of this finding is perhaps best articulated by Mischel (2004):

> Collectively, the results showed that when closely observed, individuals are characterized by stable, distinctive, and highly meaningful patterns of variability in their actions, thoughts, and feelings across different types of

> situations. These *if … then …* situation-behavior relationships provide a kind of "behavioral signature of personality" that identifies the individual and maps on to the impressions formed by observers about what they are like. (p. 8)

Evidence for predictable patterns of variability, or behavioral signatures, has been found across numerous independent investigations using a variety of methodologies (Leikas, Lonnqvist, & Verkasalo, 2012; Smith, Shoda, Cumming, & Smoll, 2009; Vansteelandt & Van Mechelen, 1998), including studies using diary methods (e.g., Fournier, Moskowitz, & Zuroff, 2008), which seem naturally poised to answer such questions. Using such methods among children in poverty, researchers could examine the particular environmental exposures or situations that reliably predict antisocial behavior in some children versus others. Using diary measures and multilevel modeling statistical techniques (Raudenbush & Bryk, 2002), a separate effect of each hassle (e.g., family conflict, chaotic home, school stressors) on momentary antisocial behavior can be obtained for each child. The strength of the association between daily hassles and antisocial behavior can be quantified as a regression coefficient for each child. This regression coefficient can then serve as an individual difference variable, characterizing each child's likelihood of engaging in various types of antisocial behaviors (e.g., verbal or physical aggression, anger, and hostility) across these specific situations (see Fleeson, 2007 for an example of this type of approach with personality). As predicted, one may find a group of children who show a strong likelihood of engaging in antisocial behavior when peer hassles are experienced, whereas another group of children shows a strong likelihood of antisocial behavior when parent hassles occur. Using other child or family characteristics, such as the child's previous level of stressful life events, history of antisocial behavior, and parental monitoring, one can then attempt to characterize children who show aggression in response to peer versus parent hassles in daily life.

Feature 3: Diary Methods Allow the Study of Within-Person Processes, Facilitating Causal Inference and Discovery of Environmentally Mediated Effects

Perhaps one of the strongest features of diary methods is their ability to capture processes that occur within a person in response to changing environments. This approach allows the researcher to control for a whole host of characteristics that remain stable over time, measured or unmeasured, by using each person as his or her own control across a range of situations or stressors. This design feature of diary studies gets researchers a step closer to causal inferences about environmental effects because in this within-person framework, stable characteristics such as genetic makeup, biological sex, and ethnicity are effectively held constant (Allison, 2005; Bolger & Laurenceau, 2013).

This within-person focus provides a novel way to facilitate causal inferences regarding the role of stressor exposure in children's antisocial development in a nonexperimental context. If it could be shown that change in stressor exposure

correlates with change in antisocial outcomes *within the same child*, this could facilitate causal inferences regarding environmental effects because stable "selection" factors such as genetic makeup, sex, and ethnicity have been held constant. Causal inferences regarding the role of stressors can be further facilitated by adding statistical controls for other potential confounds that do vary over time, such as previous negative mood, sleep quality from the previous night, or even the passage of time itself. Moreover, diary methods allow the estimation of temporal patterns, allowing researchers to test whether stress exposure predicts antisocial behaviors, or vice versa.

A recent example of this type of approach in daily life comes from work by Stadler, Snyder, Horn, Shrout, and Bolger (2012). Using daily diaries in the lives of male-female couples, they found that within-person increases in physical intimacy between partners predicted within-person decreases in self-reported physical symptoms (e.g., headache, upset stomach, back/muscle ache). Stadler and colleagues (2012) further strengthened this result by showing that *previous* increases in physical intimacy (from 2 days ago to yesterday) predicted *current* decreases in physical symptoms (from yesterday to today). They found no evidence for the reverse effect: Previous symptom change did not significantly predict current change in intimacy. All of their models controlled for the effects of elapsed time, following the rationale that this represents a proxy for unmeasured third variables (i.e., fatigue caused by duration of the study; a shared growth process that creates a spurious association between the two variables of interest; see Bolger & Laurenceau, 2013). Taken together, their results provide strong evidence for a causal effect of intimacy on physical symptoms because (a) their focus on within-person change ruled out stable selection factors, (b) they found no evidence for reverse causation, and (c) they statistically controlled for unmeasured time-varying processes that could confound the effects. Although they cannot completely rule out lurking selection effects because physical intimacy was not randomly assigned, the combined use of these methods in a daily life framework nonetheless provides a strong basis for facilitating causal inference.

This within-person process approach could be applied to the question of whether stressful events have environmentally mediated effects on low-income children's antisocial behavior. For instance, by using diary methods to test for the within-person effects of daily stressors on negative affect and aggressive behavior in daily life, each child is used as his or her own "control." If within-person effects are found, they cannot be explained by stable factors that differ between individuals but do not vary over time, such as sex, ethnicity, or genetic makeup. Additionally, information obtained through diary methods can be paired with real-time physiological measures of stress reactivity, such as heart-rate variability, which can now be obtained in children's natural contexts through the newest generation of ambulatory sensors. One of these, the Zephyr Bioharness™ 3,[2] allows real-time remote monitoring of parameters such as heart rate and breathing rate, and can wirelessly stream this information to mobile devices or to the researcher's desktop computer. By synching this information with children's diary reports of stressful events, researchers could obtain a more objective measure stress reactivity that does not rely exclusively on self-report. If daily stressors were found to predict within-person changes in negative affect, antisocial behavior, and physiological stress markers alike, this evidence would provide yet another step toward causal

inferences because the effects cannot be explained away by shared method variance. By offering researchers the ability to examine the within-person effects of daily stressors on affect, behavior, and physiology, diary methods allow researchers to get closer to causality regarding whether everyday stressors affect children's antisocial behavior through environmental pathways.

In short, diary methods, delivered through the latest generation of mobile technologies, provide numerous opportunities to improve our current understanding of environmental effects on children's antisocial behavior, while allowing us to appreciate that not every child responds to adversity in the same way. Currently, we are in a unique position to pair the methodological advances offered by diary methods with exciting new theories about why some children may be more reactive to their daily events than others, and whether this increased reactivity can help explain their risk for poor outcomes (such as antisocial behavior) or their receptiveness to targeted intervention efforts. In the next section, we discuss how the within-person power of diary methods can provide novel ways to test theories of person–environment interaction, such as diathesis-stress (Monroe & Simons, 1991) and differential susceptibility (Ellis et al., 2011).

INDIVIDUAL DIFFERENCES IN ENVIRONMENTAL EFFECTS: WHY ARE SOME CHILDREN MORE REACTIVE TO EXPERIENCE THAN OTHERS?

On average, children in poverty are more likely to engage in antisocial behavior than children from higher income backgrounds. Not every child in poverty, however, will engage in antisocial behavior. This fact naturally leads to questions about why some children exposed to high poverty-related stress will develop antisocial behavior and others will not. An exciting idea known as differential susceptibility theory (DST; Ellis et al., 2011) suggests that some children may be, by nature, more sensitive to their environments, both positive and negative, than others. These "sensitive" children may be at greatest risk when environments are chronically stressful but at lowest risk when environments are consistently supportive (Belsky, Bakermans-Kranenburg, & van Ijzendoorn, 2007; Ellis et al., 2011). "Sensitive" or "susceptible" children may be distinguished by genes, physiological parameters, and behavioral phenotypes thought to be under high genetic influence such as early temperaments (Belsky & Pluess, 2009). DST suggests that children with one or more of these sensitivity markers may be more likely to develop negative outcomes (such as antisocial behavior) when exposed to negative contexts (such as disadvantaged homes and neighborhoods), but they may also be more likely to show positive developmental outcomes (i.e., good self-regulation, empathy, prosocial behavior) when exposed to positive contexts (such as supportive home environments and socially cohesive neighborhoods). This is an exciting possibility because it suggests that youth who were previously considered to be highly vulnerable may in fact be more validly considered highly *susceptible* to the good and the bad of whichever environments they are in. As a result, these vulnerable youth may be the ones who will benefit most from targeted interventions.

Here again, diary methods offer a novel and potentially powerful way to test the core assertion of differential susceptibility: that environmental effects are

stronger for some children versus others. Differential susceptibility theory falls into a broader class of person-by-environment theories, such as the diathesis-stress model (Monroe & Simons, 1991). The diathesis-stress model suggests that some children possess genetic or temperamental characteristics that make them more vulnerable to bad environments, but not more responsive to good environments, as the differential susceptibility perspective suggests. The majority of research testing person-by-environment interaction theories has tested whether children with *both* an individual sensitivity marker and a negative environment have higher levels of antisocial behavior (for example) than children without the sensitivity marker, negative environment, or either (see, for example, Caspi et al., 2002; Lengua, Wolchik, Sandler, & West, 2000). This type of test is inherently between people, because it compares children to each other on their average levels of antisocial behavior and tests whether children with the most antisocial behavior are more likely to have *both* an individual vulnerability and an environmental risk. A complementary approach to testing person-by-environment theories is to ask whether "sensitive" children are more *reactive* to changing environments. In other words, do sensitive children show more behavior problems in stressful situations compared to themselves in nonstressful situations? This is essentially a within-person question, one which diary methods are well suited to answer. Using a within-person perspective may be particularly important for research on the differential susceptibility theory, because this theory suggests that sensitive children should both be more reactive to negative events *and* more responsive to positive events.

Figure 2.1 illustrates that the use of within-person changes in environments and behaviors could provide strong evidence for whether differential susceptibility operates in the daily lives of youth. As children go through their daily lives, they experience both stressful and positive events. However, some children

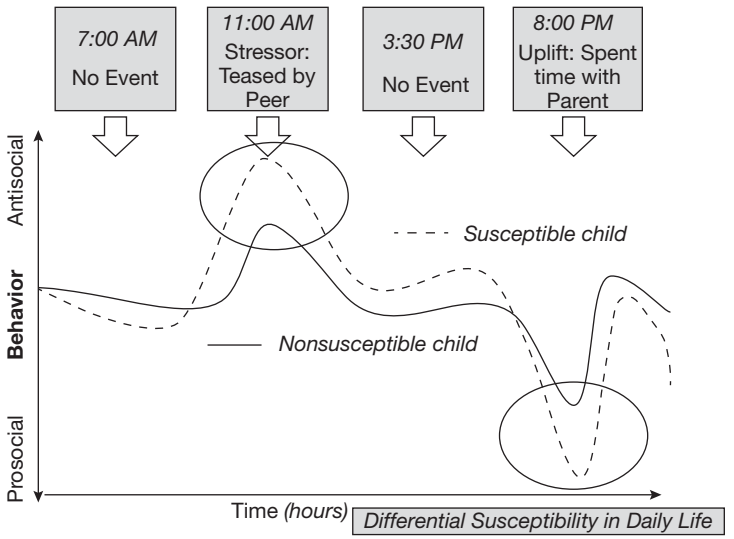

Figure 2.1 A hypothetical illustration of differential susceptibility to the environment in daily life.

will be more sensitive to these events than others. Highly sensitive children (the dashed trajectory in Fig. 2.1) will be more responsive to both stressful and positive events in daily life than typically sensitive children (the solid trajectory). As such, highly sensitive children are predicted to show greater increases in positive outcomes (e.g., prosocial behaviors and positive affect) when experiencing positive events *and* greater increases in negative outcomes (e.g., problem behaviors and negative affect) following negative events, such as daily stressors. Because diary methods allow us to (a) obtain true-to-life or ecologically valid reports of both positive and negative events in daily life, (b) test the effects of these events within each child, and (c) test whether within-person effects are stronger for youth with sensitivity markers, they allow a strong and direct test of the differential susceptibility model's key hypothesis that some children are more sensitive to their environments than others—for better *and* for worse (Belsky et al., 2007).

Which markers may help identify children who are differentially susceptible to environmental effects on behavior? To date, some of the strongest evidence points to the 7-repeat allele of the dopamine receptor D4 gene (*DRD4*-7R), a gene that has been previously associated with novelty/sensation seeking (Laucht, Becker, El-Faddagh, Hohm, & Schmidt, 2005), impulsivity (Congdon, Lesch, & Canli, 2008), anger and delinquency (Dmitrieva, Chen, Greenberger, Ogunseitan, & Ding, 2011), and attention-deificit/hyperactivity disorder (ADHD; Faraone et al., 2005). Rather than being solely a risk allele, the *DRD4*-7R gene may function more like a "plasticity allele," conferring increased sensitivity to whatever environment a child is in (Belsky et al., 2009). This increased sensitivity is thought to provide an evolutionary advantage when environments are positive, which may explain why genes and traits associated with risk have nonetheless been preserved in the human species (Belsky, 2005). In support of this, a recent meta-analysis showed that children with "risky" dopamine genes such as the 7R allele showed *the most* externalizing (or antisocial) behavior in negative rearing environments, but children with these genes in positive rearing environments showed *the least* externalizing behavior (Bakermans-Kranenburg & van Ijzendoorn, 2011).

Particularly compelling support for the *DRD4*-7R gene comes from two experimental studies showing that an intervention designed to promote parent–child attachment was more effective in reducing externalizing behavior problems for children with versus without *DRD4*-7R (Bakermans-Kranenburg, van Ijzendoorn, Mesman, Alink, & Juffer, 2008; Bakermans-Kranenburg, van Ijzendoorn, Pijlman, Mesman, & Juffer, 2008). By conferring increased susceptibility to environmental influence, the *DRD4*-7R gene may identify children who are most sensitive to positive and negative events in their everyday lives. This hypothesis could be tested using diary methods that allow researchers to examine whether daily events have stronger within-person effects on behavior—for better and for worse—among low-income children with versus without the *DRD4*-7R gene. If low-income children with this gene are more sensitive to both positive *and* negative daily events, this evidence may suggest that these children, although at higher risk in their current environments, may be more likely to benefit from intervention strategies targeting the link between daily stressors and antisocial behavior.

FUTURE DIRECTIONS

Diary methods provide tremendous flexibility in the measurement of daily experiences, and their effects, on low-income youth. The most exciting future directions for these methods may lie in their combination with more "traditional" research designs, as well as interventions of known efficacy.

Diary Measurement Bursts: Combining Diary Methods and Longitudinal Designs

Antisocial behavior is a developmental phenomenon. Because of this, longitudinal study designs that follow children over key developmental periods (such as childhood and the transition to adolescence) are necessary in order to truly understand its causes. Although traditional longitudinal designs have provided us with much valuable information about how antisocial behavior develops over years (see e.g., Moffitt et al., 2001; NICHD Early Child Care Research Network, 2004; Sampson & Laub, 2005; Thornberry & Krohn, 2003; Tremblay, 2010), these designs may miss the micro-level processes that affect whether a child will engage in antisocial behavior on one day versus another—such as a provocation from a peer or harsh discipline from a parent (Dodge, 2006; Patterson et al., 1992). Diary methods are especially useful for understanding this type of micro-level change and may be powerfully combined with traditional longitudinal studies to better understand the interaction between short-term and long-term processes in the development of antisocial behavior.

Measurement burst studies embed daily-life measurement bursts into more traditional longitudinal studies that follow people over years (Nesselroade, 1991; Sliwinski, 2008). Despite their potential, these designs have not yet been applied to the study of antisocial behavior. These powerful designs could allow researchers to examine the interplay between short-term processes and long-term changes, and thereby improve our understanding of the causal pathways through which environmental conditions affect antisocial development. For example, measurement burst designs could provide investigators with a means for (a) examining how the relationship between stressor exposure and antisocial behavior changes over time and (b) learning how changes in these micro-level processes feed into developmental "turning points" (Sampson & Laub, 2005), such as desistence or escalation in antisocial behavior during key developmental transitions (such as early adolescence). Moreover, these designs could offer better insight into the *timescale* of environmental effects. For example, with regard to the differential susceptibility hypothesis mentioned earlier, it is not yet known whether "sensitive" children (such as youth with *DRD4*-7R) will be more responsive to environments *in the moment* or whether this sensitivity will only manifest itself over years. In other words, should we expect that a single day of high support will predict less antisocial behavior the next day among youth with the *DRD4*-7R gene? Or does this relationship take years to manifest, such that we will only see larger decreases in antisocial behavior among youth with versus without *DRD4*-7R if they experience a home environment that remains supportive over longer time spans? Through their ability to separate empirically both short- and long-term processes of change, measurement burst designs could

provide powerful and unique information regarding the role of environment in low-income children's antisocial development.

Interventions at the Right Time, in the Right Place

Mobile technologies are also providing researchers and health professionals with new opportunities for assessment and intervention among previously hard-to-access, high-risk groups, such as children living in poverty. The movement toward using mobile technologies to administer assessments and deliver intervention has been dubbed *mobile health* (or mHealth) by the National Institutes of Health (National Institutes of Health, 2013) and includes diary measurement techniques such as those described earlier. Among children living in poverty, diary methods could be used to test—and eventually disseminate—message-based interventions focused on fostering positive coping strategies, triggered when youth report experiencing a stressful event. These approaches may offer promise, as evidence suggests that youth who use active coping strategies, such as problem solving, emotion regulation, and positive thinking, may be less likely to display emotional, behavioral, and physical health problems than youth who rely on avoidant coping strategies (Chen & Miller, 2012; Wadsworth, 2012). For example, mobile phone delivery of intervention content could be used as a supplement to cognitive-behavioral therapy (CBT; Beck, 1991), an intervention of known efficacy among youth with antisocial behavior (McCart, Priester, Davies, & Azen, 2006). Mobile devices could be used to reinforce intervention content by sending coping intervention-related messages, reminding children to use positive coping strategies when stressful events occur. In this way, mobile messaging may help clinical professionals with the daunting task of delivering time-tested interventions to high-risk groups, at the times and places they are needed most.

SUMMARY

Children growing up in poverty are at risk for developing antisocial behavior, a significant and costly societal problem. Evidence suggests that the association between poverty and antisocial behavior is consistent with a causal interpretation, and emerging theoretical perspectives argue that the effect of poverty on antisocial development may be driven by the chronically stressful conditions of low-income children's everyday environments. However, accurate measurement of daily events remains a persistent methodological challenge, which limits the field's understanding of causal processes. Diary methods may help by allowing researchers to measure children's everyday experiences, emotion, self-regulation, and behavior as they go through their daily lives, in their natural environments, and in a way that is sensitive to the idiosyncrasies of each individual child. The latest generation of mobile technologies, through their ability to measure within-person change and capture more objective measures of context and physiology, provide added flexibility and can get researchers one step closer to a causal understanding of environmental effects on children's antisocial behavior.

Moreover, these mobile technologies are opening up exciting possibilities for the delivery of intervention to high-risk populations, at the times and places they are needed most. In sum, the stage is set for mobile methods to improve our understanding of environmental effects on children's antisocial behavior and to open up new opportunities for interventions aimed at improving the lives of low-income children and their families.

NOTES

1. Throughout, we use the term *children* to refer to both childhood and adolescence, and to distinguish between the two developmental periods when necessary.
2. Available at http://www.zephyranywhere.com/products/bioharness-3/

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