Chaos and Its Influence on Children's Development

An Ecological Perspective

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Dynamic Developmental Systems: Chaos and Order

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Chaos is an excellent theme for academics in modern times, when multitasking at work, at home, and at play frequently elicits the feeling encapsulated in the title of an old Broadway musical: "Stop the world, I want to get off!" These negative feelings arise from a complex balancing act people perform among roles in organized institutional structures at home, at work, and at play. These settings may seem to have a life of their own but are highly dependent on the regulated functioning of their participants. When someone's home life becomes disrupted, it may intrude into his or her work life. For example, in many contemporary families child care is divided between two parents and several third parties but becomes disrupted if one partner becomes ill and the other has to fill in. This solution to the caregiving situation may reverberate to the workplace, where the absence of one or the other may mean that a function is not being performed, requiring someone else to fill in, affecting the regular role that person played. To the extent that the parents or their substitutes are in supervisory roles, their charges lose a source of regulation in their own occupations, which may affect the larger community when a product is not produced or a service not delivered (see chap. 12).

These examples reflect the ecological model that is the basis of much that is reported here. Bronfenbrenner's (1986) micro-, meso-, exo-, and macrosystems provide an important reorientation to the psychological study of human development. At a time when the child research enterprise was focused either on the unfolding of innate characteristics of the child or on the environment's reinforcement contingencies, Bronfenbrenner brought a sociological and anthropological perspective that added multiple levels of analysis to the requirements for predicting and influencing child development.

Modern times are based on highly regulated, ordered systems that connect multiple individuals to multiple roles that offer many opportunities for order but also for disorder. This disorder can have both contemporary and developmental effects and can be produced by either the individual or the context. The study of chaos must be integrated into a broader understanding of change over time in both individuals and settings. Time is part of the Bronfenbrenner model, but it is discussed primarily with regard to historical time and in terms of the accumulation of effects from either the absence or unpredictability of environmental supports, with a longer duration of chaos having more deleterious ef-

fects than a shorter duration. However, the notion of timing must be added to the study of time. Depending on what is developing at a specific point in time, chaos may have major, minor, or no effects. For example, Elder's (1995) studies of military experience document how the same historical events can facilitate the development of one cohort (teenagers) and interfere with the development of another (those in their 20s; for a detailed discussion of cumulative influences and timing issues, see chap. 8).

Models for Understanding Successful Development

Contemporary developmental science requires at least four models for understanding human growth: a personal change one, a contextual one, a regulation one, and a representational one (Sameroff, 2009a).

The Personal Change Model

The personal change model is necessary for understanding the progression of competencies from infancy on. It requires unpacking the changing complexity of the individual as he or she moves from the sensorimotor functioning of infancy into increasingly complicated levels of cognition; from early attachments with a few caregivers to relationships with peers, teachers, and individuals in the world beyond home and school; and from the early differentiation of self and other to the multifaceted personal and cultural identities of adolescence and adulthood.

The Contextual Model

The contextual model overlaps substantially with Bronfenbrenner's formulations. Before Bronfenbrenner, in the United States development was believed to be a linear progression, with each new step in behavior predictable from the preceding one, and directionality determined by the history of contingent reinforcements in a behaviorist model that could be replicated in the laboratory. But this approach was defeated as one exogenous variable after another, such as the ethnicity and gender of the subject or experimenter, was found to affect even laboratory behavior. The child psychologist now had to attend to context, and it was Bronfenbrenner who provided the theoretical basis that made attending to settings scientific. Many predecessors felt that families, schools, neighborhoods, and culture had influences on development, but Bronfenbrenner turned these ideas into a comprehensive framework with predictions of how these settings affect the child and also how they affect each other. Although his terminology of microsystems, mesosystems, macrosystems, exosystems, and chronosystems may not be universally accepted, his principles that the family, school, work, and community are all intertwined in explaining any particular child's development were part of a revolution in psychological science that is now universally acknowledged. After Bronfenbrenner, behavior in general, and

development in particular, could not be separated from the social context. An individual's behavior could not be predicted independent of situational demands and constraints.

The growing child is increasingly involved with multiple social settings and institutions. The move was traditionally from participation wholly in the family microsystem into contact with the peer group and school system. Now, however, many infants are placed in out-of-home group child care in the first months of life. Similarly, where the effects of neighborhoods used to be primarily mediated by the family, street violence now directly impacts people of every age, including the very young. Each of these settings has its own system properties. Concerns about the development of the child are only one of many institutional functions. For example, the administration of a school setting needs to attend to financing, hiring, training of staff, and building maintenance before it can perform its putative function of caring for or educating children. In chapter 6, Maxwell's description of the school setting is an excellent detailing of the many functional dimensions involved.

Attention to the effects of changing settings on children over time must be augmented by attention to changing characteristics of individuals within a setting. Contemporary social models also take a life course perspective that includes the interlinked life trajectories of not only the child but also other family members (Elder, Johnson, & Crosnoe, 2003). Experiences for the child may be quite different if the mother is in her teens with limited education, or in her 30s after completing professional training and entry into the job force. Similarly, Lustig's (see chap. 15, this volume) discussion of the refugee experience highlights the disruptions in developmental timing where young children are filling adult roles as caregivers, breadwinners, or soldiers. The life course perspective incorporates the historical changes over the past century, as described by Lichter and Wethington (see chap. 2, this volume), that produced better health and less poverty while also maintaining or even expanding major social inequalities; in other words, life for many did not fully benefit from overall societal progress. Put in terms of concepts that are the focus of this volume, chaos may be reduced for some but increased for others.

The Regulation Model

The third model of regulation reflects the systems orientation of modern science (Sameroff, 1983). Most of the rhetoric in developmental research is about self-regulation, giving the illusion that regulation is a property of the individual, but self-regulation occurs only if there is a social surround that is engaged in other-regulation (Sameroff & Fiese, 2000). This regulation by others provides the increasingly complex social, emotional, and cognitive experiences to which the child must self-regulate and the safety net when self-regulation fails. Even early functional physiological self-regulation of sleep, crying, and attention are augmented by caregiving that provides children with regulatory experiences to help them quiet down on the one hand and become more attentive on the other. Vygotsky's (1978) zone of proximal development is analogous to other-regulation in cognitive development. Successful socialization and education are based

on fitting experience to the developmental status of the child. As children create their understanding of the world, the world is made more complex through steps in a curriculum to move them along toward some societal goal of mature thought. Arithmetic is an excellent example: As soon as children learn to add they are required to learn to subtract, following which they are taught to multiply and divide. Each step is a regulation of the environment by the teacher to keep one step ahead of the child's mathematical regulation. Similarly, in the social realm increases in social responsibility are paced to the success of the child's adjustment to previous levels of responsibility (Rogoff, 2003).

More important, in the systems view no individuals are separate from relationships (Sameroff, 2009b). Each child is functioning in relation to characteristics of the physical and social world. For the most part other people are mediating this experience, from the first deitic episodes of the parent capturing the child's attention by pointing to objects in the surround to the university lecturer who uses multimedia presentations to engage a range of cognitive functions. One can consider many of these regulations in terms of affordances that capitalize on the perceptual abilities of the child, but many are developmentally paced to increase the complexity of experience for the child.

The Representational Model

In the last model, the representational one, an individual's here-and-now experiences in the world are given a timeless existence in thought. These representations are the cognitive structures where experience is encoded at abstracted levels that provide an interpretive structure for new experiences, as well as a sense of self and other. Representations are obviously not the same as what they represent. They have an adaptive function of bringing order to a variable world, producing a set of expectations of how things should fit together. In the social realm these representations include such things as an infant's working model of relationships (see chap. 4, on representations of family routines) or cultural practices (see chap. 13).

These four models for understanding development provide a framework for understanding the deleterious effects of chaos. The chapters in this volume tap into one or another model and document how the instability or incomprehensibility of experience interferes with or prevents adaptive current or later functioning. The contemporary effect of chaos is that functions are not performed, which leaves needs unmet. The developmental effect is that children growing in such circumstances may have limited or no models of effective regulation both for themselves and for their relationships with others.

Chaos

The vision of chaos discussed in the introductory chapter and detailed in chapter 14 by Evans et al. was somewhat simplified into categories of disorder or turbulence in chapter 10 by Brooks-Gunn et al.. Disorder arises from high levels of noise, excessive crowding, clutter, and lack of structure. Turbulence is

related to instability of settings, instability of relationships, and unpredictability of routines. The negative effects of such environmental chaos are evidenced in poorer physical and mental health, reduced emotional maturity and social competence, and reduced cognitive competence and communication skills. These factors clearly lead to bad outcomes, but is it equally clear that their opposites would lead to good outcomes?

The other end of the spectrum for these variables includes silence for noisiness, being alone for crowdedness, rigid systems for lack of structure, unchanging settings for instability of settings, enmeshed relationships for unpredictable ones, and boredom for unpredictability. It would seem that extremes of either chaos or order may not foster effective or healthy outcomes. What we know about successful systems is that they are adaptive, capable of responding to a range of conditions, and still maintain competent functioning; in other words, they are well-regulated. Successful development requires regularities of experience for the formation of adapted systems but also requires new stimulation that may initially be experienced as noise, if growth is to occur.

An examination of the outcomes affected by chaos shows they are actually regulatory processes related to both internal and external experience. Physical health involves the regulation of a full range of biological functions that are a necessary platform for psychological processes. Psychological processes are systems for emotional and cognitive regulation served by social and communicative interactions. If one were to ask about the negative consequences of chaos, the answer would lie in how it affects these regulatory systems.

Interpreting Chaos Within Developmental Models

Although chaos sounds terrible and the chapters in this volume have listed a variety of negative outcomes associated with chaos, most of the consequences have not been through linear causality. The majority of the effects are mediated, such as when chaos affects parenting that in turn affects child outcomes; moderated, such as when children with certain biological or personality characteristics are more affected than are children without them; or accumulated, such as when chaos has an effect only when it occurs simultaneously in many settings of the social ecology. The conclusion to be drawn from all this research is that understanding the effects of chaos is as complex as understanding development itself.

Understanding what ingredients are necessary for developmental progress will throw light on how these ingredients are affected by chaos. Will chaos have its effect by removing these ingredients such that development does not take place? Will chaos have its effect by preventing the child from experiencing the ingredients that are available? Will chaos prevent the developmental process, or will it distort it? Moreover, as Lichter and Wethington suggested in chapter 2, dealing with chaos early in development could act as a vaccination such that the child will not be as affected by chaos later in development. The answers to all these questions require an articulated idea of what development is about and they definitely will vary depending on the particular developmental outcome and the particular developmental period. The four models outlined here

provide a framework for understanding the effects of chaotic conditions on developmental success.

Personal Change Model

The time perspective of the personal change model is useful for examining the effects of chaos at specific ages as well as cascade effects, when chaotic effects during one period lead to chaotic effects during another period. The effects of chaotic conditions on regulatory systems vary in accord with their timing. Some experiences are important to the formation of regulatory systems, and others are related to their adaptive functioning once formed. The formation of regulatory systems requires consistencies of experience in repeated and then recognizable patterns. Communicative competence requires patterned experience to shape first the sound patterns for a specific language and then the words within a semantic framework. Social competence requires patterned social interactions initially in the service of emotional regulation—the soothing behavior of parents—and then in the service of using means to obtain ends, such as using parents to access desired outcomes.

To the extent that there are few regularities in experience (the unpredictability dimension of chaos), cognitive and social development is slowed or distorted. Early sensorimotor cognition is hard to derail because it is based on regularities in physical experiences such as touch, sound, or sight largely independent of the social surround, but even such basic perceptions can be distorted in children with mental challenges or children reared in stimulus-deprived institutions or in the extremely overwhelming, chaotic conditions of war and physical calamities (for a discussion on the impact of these types of conditions, see chap. 15). However, as the child reaches toddlerhood, and later in school where understanding the world requires explanations, the full range of chaotic disorder and turbulence comes into play, disrupting learning experiences as detailed in Maxwell's analysis of school effects (see chap. 6).

Early social development is typically associated with the establishment of secure attachments to caregiving figures that will be the basis for later social relationships. The study of attachment is an example of how difficult it is to pin down the effects of chaos. Almost all children form working models of relationships, so chaotic conditions do not prevent development except at the extremes. However, the instability of early experiences will affect the quality of these relationships and how they are represented. Anxious attachments are formed when experience with caregivers is unpredictable or unresponsive. Unresponsiveness is a reduction in regularity of parenting behavior, whereas unpredictability could be interpreted as an instance of chaos. But the real effect of chaos seems to be at the extreme where parental psychopathology comes into play, producing disorganized attachments through a variety of forms of emotional and physical abuse. As more longitudinal studies are completed early, insecurity with caregivers is being connected to later attachment anxiety and avoidance in peer and romantic relationships, but these are not necessarily pathology, only different forms of adaptation (Sroufe, Egeland, Carlson, & Collins, 2005). The chaos in later relationships is more clearly tied to the borderline

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personality disorders that mediate the link between earlier abuse and later social relationships.

Contextual Model

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Through the ecological lens, the chapters in this volume have identified the way chaos affects many aspects of families. schools. cultures. and economies. Moreover. the discussion extended to how chaos in one setting contributes to chaos in another. as exosystems, mesosystems. or macrosystems. For example, Repetti and Wang's (see chap. 12) analysis of the workplace as an exosystem portrays how instability of work hours and autonomy in jobs affects parent emotional stability, which, in turn, could negatively affect child rearing. In addition, a parent's stress at work could affect the marital relationship, producing another pathway toward worse child rearing. However, the workplace could act to reduce stress and the associated chaos by providing maternal leaves and child care, possibly with resources and policies provided by governmental macrosystems.

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Whether a setting increases or decreases chaos is important not only for research but also if one is seeking targets for intervention strategies to reduce the effects of chaos. Stability in primary caregivers is an important ingredient in successful socioemotional development. The historically increasing numbers of children being reared in single-parent households documented by Lichter and Wethington in chapter 2 suggest that this stability is being undermined over time. Good child care can be both a microsystem in providing additional stability to the parent's caregiving and a mesosystem by reducing parent stress, acting to offset chaotic family conditions. However, as Corapci and Bradley described in chapters 5 and 9, respectively, many poor-quality child-care settings undermine child development through low staff ratios, turnover of child-care workers, and poor facilities. These effects are further conditioned by macrosystem economic conditions that were described by Evans et al. in chapter 14. Good child care is expensive, and to the extent that economic resources are limited, as in lower socioeconomic status families, the available child care will be of a much lower quality and more chaotic than it will be where families are more affluent.

Regulation Model

Effective regulatory systems are guided by information as to what needs regulating. Negative feedback systems typically reduce discrepancies from a set point by either an increase or a decrease in activation. For effective classroom learning, the teacher must first wake up some students and quiet down other students to get their attention. Mesosystem effects can be seen when increasing student attention is made more difficult when they are tired from after-school jobs, irregular bedtime routines, or carousing late at night thanks to a lack of parental supervision. In a similar vein, getting the attention of overly aroused students is difficult when they have not developed good self-regulation skills

because of stress at home or not having had experience at self-regulation earlier in development. Only afterward can instruction begin to stimulate cognitive development via other-regulation by teachers, through the use of curricula that move the child from one step to the next.

Chaos in and between settings interferes with the flow of information necessary to both self- and other-regulation. At one extreme is the destruction of regulatory systems by extreme conditions of war or disaster in which families, schools, neighborhoods, and other social settings are shattered. Less extreme chaotic conditions of high levels of noise, crowding, or instability of participants in the system prevent communication. This degraded communication may not stop development but should act to slow or distort growth processes.

Representational Model

Representations are encodings of experience. They are a more or less elaborated internal summary of the external world. In such a summation certain aspects are selected and others ignored. In the representation of a square, for example, the size, color, and texture of the square object are ignored. In an analogous way, when representations are made of a social object such as a parent, certain features are included in the representation and others are ignored. Research using the adult attachment interview (Main & Goldwyn, 1984) has found that such representations of parents are often idolized, with only positive aspects being included in the mental model.

Chaotic experience can be seen as both a hindrance and distorter in the formation of representations during development. In Weisner's summation of culture and chaos (see chap. 13, this volume), he argued that well-being is a result of meaningful cultural engagement with desirable everyday routines that have a script, goals, and values. Meaningfulness, a key component of his analysis, is found only in coherent representations. The development of this engagement is negatively affected by chaotic conditions. Once formed, these representations frequently provide a script for social engagement that may act as a buffer against later chaos. In dynamic family systems when one member of a family becomes disruptive, such as through alcoholism, activities of all other members are affected. An excellent example is Fiese and Winter's (see chap. 4) descriptions of how family routines provide a narrative representation for the rest of the family members that allows the whole to continue adaptive functioning despite the disruption of one of its parts. The order or disorder in a society's representation of itself certainly affects the adaptive functioning of its members. For example, native youth show much higher levels of suicide and other problem behavior when there are large inconsistencies in cultural continuity from one generation to another (Chandler, Lalonde, Sokol, & Hallett, 2003).

Person, Process, Context

An overarching problem for developmental research, in general, and the studies of chaos described in this volume, in particular, is that the effect sizes are usually small. Although statistical differences are found between individuals

experiencing a variety of chaotic conditions on a variety of outcomes, there are few, if any, demonstrations of causal connections between disruptions in experience and behavior. One explanation of such weak effects is that there are so many influences on any developmental outcome that single variables such as noise or crowding cannot have a large effect. To demonstrate larger effects one must accumulate a number of chaotic variables into some form of aggregate chaos score. Such is the strategy suggested by Evans et al. (see chap. 14) and by Ackerman and Brown (see chap. 3). Their argument is that a single area of chaos will not have a major effect because it is only one of the many ingredients in each developmental achievement. Therefore, a cumulative aggregate composed of multiple chaotic elements would be a much better predictor of aberrant development.

The problem with cumulative scores is that they do not reveal the process by which a particular chaotic element might influence a particular developmental outcome, nor do they necessarily separate chaotic factors in microsystems from those in the meso- or macrosystems. An explanation of process would need to be framed by the developmental models outlined earlier. Those models have as a final common pathway Bronfenbrenner's (Bronfenbrenner & Crouter, 1983) person, process, context model, where outcomes may change when any of the three components change. The ultimate usefulness of this model could be achieved through a complete mapping of all the persons, processes, and contexts in which a function develops. Such a large-scale model was attempted by Wachs in chapter 7. He argues that the influence of chaos will depend, in part, on person characteristics such as temperament, age, gender, and prior history, as well as the larger macrosystem context within which the individual develops including measures such as war, poverty, and disaster. Dunn, Schaefer-McDaniel, and Ramsay (see chap. 11) contributed to this discussion by emphasizing the need to define specific aspects of development, specific age groups, and specific aspects of social settings to determine how chaos has its effect.

What is clear from such mappings of the literature is that direct effects are few and small because most indicators of chaos operate through mediating processes or are moderators of still other developmental processes. In light of the complexity of the constructs involved, one of the implications of the operation of mediating and moderating processes is that attempts to catalog the dimensions and influences of chaos are very likely to be oversimplified.

Reducing the Effects of Chaos

The goal of this volume is to offer an analysis of how chaos affects development, followed by strategies for reducing any negative effects. If one were to focus on the list of chaotic conditions presented in chapter 1—noise, excessive crowding, clutter and lack of structure, instability of settings, instability of relationships, and unpredictability of routines—then the most direct intervention strategies would be to reduce noise, crowding, clutter, instability, and unpredictability. Reduction rather than elimination should be the goal, because as Wachs and Evans pointed out in chapter 1, depending on individual and contextual characteristics, it is not clear what the demarcation is between amounts of chaos that

produce a negative effect, a neutral effect, or even a potentially development-enhancing effect through stretching the adaptive regulations of the child into new realms.

Intervention itself, however, must be subject to an ecological analysis. If the effects of chaotic conditions are cumulative, then what are the costs and benefits of reducing one or another aspect? All social institutions have limited resources, so the decision of how to best invest in improving child development is generally difficult. Is it better to reduce noise or crowding? Is it better to foster cognitive growth or socioemotional adaptation? Such questions interact with the information provided in this volume. Suppose there were a higher social value on cognitive than social competence, but more was known about the effects of chaos on social development. How would one decide where to intervene? This volume has offered a major foundation for such discussions while at the same time pointing to the research necessary to further answer such questions.

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