Causes of Behavior Development and Contextual Variables

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Understanding human behavior and its development involves identifying and analyzing its causes, that is, its origin, structure, substrate, function and the contextual interacting variables. This paper discusses various types of causal explanations for behavioral development and introduces the concept of contextual variables called "interactants." It provides illustrations from infant research that suggest that behavior analysis of development is moving beyond the mere analysis of the components of Skinner's three-term contingency into a principle-based understanding of contextual variables.

Analyses of Aristotle's notions of explanations have identified several types of causes of behavior including efficient, formal, material, proximal and final causes (e.g., Killeen, 2002; Rachlin, 1992; Schlinger, this volume). In what follows, I have attempted to broaden the historical fascination with Aristotelian causes by including the anal sis of contextual interactants in the study of the determinants of human development

Efficient causes are the elicitors of behavior change. These are the stimuli in the environment that trigger or elicit a change or a response. The efficient causes are identified in early behavior development because they make the early components essential for later developmental outcomes. They are what initiate a developmental change. In early human development, one of a neonate's greatest strengths for survival is starting with a full set of useful reflexes. These involuntary and automatic responses to stimuli originally have a clear adaptive value, as when infants turn their heads in the direction of a tactile (touch) stimulus to the cheek and search for something to suck, or when infants suck an object placed into their mouths, allowing them to take in nutrients. Many of these basic survival reflexes later disappear or become operant responses. Another example of an efficient explanation in development are the teratogens, which involve any environmental agent, drug, disease that causes harm to the developing fetus by triggering physical deformities, severe mental retardation, and retarded growth.

Material causes are the substrates, machinery, or material components that can be identified as *forming the behavior.* Geneticists use the genes and DNA strings as explanations for behavior and development once their location has been identified. For instance, one important genetic disease produced by a dominant gene is Huntington's disease, a condition that causes a gradual deterioration of the nervous system, leading to a progressive decline in behavioral abilities and ultimately to death. Another example is Fragile-X-syndrome, a leading cause of mental retardation, caused by an abnormal gene (genotype) on the X chromosome that is more likely to be expressed (phenotype) when passed from mother to child. Also, many neuroscientists and psychologists use brain imaging (MRI) and its neurosubstrates to explain behavior changes. Researchers study neurotransmitters to discern their role in behavior and emotion. For example, when imbalances occur in the brain neurochemicals, this is said to cause depression (changes in cortisol, dopamine and serotonin levels have been associated with depressive symptoms). Natural opiates, such as endorphins, which are released in response to pain and vigorous exercise (Farrell, Gates, Maksud, & Morgan, 1982) have been used by researchers to explain all sorts of good feelings and happy moods, such as the "runner's high," or the painkilling effects of acupuncture caused by endorphins. These are reductionistic explanations of behavior that often times are inaccessible to the observer; and frequently, these presumed explanations are either concomitants or outcomes of another more fundamental process or cause in which a different, more molar, level of analysis would be required, in which behavior would be seen as emerging from the organism contingent upon interactions with the environment.

Formal causes are models, paradigms, equations or formulas used to explain behavior. In behavioral psychology, the matching law is an example (Herrnstein, 1970). The formula states that relative responding matches the relative reinforcement produced by that responding. The matching law summarizes organism performances on a variety of schedules of reinforcement. Often times, in the absence of material, efficient, and functional causes, the formal causes are useful. Another example is the schematic model of the human information processing system (Atkinson & Shiffrin, 1968). The store model explains how information flows through a series of separate but interrelated sets of processing units, or stores. It attempts to attribute the functions of memory, retrieval, and problem solving to this schematic theoretical model. Killeen (2002) presents as examples of formal causes the traditional associative (conditioning) and computational models of learning, and he explains how these models are formulated in the languages of probability and automata, respectively. In developmental psychology, a popular model is Bronfenbrenner's (1979) ecological model

of the environment in which a series of nested structures (i.e., microsystem, mesosystem, exosysstem) surround the individual. The developing person is said to be at the center of, and embedded in, these layers of systems that range from the individual's immediate surroundings, to the family, schools, society and culture. The model has been criticized because it does not provide a causal explanation of why children learn and how they process information for problem solving (it lacks a functional explanation for behavior change).

Final causes are the *functional explanations* of behavior change. What is the purpose of behavior? What is behavior development supposed to do or ultimately accomplish? These are questions that developmental psychologists often address. At least two types of functional causes: proximal and distal/ultimate causes can be conceived. Reinforcement is an example of proximal cause, whereas survival of the fittest, or behavior selected by long-term consequences in evolution, are seen as maintained by ultimate causation (also see Schlinger, this volume). Humans behave in ways to maximize their success and chances of survival. The study of human development is concerned with the proximate as well as ultimate causes of behavior. In the second part of this paper, I identify a taxonomy of the historical and contemporaneous variables (also called interactants) mostly in the ontogenetic learning history of individuals dynamically interacting with their environment.

A dynamic systems approach to development emphasizes that none of these explanations makes sense in isolation without specification of the other three. Killeen (2002) has also stated:

> Of all behavioral phenomena, conditioning is the one least able to be comprehended without reference to all four causes: The ability to be conditioned [both classical and operant] has evolved because of the advantage it confers in exploiting efficient causal relations (p. 137).

In the dynamic systems approach of Novak and Peláez (in press), the efficient causes are seen as initial conditions for behavior development (reflexes into operants) whereas the final causes are seen as the terminal conditions (e.g., reinforcement, evolution). The functional causes are not considered as alternatives to efficient causes but as complementary, an inseparable functional and dynamic unit. (For other discussions on efficient vs. final explanations, see Rachlin, 1992).

Thus, these are all complementary causes: the *efficient* (triggers), *material* (substrates), and *final* (functional) causes can be identified in the *formal* cause of the three-term contingency model Sd----R----Sr in which: (a) the efficient causes reside in the controlling/interacting antecedent stimuli (e.g., Sd) and on the contextual organismic variables (e.g., initial boundary conditions like deprivation and the eliciting/triggering effects of environment); (b) the material causes reside in the deconstruction of the R into the substrates of both overt response (e.g., speech activity) and also the covert-activity such as the neurological; (c) the functional causes reside in the Sr or controlling consequences (e.g., schedules of contingencies).

Discriminative and Reinforcing Functions of Stimuli

Developmentalists who use the operant learning paradigm (Peláez-Nogueras & Gewirtz, 1997) have been clear in that a stimulus that functions as discriminative for a particular response in a given context need not function as an S^D for a different response in the same context for the same response in a different context or for the same response of a different person in the same or a different context. An organism's responses are functionally related to the controlling stimuli. No comprehensive empirical account of the causes of behavior development can be attained if the functional relations between stimuli, responses, and contextual variables are not delineated.

Increasing evidence shows that the effectiveness and the function of a stimulus in controlling an individual's behavior (by evoking/discriminative and reinforcing functions) depends upon the *contextual interacting variables*, including the current and historical, organismic/biological and environmental/ecological variables discussed in this paper.

Linear Causality versus Nonlinear Interactionism

The typical view of causality in mother-child studies, particularly in controlled laboratory experiments, has been linear. Linear causality models (e.g., Rapoport, 1968) and traditional research methods have defined causality in terms of a linear relationship between antecedent stimuli, behavior, and consequent events. The concept of causality, as reflected in classical deterministic and mechanistic models, represents problems for understanding behavior development and its dynamic nature. An understanding more consistent with a dynamic systems model requires an analysis of the interdependence between this three-term contingency and the interrelated contextual variables participating. This type of analysis presents a major challenge because the many contextual variables involved can create multiple patterns of functional relations in the antecedent discriminative and reinforcing stimuli operating. The existing traditional methods in basic and applied research ordinarily do not take these multiple interrelated influences into account.

There has been interest in determining whether the behavior of the mother provides the proximal causes of the behavior of the child (see Gewirtz & Peláez-Nogueras, 1992b for a review of operant learning studies in infancy). At other times, it has been asked whether the behavior of the child is a proximal cause of the mother's behavior (Gewirtz & Boyd, 1977). More recently, it has been shown in research analyzes that the behavior of the mother and the behavior of the child function not only as concurrent influences on each other, but also as functions of the contextual conditions within which these behaviors are embedded (e.g., Peláez Nogueras, 1989). The cause of the behavior change depends on the multiple interacting variables. The goal is to expand behavior-analytic methods by moving into both descriptive and functional analyses of the contextual determinants of behavior.

Strong Effects of Interacting Contextual Variables

In addition to altering the efficacy of discriminative and reinforcing stimuli, the contextual variables also determine the functionality (and directionality) of stimulus effects (e.g., whether a stimulus functions as positive reinforcer or punisher). Hence, contextual variables not only inflect behavior and the various antecedent and concurrent variables (e.g., inhibitory and facilitatory mechanisms), but also affect the interplay between reciprocal interactions among stimuli and response functions in context. Because contextual variables interact reciprocally with behavior, these variables can be seen to alter the functional relations within the three-term contingency. Indeed, the probability of behavior change at any given moment, even within a narrow segment of the life span, may vary as a function of diverse contextual conditions.

Numerous researchers have dealt with these variables under different headings: "third variables" (Skinner, 1931), "setting factors" (Kantor, 1946), "setting events" (Bijou & Baer, 1978; Bijou, 1996), "state" and "potentiating" variables (Goldiamond & Dyrud, 1967), "contextual determinants" (Gewirtz, 1972; Morris, 1988; Peláez-Nogueras & Gewirtz, 1997), and "establishing operations" (Michael, 1982, 1993). But rather than take context as a source of variation and hold it constant--which has been the typical research method within behavior analysis--the historical and current context should be a subject matter for experimental analysis (Morris, 1988, 1992). Knowledge of phylogenic history (i.e., species-typic boundaries and preparedness in biological structure/vulnerability and behavioral function) and ontogenic historical causation (individual-typic boundaries and preparedness in biological and behavioral form and function, and variability in both) is fundamental for a complete behavior-analytic research strategy. The structure of the current context involves the biological organism (i.e., the child's anatomy and physiology), the environment (physical ecology), and the changes and variability in both. The function of the current context can potentiate or actualize the functions of stimuli and responses. The function of contextual variables for stimuli and responses involves the analysis of variables such as deprivation, illness, fatigue, drug effects, and history of reinforcement, among many others.

Contextual Variables as "Interactants"

As mentioned in the introduction, the contextual variables that have been emphasized are not restricted to static boundary or initial conditions; they are "interactants," to borrow a term from Oyama (1985). It is preferred by the author to have preferred to use the term contextual interactants to stand generically for all developmentally-relevant factors over other terms such as "setting factors," "setting events," "establishing operations," "potentiating variables," and "third variables," because it has not always been clear what these other terms were intended to encompass (Peláez-Nogueras & Gewirtz, 1997). Even so, one should be cautions because all such terms may carry considerable explanatory burden in an interpretive account (Marr, 1993). For this reason, I restrict the usage of contextual interactants to the identities of fundamental classes of variables that interact with the behavior of the organism and with the discriminative and reinforcing contingencies that control it.

The study of "context" is challenging because context should not be limited to those conditions that influence the effects of reinforcing stimuli, such as motivational variables (e.g., deprivation), or establishing operations (Keller & Schoenfeld, 1950). Nor should studies be limited to controlling the boundary or initial/static conditions in the test chamber (e.g., temperature, or light). The effects of the contextual interactants need to go beyond variables that have momentary effects. That is, these variables are not static in natural environments, and thus should not be kept constant by the researcher. Furthermore, they are continuously interacting with the organism's behavior as well as with other environmental variables, and therefore are interdependent.

Although behavior analytic research for many years has been capable of predicting and controlling behavior without knowledge of the roles of contextual interactants, such research has been limited to behavior that is highly stable and mostly under laboratory conditions. Such research may fail to contribute to the understanding of complex dynamic human interactions. In human behavioral development, it is precisely the multidirectionality of behavior and its variability, within and between individuals, which are the phenomena of interest. Behavior that shows stability may be easy to predict, but behavior with variability is often not well understood and is difficult to predict.

Context in the Study of Dyadic Interactions

If contextual determinants of behavior are to be investigated, some departures from and expansions of the traditional behavior-analytical methodologies may be necessary. For instance, Wahler and Fox (1981) have proposed that behavior-analytic methodology should focus on at least three features: a) the measurement unit (global entities monitored through molar units of measurement), b) the temporal relations among the unit of study (where we should have no a priori assumptions about "ideal" or necessary time spans between relevant contextual variables interacting and the particular behavior under study), and c) the mode of analysis (alternative methods to the experimental analysis, like descriptive and correlational methods). Their program of research suggests ways of studying contextual variables in applied behavior analysis.

Understanding Dyadic Interactions

For the behavior-analytic researchers studying human dyads (pairs), it is axiomatic that a response of one of two actors (A) that routinely follows a recurring response of the other actor (B), can constitute a reinforcement contingency for actor B's response if it increases systematically in rate. Similarly, the increase in B's rate of responding may also

function as a reinforcer for A's response and A's response will also increase in rate. Thus, one feature of the dyadic interaction is the potential bidirectionality of reinforcement effects--each actor's behavior is influenced by the behavior of the other. However, a problem in the study of spontaneous dyadic interactions, for instance in the parent-infant case, is that the identity and topography of response elements of the set of turn-taking responses (e.g., smiles, touches, vocalizations, turning away). During these interactions, each member of the dyad can change at every turn in the series. For this reason, behavior analytic researchers who have tried to study the effects of reinforcement contingencies on dyadic behavior have missed the flow of influence in such interaction sequences because one of the variables is held constant. For example, in mother-infant dyadic interactions the turn-taking response of one dyad member (typically the mother) is controlled or manipulated, while the infant's response that provides the dependent variable is left free to vary (e.g., Gewirtz & Peláez-Nogueras, 1991, 1992a; Peláez-Nogueras, 1989; 1992; Peláez-Nogueras et al., 1996a; 1996b; Poulson, 1983).

Recently, however, operant developmentalists have begun to analyze infant-mother interactions in natural interaction settings without the use of a limiting experimental procedure as above. For example, the behavior analyst may record the behavior-unit elements of each of the two interactors in sequence and then search for conditional relations between adult behavior elements at different turn positions (sequential lags) for each infant behavior of interest (e.g., Haupt & Gewirtz, 1968; Patterson & Moore, 1979). By observing the conditional probabilities in sequential-lag analysis, the researcher can examine the impact of presumptive reinforcement contingencies for each infant target response under ecologically valid circumstances while taking contextual variables into consideration (e.g., stratifying for contextual functions).

Attempts at Studying Multiple Interactions

There are several models for studying multiple interactions. For instance, contingency frequency analysis is a data-analytic model that attempts to analyze patterns of multiple interactions in causal fields (von Eye, 1990). The lag-sequential model analyzes the contingency and cyclicity in behavioral interaction (Sackett, 1979). Even so, these tools for identifying *functional* relations among large numbers of responses in interaction still pose difficult problems. The method of sequential analysis of dyadic responses is not optimally conducive to translating the contingencies implied into reinforcement effects. This is because at every turn in the interaction sequence, there could be different behavior combinations emitted by a dyad member, different numbers of responses can occur concurrently, and/or a particular dyad member's behavior might occur intermittently or infrequently. Thus, the behavior-analytic model may have difficulty isolating the functional relations involved. In the past, these complications led many behavior researchers to study the flow of influence in two-way parent-infant interaction in experimentally contrived settings, in which the responses of one member of the dyad are controlled.

Kantor (1924) originally distinguished between organismic and environmental setting factors and placed "immediacy" as a temporal restriction on the effects of setting factors. Morris (1992), however, emphasized that the distinction between historical and current context is necessary and should not be defined temporally or structurally. Rather, he suggested a functional distinction between current and historical context based on effects: "The historical context established what behavior may occur, as a disposition, whereas the current context enables what behaviors can occur and, if it can occur... whether the functional relations will be actualized" (p. 7).

Classification of Contextual Interactants

A taxonomy of current and historical, phylogenic and ontogenic, biological-organismic and environmental-ecological contextual variables, in terms of form and function of context has been outlined in detailed by Morris (1992). Earlier behavior analysts provided a classification of contextual qualifiers (Gewirtz, 1972), setting events (Bijou & Baer, 1978; Bijou, 1996), and establishing operations (Michael, 1982). In what follows, I will elaborate on these contextual taxonomies while highlighting several studies, mainly from the infancy literature, that will illustrate the function of the contextual variables.

Contextual variables may operate either concurrently with or preceding the stimulus-response interaction under study. Thus, they can be classified into two main categories: historical and contemporaneous (Gewirtz, 1972; Morris 1992). These two can be ordered along several dimensions, some which inevitably overlap. Historical contextual interactants can be readily interpretable as outcomes of learning (e.g., history of respondent and operant conditioning, habituation). The concept of contextual variables also includes such antecedent conditions as previous stimulus-response interactions. To study the "act in context" also means the study of the historical context that includes the individual's earlier learning experiences (i.e., history of conditioning). This history of behavior and contingencies is certain to influence the functional relations among stimuli and responses in subsequent interactions. These historical variables (that I call here interactants) thereby can affect the reinforcing contingencies that will be effective for behavior and developmental change (e.g., Wanchisen & Tatham, 1991). The conditioned value of a particular reinforcer source is one example.

Contemporaneous contextual interactants that heighten stimulus saliency for the most part do not appear to be established through learning (e.g., deprivation-satiation context for a stimulus ground that contrasts with a stimulus figure). Typically these are variables associated with a person's biological, physiological or organismic characteristics (e.g., genes, physical characteristic, organ functions), and organismic constraints such as fatigue, deprivation, illness, drug, hormonal changes) determine the efficacy and function of discriminative and reinforcing/punishing stimuli.

These biological variables both influence and, reciprocally, are influenced by discriminative and reinforcing stimuli.

Research Examples with Infants and their Mothers

In early interventions (Peláez-Nogueras, Field, Cigales, Gonzalez, & Clasky, 1994) depressed mothers who were *withdrawn* and unresponsive to their infants' cue, were trained to use an attention-getting procedure to elicit/evoke, and to respond contingently to, their infants' initiations of given behaviors. On the other hand, depressed mothers who were *intrusive* and overstimulating were trained to decrease the amount and degree of stimulation and the contingencies they provide their infants via imitation (Malphurs et al., 1996).

Under both procedures, mothers learned to regulate their behavior and also to detect the behavioral cues that their infants emit during the interaction. One such cue for the mother was the infant's state of arousal from deep sleep, to active alert, to high arousal as assessed by the Carolina Record of Individual Behavior, or the Brazelton Neonatal Behavior Assessment (Brazelton, 1973). If a mother initiated an action when the infant is at either end of the arousal continuum, the infant would likely not respond positively. A mother can readily detect these states following training. Hence, the infant's state of arousal is an intrachild variable denoted by the infant's overt actions that set the context for the next interaction. But more important to the theme of this article, the infant's state of arousal may change during the interaction and a well trained mother adjusts the quality, timing, and intensity of the stimulation provided. The interaction is a dynamic ever-changing process, and to determine whether training for the mother is effective, it is important to record whether the mother's behavior changes systematically with changes in the infant's behavior. This is difficult to demonstrate if the infant's behavior is held constant.

Prenatal Experience as Determinant of Later Preferences

One example of a contextual interactant is that earlier experience determines stimulus efficacy on later operant learning. This point can be illustrated by the work of DeCasper and associates, who demonstrated the impact of systematic prenatal auditory exposure on postnatal operant conditioning (e.g., DeCasper & Fifer, 1980; DeCasper & Prescott, 1984; DeCasper & Spence, 1986). In the DeCasper studies, human newborns exhibited increased nonnutritive sucking to produce the acoustic properties of a speech passage their mothers had recited repeatedly during the last trimester of gestation, compared to a passage their mothers had not recited--i.e., they preferred the maternal passage (DeCasper & Spence, 1986). Also, the maternal voice, to which the fetus was exposed during gestation, was found to function as a more effective reinforcer for the newborn (as evidenced by high sucking response rates) than did a stranger's voice, to which the infant was never exposed (Spence & DeCasper, 1987). These studies indicate how in-utero auditory experience can affect postnatal behavior and learning.

Learning to Reference in Unknown Contexts

In the area of infant socio-emotional development, infant social referencing in ambiguous contexts (i.e., infant behaviors being cued by maternal facial expressions) and subsequent behavior can result from operant learning generated by positive and aversive contingencies for differentially cued infant behavior in those ambiguous contexts. For example, Gewirtz and Peláez-Nogueras (1992a) showed that maternal facial response-cues need not be limited to those providing affective or emotional information to their infants, such as those of joy and fear, as proposed by Campos (1983). Nine-month-old infants learned to socially reference nonsense, originally arbitrary, maternal expressions. The results of that study suggest that the extent to which an infant turns to search its mother's face for discriminative expressive cues in contexts of uncertainty depends on success in obtaining such information, its validity, and its utility in such a context.

The Role of Context in the Initial Formation of Attachments

Two experiments conducted in our laboratory to study mother-infant attachment (Gewirtz & Peláez-Nogueras, 1991; Peláez-Nogueras, 1989) demonstrated how infant protests can come under the close control of discriminative stimuli and reinforcement contingencies generated by a mother's behaviors in different contexts. The infants' protests were conditioned in two *contexts*: during maternal departures and during brief maternal separations from the child. By changing the cues and contingencies provided by the mother in the two contexts (departure and separation), we were able to demonstrate that infants learned to respond differentially to maternal departures and separations, in addition to maternal cues and contingencies. That is, in one condition their protests were conditioned during their mothers' departures, and they learned a behavior as an alternative to protest immediately after the separation occurred. In the second condition, the infants learned the inverse relation of protests to context: that is, to play with their toys during maternal departures and not to protest to her "goodbye" cues, while protesting immediately after she left the room (separations). Those two conditions showed that such infant protests can be differentially shaped by patterns of contingent maternal cues and contingencies in two distinct settings. They also provide evidence for the conditioned basis of the separation protests that, in the developmental literature, have served as indices of attachment for Schaffer and Emerson (1964), as denoting security or insecurity of "attachment" for Ainsworth and Wittig (1969), and as index of "separation anxiety" for Kagan, Kearsley, and Zelazo (1978).

In sum, a behavior-analytic approach to development calls for an analysis of stimulus structure and functions,

response structure and functions, their interchange at a particular point, and the sequences of such interactions across successive moments. Behavior analysts should be interested not only in the principles responsible for the changes observed in behavior, but also in the different directions, speeds, and contingency arrangements that result from the behavior-environment interchanges, and on determining how the contextual variables alter these interactions. The operant learning paradigm provides a valuable model for the study of infant (indeed all human) development, if only to determine which behavior change denoting development could, and which could not, be susceptible to learning operations. Thus, learning operations can focus those contextual/environmental factors that can inflect the course of human development.

Contextual Interactants can Change Stimulus Function

As the infant behavior repertoire increases and becomes more complex (due to maturational/organismic processes and changes in socialization practices), some of these potential discriminative and reinforcing stimuli may drop out functionally to be superseded by others, or their relative ability to function as reinforcers may change. The nature of the event patterns constituting the discriminative and reinforcing properties of certain stimuli change as the infant physically matures and moves from one capacity level to a higher one. For example, the social (and very likely conditioned) stimulus of attention produced by the parent may be superseded in salience by that of verbal approval provided by parents for successively more complex performances. This occurs in restricted settings in which the parent's cues (e.g., as denoted by smiles) signal the delivery of most of the array of important reinforcing stimuli for the child. A developmental analysis of infant behavior, for example, would examine changes in the efficacy of discriminative and reinforcing stimuli for diverse infant behaviors, considering changes in the infant's receptor and effector capacities due to early neonatal stimulus response interactions.

A Comment on Research Methods

To behavior analysts who rely only on experimentation to understand functional behavior-environment relations, the results of interpretive methods might seem speculative and subjective. Knowledge obtained from experimentation, however, is no different from any other knowledge. This is because results from experimental methods require as much interpretation as any other kind of data (Dougher, 1993). Whether using interpretive, narrative or descriptive methodologies, new research techniques that focus on understanding the relation between behavior and its contexts seem consistent and could be exercised within behavior analysis. Descriptive and interpretive methods allow us to identify variables that predict behavior and that can later be used in a functional analysis.

Conclusion

I have emphasized that both contingencies and contextual interactants are primary causes of behavior development. Consequently, the probability of an individual learning at a given developmental point will vary not only as a function of reinforcing stimuli (or punishers), but also as a function of the historical and contemporaneous contextual variables interacting (or participating).

The study of the contextual interactants may help behavior analysts interested in human development to explain the multidirectionality of behavior development, intraindividual variability, and interindividual differences. Moreover, identifying and when possible manipulating these variables is indispensable for a proper analysis of the effects of stimulus control on behavior change. By identifying these variables in our descriptive analyses or including them in our subsequent functional analysis (by controlling reinforcing contingencies and manipulating context), or by conducting frequency analyses, sequential analyses, and other methods, we may be able to better understand and predict behavior change and to explain behavior variability. Furthermore, we may work more successfully with existing data and generate new information about human behavior, constituting information that would lead us to a greater understanding of human behavioral development than has been achieved thus far.

Perhaps the change and growth that has taken place in behavior analysis of human development within the last decade suggests that behavior-analytic theory may be undergoing a paradigm shift. I take a risk and say that it may be moving to a new stage of behavior analysis: a stage with adventurous researchers who wish to contribute toward solving everyday practical problems and towards a greater understanding of human interactions in context.

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