

Mayville

Behavioral Foundations of Effective Autism Treatment

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editors

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[Table of Contents](#)

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Behavioral Foundations of Effective Autism Treatment is a comprehensive volume of key topics in behavior analysis for individuals with Autism Spectrum Disorders (ASD). Consisting of 17 chapters by noted experts in clinical research, this book is an authoritative resource in helping students and clinicians understand and apply behavior analysis to a wide variety of ASD-related issues.

The first section, "Theory and Conceptual Issues," provides behavioral conceptualizations of key issues and careful analyses of relevant learning processes. Specific topics include behavioral theories of autism, behavior analytic language and interventions for autism, verbal behavior, cumulative-hierarchical learning and behavioral

cusps, joint attention, and complex social behavior. The second section, "Clinical Practice Issues," contains in-depth description of key clinical practice topics, including Early Intensive Behavioral Intervention, continuum-based education and treatment models, prevention and treatment of severe problem behavior, interventions for adolescents and adults with ASD, psychopharmacology and behavior analysis, Precision Teaching, and Direct Instruction.

Table of Contents:

1. Behavioral Theory of Autism: Lessons from 50 Years of Research
Crighton Newsom
2. Autism: A Behavioral Systems Approach
Gary Novak and Martha Pelaez
3. Behavior Analytic Language and Interventions for Autism
Philip N. Hineline and Stacy Groeling
4. Verbal Behavior: An Operant Analysis of Language
Linda A. Leblanc, Kaneen B. Geiger, and Rachael A. Sautter
5. Joint Attention and Behavior Analysis *Per Holth*
6. An Analysis of Complex Social Behavior
Louise McHugh
7. Functional Analysis of Behavioral Disturbance Related to Autistic Symptomatology
Iser G. DeLeon and colleagues
8. Cumulative-Hierarchical Learning and Behavioral Cusps
Michael D. Hixson and colleagues
9. Some Current Dimensions of Translational Behavior Analysis: From Laboratory Research to Intervention for Persons with Autism Spectrum Disorders
William J. McIlvane and colleagues

10. Early Intensive Behavior Analytic Intervention for Autism Spectrum Disorders
Gina Green
11. Continuum-Based Model of Behavioral Treatment for Children with Autism: A Multi-Factor and Multi-Dimensional Perspective
Raymond G. Romanczyk and colleagues
12. Behavior Analytic Interventions for Adults with Autism Spectrum Disorders
Peter F. Gerhardt and Mary Jane Weiss
13. Prevention and Treatment of Severe Problem Behavior
Gregory P. Hanley

14. Psychopharmacology and Behavior Analysis in Autism Treatment

Alan Poling and colleagues

15. Precision Teaching and Behavior Analysis

Richard M. Kubina, Jr. and Fan-Yu Lin

16. Direct Instruction: Relevance and Applications to Behavioral Autism Treatment

Cathy L. Watkins, Timothy A. Slocum, and Trina D. Spencers

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Running head: Behavioral Systems and Autism

Autism: A Behavioral Systems Approach

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Human development involves constant behavior change influenced by dynamical forces and multi-level systems. The ever-changing child is in continual and reciprocal interaction with a continually changing environment. The environment both is affected by and effects changes in the child. In turn, the child both is affected by and effects changes in the environment. In this presentation we discuss the principles of behavioral systems and relate them to the concept of autism from a behavior-analytic perspective. We will argue that to be complete, the analysis of “autism,” should be developmental and contextualistic both in theory and practice.

This chapter explores the application of principles of behavioral development and attempts to treat autism as a developmental disorder involving the dynamic interplay of the organism and environment over time. We will make the case that interactional skills such as mutually responsive orientation, joint attention, social referencing and child’s relating (as in derived relational responding) should warrant a potentially important place in early behavior-analytic intervention programs, especially those aimed at establishing critical language prerequisites. We take into account genetic and environmental transactions and highlight the factors that appear to significantly impact the emergence of this pervasive developmental disorder.

The approach we have taken in the past (Novak & Pelaez, 2004) views psychological disorders as characterized by a set of behaviors that deviate in some relative and often arbitrary way from those considered normal or typical.

Usually, the behaviors deviate in one of three ways. First, some behaviors, such as stereotypical and self-stimulatory behaviors, may be excessive. They are excessive in that they occur at too high a frequency or magnitude compared to their level in typically developing

children. While most normal individuals engage occasionally in self-stimulatory behavior, such as twiddling their thumbs or stroking their chin, deviant or socially unacceptable self-stimulatory behavior occurs at magnitudes or frequencies that are too high. The hand flapping of an autistic child is considered problematic when it is violent or frequent. Second, some behaviors are deemed deviant because their frequency, magnitude, or duration is too low. Low levels or frequencies of social interaction and communication characteristic of autism fall into this category. Last, behaviors may be considered deviant if they occur under the wrong stimulus control conditions. Echolalia, which is frequently displayed by autistic children, is an example of speech being present, but rather than occurring under the control of environmental objects (as would be the case with mands and tacts), echolalia is under point-to-point control of a model's speech (as with echoics).

While behavior analysts focus on specific behavioral excesses or deficits, the term "autism" often connotes more. To many, the term suggests an internal disorder that the child "has" rather than something the child does. Treated in this manner, as an entity that causes behavior, the term autism is a reification, and in our view, unwarranted. Rather than being a causative biological entity, autism is a description of what the child does. But rather than merely describing individual behavior classes, autism should be a term describing organized patterns of characteristic behaviors.

The Changing Definitions of Autism

The definition of autism has shown continual change since it was first identified by Leo Kanner (1943). As originally defined by Kanner, autism was characterized by 1) profound lack of affective contact with other people, 2) an anxiously obsessive desire for the preservation of sameness, 3) a fascination for objects, which are handled with skill in fine motor movements, 4)

a level of language that does not seem to be intended to serve inter-personal communication, and 5) an intelligent, pensive physiognomy and good cognitive potential. By the time of DSM III (1980), the definition of autism had changed to include the following three characteristics: 1) Lack of responsiveness to other people, 2) Gross deficits in language development including peculiar speech patterns such as immediate and delayed echolalia and pronoun reversal, and 3) Bizarre response to various aspects of the environment. The definition has continued to change so that the current DSM IV-R lists three main categories: A) qualitative impairment in social interaction, B) qualitative impairments in communication, and C) restricted repetitive and stereotyped patterns of behavior, interests and activities. Today, there are four subcategories under each, and the diagnosis requires a total of six (or more) items from (A), (B), and (C), with at least two from (A), and one each from (B) and (C).

These changing definitions of autism could in part be responsible for the increased diagnosis of autism (Wazana, Bresnahan, & Kline, 2007). Along with the changing definition, heightened awareness of the disorder in the professions and the media is also likely responsible in part for the greatly increased diagnosis of autism. Autism has moved from being considered very rare in 1958, with an estimated prevalence of less than 1 percent of Kanner's initial clinical cases (Leo Kanner, 1958), to an estimated one in 150 of all American children in 2007 (Yeargin-Allsopp & Rice, 2007). The causes of this enormous increase in the estimates of the prevalence of autism have been widely debated and the increase has been attributed to many factors. In particular researchers are focusing on various environmental pathogens, increases in the frequency of diagnoses due to greater public and professional awareness of this disorder, and the broadening of diagnostic criteria.

The current DSM-IVR diagnosis of autism is complex and requires at least six characteristics, with at least two each chosen from the four listed in each of the three major categories. This means that there are hundreds of unique possible combinations of characteristics that can produce a diagnosis of autism. Therefore, instead of one disorder there are literally hundreds of possible patterns of autism. Consequently, from a behavioral development viewpoint, we should be speaking of “autisms” not “autism.”

The range of possible behaviors may be organized differently for each individual and may be a function of different developmental pathways resulting from multiple causes in complex interaction. Different constellations of characteristics may, with the influence of multiple interacting factors, result in different developmental outcomes and behavioral irregularities. At the most basic level, one may ask if autism has a biological cause, or an environmental one. Causation of psychological disorders is not nearly so simplistic that there is but a single cause. Rather, for any individual showing characteristics diagnosed as autism, the developmental principle of “multiple determinism” suggests that the disorder is likely to be some combination of “causes” none of which works in isolation of the others (Pelaez, 1996). Furthermore, the constant interaction of these factors develops over time, during which millions of social and non-social interactions occur. While the notion of biological “predispositions” has been a popular theme in the autism field, as it is with in other psychological disorders, the concept of predisposition is generally overly simple and unidirectional. We argue here for autism as a set of pluralistic developmental disorders in which the course of development is influenced by multiple factors in reciprocal interaction or transaction over developmental time.

Multiple Determination and Causation

Elsewhere we have outlined a Behavioral Systems Approach that suggests five major categories of behavioral determination (Novak, 1996; Novak & Pelaez, 2004). These five (see Figure 1) are 1) the genetic-constitutional make-up of the individual and the biological equipment that results, 2) the learning or interactional history of the person with the environment, 3) current physiological conditions, 4) current environmental (in the sense of stimulus) conditions, and 5) the influence of earlier behavioral trajectories on current development, or behavioral dynamics, including behavioral momentum and behavioral inertia (Hake, Azrin, & Oxford, 1967). Early intensive behavioral intervention (EIBI) focuses primarily on the current environmental conditions, and establishing a highly effective learning environment. By intervening early and intensively, we may be able to replace a potential history of autistic interactions with a functional social and communicative one.

Within the five broad categories of causation there are, of course, thousands of possible specific influences, many of which may have no influence by themselves in isolation, but in combination with others, and given early, and frequent influence, may crucially impact the development of the organization of autism in an individual. Different children may have different interactive combinations of influences fitting under the five factors. As the developmental principle of “equifinality” implies, these different combinations may produce similar outcomes of behavior denoting autism. It is possible that there may never be found a single “cause” (gene or environmental factor) of autism since it appears that there is no single disorder that should be named ‘autism.’ Furthermore, we argue that autisms, or autistic patterns of behavior may result from these ever changing dynamic interactions over time. Although there may be detectable

behavioral precursors of autism, it may take two- to- three years for the autistic pattern of behaviors to become sufficiently organized into a pattern that can be diagnosable as autism.

Multiple Levels of Systems

We also argue for viewing autism from multiple levels of systems (see Figure 2). Thus, our behavioral systems approach is a multivariate, multilevel (Ford & Lerner, 1992) one. Horowitz (1987) suggested that development could be analyzed at different levels of systems. As viewed from a behavioral systems approach, these levels exist contemporaneously, with increasing complexity of the system as we move up the systems levels. We categorize the levels of analysis of psychological systems as System Level I: Basic processes of development; System Level II: Emergent characteristics; System Level III: Social interactions; and System Level IV: Societal and cultural contexts. We have also suggested that biological structures such as organ systems (including the brain and the rest of the central nervous system) could be seen as another level of systems (System Level 0) (Novak, 1996; Novak & Pelaez, 2004).

The sets of individually organized patterns of behavior that are diagnosed as autism emerge out of the basic processes of learning and physical development that we focus on when we use a Level I analysis. Most behavioral learning principles function at this level. The organized pattern of behavior diagnosed as autism is viewed from the System II level. In that regard, it emerges like other organized and emergent characteristics, such as language, cognition, and personality from basic processes. It is useful to employ Lundin's (1961) behavioral definition of personality as "that organization of unique behavioral equipment an individual has acquired under the special conditions of his development (p. 7)" to autism as well. What is important in this definition is that it is the unique organization of the child's behaviors rather than individual behavioral classes that constitutes a diagnosis of autism. Furthermore, when the

behaviors are organized around the same constellation of behaviors specified in the DSM-IV, the diagnosis is autism. Thus, individuals may have unique organizational patterns, but must share enough overlap with the diagnostic patterns that the child is identified as autistic. Children sharing some of the organized patterns brought together by non-social reinforcers and avoidance of social reinforcers, but share more sophisticated language and cognitive patterns are diagnosed with Asperger's Disorder, a form of autism. These children will have very many characteristics distinct from non-Asperger's Disorder autistic children, but fall onto the autism spectrum by virtue of the organized non-social pattern they display.

While the organized patterns of behavior that we call autism is the result of analyzing at Systems Level II, it is important to recognize the role that analysis at other systems levels can provide. Many researchers are looking for explanations of autism solely on the biological level. We feel that this level of reductionism is not especially useful by itself for what is essentially a psychological disorder. However, analyzing in terms of biological/environmental interactions seems very important to us in understanding under what conditions autistic patterns of behavior emerge and are maintained (Thompson, 2005, 2007). Furthermore, it seems useful to look at the level of social interactional systems that are involved in the development of autism, especially in light of the importance of impaired social interactions in identifying autism. While social and cultural practices may influence the type of social interactions and basic processes contributing to autism (e.g., whether or not to immunize children), at this time little is understood about analysis at this highest level. In what follows we will describe the behavior systems principles as applied to autism.

Equifinality

The principle of ‘Equifinality’ in behavioral systems describes a snapshot of developmental measurement where characteristics of individuals appear to be the same, although they may have reached this point through very different pathways (Novak & Pelaez, 2004). A broad diagnostic category, such as the DSM-IV’s autism category, makes it more likely that individuals will be treated as if they are the same even though developmentally, they are not. The important point here is that all of these children are treated as equal by virtue of their diagnosis of autism and not necessarily because of similar causation. Consequently, all autistic children included in studies of autism are treated as if they are the same, when in fact, developmentally they are very likely quite heterogeneous. As suggested earlier, each child included in the study may have their own organization of physiological, historical, and environmental determinants, and the unique organization may mean different causation, different behavioral organization, different prognoses, and different outcomes.

Differential causation may mean that some autistic children have profound physiological or neurological impairment, while others may have none. Similarly, other unique dynamic combinations of physiology, environment, and history will be responsible for producing similar outcomes. In typical development, equifinality is to be expected. In abnormal development, especially when the diagnostic criteria are so broad and dispersed, equifinality should be anticipated.

Non-linearity in Development - Phase Shifts and Cusps

The common view of disorders assumes a linear model of development (Sameroff, Woodhead, Carr, & Light, 1991). In autism, this means that the child inherits or contracts autism and continues to show constant or worsening levels of autistic behavior over age. In a linear model, specific behavior, such as autistic aloneness, may be thought to be there initially and

continue to get worse until it reaches a point at which the child is diagnosed as autistic. At that point, the disorder may level off, get worse, or reverse course and gradually lessen. Studies of changes over time in individuals diagnosed as autistic typically employ group designs that mask individual developmental patterns. Yet, follow-up, studies have reporting individual data have shown individual variation in autistic behaviors over time. For instance, Sigman (1998) reported that while there was only small change in mean IQ differences in children 8-9 years after pre-school-age diagnosis, about half of the children increased “markedly” in IQ scores and about half decreased. The differences of those increasing and those decreasing both showed mean change scores of about 23 IQ points (Sigman, 1998). McGovern and Sigman (2007) found that while 40 of 44 children diagnosed as autistic in preschool maintained their diagnosis at adolescence, improvements were found in social interactions, stereotypy, adaptive behaviors, and emotional responsiveness to others. Furthermore, improvement in these individual response classes was seen to be more pronounced in higher functioning children, and to be affected by environmental conditions. These longitudinal outcomes are similar to those reported by Seltzer, Shattuck, Abbeduto, and Greenberg (2004) and suggest that while group studies may show continuity in autism diagnosis, individual trajectories and changes in specific characteristics may be much more varied.

Differences in observed behavior are typically viewed as differences in quantity rather than quality. Our behavioral systems approach takes the view that behaviors may show sudden changes in magnitude or organization so that new constellations of behaviors may emerge thus resulting in what seem to be “qualitative” changes in mainstream developmental literature. Thus, autistic characteristics may suddenly emerge which were previously undetected. These sudden qualitative or quantitative changes in levels or kinds of behavior are called “phase shifts”. When

these phase shifts are shifts to the emergence of behaviors that are significant or important for the development of many other behaviors, these shifts are referred to as behavioral cusps (Hixon, Reynolds, Bradley-Johnson, & Johnson, 2009; Rosales-Ruiz & Baer, 1997). Another way of viewing cusps is that their importance may be due to their disproportionately large role in the development of organized patterns of autistic behavior. Thus, while the development of a mutually responsive orientation by a child might seem of only minor importance and be overlooked, it may serve as a leading part for autistic development (Horowitz, 1987).

Furthermore, the apparently emergent behavior appearing as ‘phase shifts’ and “cusps” can result from a history of derived relational responding (DRR) and learned relational frames by the child (Pelaez, 2009). Because early intervention has proven to be effective in treating autism spectrum disorders, much research has been devoted to early detection. From the present behavioral systems approach, the search consists of identifying the behavioral cusps in the development of autism. That is, it is a search for the sudden emergence of new and important phases of development that will lead to autism or typical development. Hidden Skills – Hidden Deficits

Adding to the difficulty in identifying early indicators of autism is that in development some individual components of a pattern of behavior may be present, but unobserved, because their contribution to the emergence of the pattern is unknown. Thelen and Ulrich (1991) have called these components “hidden skills”. For example, many of the necessary components of bipedal walking are present in infants months before they are able to walk. These components include balance and coordinated oppositional leg movement. These skills can be observable under specially controlled environments, such as putting a child in a harness supporting the weight of the head, or a treadmill providing movement. However, under normal conditions the leg movements are unobservable because other needed skills, such as supporting the weight of

the body by the legs and holding the proportionally large head upright, are missing, making it impossible for all the skills of walking to come together under normal conditions.

The implication is that some of the hidden skills underlying autism may be present early, but are hidden because by themselves, they do not constitute autistic behaviors but underlie autistic behavior. These skills may be necessary, but not sufficient contributors, which, given the existence of other organismic and environmental conditions over time, may coalesce into emergent patterns of behavior that are then diagnosed as autism. Later, we shall discuss some possible “hidden skills” in the development of autism, including stimulus overselectivity, and the absence of other hidden skills present in typical behavior such as mutually responsive orientation (MRO), social referencing and relational responding, that are deficient in autism. Thus rather than hidden skills, the deficits that underlie autism should be considered hidden deficits.

Coalescent Organization and Reinforcers

Dynamic systems theorists have used the term “self-organization” (e.g., Thelen & Ulrich, 1991) to describe the coming together of many overt and hidden skills into consistent and organized patterns of behavior called “behavioral attractors” or simply “attractors”. We (Novak, 1996; Novak & Pelaez, 2004) have argued that the term “self-organization” may wrongly place the catalyst for the organizing process inside the organism. We prefer the term “coalescent organization” because we feel it is more descriptive of this naturally occurring process and does not carry connotations that wrongly internalize the process. In many cases the catalyst for the organization is the environment, specifically the consequences that the newly organized behavior produces. Some of these consequences may be phylogenically determined, as in the case of species-evolved characteristics in which natural selection determines the limits and effectiveness of the characteristics, such as walking in (most humans) and flying (in most birds). In other

cases, and more importantly, in most behavioral interventions, the consequences are ontogenic, specifically reinforcement by consequences. In both phylogenic and ontogenic contingencies, the consequences are frequently environmental ones determining which physiological characteristics survive, in the former, and which behavioral ones survive in the latter.

Work by Field (1982; 1986; Field & Osofsky, 1987) illustrates the importance of bi-directional influences between the characteristics of the mother and the child, and the importance of development of positive social interactions. Field and her colleagues have looked at premature infants, who by virtue of their biological immaturity seem to have a smaller range of tolerance to social stimulation. For these infants, more stimulation is required to arouse them into attending to their mother, but they are also more easily over-aroused by social stimulation the mothers provide. The result is either they do not begin to interact with mother, or when they finally do, the over-stimulation provided by the mothers involvement to quickly produces gaze aversion by the child, followed by fussing and ultimately crying if the mother does not reduce the stimulation. Prior to “interaction training” at risk dyads did not develop good interaction because mothers were not active enough to get their child’s interest, or, if they did get the child’s attention, failed because the mother’s over-stimulation made the infant cry. Field and colleagues (Malphurs, et. al., 1996) were able to coach mothers to be sensitive to the infant’s responses, coaching intrusive mothers to slow down their interactions and uninvolved mothers to enhance their infant’s attention.

In coaching, mothers are trained how and when to touch their ‘at risk’ infants during face-to-face interactions. Pelaez and colleagues (Pelaez–Nogueras, Field, Hossain, & Pickens, 1996; Pelaez-Nogueras, Gewirtz, Baer, and Pinkston, 1997; Pelaez-Nogueras, Gewirtz, et al., 1996) have demonstrated that caregiver’s touch can be a very powerful reinforcer during

interactions with her child. Pelaez conducted a series of studies where mothers were instructed to touch the infant in a rhythmic manner for as long as the child was making eye-contact. Ten infants at risk of developmental disorders with very low APGAR scores from 1 to 3 months old received two types of social reinforcers. In the condition that included touch, a female smiling, cooing and rubbing the child's legs, feet and arms was provided contingent on the infant making eye contact. Again, the tactile stimulation continued for as long as the infant continued eye contact with the female experimenter. In this *synchronized reinforcement procedure* the onset of infant response (eye contact) corresponds to the onset of the consequent stimuli (the touch). By making eye contact with the mother the baby produced as much stimulation as he or she wanted. Once the infant becomes disinterested (or aversive) he or she will stop the touch stimulation by gazing away. This is a bidirectional procedure that allows the caregiver and the infant to regulate (increase or slow down) the interaction (Pelaez-Nogueras, Gewirtz, et al., 1996).

In sum, the development of positive social interactions is a dynamic interplay between child behaviors and parent behaviors that may fail due to mismatches between the two. Failure is also likely to lead to avoidance of social interaction by either the child, the parent, or both.

Some Hidden Deficits in Autism

Earlier in this chapter we noted that dynamical systems approaches (e.g., Thelen & Ulrich, 1991; Novak & Pelaez, 2004) emphasize the importance of hidden skills in enabling the coalescence of biological and learned characteristics in the sudden emergence of behavior. The organized patterns of behaviors considered in autism have typically not coalesced into a diagnosable pattern until the age of two or three (Volkmar, Lord, Bailey, Schultz, & Klin, 2004). These same dynamical systems approaches suggest that in the early phase of organization the patterns are loosely organized and therefore more easily disturbed or reorganized. For example,

relatively small environmental changes can disrupt the walking on new walkers (Adolph & Avolio, 2000; Adolph, Vereijken, & Shrout, 2003). This may explain why it is recommended that early behavioral intervention be begun as early as possible ("New guidance on autism," 2007). That is, intervening before the autistic pattern becomes well organized. This "the earlier the better" approach has fueled the so far yet elusive search for early identification of autism or early precursors to autistic behavior. Finding early indicators mean that children needing intervention can be identified and given appropriate treatment before an autistic pattern can coalesce. One area that has received considerable attention is the search for a physiological indicator, such as genetic or brain abnormalities. To date, no clear physiological indicators have been identified, although some behavioral genomic studies have found limited linkages of some areas of some chromosomes to autism (Plomin & McGuffin, 2003)

Researchers have been more concerned with identifying early behavioral indicators that are precursors for the development of autism. In our view, these are the hidden skills or hidden deficits, such as the lack of joint attention and social referencing discussed later in this chapter, that contribute to the development of autisms. Since the development of these skills are leading parts for later development, and are crucial to the development of many other behaviors, they also meet the definition of "behavioral cusps" (Rosales-Ruiz & Baer, 1997).

In what follows we will examine several related skills that may be present or missing in children showing autism: stimulus overselectivity, facial recognition, mutually responsive orientation, joint attention, social referencing and relational framing (or derived relational responding) all of which may be behavioral cusps leading to typical or autistic development. Specifically, types of behaviors such as joint attention, social referencing, perspective taking, and relational responding in general normally result from environmental contingencies maintaining

early mother-infant verbal and gestural communication and are all developmental precursors of derived relational framing (Pelaez, 2009).

Face Recognition and Stimulus Overselectivity

Stimulus overselectivity describes behavior that is controlled by a single stimulus in an array of many stimuli. This type of “tunnel vision” (Rincover & Ducharme, 1987) has been reported in many, but not all autistic children (Lovaas, Koegel, & Schreibman, 1979). Because the research they reviewed shows a correlation between stimulus overselectivity and autism, the authors (Lovaas, et al., 1979) were reluctant to suggest whether stimulus overselectivity is a cause of autism or a result. Regardless, stimulus overselectivity may be a hidden skill that contributes to autistic development in some children by interfering with normal social interactions, including early social interactions in which the child must respond to changing, but relevant facial cues that the mother provides. If the child’s gaze is controlled by and has this “tunnel vision” to the wrong environmental cues, the child will not learn to respond to the relevant ones, such as eye contact, in normal social interactions.

When examining autistic spectrum disorder in relation to a dynamic systems perspective, the prior concept of coalescent organization is consistent with how autistic persons lack the ability to “process” faces configurally and rely instead on part based “encoding” (Lahaie et al., 2006). First, the recognition of face parts consists of a holistic integration of processes. The typical individual is able to recognize face parts based on the presence of concrete facial factors. When any of the prior components are missing, an individual cannot produce the desired behavior of configural face processing. Individuals with autism may not perform well on discrimination tasks involving face recognition. This could be because the holistic application of the aforementioned behaviors that are necessary for the pattern of producing

perceptual observations are lacking or not yet learned. Thus, overselectivity to one part of the face would interfere with face-recognition and, in turn, it may interfere with the development of social reinforcement and appropriate social interactions.

Mutually Responsive Orientation (MRO)

Kochanska (1997) has proposed a construct, mutually responsive orientation (MRO), to describe the positive relationship that develops between children and their parents early in the child's life. As viewed by Kochanska and her colleagues (Kochanska, Aksan, Prisco, & Adams, 2008):

MRO emphasizes mutual, bidirectional, and reciprocal qualities of parent child interactions that involve responsiveness to subtle cues. MRO also involves shared positive affect and "mutually coordinated enjoyable routines" and other learned prompts. The "cooperative interpersonal set"—the parent's and the child's internalized sense of shared willingness to cooperate with each other and to be receptive and responsive to each other overtures, bids, and subtle cues. We also stress the importance of shared positive affect and "good times" and mutually coordinated enjoyable routines. (p. 30)

As defined, the dyadic level behavior comprising MRO (e.g., coordinated routines, harmonious communication, mutual cooperation) seems to be an early developing cusp in the development of later social interactions. In the absence of the development of an MRO, the lack of social orientation characteristic of autistic children would seem to follow. Kochanska, et al. (2008) not only found evidence of MRO in children as young as seven months with their families, but this type of positive interaction had influence on the amount of power assertion (e.g., direct commands, prohibitions) that parents used when the children were 53 months of age, and influence on the children's "self-regulation" (e.g., slowing down, delaying gratification) at that

age. MRO has also been associated with later child cognitive-affective development described as development of the “conscience” (Kochanska, 2002; Kochanska & Murray, 2000). Since child-parent dyads vary in terms of the extent of MRO shown, and since this orientation begins early in life, it is possible that children who do not develop this mutual orientation with their parent may fail to develop other social relational skills. While the importance of MRO in autism has not been directly studied, two similar areas of deficit that have been studied in autistic children are joint attention and social referencing.

Joint Attention

The development of a mutually responsive orientation, joint attention and referencing may be a behavioral cusps that are absent in autistic children. The reason these are cusps is that they enable a large number of other social behaviors to develop. The disparity among children with autism and children with developmental lag is apparent by the end of infancy (Murray, et al., 2008). The true meaning of joint attention according to Holth (2005) is that a child’s focal point must only be what has functioned as a discriminative stimulus for the adult to look, not solely dependent upon looking at anything that reinforces the child’s seeing (p. 60). Joint attention occurs when a child learns to look first at the parent, and then when the parent looks at another object, the child learns to use the parent’s gaze shift as a discriminative stimulus to look at the object that they then are jointly attending to. (For a review, see Holth, 2009, this volume). Dube, McDonald, Mansfield, Holcomb, & Ahearn (2004) established the defining characteristic of joint attention as “sharing the experience” or “sharing an awareness” which is not to be confused by the child’s aim of attaining an object. Joint attention refers to the ability to “use” eye contact and cues to synchronize one’s attention with another person in the sharing of an object or event (Mundy, Sigman, & Kasari, 1994). If the parent’s behavior is a generalized

reinforcer, the process may result in the development of the shared object as a reinforcer. Joint attention begins to emerge between nine and twelve months of age and initially consists of *gaze shifts* between a target object and a familiar person (Bakeman & Adamson, 1984). Behavioral researchers argue that learning history guides the emergence of joint attention (Dube, et al., 2004; Holth, 2005; Pelaez, 2009). Joint attention begins to emerge between nine and twelve months of age and initially consists of *gaze shifts* between a target object and a familiar person (Bakeman & Adamson, 1984). Consider a three-year old girl and her mother visiting family friends. As the adults sit in the living room and chat, the girl plays with a puzzle on the floor. Suddenly, a kitten runs into the room and the little girl's face lights up with surprise and pleasure. However, her next action is not to engage the kitten in play, but to look up at her mother's face while pointing to the kitten, to see if her mother had also witnessed the animal's dramatic entrance. Gaze shifts may subsequently be combined with gestures towards the object within the visual field of the familiar face.

A distinction has been made between two response classes within the rubric of joint attention: responding to joint attention (RJA) and initiating joint attention (IJA). RJA involves gaze shifting from parent to object and back. This involves responding to the parent's discriminative cues, such as "Look at the pig". IJA refers to the child providing cues that function to cause the parent to respond with joint attention. Taylor and Hoch (2008) argued that RJA and IJA were largely independent response classes with RJA acting like a tact, reinforced by social reinforcers, and IJA acting as a mand influenced by establishing operations created by the presence of certain objects. The authors showed that both classes, initially absent in the autistic children in their study, could be taught with operant procedures.

Working from a non-behavioral, mathematical modeling approach, Mundy and his associates have modeled reinforcer effects on joint attention. In one study, (Mundy et al., 2007) looked at the two classes of joint attention, RJA and IJA in infants between 9 and 18 months. They found that there was significant inter-infant variability in the amounts of both of these. Furthermore, between 9 and 15 months RJA showed a linear model of development. However, the development of IJA was non-linear, instead fitting a cubic model, indicating sudden phase shifts in its appearance. Of additional significance for language development was that infants' RJA levels at 12 months and IJA levels at 18 months predicted language development skills at 24 months. Morales and colleagues (Morales et al., 2000) found systematic differences in RJA in children as early as six months of age. In a similar study, MacDonald, et al. (2006) found that children with autism between 24 and 48 months demonstrated small deficits in responding to joint attention (RJA) and significant deficits in initiating joint attention (IJA), compared to normal developing children. However, some might argue that RJA is regarded as fulfilling an individual's request for attending behavior (Dube, et al., 2004). Deficits in joint attention within children with autism have been well recorded (Carpenter, Pennington, & Rogers, 2002; Mundy, Sigman, & Kasari, 1994).

An early cusp in the development of joint attention is gaze following. In order for joint attention to be effective in development, the infant must be able to attend to the parent and use shifts in parent gaze to lead to jointly reinforcing aspects of the environment. And as discussed earlier, stimulus overselectivity would seem to interfere with the development of gaze following and joint attention.

Joint attention deficits has become an increasingly popular research topic in autism because of its putative role in developmental disabilities (Carpenter, et al., 2002). Dawson et al.,

(2004) have even argued that joint attention deficits alone can differentiate between normally-developing learners and those with autism. Specifically, learners with autism appear to lack prerequisites for joint attention that include orienting to speech sounds and other social stimuli (e.g. when someone points) and show more direct evidence of deficiencies in joint attention behaviors. For example, (Charman et al., 1997) demonstrated that children with autism looked at a mechanical toy when it was activated, but did not exhibit gaze switches between the toy and an adult who was present.

Deficits in joint attention have also been associated with deficits in responding to adult indications to attend to objects (Mundy, Sigman, Ungerer, & Sherman 1986). Specifically, in children with autism, correlations have been recorded between low frequencies of adult-object gaze switching at 20 months, limited language gains, and diminished social communication at 42 months (Charman, et al. 1997). A reason for the continuing pairing of joint attention and language is the learner's capacity to ascertain, thru visual study of adult-attending stimuli, adult's speech and movement, suggests how quickly the learner's vocabulary advances (Pelaez, 2009).

In conclusion, joint attention should warrant a potentially important place in early behavior-analytic intervention programs, especially those aimed at establishing critical language prerequisites. Indeed, despite its pivotal developmental significance, there are few effective interventions for ameliorating deficits in joint attention in the literature (Mundy & Crowson, 1997). For instance, Jones, Carr, and Feeley (2006) have outlined a procedure for the teaching of joint attention in cases where it is deficient. Others (Rocha, Schreibman, & Stahmer, 2007) have reported on a successful joint attention training program that focused on the parents of children with autism. Their participants were three parent-child dyads with children between the age of 2.2 and 3.6 years. Intervention involved training the parents how to teach the development of

joint attention in six steps. Parents themselves taught the children for a minimum of 51 20-minute sessions across six weeks. After the child met the 80% criterion level for a step, the next step was introduced. The steps progressed from heavy physical prompting and social reinforcement, to unprompted following the parent's gaze to a toy. The program proved effective in increasing both the parent's initiations of joint attention and the children's response with joint attention. There was also generalization to non-training sessions. In conclusion, there is great need for additional behavior analytic research on effective interventions to maintain treatment effects in light of the findings that parents acquired teaching skills were not maintained outside the clinic at follow-up three months following intervention.

Social Referencing

Infants begin to look at the facial expressions of their caregiver's for guidance on how to respond to ambiguous or uncertain situations around 6 to 9 months. Social referencing is known in the literature as the infant's ability to use those maternal cues and emotional expressions to determine how to behave in unknown contexts (Gewirtz & Pelaez, 1992). Behaviors can include looking at another's facial, vocal, or bodily expressions as discriminative cues for one's own responses and it is the reinforcing or punishing contingencies in the environment that maintain the communicative function of those cues (see Figure 3).

Many scholars merge the concepts of joint attention and social referencing. However, as Pelaez (2009) has argued, joint attention comes before social referencing, and the paradigm makes a clear distinction (see Figure 3). Social referencing adds to joint attention by cuing the learner to respond to a novel stimulus in a way that is in accordance with other's expressions (cues or Sds). That is, the emotional aspect of social referencing appears to make up a four-stage process that entails (1) distinguishing emotional expressions, (2) comprehending emotional

expressions, (3) reacting to emotional expressions as discriminative cues, and (4) modifying behavior in accordance with changes in emotional expression (Pelaez, 2009). Moreover, the abilities that are derived from basic visual discriminations such as those in joint attention and social referencing seem to be mutually dependent and critical aspects of parent-child or teacher-learner exchanges, which aid the learner to congregate information to direct his or her own thoughts, emotions, and actions. Joint attention and social referencing also appear to be necessary foundations for conditional discriminations, developing language, and socializing with others.

Gewirtz and Pelaez (1992) experimentally demonstrated that young children learn to use their mother's cue as a discriminative stimulus for reaching, depending on the consequences associated to the mother's cue. They conducted two laboratory experiments with infants who learned to respond to maternal "expressive" facial cues following the presentation of ambiguous objects. In the first experiment, mothers were instructed to present two meaningless cues, either palms-to-both-cheeks (in which the mother held her palms against the sides of her face) or fist-to-nose (in which the mother held her clenched right fist to her nose) after the infant looked at them. These two originally meaningless (arbitrary) expressions were selected because they had no preexisting history or status as emotional communication cues. They could be conditioned to signal the infant on how to respond to an ambiguous covered object appearing in front of the infant through a puppet theater (see photo). In this way, twenty infants from 9-12 months were trained daily with their mothers over a period of 8 to 13 weeks. On each conditioning trial, the covered ambiguous object was placed before the child. At this point, the mother presented one or two of these originally meaningless cues contingent on the child looking at her for information on the object. The object was uncovered and moved within the infant's reach. As soon as the

infant touched the uncovered object, one of two consequences were delivered (either positive reinforcement or presentation punishment). The reinforcer consisted in musical sounds. Punishment consisted on presenting a 3-sec loud sound. For half of the infants, the mother's palms-to-both cheeks (Sd+) was predictive of a reinforcing consequence, and the baby's reaching the object was reinforced by brief musical baby melody and slow movements of the object. For the other half of the babies, the fist-to-nose (Sd-) predicted an aversive harsh sound (either a harsh door buzzer, concrete drill, or food blender sounds) accompanied with abrupt movements from the object. These experiments demonstrated the learned basis of the early communicative processes in social referencing. They showed that a very early age (as early as 4 months) normally developed infants can learn (via operant contingencies) to use the caregiver's expressions as a discriminative stimulus to approach and reach objects. As earlier indicated, the literature suggest that this skills is often absent in autistic children.

Relational Responding

The development of the ability to respond to relationships among stimuli is important in the development of many human abilities, including cognition, social behavior, and language (Barnes-Holmes et al., 2001; McHugh, Barnes-Holmes, & Barnes-Holmes, 2004; McHugh, 2009). A major component of the ability to respond relationally is the development of relational frames in which novel stimuli can replace the function of taught stimuli. The basic model for the construction of relational framing is multiple exemplar training. In this procedure, multiple stimuli are used to show relationship identity and symmetry. While used in the laboratory to produce arbitrary relational responding, the condition of multiple exemplar training appears to occur at high rates in every day dyadic relationships between parents and their infants.

Novak and Scott (1998) found high levels of this type of interaction in the normal social interactions mothers have with their infants at least as early as 6 months, the earliest ages that were studied. There was wide variation, but mothers interacting with their infants tended to use objects in multiple ways, picking up objects, manipulating objects, labeling objects, placing objects in the child's hand, moving the object by moving the child's hand, and even asking the child the label of the object and asking him what he "thought" of the object, many months before the child would actually be able to utter his first word. This type of activity occurred highly frequently in the 10 minute observation periods. It is likely that they occur with similar frequency every time parents play with, feed, or change their infants, so that by the child's second birthday, they have had millions of trials of social-cognitive-linguistic interactions. By this time, multiple exemplar training like this will enable children to follow gazes, attend to parent prompts, and develop relational frames. Children who do not experience these interactions for a range of reasons, including the absence of social reinforcers, stimulus overselectivity of non-social stimuli, ineffective parenting, physiological differences, or a variety of other reasons will have missed out on these millions of interactions necessary to produce the hidden skills important for the coalescence of typical behavior. Years of intensive intervention may eventually be enough to replace the behavioral pathways that had developed naturally in the home.

Relational repertoires seems to shape the core of language and higher cognition, Repertoires such as reciprocal dialogue, joint play, and exhibition of sympathy and empathy for others are all social skills that draw upon the fundamentals of joint attention, social referencing and relational responding to others. For that reason, without social skills the learner would not use the cues of others to decide how they were feeling and how to proceed accordingly.

Consequently, it is not surprising that individuals with autism who show deficits in referencing would develop significant delays in their social and emotional skills

As noted by Pelaez (2009):

... it seems likely that the emotional and social aspects of social referencing form the basis of the later development of perspective-taking. As reciprocal conversation, cooperative play, and displays of sympathy and empathy for others are all social abilities require the basics of joint attention and social referencing, because without them you would not use the on-going cues of others to determine how they were feeling and to act accordingly. Hence, it is not surprising that individuals with autism, for example, who present with deficits social referencing subsequently develop considerable delays in their social and emotional skills. (p. 76)

Early Intervention as a Developmental Process

Early Intensive Behavioral Intervention (EIBI) has been shown to an effective treatment for autism. Its effectiveness varies from individual to individual (McEachin, Smith, & Lovaas, 1993), perhaps reflecting the equifinality inherent in the autism diagnosis. That is, EIBI may be more effective for some constellations of autisms than for others. As previously mentioned, one commonly agreed upon tenants of EIBI is that the earlier that intervention starts, the better ("New guidance on autism," 2007). A second is the intensity of the intervention, with EIBI frequently involving 40 or more hours per week. Why do these need to be the case? We would make the following observations from a behavioral systems perspective.

Although early and intensive, the interventions are neither as early nor as intensive as the naturally occurring pathway to autism that the child has been on prior to treatment. If a child enters EIBI treatment at the age of three, she has already been exposed to alternative social

interaction and non-social contingencies for 24 hours a day, seven days a week for 36 months. Moerk (1989) has described how language interactions involve a social environment rich in reinforced learning trials with, under typical conditions, parents intuitively providing highly structured and highly frequent prompts and consequences. Hart and Risley (1995) have documented how, by the age of three, millions of utterances are spoken to children by their parents, and how it was impossible to make up in preschool, deficits produced by reduced language experiences in the home during the child's first three years. There simply were too many linguistic interactions to make-up, and too many non-linguistic interactions to overcome, by later intervention. This suggests that by the age of three there have already been millions of behavioral interactions organizing behavior into normal or autistic patterns. Early behavioral interventions by coaching mothers, teachers, and/or caregivers attempt to correct the organizing effects of this history of interactions, and it is best to be early and often if it is to do so successfully.

Pelaez (2009) offers teaching strategies for establishing these core skills with very young learners or learners with developmental delay, including autistic spectrum disorders. These strategies include protocols for using basic conditional discrimination training and identity matching using touch screen procedures with very young children. This work offers behavioral interventions and strategies for establishing the core features of pre-requisite skills such as joint attention and social referencing.

Summary

This chapter describes autism as a naturally developing set of organized patterns of behavior. Causes of autism are likely to be multiple, including long term environmental

interactions in conjunction with physiological and historical factors. We emphasized the multiple levels of systems and multiple sources of influence that contribute to normal and atypical development. Some hidden skills and deficits serving as behavioral cusps in the development of autism were identified. The significance of the role of early and intensive behavioral interventions aimed at these hidden deficits was discussed. In particular we focused on crucial hidden skills that underlie the atypical development of children with autism spectrum disorders. The development of a mutually responsive orientation, joint attention, referencing skills, and relational responding appear to be critical features in the parent-child or teacher-learner exchanges that help the learner gather information that guides her own thoughts, feelings, and behavior. We argued that both joint attention and social referencing are necessary precursors for the emergence of derived relational responding, which in turn underpins much of higher cognition and language development.

The importance of taking a developmental, multi-level, multi-factor behavioral systems approach is beginning to be recognized in behavioral treatment of autism. Cuvo and Vallelunga (2007) described a transactional model based on behavioral systems (Novak & Pelaez, 2004), structural-behavioral (Horowitz, 1987), and bioecological (Bronfenbrenner, 1977) models of development. Their model of the development of autism includes many of the developmental concepts described in this chapter. Importantly, Cuvo and Vallelunga outline a service model that is based on this dynamical view of autism development and treatment. We believe this and similar models (e.g., Guralnick, 2005) are likely to contribute to better understanding of and treatment for individuals diagnosed with autism.

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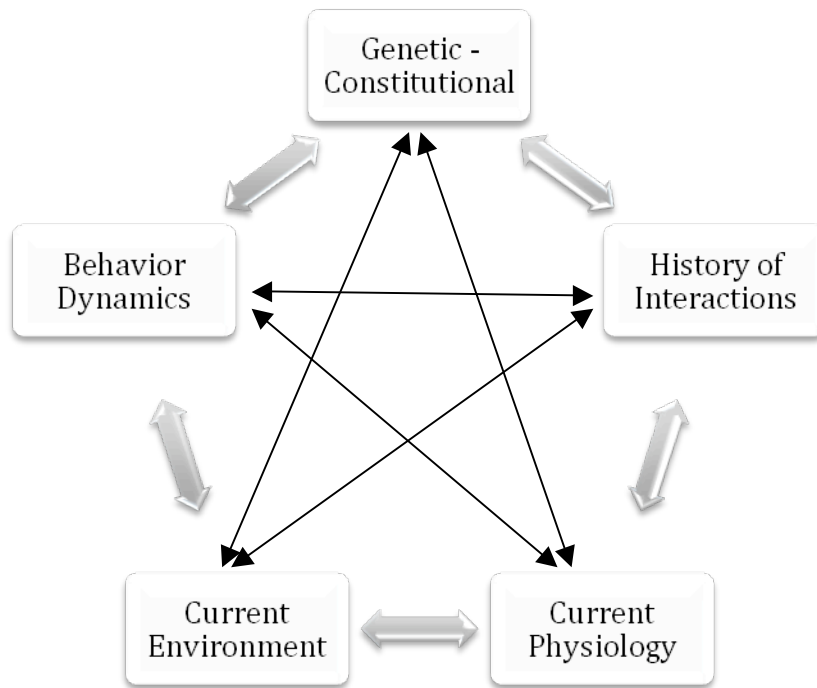


Figure 1. Development is multiply determined. This figure shows five major categories of factors that are in constant reciprocal interaction in producing behavior change. Various disciplines may focus on one or more of these areas. For example, medicine may be directed toward changing the current physiological conditions through medication. Behavior analysis most often focuses on changing the current environmental conditions, and over time, in creating a new interactional history.

Levels of Analysis of Behavioral Systems

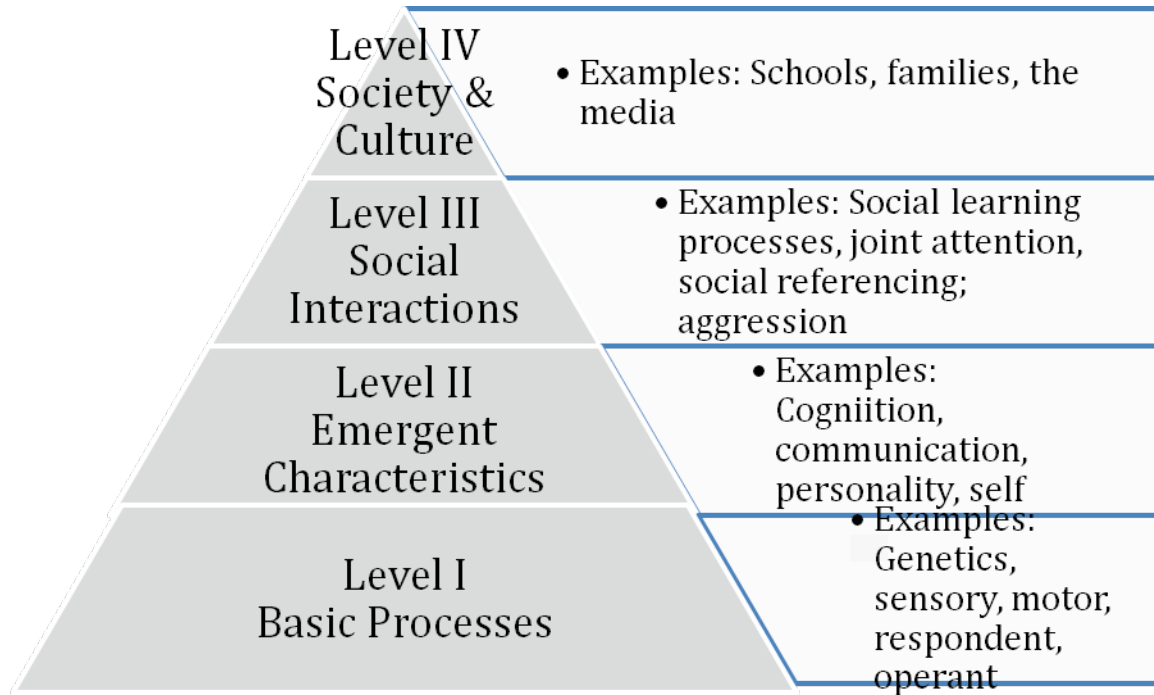
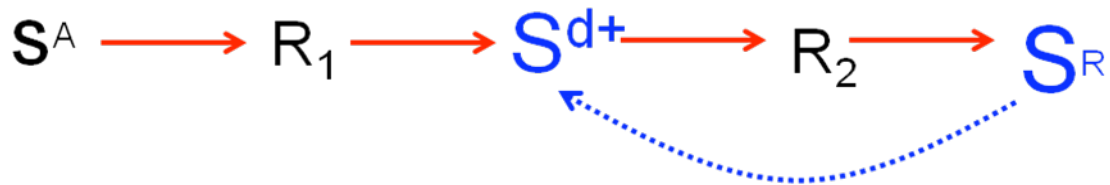


Figure 2. Levels of Systems

Social Referencing Paradigm

Ambiguous Stimulus	Infant Referencing	Maternal Expressive Cues	Infant's Action	Consequences for Infant's Action
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POSITIVE TRIALS



NEGATIVE TRIALS

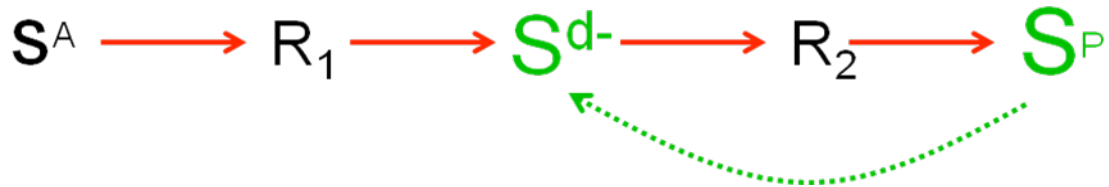


Figure 3. The Social Referencing Paradigm