

## Hidden Communication Deficits in Children with Autism and Early Behavioral Interventions

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**Abstract:** Taking a behavioral systems approach to autism, early hidden communicative deficits are introduced as precursors of autistic development. This paper argues that early identification of communication (language and cognition) impairments followed by intensive behavioral interventions, as early as infancy, may have the most preventive effect on the development of autism.

Autism Spectrum Disorder (ASD) has been looked at as a genetic disorder, cognitive deficit, and linguistic or social dysfunction. Cognitive psychologists attribute ASD to one or more cognitive disorders such as impairment in theory of mind, executive function, and central coherence (Doherty, 2009). The *Diagnostic and Statistical Manual* identifies ASD using 12 diagnostic criteria (DSM-IV-TR; American Psychiatric Association, 2000; as cited in Ingram, 2006). The criteria are categorized into three main characteristics: (a) deficits in social interactions, (b) deficits in communication skills, and (c) narrow interests and ritualistic stereotyped behaviors. In order for children to be diagnosed as autistic, they need to meet six out of twelve diagnostic criteria. Among them, at least two of four impairments should be specified in the first and second category and at least one of four should be in the third set. Largely, psychologists believe that these cognitive deficits lead to dysfunctionality in other areas of development.

Unfortunately, their work is usually limited to a diagnosis. This, however, is not the case with behavior analysts. From a behavioral systems approach, ASD is a behavioral disorder. Although influenced by multiple factors (e.g., genetic, cognitive), it may be treated by providing intensive structured interactions with the social and physical environment.

In the case of autism or any other developmental delay, early identification of and intervention with deficits or potential deficits may help prevent the negative effects of evocative genetic-environment interactions. The purpose of this paper is to describe, from a dynamic systems approach, the critical role played by the environment in the ultimate expression of typical or atypical characteristics in the phenotype (Novak & Pelaez, 2004). In addition, this paper clarifies how infants' *stimulus overselectivity* and *oversensitivity* to environmental stimuli (e.g., tonality of mother's voice or stimulation) and *deficit in joint attention* and *social referencing* can evoke aversive reactions and avoidance in adults who interact with autistic children. The case is made that the interaction is quite dynamic. By being aware of these characteristics in autistic children or children with developmental impairments, adults are more likely to be able to regulate their responses and maintain reciprocal interactions, which are critical for enriching the child's learning environment.

### Hidden Communication Deficits

From a behavioral-analytic point of view, some deficits can suddenly emerge that are quantitatively and qualitatively different from previously detected ones. The same thing is true

for skill development. At a point in development, some quantitative and qualitative changes may occur that were previously undetected. These changes, called *phase shifts*, can be the emergence of skills such as overselectivity, or result from lack of skills, such as joint attention and social referencing, that manifest as developmental deficits.

Phase shifts, according to Novak and Pelaez (2010), happen due to “hidden skills-hidden deficits” (p. 11). Hidden skills or deficits, as stated by Thelen and Ulrich (1991), are essential components of emergent behavioral pattern in language and cognitive development, they will not be unraveled or observed except under specially controlled environment and in conjunction with other essential skills. A hidden deficit in a certain skill, or a hidden skill does not cause autism by itself; but it can be an underlying leading factor or a contributor that in coalescence with other deficits may result in autistic development (i.e., *coalescent organization*; Novak & Pelaez, 2004)

### **Mutually Responsive Orientation**

Mutually responsive orientation (MRO) is defined by Kochanska (1997) as a positive parent-child relationship. Delay in development of mutual responsiveness on the part of the child may play a leading part in a *phase shift* towards autistic development. For instance, mutual responsiveness in infancy is also found to be correlated with self-regulation later, at the age of four and a half (Kochanska, Aksan, Prisco, & Adams, 2008). Joint attention and social referencing are precursors of MRO since they are important for maintaining reciprocal interactions between the child and the environment. Development of joint attention from 12 to 18 months was found to be correlated with language development at the age of two (Mundy et al., 2007). It also has a long-term effect on language development, especially vocabulary enhancement during adulthood. Joint attention together with social referencing is a prerequisite for establishing conditional discrimination (Pelaez, 2009). Lack of eye contact and lack of establishing visual discriminations for facial cues delays the development of social referencing.

According to Novak and Pelaez (2010), stimulus over selectivity, which makes face recognition or configural face processing difficult, is one factor that interferes with following basic visual discriminations and cues in the face (e.g., gaze following or emotional expressions). Sensitivity to the response that the child provides in regards to the stimuli, and coordinating the counter-response by the mother accordingly, would help establish a mutual responsiveness in mother-child interactions. Utilizing an awareness on the part of the mother, effective reinforcers can be identified and be used to maintain mutual responsiveness.

For instance, synchronized touch is identified to be a good reinforcer. The “*synchronized reinforcement procedure*” used by Pelaez-Nogueras et al. (1996) showed the reinforcing effect of synchronized touch on establishing, increasing, and maintaining eye contact, smile, and vocalization of the infants at risk of developmental disorders (from 1.5 to 3.5 months of age). It also demonstrated that the child response, which is gaze shifting towards or away from the mother, is essentially a communicative signal by which the child and the mother can regulate their relationship.

From a behavioral systems approach, all behavioral cusps like any patterns of behavior result from developing a learning history, a history of contingencies (Dube, McDonald, Mansfield, Holcomb, & Ahearn, 2004; Pelaez, 2009). Joint attention, social referencing, and relational frames are all learned through typical early “trials of social-cognitive-linguistic interactions” (Novak & Pelaez, 2010, p. 25). In this sense, infants who are deprived of these constructive reciprocal interactions in their environment are likely to develop hidden deficits of necessary skills for a typical development. This deprivation can occur for a variety of reasons, such as ineffective parenting that leads to the absence of social reinforcers, physiological

deficits, and/or stimulus over selectivity of non-social stimuli that interfere with purposive attention to the social stimuli provided in an interaction (Novak & Pelaez, 2010).

In children with autism, an impaired social interaction that could be covert in early ages in the form of hidden deficits in joint attention, social referencing, and relational responding makes them more isolated. That is, their impaired behavioral patterns of early communication and cognitive skills do not provide effective reinforcement for other people to establish or maintain a dyadic/social relationship with autistic children. In turn, it keeps them away from a typical learning environment that every child needs to experience in order to develop typical communicational and cognitive development. The speculation is that early history of contingencies can be replaced or re-established through early operant learning. For instance, Taylor and Hoch (2008) showed that children with ASD can learn to initiate and respond to joint attention through operant procedures.

### **Is Early Detection of Autism Possible?**

Developmental deficits in children with ASD are normally identifiable as early as two or three years of age. However, some children remain unidentified until school age. But differences in behaviors of autistic and typical children are proved to be identified as early as one year of age. A study (Osterling & Dawson, 1994) of home videotapes from the first birthday of children who were later identified as autistic or typical showed possibility of this early detection. It also drew special attention to infants' behavior in initiating or responding to eye contact and joint attention and tact- or mand-making when screening for autism. This study, in line with more recent studies by Novak and Pelaez (2010), took implications further and highlighted the necessity for early detection of and intervention with autistic children as early as infancy. Recently there has been an effort to modify the Autism Diagnostic Observation Schedule (ADOS; Lord et al., 2000) to be used with toddlers under 30 months-old and the result has been published as Toddler Module or Module T by Luyster et al. (2009).

### **Applied Behavioral Analysis: An Interventional Approach**

The comprehensive approaches taken by ABA-based treatments have been successfully established in the form of training programs. They addressed a wide range of pivotal skills including cognitive skills, language skills, social-emotional skills, motor skills, academic skills, and daily living skills (Granpeesheh, et al., 2009; Rogers & Vismara, 2008). All intervention programs incorporate at least one of two teaching strategies, discrete teaching trials (DTT) or natural environment training (NET; Granpeesheh, et al., 2009).

DTT consists of very intense and structured trials, while NET (including incidental teaching, milieu teaching, and pivotal response training) focus on natural environmental reinforcement and is child-initiated (as opposed to therapist-initiated). It overcomes some limitations of DTT by making the generalization and transfer of learning to other settings more probable and results in less aversive reaction on the part of the participants (Granpeesheh, et al., 2009). These programs usually incorporate some or all of behavioral intervention approaches such as the *Picture Exchange Communication System (PECS)* (Bondy & Frost, 1994), *Pivotal Response Training (PRT)* (Koegel, Koegel, Shoshan, & McNerney, 1999), and *Applied Verbal Behavior* (see LeBlanc, Esch, Sidener, & Firth, 2006 for reviews). *Parent training* is a key part to the interventions with a focus on joint attention skills, routines for joint action, and behavioral management in natural home settings (Rogers & Vismara, 2008).

### **Early Intervention Programs**

Lovaas' (1987) longitudinal study of children with autism who received at least two years of early intensive one-to-one behavioral treatments (started before age of 40 or 46 months, for 40

hours per week) indicated that by the time children are in the first grade, 47% of them showed normal intellectual and educational achievement, as opposed to 2% in the control group. A follow-up 6 years later with the experimental group (at age 13) showed that they maintained their achievement compared to the control group (McEachin, Smith, & Lovaas, 1993).

A recent meta-analysis (Makrygianni & Reed, 2010) on 14 studies also showed that behavioral *early intervention programs (EIPs)* that have been established based on behavioral systems approach are very effective in improving cognitive, language, and communication development in children with ASD. It pointed out that the *intensity* of interventions (at least 25 hours per week) was an effective factor in the enhancement of children's cognitive ability and adaptive behavioral skills. However, in the same meta-analysis by Makrygianni and Reed (2010), language ability showed improvement at different levels for different individuals due to their initial adaptive behavioral skills. In other words, the higher the adaptive behavioral skills were, the more improvement in language development was witnessed.

This latter finding on language development of autistic children is in line with the principle of equifinality, in the sense that even starting with the same intervention (the same intensity and duration) individuals may develop in different pathways due to multiple determinant factors, one of them being their initial adaptive behavioral skills. Interventions are helping them with developing more adaptive behavior but at their own pace. In general, ABA-EIPs are more effective than non-ABA programs when they were higher in *intensity* and *duration* and when *parent training* is included (Makrygianni & Reed, 2010).

An emphasis on necessity of *sufficient* language input for acquiring language in Cooper and Aslin (1989)'s argument also highlights the importance of the intensity of early interventions. That is, interventions need to be implemented in an intense manner so that they can sufficiently compensate for the lack of a rich language and communicative environment earlier in life. Furthermore, as the child by the age of three has already shaped a rich history of contingencies through millions of interactions with the social environment that could potentially label the child as typical or autistic, Novak and Pelaez (2010) considered training of related interventions in infancy essential for parents, teachers and caregivers. Based on this rationale, *basic conditional discrimination training* and *identity matching procedure* have been offered as training practices for very young children (Pelaez, 2009).

From a dynamical systems perspective, *Early Intensive Behavioral Interventions (EIBI)* are the most recommended treatments with autistic children (with the intensity of up to 40 hours per week and duration of at least 2 years; Lovaas, 1987). Aside from genetic make-up, other multiple determinations that are responsible to organize the development of an autistic pattern of behavior appear right after the birth, when the first parent-child interactions naturally emerge. In early ages, these bidirectional interactions should typically proceed in a rapid rate and in an environment rich in learning contingencies. Any factor from biological impairments to mother's and child's atypical characteristics may lead to establishing impaired contingencies (i.e., diverted from typical). From a behavioral systems approach, these *atypical, learned contingencies* are the main contributors to the *phase shifts* in autistic development.

### **Vocal Interventions**

#### **Verbal Imitation Training**

Imitation is one of the early emergent skills in typical infants that play a crucial role in cognitive and language development. In other words, imitation is a behavioral cusp that leads to a typical development in language and cognition. According to Masur (2006), imitation studies

have revealed association between imitation and cognitive competence such as memory, and visual-motor coordination as well as language that is a cultural pattern of behavior.

Most verbal interventions for non-vocal children with autism include verbal imitation training before proceeding to higher level forms of speech like demands (Ross & Greer, 2003). They use different techniques such as *shaping* and *time-delay* to develop verbal imitation repertoires in autistic non-vocal children. These techniques are usually applied to a combination of *motor* and *vocal imitations*. For instance, shaping procedures follow a motor imitation first and then proceeds to a vocal imitative behavior; time-delay for vocal imitation (i.e. waiting a predetermined time for the child to respond) happens in a functional environment when a motor activity (e.g., having a meal, drawing, and playing with toys) is ongoing by the child.

Motor imitation (large motor actions like clapping hands or touching the head and small motor actions like touching the eyes or nose) just before vocal imitation showed to enhance the verbal-vocal imitation and mand initiations in five elementary-school aged children with autism (Ross & Greer, 2003). However, this association does not mean that motor imitation would be spontaneously generalized to vocal imitations for autistic children. It is not the case. Findings basically say that motor imitation may facilitate the training procedure to proceed more efficiently to a vocal imitation. In general, verbal imitation training has been used also as part of mand training procedure in most of functional communicative training packages.

Stimulus overselectivity of autistic children that make the configural facial processing difficult may distract them from facial-vocal imitation. To address this problem, Tardif, Laine, Rodriguez, and Gepner (2007), in a study on 12 autistic children and 24 typically developing children, found out that slowing down the facial-vocal expression enhances the facial-vocal imitation by children with autism in a reciprocal interactions. It suggests modifying interventional approaches that involve imitation training. *Reciprocal imitation training*, including techniques like contingent imitation and linguistic mapping during play as a naturalistic behavioral treatment, was also shown to have positive effect on joint attention and language development in children ages 29 to 45 months (Ingersoll & Schreibman, 2006).

Furthermore, in addition to vocal imitation of adult speech by the child in very early ages (i.e., infancy) maternal vocal imitation of the infant's vocalization (i.e., sound-making) functions as both *discrimination* for "higher articulatory complexity" (Pelaez, Virues-Ortega, & Gewirtz, 2011, p.34) of infant's vocalization and *reinforcement* for further vocalization by the child.

### **Motherese Speech and Maternal Facial Expression**

Infants, as young as one-month-old, demonstrated *perceptions of auditory stimuli* by showing preference or recognition towards the *motherese* speech (from an unfamiliar source of speech) versus adult-directed speech (Cooper, Abraham, Berman, & Staska, 1997). As young as four-month-old infants prefer their mother's motherese speech versus the mother's adult-directed speech. While at one month, they were acceptant of their mother's voice talking either motherese speech or adult-directed speech (Cooper et al., 1997).

*Perceptions of visual stimuli* are also present in infants of 4 to 5 months of age. In other words, infants as young as 4 to 5 months look at their mothers when faced with an ambiguous event or context and establish a perception of maternal facial expression (joyful or fearful) that can be linked to a prior experience with related contingencies (Pelaez, Virues-Ortega, & Gewirtz, 2011). Detecting any delay in typical development of infants in any of these early characteristics and addressing identified deficits by evidence-based interventions is critical to establish the right contingencies for typical development.

In order to establishing successful interventions, studying and identifying effective reinforcement is essential. Only a few studies have focused on identification of effective reinforcers of early communication skills. For instance, synchronized touch is shown to function as a reinforcement for initiating and maintaining eye contact and infants' vocalization (Pelaez-Nogueras, et al., 1996). Motherese and contingent maternal vocal imitation in infancy also has been explored to develop communication skills in infants at risk for developmental language delays (e.g., Bendixen & Pelaez, 2010; Pelaez, et al., 2011). Bendixen and Pelaez (2010) compared *motherese* and *maternal imitation* in their effectiveness to maintain a dynamical communication (in this case, increasing babbling) with an infant.

Motherese as the *reinforcer* of babbling behavior showed to be more effective than contingent maternal vocal imitation for the infant at the age of 12 months (Bendixen & Pelaez, 2010). However, in younger infants, 3 to 8 months, maternal imitation of the infant's vocalization plays a reinforcing role in increasing babbling (Pelaez et al., 2011). These findings highlight that both maternal vocal responses are important reinforcers of infants' vocalization behavior, which is a precursor to the child's language development and should be considered in early interventional programs.

As it was a topic of study in the above example, it is important to identify and individualize effective reinforcers that lead target behaviors in a particular individual. Effective behavioral interventions that are to establish operant learning relied on positive reinforcement. Therefore, identifying effective reinforcers in interventional approaches are determinant in promoting desirable responses and achieving developmental goals.

### Summary

The consensus among behavior analysts is that children dealing with communication developmental impairments and autism spectrum disorders benefit from an early diagnosis only if they receive the early intensive interventions that will help them, at least to some extent, cope with the normal pace of their developmental course. Communicational interventions in infancy would be a good starting point to prevent impairments in language and cognition as well as to enhance communicative skills. Some early skills that need to get special attention in interventional approaches are establishing and maintaining eye contact, joint attention, imitation, and social referencing, which all lead to mutual responsiveness and provide a rich learning environment.

Early intensive behavioral interventions may even prevent forming flawed contingencies that may lead to atypical development. As emphasized by Novak and Pelaez (2010), hidden skills and deficits are leading parts in formation of autistic behavioral pattern and the early (as early as infancy) identification of and intervention with these skills or deficits would help to prevent maintaining or underpinning impaired environmental contingencies that potentially lead to coalescence of autistic patterns of behavior by the age of two or three.

In order for interventional approaches to be more effective with the autism population, interventions need to be built upon the knowledge of early typical development. Identifying early characteristics and precursors of typical communication development and also early recognition of communication impairment is the gateway to address language and cognitive deficits in autism. In other words, early interventions need to be designed in a way that foster a typical development and build the ground to replace already-learned flawed contingencies with establishing and teaching right learning trajectories through incorporating early-effective reinforcers.

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