A Functional Developmental Approach to Autistic Spectrum Disorders

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Historically, severe developmental disorders, including autism, have been approached from the point of view of presenting symptoms as well as the overall syndrome. Although individual practitioners, such as speech pathologists, occupational and physical therapists, and educators have worked with the child’s individual capacities, a developmentally-based functional approach has not been sufficiently articulated and systematized to guide assessment, intervention, and research efforts. In this article, we describe a dynamic, developmental model which conceptualizes the child’s functional emotional developmental capacities, individual differences in sensory processing and modulation, motor planning and sequencing, as well as child/caregiver and family interaction patterns. Because each child with developmental challenges is unique, the functional developmental approach will capture the child’s special strengths and challenges, as well as provide a more comprehensive and individualized framework for clinical work with a child and his or her family.

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Most non-progressive developmental and learning disorders, including autism spectrum disorders (ASD), are nonspecific with regard to etiology and pathophysiology. Non-progressive developmental disorders are, therefore, best characterized in terms of types and degrees of limitations in fundamental developmental areas of functioning such as auditory processing and engaging with others purposefully, as well as symptoms (e.g., echolalia). Yet, both historically and recently, we have focused on symptoms and groups of symptoms comprising syndromes and very specific behaviors, such as saying “hello,” with only partial emphasis on identifying and working with functional developmental capacities which often underlie symptoms and determine overall adaptation.

The functional approach has traditionally been geared to specific behaviors, such as eating. However, many practitioners, especially in speech and language therapy and occupational and physical therapy are expanding the use of the term “functional,” that is, they work with core functional developmental capacities. For example, oral-motor exercises can help with the motor
planning and sequencing needed for language development; visual-spatial problem-solving approaches can help with the big-picture type thinking necessary for more abstract academic challenges; and auditory discrimination work can facilitate phonemic awareness as a basis for reading. By functional we mean the child’s ability to use a capacity toward an emotional goal or to satisfy a need. It is timely to further systematize a functional developmental approach and explore its implications for improving assessment and intervention practices.

A functional developmental approach can change not only the way we think about developmental disabilities, including ASD, but what is included in the research base to improve assessment and interventions. For example, research reviews on autism are often limited to assessment, intervention, or etiologic studies on children with ASD. From a functional developmental perspective, using a syndrome to define the research base may be overly limiting, however. Instead, the research base should be defined by the relevant areas of developmental functioning, some of which are impaired in a variety of syndromes or problems. For example, all studies on improving auditory processing should be included in looking at interventions for children with autism because these children generally evidence receptive language problems that are quite similar to those of children without autism who have receptive language problems. Similarly, almost all children with autism have severe motor planning and sequencing problems, as do lots of other children. Therefore, the general literature on motor planning and sequencing is relevant. In short, do we use the more limited autism literature or the broader literature on various types of functional developmental challenges, which are present in ASD as well as many other types of disabilities?

Because there is not yet a clearly identified etiologic mechanism or well-described pathophysiologic pathway for autism, we must be modest in our assumptions and base assessments and interventions on what is clearly observable and known. What is observable and known are the functional developmental limitations in critical areas, including emotional and social, language, motor planning and sequencing, and sensory processing and modulation. In fact, as most clinicians recognize, there are huge differences among children with autism: one may be relatively strong in visual-spatial processing whereas another may have better auditory-verbal memory. A child with autism may be more similar to a child with Down syndrome in terms of motor planning or visual-spatial processing than to another child with autism. A functional developmental approach enables us to study all the relevant problems in their unique configurations and, in this way, improve assessments and intervention for a range of developmental disabilities, including ASD.

In the functional approach, assessments and interventions must include all relevant areas of developmental functioning and deal with each child and family in terms of their unique profiles. We have developed a model that identifies the relevant areas of functioning, helps with the construction of each child’s functional developmental profile, and provides a developmental framework for the assessment and intervention process: the Developmental, Individual-Difference, Relationship-Based model (DIR) (Greenspan, 1992a; Greenspan & Wieder, 1998). In this article, we will describe the DIR model and discuss its application to assessment, intervention, classification, and prognosis.

**The DIR Model**

The DIR model attempts to facilitate understanding of children and their family by identifying, systematizing, and integrating the essential functional developmental capacities. These include the child’s (a) functional-emotional developmental level, (b) the child’s individual
differences in sensory reactivity, processing, and motor planning, and (c) the child’s relationships and interactions with caregivers, family members, and others.

**Functional Developmental Capacities**

**Functional Emotional Developmental Level.** The child’s functional emotional developmental level examines how children integrate all their capacities (motor, cognitive, language, spatial, sensory) to carry out emotionally meaningful goals. The support for these functional emotional developmental levels is reviewed elsewhere (See Greenspan, 1979, 1989, 1992a, 1997). These capacities include the ability to:

1. Attend to multisensory affective experience and, at the same time, organize a calm, regulated state (e.g., looking at, listening to, and following movement of a caregiver).
2. Engage with and evidence affective preference and pleasure for a caregiver or caregivers (e.g., joyful smiles and affection with a stable caregiver).
3. Initiate and respond to two-way presymbolic gestural communication (e.g., back-and-forth use of smiles and sounds).
4. Organize chains of two-way social problem-solving communications (opening and closing many circles of communication in a row), maintain communication across space, integrate affective polarities, and synthesize an emerging prerepresentational organization of self and other (e.g., taking Dad by the hand to get a toy on the shelf).
5. Create and functionally use ideas as a basis for creative or imaginative thinking, giving meaning to symbols (e.g., pretend play, using words to meet needs, “Juice!”).
6. Build bridges between ideas as a basis for logic, reality testing, thinking, and judgement (e.g., engage in debates, opinion-oriented conversations, and/or elaborate, planned pretend dramas).

**Individual Differences in Sensory, Modulation, Processing, and Motor Planning.** These biologically-based individual differences are the result of genetic, prenatal, perinatal, and maturational variations and/or deficits and can be characterized in at least four ways:

1. Sensory modulation, including hypo-and hyperreactivity in each sensory modality, including touch, sound, smell, vision, and movement in space;
2. Sensory processing in each sensory modality, including auditory processing and language and visual-spatial processing. Processing includes the capacity to register, decode, and comprehend sequences and abstract patterns);
3. Sensory-affective processing in each modality (e.g., the ability to process and react to affect, including the capacity to connect “intent” or affect to motor planning and sequencing, language and symbols). This processing capacity may be especially relevant for ASD (Greenspan & Wieder, 1998, 1997).
4. Motor planning and sequencing, including the capacity to sequence actions, behaviors, and symbols, including symbols in the form of thoughts, words, visual images, and spatial concepts.

**Relationships and Interactions.** Relationship and affective interaction patterns include developmentally appropriate, or inappropriate, interactive relationships with caregiver, parent, and family patterns. Interaction patterns between the child and caregivers and family members bring the child’s biology into the larger developmental progression and can contribute to the negotiation of the child’s functional developmental capacities. Developmentally appropriate
interactions mobilize the child’s intentions and affects and enable the child to broaden his/her range of experience at each level of development and move from one functional development level to the next. In contrast, interactions that do not deal with the child’s functional development level or individual differences can undermine progress. For example, a caregiver who is aloof may not be able to engage an infant is underreactive and self-absorbed.

The DIR model examines the developmental capacities of the children in the context of their unique biologically-based processing profile and their family relationships and interactive patterns. As a functional approach, it uses the complex interactions between biology and experience to understand behavior. Implementation of an appropriate assessment of all the relevant functional areas requires a number of sessions with the child and family. These sessions must begin with discussions and observations.

The assessment process which is described in detail elsewhere (Greenspan, 1992; Greenspan & Wieder, 1998) includes: (1) two or more clinical observations, of 45 minutes each, of child-caregiver and/or clinician-child interactions; (2) developmental history and review of current functioning; (3) review of family and caregiver functioning; (4) review of current programs and patterns of interaction; (5) consultation with speech pathologists, occupational and physical therapists, educators, and mental health colleagues, including the use of structured tests on an as-needed, rather than routine basis; and (6) biomedical evaluation.

The Functional Developmental Profile

The assessment then leads to an individualized functional profile which captures each child’s unique developmental features and serves as a basis for creating individually-tailored intervention programs (i.e., tailoring the program to the child rather than fitting the child to a general program). The profile describes the child’s functional developmental capacities and contributing biological processing differences and environmental interactive patterns, including the different interaction patterns available to the child at home, at school, with peers, and in other settings. The profile should include all areas of challenge, not simply the ones that are more obviously associated with symptoms of one or another syndrome or disease. For example, the preschooler’s lack of ability to symbolize a broad range of emotional interests and themes in either pretend play or talk is just as important, if not more important, than that same preschooler’s tendency to be perseverative or self-stimulatory. In fact, clinically we have often seen that as the child’s range of symbolic expression broadens, perseverative and self-stimulatory tendencies decrease.

The functional approach to creating a profile enables the clinician to consider each functional challenge separately, explore different explanations for it, and resist the temptation to assume difficulties are necessarily tied together as part of a syndrome (unless all alternative explanations have been ruled out). For example, hand flapping is often related to motor problems and is seen when children with a variety of motor problems become excited or overloaded. Many conditions, including cerebral palsy, autism, hypotonia, and dyspraxia involve motor problems and, at times, hand flapping. Yet this symptom is often assumed to be uniquely a part of the autistic spectrum. Similarly, sensory over- or underreactivity is present in many disorders and developmental variations. Yet it is also often assumed to be a unique part of autism. The functional approach does not detract from understanding existing syndromes. In fact, over time it may clarify what symptoms are unique to particular syndromes, lead to new classifications, and further tease out biological and functional patterns.
Constructing the child’s profile of functional capacities through appropriate clinical assessments enables the clinician to tailor the intervention program to the child’s and family’s unique features, rather than have the child fit the program, based on some broad, but non-specific, diagnostic criteria.

**Functional Disabilities Underlying Autistic Spectrum Disorders**

Looking at how certain functional capacities do or do not arise may help us understand important features of one of the most complex groups of developmental disorders—Autistic Spectrum Disorders—and at the same time illustrate why a functional approach helps us understand the relationship between adaptive capacities and pathologic symptoms and sets the stage for creating an appropriate intervention. For example, if an infant, toddler, or preschooler has auditory-verbal, visual-spatial, and/or perceptual-motor processing difficulties, it may make ordinary relating and communication challenging. The people in her immediate environment often will not be able to find some special way to engage and interact with her. Without appropriate interaction, vital social learning may not occur during important periods of development. For example, critical social skills, such as reciprocal affective and motor gesturing and comprehending the ‘rules’ of complex social interactions, as well as patterns of recognition, a sense of self, and early forms of thinking are learned at an especially rapid rate between 12 and 24 months of age. A deficit in these skills could easily look like a primary deficit rather than a reaction to underlying biologically-based processing difficulties. By the time these children come to professional attention, their challenging interaction patterns with their caregivers may be intensifying their difficulties. They are likely to perplex, confuse, frustrate, and undermine purposeful, interactive communication of even very competent parents. Parents often rely as much on the child’s communicative signals as the child relies on the parent’s signals. Parents are not prepared for a toddler who looks away or withdraws. Losing engagement and intentional, interactive relatedness to key caregivers, a child may withdraw more idiosyncratically into his own world.

This hypothesis suggests, therefore, that there are biologically based processing (regulatory) difficulties which contribute to, but are not decisive in determining relationship and communication difficulties. When problems are perceived early, caregivers and children, with appropriate professional help, can, to varying degrees, learn to work around the regulatory dysfunctions and their associated relationship and communication problems, and form varying degrees of warm, empathetic, and satisfying relationships.

**The Affect Diathesis Hypothesis:**

**A Proposed Processing Deficit Unique to Autistic Spectrum Disorders**

Our observations suggest a hypothesis that may facilitate understanding of a psychological deficit in ASD and provide additional clues for biological inquiries and interventions. Children at risk for ASD may have a unique type of biologically-based processing deficit involving the connection of affect, (which provides intent), to motor planning and sequencing capacities and symbol formation (Greenspan & Wieder, 1997). Typically, during the second year of life, we can observe the ascendancy of intentional social problem-solving behavior and, later on, meaningful use of language based, in part, on the child’s ability at this time to connect affect to his motor sequencing and emerging capacity to form symbols. When this critical affect diathesis is not occurring and creating the connections that provide direction and meaning to behavior, the child may be vulnerable to aimless or repetitive use of behavior and/or words. The level of functioning of many of the components of the Central Nervous
System, such as aspects of motor behavior and auditory memory, may determine the different symptoms and the presence or absence of splinter skills. For example, when a child with some degree of motor skills is missing the connection to affective intent, he may be more likely to line up toys than be aimless. A child with some degree of verbal memory may be more likely to repeat or use scripts than be silent.

Interestingly, the complex affect-directed, problem-solving behaviors of the second year of life (in comparison to the simpler behavior of the first year) require greater integration of different areas of Central Nervous System (CNS) functioning. Greater integration ordinarily begins to occur more fully during the latter part of the first year and in the second year of life (Sperry, 1985; Benson & Zaidel, 1985; Greenspan, 1997a; Dawson, Warrenburg, & Fuller., 1982; Courchesne, Akshoomoff, Egaas, Lincoln, Saitoh, Schreibman, Townsend, & Yeung-Courchesne, 1994).

The affect diathesis hypothesis is consistent with recent neuropsychological research on individuals with autism without mental retardation that shows “within affected domains, impairments consistently involved the most complex tasks dependent on higher-order abilities [i.e., concept formation, complex memory, complex language, and complex motor abilities] whereas intact or superior function was found on simpler abilities within the same domains [i.e., sensory perception, attention at the perceptual level and associative memory]” (Minshew & Goldstein, 1998, p. 35). According to our hypothesis, higher-level cognitive, social, and motor skills, including creative, logical, and abstract thinking, build on the meaningful (not rote) use of ideas. Meaning is imparted to behavior and ideas through their connection to emotional inclination, intent, or affect. This hypothesis may also help explain why children with ASD diagnoses have problems in reciprocal interactions, empathy, and forming a theory of mind (Baron-Cohen, Frith, & Leslie, 1988, Baron-Cohen, Tager-Flusberg, & Cohen, 1993; Frith, 1993). Empathy and having a theory of mind depend on investing symbols and behaviors with meaning, which, as indicated, we believe depends on connecting affect to motor planning and symbol formation. The central role of affect also partially explains behavioral problems not routinely assessed in neuropsychological batteries and difficult to explain as part of higher-level cognitive dysfunctions. This is the problem most toddlers who are eventually diagnosed with autism have with intermittent self-absorption. They are unable to engage in a continuous flow of affective problem-solving interactions ordinarily seen by 12 to 16 months of age. Such interactions, which depend on affective intent to provide purpose to action patterns, underlie the ability to understand social relationships, social rules, humor, and friendship, as well as engage in higher levels of shared attention (Greenspan, 1997a). This hypothesis may also help direct genetic and biological studies to look further at CNS pathways and related neurochemical processes (Barinaga, 1997) associated with connecting affect and intent to motor planning and emerging symbolic formation.

The DIR Intervention Program

A comprehensive intervention program for infants, toddlers, and pre-schoolers with these problems involves helping the child reestablish the developmental sequence which went awry, with a special focus on helping the child become more affectively connected and intentional. This means determining which of the functional emotional levels described earlier have been mastered fully, partially, or not at all. It also means using understanding of the child’s individual differences in sensory modulation, processing, and motor planning to establish a relationship which creates interactive, affective opportunities to negotiate the partially mastered or
unmastered functional emotional developmental process. Rather than focus only on isolated behaviors or skills, the DIR approach focuses on these more essential functional emotional developmental processes and differences, which underlie particular symptoms or behaviors.

*For example, rather than trying to teach a child who is perseveratively spinning the wheels on a car to play with something else or to play with the car appropriately, it would use the child’s interest and, warmly smiling, spin the wheel in the opposite direction to get reciprocal, affective interaction going.*

The DIR model provides a developmental framework for conceptualizing the relationships among the areas of functioning central to autistic spectrum and other non-progressive developmental disorders. In helping to conceptualize various developmental dimensions, it also may facilitate understanding of the assessment and intervention process. The DIR model, however, is not an assessment tool or a discrete intervention. Rather, it helps to systematize many of the traditionally helpful assessments and interventions and to emphasize elements of a comprehensive approach that are often ignored or only dealt with superficially.

All the elements in the DIR model have a long tradition, including speech and language therapy, occupational therapy, special and early childhood education, and floor time-type interactions with parents (which is consistent with the developmentally-appropriate practice guidelines of the National Association for the Education of Young Children [NAEYC] [Bredekamp & Copple, 1997] and pragmatic speech therapy practices, both of which attempt to foster preverbal and symbolic communication and thinking). The DIR model, however, contributes to these traditional practices by further defining the child’s developmental level, individual processing differences and the need for certain types of interactions in terms of a comprehensive program where all the elements can work together toward common goals.

In this model, the therapeutic program must begin as soon as possible so that the children and their parents are re-engaged in emotional interactions that use their emerging, but not fully developing capacities for communication (often initially with gestures rather than words). The longer such children remain uncommunicative and the more parents lose their sense of their child’s relatedness, the more deeply the children tend to withdraw and become perseverative and self-stimulatory.

Such an “intensive” approach is not intended to overwork or stress a child, however. The child’s state of mind is considered and the interactive activities recommended are part of playful interactions where the child’s interests and initiative are followed and opportunities are created for joyful, soothing, and pleasurable interactions. When the child is tired, the playful interactions might involve the child showing the parent or verbalizing to the parent where it is best to rub his back or feet. Passive TV-watching (except for ½ hour a day) and rote memory exercises such as memorizing letters or numbers are not recommended.

The DIR interventions is fundamentally different from behavioral, skill-building, play therapy, or psychotherapy. The primary goal of the DIR-based intervention program (sometimes referred to as Floor Time) is to enable children to form a sense of themselves as intentional, interactive individuals, develop cognitive language and social capacities from this basic sense of intentionality, and progress through the six functional emotional developmental capacities.

Comments on the Therapeutic Process

The therapeutic process is described in detail elsewhere (Greenspan, 1992; Greenspan & Wieder, 1998). Only a few essential features will be described here. Children with ASD often lack the most basic foundation for interpersonal experiences (that is, they are often not
interactive in the purposeful way that ordinary eight-month-olds are) they might use to abstract a sense of their own personhood. Therefore, the earliest therapeutic goals are to mobilize shared attention, engagement, and intentional back-and-forth signaling. Interactive experiences enable the child to abstract a sense of self and form higher level cognitive and social capacities.

As one fosters focus and engagement, one must pay attention to the child’s regulatory profile, as described earlier. For example, if he is overreactive to sound, talking to him in a normal loud voice may lead him to become more aimless and withdrawn. If he is overreactive to sights, bright lights and even very animated facial expressions may be overwhelming for him. On the other hand, if he is underreactive to sensations of sound and visual-spatial input, talking in a strong voice and using animated facial expressions in a well-lit room may help him attend. Similarly, in terms of his receptive language skills, if he is already at the point where he can decode a complex rhythm, making interesting sounds in complex patterns may be helpful. On the other hand, if he can only decode very simple, two-sequence rhythms, and perhaps understands a single word here and there, using single words (not as symbolic communication, but as gestural communication) and using simple patterns of sound may help him engage.

One may find that he remains relatively better focused in motion, such as being swung. Certain movement rhythms may be more effective than others. For some children, fast rhythms, such as one swing per second, may be ideal. For others, slow rhythms, similar to the breathing rate (one swing every four or five or six seconds) may be ideal. Different kinds of tactile input may foster concentration and focus, such as firm pressure on the back or the arms or the legs. Large motor movement and joint compressing may also foster attending (i.e., jumping on the bed or any trampoline-like motion). Each infant and child is unique.

It is especially difficult to foster a sense of intimacy. Here, as one helps a child attend and engage, it is critically important to take advantage of a child’s own natural interests. It is most helpful to follow the child’s lead and look for opportunities for that visceral sense of pleasure and intimacy that leads a child to want to relate to the human world. Intimacy is further supported as one works on forming simple, and then more complex, gestural communications.

For example, the father of a very withdrawn child was only verbalizing to his child. The therapist suggested trying simple gestural interactions first. The father put his hand on a toy car very gently, as his son was exploring it, and pointed to a particular part, as though to say, “What’s that?” But, in pointing, the father actually moved the car, so the son felt the car moving in his hands and noticed, without upset, his father’s involvement. The son took the car back, but looked at where the father had touched with his fingers. This more physical, gestural communication seemed to get at least a faint circle of communication—the son’s interest in the car and the father’s pointing to a spot on the car and moving it a little opened a circle of communication. The son’s looking at that particular spot, and taking the car back closed a circle of communication. These opening and closing circles of communication create a foundation for subsequent communication.

After getting this minimal interaction going, as the son was moving the car back and forth, the father got another car and started moving it back and forth next to his son. The father and his car moved toward his son’s car, but did not crash into it. The son initially pulled his car out of the way but then moved his car fast as his father had, toward his father’s car. Now three or four circles were closed in a row and a real interaction was beginning.
After gestural interaction becomes complex with, for example, the father hiding his son’s car and his son pointing, searching, and vocalizing to find it, one fosters the movement from gestures to symbols. As father and son were using the car for simple and complex gestures, the father started to say, “fast” and “slow” to describe his own action. When he moved the car fast, he said, “fast,” and when he moved it slow, he said, “slow.” After four or five repetitions, the boy boomed his car into his father’s car and said the word fast although not pronouncing it quite clearly. The father beamed. He was amazed that his son could learn a new word and use it appropriately so quickly.

While in this case symbols came in quickly, in many cases it is a long and slow process with lots of work occurring first at presymbolic levels. Words and symbols are more easily learned, however, if they are related to the child’s actual experiences and built on the child’s affective gestures. Words in isolation or as imposed labels have little meaning for the child.

A major challenge is a child’s tendency to perseverate. One child would only open and close a door. Another would only bang blocks together. The key is to transform the perseveration into an interaction. We use the child’s intense motivation to his advantage to get gestural circles of communication opened and closed. For example, we get stuck in his door or our hands caught between his blocks. We are gentle and playful as he tries to get us out of his way (like a cat and mouse game). As gestural interactions occur, behavior becomes purposeful and affective. We modulate his feelings of annoyance and help soothe and comfort as well, though often a child finds our “playful obstruction” amusing.

As the child becomes more purposeful, we have found he can imitate gestures and sounds more readily and can copy feeding a doll or kissing a bear. With continuing challenges to be intentional, he copies complex patterns and imitates sounds and words, often gradually beginning to use words and “pretend” on his own.

Another challenge, as one moves toward more representational or symbolic elaboration, is to help the child differentiate his experience. The child needs to learn cause-and-effect communication at the level of ideas and to make connections between various representations or ideas.

Since most children with pervasive developmental problems have difficulty with receptive language (that is, auditory processing), and some also have difficulty with visual-spatial processing, it is much easier for them to pay attention to their own ideas rather than the ideas of others. The way the child categorizes his experiences at the level of symbols or representations, however, is through interaction which involves opening and closing symbolic circles. The parent becomes the representative of what is outside the child and the foundation for reality. The clinician’s or parent’s ability to enter the child’s symbolic world becomes the critical vehicle for fostering emotional differentiation and higher levels of abstract and logical thinking. Many children, because of their receptive language problems, do not fully process the “other” person’s words and, furthermore because it is difficult, may ignore the other’s words rather than listen especially intently. When during pretend play the child ignores the therapist’s inquiry about who sits where at the tea party, the therapist does not simply go with the flow, but brings the child back to the comment or question until the child closes the symbolic circle. The therapist might “play dumb” (a little like the TV character Columbo) and challenge the child to close the circle of communication and deal with what he is saying. In this way, he helps the child deal with words and ideas that arise outside the child in external reality, as well as to be logical.
For example, when the child has the puppet biting the head off the cat, the parent may say, “Ouch, you hurt me.” Then, if the child looks at the tree outside, the parent might ask, “I see the tree you are looking at, but what about the cat? What about his ouch?” If the child then says, “I’ll give another ouch,” and bites the cat with the puppet, the child has closed the symbolic circle of communication. If the parent then says, as the child goes back to the tree, “Do you want to talk about the tree or the cat?” and the child says, “Let’s look at the tree,” the child has closed yet another circle and also created a logical bridge from one set of ideas to the other.

As the parent or therapist helps the child create such bridges, always following the child’s lead, the child becomes more representationally differentiated. But if the parent either lets the child become fragmented or becomes too rigid and controlling, differentiation may become compromised.

Relating to the child when he is feeling strong affects is critical. He is connecting his words to underlying affects which give them purpose and meaning. When a child is motivated, for example, in trying to negotiate to get a certain kind of food or to go outside, there is often an opportunity to open and close many symbolic circles. The child who is trying to open the door because he wants to go outside and is angry that he can not, may, in the midst of his annoyance, open and close twenty circles of communication if the adult soothingly tries to find out what he wants to do outside.

Children with pervasive developmental disorders often find it especially difficult to shift from concrete modes of thinking to more abstract ones, in part because they do not easily generalize from a specific experience to other similar experiences. There is a temptation to teach the child answers and repeat the same question by scripting the dialogue. But the child can only learn to abstract and generalize through active, emotionally meaningful experience. Most helpful are long conversations with debates or the child giving his opinions (e.g., “I like juice because it tastes good.”) rather than memorized elaborations of facts (e.g., “The juice is orange.”).

As the child progresses through the six functional emotional milestones, the therapeutic program works on mobilizing all six levels at the same time in each and every interaction. The therapeutic program often evolves to a point where the child and family are involved in three types of activities: 1) spontaneous, creative interactions (floor time); 2) semi-structured, problem-solving interactions to learn new skills, concepts, and master academic work (e.g., creating problems to solve, like negotiating for cookies or mastering spatial concepts, such as “behind” and “next to” by discovering where the favorite toy is located); 3) motor, sensory, and spatial play to strengthen fundamental processing skills.

Characteristics Associated with Different Patterns of Progress

In working clinically with a large number of cases, we have observed patterns which have permitted us to form hypotheses on the relationship between presenting patterns and different types of progress. We systematically reviewed 200 cases that had been seen by us and used the DIR model as the basis for a comprehensive intervention program for two or more years. For each case, there was a full evaluation and periodic re-evaluations by the first author, reports of an earlier evaluation(s) by another professional clinic or center, a detailed clinical description, progress notes, videotaped interactions, Childhood Autism Rating Scale (CARS) scores (Schopler, E., Reichler, R. J., & Rochen Renner, B., 1988) and periodic evaluations by speech pathologists, occupational therapists, educators, and psychologists (Greenspan & Wieder,
1997). We have found that the severity of symptoms such as perseveration or self-stimulation is not a good predictor of a child’s potential for progress. The way the child responds to the early phases of the intensive DIR, in contrast, can be a useful indicator of progress. Two related features appear to enable a child to respond quickly to the intervention program. One is the ability to sequence actions (i.e., motor planning) and use this to form complex reciprocal problem-solving interactions, and to learn to imitate. Banging a block is a one-step sequence, while putting a toy car in a garage, taking it out, and zooming it is a three-step sequence. Complex intentional behavior and imitation then leads to symbolic communication and imaginative play. Children with little or no progress were four times as likely to have severe motor planning difficulties as a child who made consistent and/or good progress (Greenspan & Wieder, 1997).

The other feature we found associated with rapid progress is the availability of a great deal of interactive opportunities geared to the child’s developmental level and individual differences, together with the comprehensive program described earlier. Such interactions do not allow the child to perseverate, self-absorb, or self-stimulate for long periods of time. When these two conditions are present, some children make rapid progress and shift from varying degrees of self-absorption and avoidance into patterns of engagement, preverbal reciprocal interaction and, eventually, symbolic communication and imaginative play.

The children in the group who make the most progress are able to learn to be warm, emotionally expressive, flexible children with a sense of humor, empathy, solid abstract thinking skills, and age-appropriate academic capacities. They are eventually able to go to regular schools and have lots of friends. In our review of 200 cases, over 50% of the children were able to progress to this level. It should be pointed out, however, that our cases were not of a representative sample of children with Autistic Spectrum diagnoses and, therefore, the percentage should only indicate that there appears to be a subgroup capable of significant progress (Greenspan & Wieder, 1997).

As part of the study, to further understand this group that make very good progress, we compared 20 children diagnosed with autistic spectrum who were at the top of the outstanding-progress group, 14 typically-developing school-aged children, and 12 children with continuing difficulties. We wanted to answer the following question: could some children diagnosed with an ASD develop high levels of creative and abstract thinking, empathy, friendships, and flexible personalities? Or could they only develop some high-level, but circumscribed, academic and language skills with limited creativity, empathy, and friendships? We used the Functional Emotional Assessment Scale (FEAS) (Greenspan, 1992a; DeGangi & Greenspan, 1999) and the Vineland (Sparrow, et al., 1984) to describe the children’s functioning. The FEAS reliably measures subtle aspects of emotional and social functioning through the analysis of videotaped interactions between the child and his or her caregiver. Both the outstanding progress group and the typically developing group evidenced age-appropriate emotional, social, and cognitive capacities. There were no significant differences between these groups (Greenspan & Wieder, 1997). The group with continuing difficulties, in contrast, evidenced low functioning on these scales.

A number of studies have looked at outcomes with intensive interventions for children with pervasive developmental disorders. Interestingly, many of the studies report that roughly 50% of the children become verbal, academically able (at age and grade level) and social (Bondy & Frost, 1994; Lovaas, 1987; Miller & Miller, 1992; Rogers, Herbison, Lewis, Pantone, & Reis, 1988; Rogers & Lewis, 1989; Strain et al., 1983; Strain & Hoyson, 1988). These studies,
however, do not use representative samples. In the Lovaas study (Lovaas, 1987; McEachin, Smith, & Lovaas, 1993), for example, all of the children who enrolled had developmental quotients at least in the 10 to 12 month age level, and could do some early types of imitation and reciprocal interactions. The families were motivated and relatively well-organized. There were a number of additional methodological limitations, including the fact that their outcome evaluations did not look closely at the emotional range, depth, and flexibility or creativity of the children (Gresham & MacMillan, 1998; Bristol, et al., 1996; Rogers, 1996; Schopler, 1987). Therefore, the most widely cited behavioral study has significant methodological limitations and its findings cannot be applied to the general population of children with ASD diagnoses. In addition, discrete trial behavioral approaches with children with ASD diagnoses who have more severe cognitive limitations, have not lead to clinically meaningful progress (Smith, Eikeseth, Morten, & Lovaas, 1997).

In our chart review of 200 cases (Greenspan & Wieder, 1997), we saw children whose parents were highly motivated and often traveled great distances to seek extra help. Although there was no exclusion criteria, and some of the children began their intervention functioning in the 6 – 8 month developmental level, parents may have seen behaviors in their children that gave them reason to be especially hopeful.

Because none of the studies were a representative sample, it is not possible to determine potential rates of improvement. The fact that some children can do especially well is encouraging. Yet, it does not suggest that it is possible to significantly improve the functioning of many children with autism. Many children with autistic disorders do not show rapid gain. Working with children for six to twelve months before making a definitive diagnosis can help determine the type of developmental pattern that is likely. In the next section, we will discuss criteria that may help to determine the type of progress a child may make.

Neurodevelopmental Disorders of Relating and Communicating

A number of years ago, we introduced the category Multisystem Developmental Disorder with three subtypes to further individualize the classification of children with disorders in relating and communicating (Greenspan, 1992a; Diagnostic Classification: 0-3, 1994). Since the publication of Diagnostic Classification: 0-3 and the proposal of Multisystem Developmental Disorder, we have collected diagnostic, treatment and outcome data on several hundred more children diagnosed with severe disorders of relating and communicating. Based on this additional clinical information, we have been able to broaden and add subtypes to the classification of Disorders of Relating and Communicating.

Based on the functional developmental dimensions systematized in the DIR model and outlined earlier, we propose the following classification involving subtypes under the broad heading of Neurodevelopmental Disorders in Relating and Communicating. The revised subtypes are based on the child’s presenting profile and his or her early response to a comprehensive, developmentally based intervention program. We have identified four broad groups which are classified in the tables which follow according to the six core functional developmental levels of attention, engagement, purposeful behavior, problem solving, motor planning, imitative skills, and symbolic capacities.

**Type I**

This group tends to make very rapid progress, often moving from patterns of perseveration, self-stimulation and self-absorption toward warm, emotionally-pleasurable engagement, spontaneous use of language, abstract levels of symbolic play, with healthy peer
relationships, and solid academic skills, over the course of two to four years. This group includes four subtypes.

**Type I: Identifying Criteria and Sequence of Progress (constricted early symbolic type)**

Table 2 below shows the identifying criteria and sequence of progress for Type 1. Children in this group tend to make relatively rapid progress, evidence mild to moderate processing difficulties, and are perseverative and intermittently symbolic.

There are four different patterns under Type I. All the patterns meet the basic criteria described above and are explained more fully in Table 3.

**Case Illustration of Type IA**

A two-and-a-half-year-old boy presented with self-absorption, perseveration, and self-stimulation, no peer play, and lack of eye contact and pleasure in relating to his parents. During his evaluation, David spent most of his time reciting numbers in a rote sequence, spinning and jumping around aimlessly and randomly, and lining up toys and cars, while making self-stimulatory sounds. There were occasional shows of affection with some hugs.

David, however, showed strengths in his ability to show what he wanted when extremely motivated, his intimate shows of affection, the capacity to imitate actions, sounds, and words, and in his ability to recognize pictures and shapes. With a comprehensive program, he quickly became more engaged and began some pretend-oriented sequences and gradually began using his language purposefully and creatively. He then went through the pattern described above and, at present, is in a regular school excelling in reading and English as well as math. He has a number of close friends, a sense of humor, and insights into other people’s feelings. His remaining challenges are with fine motor sequencing (penmanship) and becoming somewhat anxious and argumentative when in a competitive situation.

**Type II**

Children in this group have greater challenges than Type I. They make slower, but consistent, progress. Each hurdle requires a great deal of work and is time consuming. Typically, these children can initially engage a little bit and be partially purposeful, and intermittently do some problem solving. However, they take much longer to be able to become consistent, preverbal problem-solvers and to learn to use imitation as a basis for language and imaginative play. When they achieve these milestones, they do not generally go through a stage of hyperideation and rapid learning, but rather move through each new capacity very gradually. While many children in this group make continuous progress, most are not able to participate in all the activities of a regular classroom with large class size, as well as the children in Type I, thought they may read early, but can benefit from appropriately-staffed inclusion or integrated programs, or special needs language-based classrooms where the other children are interactive and verbal.

**Type II: Identifying Criteria and Sequence of Progress (variable complex problem-solving type)**

Type II children tend to make consistent, but slow progress, evidence moderate to severe processing challenges, and are intermittently purposeful, as described in Table 4.
There are two different patterns under Type II, both of which meet the general criteria for Type II above. They are explained in Table 5, which follows.

Case Illustration

Three-year-old Joey presented with a great deal of avoidant behavior, always moving away from his caregivers, having only fleeting eye contact, and showing a great deal of very simple perseverative and self-stimulatory behavior, such as rapidly turning the pages of his books or pushing his toy train round and round the track as he approximated a phrase or two. He could purposefully reach for his juice or take a block from his parents, but was not able to negotiate complex preverbal interactions or, for that matter, imitate sounds or words, unless imbedded in a song. Now, at age six and a half, Joey, almost four years after his program began, shows abilities to relate with real pleasure and joy, use complex gestures to lead his parents places and describe what he wants in sentences, such as, “Give me my Lion King now!” respond to simple questions (“Where do you want to go?” “To the park.”) and have short sequences of back and forth communication with five to ten exchanges of short phrases. He is also able to engage in early imaginative play, having his action figures fly around the room with great joy and delight or reenact a scene from a beloved story or video. He is not yet, however, able to consistently answer “why” questions and is only able to play with peers where there is action and, with some adult involvement, can do structured games or dramatic play. However, he continues to make progress at a consistent but slow pace. Interestingly, Joey’s perseverative, self-stimulatory patterns are only in evidence occasionally.

Type III

This group is characterized by moderate to severe auditory processing and visual spatial processing difficulties. More severe motor planning problems impede purposeful communication and problem solving. Children in this group are capable of intermittent problem solving interactions but cannot sustain their interactions. They are also only intermittently purposeful with a great deal of self-absorption and/or aimless behavior. This “in and out” quality, with presymbolic islands of purposeful and problem-solving behavior characterizes this group. These islands may, at times, also involve the use of words, pictures, or signs and/or two- to three-step gestures/actions to communicate basic needs. Receptive understanding of often-used phrases in routines and/or when coupled with visual cues or gestures is a relative strength. Some children in this group will also use toys as if they are real, but do not usually represent themselves or others through figures, e.g., they will eat pretend foods or feed a life-size baby doll, or put their feet into a pretend swimming pool as if they could go swimming. Some children with severe oral motor dyspraxia will not speak more than a few ritualized words, if at all, but may evidence preverbal communication through a few signs, or picture communication, or through the use of favorite toy. Some children in this group can recognize logos and may read words.

Type III: Identifying Criteria and Sequence of Progress (partially purposeful and engaged type)

Children classified as Type III generally evidence very slow progress and have severe processing challenges. They are most often self-absorbed and intermittently engaged, as will be seen in Table 6 below.

Case Illustration
Sarah ran in looking for Winnie the Pooh, climbed up on the stool in front of the shelves, but could not move the little figures in the basket around to search for her beloved character. The next moment the basket was pulled off the shelf and all the figures fell out. She then looked in the next basket without bothering to look further on the floor. Her mom ran over before the second basket was dropped and offered to help. Sarah echoed, “Help!” and grabbed her mother’s hands and put them in the basket. Her mother had to point to Winnie before Sarah actually saw it. She then grabbed it and ran off to lie on the couch. Mom then came over with Tigger to say hello, and Sarah grabbed Tigger and ran to the other side of the room. She held her figures tightly and turned away when Mom came over again. Mom then took another related figure Eeyore and started to sing “Ring around the rosie…” moving her figure up and down. This time Sara looked and filled in “down” to “all fall down.” But then moved rapidly away and went over to the mirror. This pattern of flight and avoidance after getting what she wanted, followed by not knowing what to do next, was quite typical. Sarah slowly learned the labels for things she wanted and to protest. She recognized and could express familiar phrases like, “Come and eat,” “Go out,” and “Bath-time.” She became quite engaged with sensorimotor play and loved to be swung and tickled. She even began to play with toys, first dipping her toes into the water of the play pool and then letting Winnie “jump” in. She began to imitate more words and actions, tried to solve problems to get her figures, but only when very motivated or very mad, and usually only after energetic sensorimotor play which pulled her in. Her expressive language expanded to more and more phrases indicating what she wanted, but it was difficult for her to answer any questions (weak receptive processing) and she relied on visual and affect cues to understand what was said to her. This transferred to puppet play and even simple role play as a cook or doctor. Problem-solving also progressed very slowly because of her very poor motor planning, but she became more easily engaged and more responsive to semi-structured and structured approaches to learn. Between ages four and five she learned to count, identify colors, and loved to paint and cut with scissors. Sarah, who also began intervention at age three, demonstrated some pre-academic abilities able to read some sight words at age six and a half. Now she enjoys being with other children and joins the crowd running around, hiding, and chasing, but does not yet play interactively though she has learned various social rituals of greeting, sharing, protesting, etc. Sarah can also spontaneously communicate with a big smile, “Feel happy” or with a frown, “Feel mad.”

**Type IV**

This group is characterized by very severe motor planning problems, as well as significant auditory and visual-spatial processing difficulties. Children in Type IV fall into two subgroups. Both subgroups are distinguished from Type III by having more severe challenges in all processing areas and especially motor planning, including oral-motor dyspraxia. As a consequence their progress is very uneven, with most difficulty in developing affectively purposeful interactions, complex problem-solving interactions, expressive language, and motor planning, and most success in becoming warmly engaged and partially interactive through gestures and action games.

There are two subtypes in Type IV and each is described in Tables 7 and 8. Type IV children make very slow progress with no development of expressive language. Generally, they have very severe processing problems and are aimless and nonverbal.

**Type IV-A: Identifying Criteria and Sequence of Progress (aimless, unpurposeful type)**

Insert Table 7 about here
Case Illustration of Type IV-A:

Harold was able to progress only very slowly to imitating sounds and words, even with an intensive program organized to facilitate imitation and oral motor capacities. He could say one or two words spontaneously when mad or insistent on getting something, but otherwise had to be prompted and pushed to speak. Every utterance was extremely difficult and he would sometimes stare at a caregiver’s mouth to try and form the same movements. His severe dyspraxia (i.e., low muscle tone) also interfered with his evidencing pretend play, although from the different facial expressions and the gleam in his eye when he engaged in playful interactions with his parents, it appeared he was playing little “tricks”. He sometimes held onto toy objects, such as a Nerf sword or magic wand, and used them in ritualized ways but could not use toys to sequence new ideas. He could get engaged and even initiated sensorimotor interactions where pleasure and affection got expressed. While games with his brother had to be orchestrated, he did enjoy running around the schoolyard and the pool with other children. In the second year of intervention, he was able to interact and communicate with three or four back-and-forth exchanges about what he wants, pulling his dad over to the refrigerator and finding the hot dogs. He could even retrieve a few words at such moments, “Hot dog,” and when asked what else, “French fries.” Harold became more consistently engaged over time, with islands of presymbolic ability, and tuned into more of what was going on around him. He no longer wandered aimlessly and could be observed picking up trucks to push or other cause-and-effect toys and simple puzzles. He let others join him but invariably turned the interaction into sensorimotor play which brought him great pleasure. Pre-academic progress was also very slow, even with lots of structure, repetition and practice, but he did make progress learning to complete “work” and self-care.

Case Illustration for Type IV-B

Margaret had severe perinatal complications and evidenced low muscle tone from shortly after birth. Her motor milestones were very slow, sitting up at nine months, crawling at twelve months, and walking at seventeen months with some asymmetry noted. Other than showing some pleasure in cuddling during the first year and some purposeful mouthing towards the end of the first year, she did not progress into consistent, purposeful interaction or complex preverbal problem-solving. Now she tends to perseveratively rub a favorite spot on the carpet and stare towards the light, but can smile and show some fleeting pleasure with sensory based play. With a comprehensive program, she has been able to make a little bit of progress and become more robustly engaged with deeper smiles and pleasure and more purposeful reaching and some exchange of facial expressions, as well as indicating preferences with facial expressions. At present, however, she has not progressed into complex behavioral problem-solving interactions and recently began evidencing a seizure disorder for which she has been placed on medications.

In this section we have presented a new classification of disorders of relating and communicating. As indicated, observation over a period of time is necessary for understanding a
child’s functional strengths. At times, with a comprehensive program, children will make better-than-expected progress and meet the criteria for a different group than originally thought.

Conclusion

We have presented a model (The DIR Model) to help systematize functional understanding of processing and developmental challenges in complex developmental disorders, including ASD. We have discussed the implications of this model for assessment, intervention, and a new functionally-based approach to classification. The DIR model provides conceptual tools to profile each child’s strengths and challenges and formulate interventions to promote developmental progress in the most critical areas of functioning.
References


Diagnostic Classification Task Force, Stanley Greenspan, M.D., Chair Diagnostic Classification: 0-3: Diagnostic Classification of Mental Health and Developmental Disorders of Infancy and Early Childhood. ZERO TO THREE/National Center for Clinical Infant Programs: Arlington, VA. 1994.


Table 1. Elements of a Comprehensive Program

<table>
<thead>
<tr>
<th>Home-based, developmentally appropriate interactions and practices (Floor Time).</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Spontaneous, follow-the-child’s-lead floor time (20 – 30 minute sessions, eight to ten times a day);</td>
</tr>
<tr>
<td>• Semi-structured problem-solving (15 or more minutes, five to eight times a day);</td>
</tr>
<tr>
<td>• Spatial, motor, and sensory activities (15 minutes or more, four times a day), including:</td>
</tr>
<tr>
<td>a. Running and changing direction, jumping, spinning, swinging, deep tactile pressure;</td>
</tr>
<tr>
<td>b. Perceptual motor challenges, including looking and doing games;</td>
</tr>
<tr>
<td>c. Visual-spatial processing and motor planning games, including treasure hunts and obstacle courses;</td>
</tr>
<tr>
<td>d. The above activities can become integrated with the pretend play</td>
</tr>
</tbody>
</table>

| Speech therapy, typically three or more times a week |

| Sensory integration-based occupational therapy and/or physical therapy, typically two or more times a week. |

<table>
<thead>
<tr>
<th>Educational Program, daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>• For children who can interact and imitate gestures and/or words and engage in preverbal problem-solving, either an integrated program or a regular preschool program with an aide.</td>
</tr>
<tr>
<td>• For children not yet able to engage in preverbal problem-solving or imitation, a special education program where the major focus is on engagement, preverbal purposeful gestural interaction, preverbal problem-solving (a continuous flow of back-and-forth communication) and learning to imitate actions, sounds, and words.</td>
</tr>
</tbody>
</table>

| Biomedical interventions, including consideration of medication, to enhance motor planning and sequencing, self-regulation, concentration, and/or auditory processing and language. |

<table>
<thead>
<tr>
<th>A consideration of:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Nutrition and diet;</td>
</tr>
<tr>
<td>• Technologies geared to improve processing abilities, including auditory processing, visual-spatial processing, sensory modulation, and motor planning.</td>
</tr>
</tbody>
</table>
Table 2: Type I

<table>
<thead>
<tr>
<th>Attention and Engagement</th>
<th>Purposeful (Affective) Behavior</th>
<th>Problem Solving</th>
<th>Motor Planning</th>
<th>Imitative Skills</th>
<th>Symbolic Capacities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partially has (or with intervention acquires) ability for warm engagement with positive affect.</td>
<td>Hard to connect affect (intent) to motor planning. Behavior tends to be repetitive, self-stimulatory. With affective interactions, behavior acquires purpose</td>
<td>Partially has (or with intervention acquires) ability to engage in preverbal, gestural problem-solving interactions with caregivers.</td>
<td>Relatively strong motor planning (but not age-appropriate). Can sequence three or more motor actions in a row.</td>
<td>Partially has (or with intervention acquires) solid imitative skills for motor actions and/or sounds/words.</td>
<td>Progresses into imaginative play quickly. Can gradually learn to build logical bridges between ideas and become an abstract thinker.</td>
</tr>
</tbody>
</table>

**Processing Capacities:**
- In general, hypersensitive to sensation, such as touch and sound.
- Visual-spatial processing a relative strength for some and a relative weakness for others.
- Auditory processing impairment mild to moderate with good progress once intervention begins.

**Sequence of Progress:**
- Often makes rapid improvement in engagement, purposeful gesturing, range of affect expressed, and shared attention with caregivers and peers. Also rapid improvement in imitative skills because of better motor planning abilities, leading to language and imaginative play sequences.
- May enter hyperideation stage with a lot of words spoken in a very fragmented (free-associative) manner, but continue some preoccupations and perseverative tendencies with special interests, and, at this time, may fit a description similar to Asperger’s Syndrome. Can learn to be more logical as the environment challenges them to build bridges between their ideas. With an emphasis on creative interactions, gradually become more spontaneous, flexible, creative, and empathetic and, over time, progress to higher levels of abstract reasoning and social skills.
Table 3: Subtypes of Type I

| Type I-A | Relatively strong auditory, visual-spatial and motor planning, and overreactive to sensation:  
|          | • Tends to make the most rapid progress.  
|          | • May evidence precocious academic skills.  
|          | • Relatively strong short-term auditory memory and expressive abilities.  
|          | • Has relatively strong visual-spatial memory skills.  
|          | • Tends to be more reactive to sensation and emotional states, but develops better modulation over time.  

| Type I-B | Relatively strong auditory processing but weaker visual-spatial and motor planning with a tendency to be underreactive:  
|          | • While making rapid progress, may tend to remain more fragmented and concrete.  
|          | • Relatively strong short-term auditory memory.  
|          | • Relatively weaker visual-spatial memory and processing capacities than I-A.  
|          | • Relatively weaker motor planning than I-A.  
|          | • Tends to be more underreactive with some hypersensitivity.  

| Type I-C | Relatively strong auditory-verbal and visual-spatial memory, but relatively weaker verbal and visual-spatial comprehension and motor planning. Tends to be underreactive:  
|          | • Makes consistent progress, having good rote verbal skills but narrower range of ideas.  
|          | • Auditory processing and memory retrieval tends to be relatively weaker than I-A.  
|          | • Visual-spatial processing and memory tends to be stronger than I-B.  
|          | • Tends toward underreactivity, but may get more emotional because of weaker auditory processing and verbal communication.  

| Type I-D | Relatively strong auditory-verbal and visual-spatial memory, but relatively weaker verbal and visual-spatial comprehension and motor planning. Tends to be overreactive:  
|          | • Makes consistent progress with good rote verbal skills but with a narrower range of ideas and acceptable emotions. Can be rigid and anxious. Has similarities to Asperger’s Syndrome.  
|          | • Both auditory and visual-spatial memory are relative strengths.  
|          | • Auditory and visual-spatial comprehension tend to be relatively weaker.  
|          | • Motor planning is weaker.  
|          | • Tends to be more overreactive, but can be underreactive in some modalities. May have reduced muscle tone.  

### Table 4: Type II

<table>
<thead>
<tr>
<th>Attention and Engagement</th>
<th>Purposeful (Affective) Behavior</th>
<th>Problem Solving</th>
<th>Motor Planning</th>
<th>Imitative Skills</th>
<th>Symbolic Capacities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intermittent, but not full, capacity to engage with caregiver(s). Initially relies more on sensorimotor stimulation.</td>
<td>Hard to connect affect to motor planning and sequencing; difficulty with symbol formation. Tends to be repetitive, fragmented.</td>
<td>Can be partially purposeful, but without solid mastery of preverbal, gestural problem-solving.</td>
<td>Tends to be limited to two or three sequential actions.</td>
<td>Spontaneous imitative skills are not yet in evidence, but can be learned with practice.</td>
<td>Can learn to use words and pretend play, but often uses scripts of well-used phrases to initiate play.</td>
</tr>
</tbody>
</table>

**Processing Capacities:**
- Mixed reactivity to sensation with a tendency to be underreactive/self-absorbed or underreactive/sensory craving.
- Relatively limited auditory processing capacities.
- Relative degrees of compromise in visual-spatial processing, but may have good visual memory.

**Sequence of Progress:**
- Has the capacity to become joyfully engaged, but may require wooing and persistent pursuit. Also has the capacity to move from simple purposeful gestures to complex problem-solving, preverbal interactions, and use of imitation as basis for learning words and doing pretend play.
- May use scripts to initiate symbolic play.
- May evidence a large range of patterns of progress in transition from preverbal gesturing to use of ideas.
- Progress is gradual and often takes a long period of time, but with persistent work, progress appears to continue.
Table 5: Subtypes of Type II

| Type II-A | Visual-spatial memory relative strength, other visual processing, auditory processing, and motor planning relative weaknesses. Tend to be more reactive.  
|           |  
|           | - More easily engaged and spontaneous than Type II-B.  
|           | - Can develop language, retrieve often-used phrases and borrow fragments of scripts to use for symbolic play.  
|           | - Although language develops slowly and tends to be descriptive, can become more logical and able to reason over time.  
|           | - Moderate compromises in visual-spatial processing; visual memory a strength.  
|           | - Moderate compromises in auditory processing.  
|           | - Moderate compromises in motor planning.  
|           | - Tends to be overreactive and intermittently sensation seeking.  
| Type II-B | Differs from Group II-A in that it is underreactive with overreactivity to certain sounds.  
|           |  
|           | - Tends to be more self-absorbed and avoidant than Type II, requiring more encouragement to speak.  
|           | - Greater difficulty understanding unpredictable speech of others, retrieval difficulties, and reliance on often-repeated phrases and scripts.  
|           | - Moderate compromises in auditory processing.  
|           | - Moderate to severe difficulties with motor planning and low muscle tone.  
|           | - Tends to be underreactive to sensation but overreactive to certain sounds and can have sensation-seeking behavior.  

Table 6: Type III

<table>
<thead>
<tr>
<th>Attention and Engagement</th>
<th>Purposeful (Affective) Behavior</th>
<th>Problem Solving</th>
<th>Motor Planning</th>
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<th>Symbolic Capacities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very intermittent capacity to engage with caregivers. Engagement usually around sensorimotor stimulation.</td>
<td>Very intermittent affect-directed purposefulness at presymbolic level.</td>
<td>Islands of problem-solving. Cannot sustain interactions.</td>
<td>Tends to be very limited to two or less sequential actions.</td>
<td>Does not imitate spontaneously and learns only through tremendous repetition.</td>
<td>Islands of symbolic language with often-used phrases. May use toys as if they were real but do not generally represent themselves in them.</td>
</tr>
</tbody>
</table>

Processing Capacities:
- Moderate to severe auditory processing problems, but can be a relative strength. More severe motor planning, oral-motor, and/or visual-spatial challenges make it difficult to express/convey what is understood.
- Moderate to severe visual-spatial processing, but visual memory relatively stronger.
- Severe motor planning, sometimes with oral-motor dyspraxia and low muscle tone.
- Mixed reactivity to sensation with a tendency toward being underreactive.

Sequence of Progress:
- Tend to progress very slowly given the severity of their processing difficulties.
- With sustained affective engagement and continuous opportunities for interactions, can become more purposefully engaged and interactive and gradually progress to some complex problem-solving and imitation. Lots of semi-structured imitative exercises will be helpful. Over time, using visual communication strategies, practiced learning can improve, and can go on to early levels of symbolic play and communication.
Table 7: Type IV-A

<table>
<thead>
<tr>
<th>Attention and Engagement</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Very intermittent capacity to engage with caregivers. Tends to be very avoidant and wander aimlessly or lie down passively.</td>
<td>Fleeting to intermittent purposeful behavior related to very strong needs. Can participate in presymbolic play when toys relate to real life experiences and are in sight and modeled.</td>
<td>Very dependent on adult actions to get what they want, though over time can learn to communicate a limited range of desires through simple and, eventually, more complex gestures.</td>
<td>Severe motor planning impedes more than 1-step sequences, usually initiated to get needs met.</td>
<td>Imitation tends to be very limited, sometimes a single-step actions with objects, such as throwing, pushing, etc.</td>
<td>May eventually learn some need-based words, but relies on visual cues to understand what others say. Some may eventually learn to say or sign some words through much practice and repetition.</td>
</tr>
</tbody>
</table>

**Processing Capacities:**
- Severe motor planning and oral motor difficulties.
- Visual-spatial processing is a relative strength, with moderate compromises. Visual memory better than visual-motor or visual-spatial comprehension.
- Severe auditory processing difficulties.
- Shows a wide range of reactivity. Tends to be more underreactive to sensation.

**Sequence of Progress:**
- With intensive pursuit, can become more engaged, enjoy being around family, and become more purposeful to get what they want.
- Because of severe motor planning difficulties, do not often initiate purposeful steps, but can readily undo what they do not want and have difficulty knowing what to do next, often resorting to repetition.
- May learn words, usually through ritualized phrases, songs, and filling in the blank, but eventually may retrieve words for highly desired objects.
- Some show visual-spatial learning on semi-structured tasks, but cannot sequence actions to express ideas independently.
- Over time some children evidence unexpected strengths, moving on to presymbolic problem-solving and increased rate of learning.
Table 8: Type IV-B

<table>
<thead>
<tr>
<th>Attention and Engagement</th>
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<th>Imitative Skills</th>
<th>Symbolic Capacities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Only fleeting to intermittent engagement.</td>
<td>Fleeting or intermittent purposeful behavior related to very strong needs.</td>
<td>Can learn to be partially purposeful to solve problems when something is wanted.</td>
<td>Severe motor planning difficulties. May intermittently use one and two step sequences if very motivated.</td>
<td>Little or no imitative ability is in evidence.</td>
<td>Not in evidence.</td>
</tr>
</tbody>
</table>

**Processing Capacities:**

- Auditory processing capacity is extremely limited.
- Visual-spatial processing is extremely limited.
- Tends to be underreactive to sensation.
- May also evidence more overt neurological symptoms.

**Sequence of Progress:**

- Can become happier and more purposeful with a comprehensive program, but often find it hard to move into complex preverbal problem-solving.
- Over time, can learn to be intermittently purposeful and engaged and involved in preverbal, gestural problem-solving.
- Often not able to progress to symbolic capacities.
- With structure, visual communication strategies, repetition and practice, can develop some basic adaptive skills for home and school.