Chapter 4

Developmental Issues

An infant is born into an environment which, from a perceptual standpoint, is undifferentiated. Initially, the child does not know the difference between the self and the non-self. The child first begins to experience sensations from outside itself and inside itself without the ability to differentiate between the two. Sensory stimulation from all the senses are bombarding the child's central nervous system who's job it is to make sense out of all of this new information. The main problem faced by the child is to learn to integrate and understand all of this new information. The first task for the child is to become comfortable with the physical, visual, auditory and vestibular sensations that impinge on the child from the environment and to integrate these sensations into meaningful perceptions.

Originally the child has very little ability to control the sensations impinging from the environment or emanating from its own nervous system. The child relies on a care-giver to control these sensations and diffuse crying, body movements, and facial gestures become the first functional behaviors the child emits. Through these behaviors the child connects with a caregiver. As a result of these first reflexive behaviors the child connects with his/her environment and initiates contact with a caregiver. As this occurs, contingencies are doled out and eventually reacted to and understood as a way of being more successful at controlling sensations.

As the child learns that there is a visual/spatial outside world and that outside world is separated into discrete objects, the child gains more ability to control sensations. One object may stop hunger while another does not. While this is occurring the child

also learns about the auditory/verbal world and the adaptive function of vocalizations. One cry or movement will bring milk; another results in being picked up or a diaper change. Through interacting with the sensations in this auditory/verbal and visual/spatial world, the child begins to behave through motor functions, motor planning and vocalizations in relation to the perceived world. The child learns to respond to the discrete sensations and to use motor and vocal patterns to imitate, respond to, and manipulate the world. It becomes adaptive to label the differences between things and to respond to them differently.

Originally the child learns to label things based on physical characteristics. Eventually the child learns to label things not based on physical characteristics but instead based on what others say it is or it's socially derived meaning (Hayes, et. al., 2001). Therapy involves systematically building these perceptions of the world to be consistent with the perceptions of the larger society, hence supporting object constancy, teaching the child to label discrete perceptions, and finally, teaching a child to understand how those discrete perceptions relate to one another and what social meaning is attached to each.

Understanding and building complex behavioral repertoires form the basis for advanced developmental patterns. Every therapist should have a strong understanding of typical developmental milestones. In this chapter we will present basic information about typical developmental milestones and provide some commentary related to our observations of the struggles children with autism have achieving these milestones. Piaget is widely regarded as one of the fathers of developmental psychology. The work of Piaget is often contrasted with and seen as in opposition to behaviorism. We do not

believe that Piaget's work needs to be viewed as incompatible with behaviorism. Behaviorists do not believe that it is necessary to speculate about structures developing inside the brain. We do believe that the brain changes as a child interacts with the world. We generally believe that we do not need to speculate about what is happening inside an organism to be able to predict and change behavior. Every time a person takes a step forward or says one word to another person neurological changes are occurring in the brain.

Piaget believed that infants are born with the ability to categorize the world but that they must interact with the world to construct knowledge about the world (Rosenblith & Sims-Knight, 1985). From our behavioral perspective it is a given that the neurology of the brain creates an information processing system which reflects the external world and one of the main functions of the nervous system is the systematic organization of the information that is taken in. The second main function of the nervous system is the systematic organization of motor and verbal output. Through thousands of years of evolution the nervous system has evolved to systematically organize sensations and motor behavior. The nervous system must have contact with the external world in order for that organization to occur. Children are born with reflexes that permit them to act upon the world. The reflexes develop through the process of adaptation into what Piaget termed cognitive structures. The behavioral perspective would not deny that neurology changes. We would argue that labeling the neurological changes "Cognitive Structures" adds nothing to our understanding.

According to Piaget there are three possible ways that a child will deal with new information. If the information is too complex the child will ignore it. If the new

information is close to what they already know they will assimilate the information. Finally if the information is in opposition to something they know they will change what they know to accommodate the information. Adaptation occurs through the process of assimilation and accommodation (Rosenblith & Sims-Knight, 1985). .

From a behavioral perspective information provided by the world is a discriminative stimulus (SD). Information that is too complex is information that does not clearly convey to the child information that can be used to predict outcomes of success or failure in the world. It makes sense that this information would be ignored. It conveys no predictive information so for all intensive purposes it is useless. We find children with autism often turning away from and ignoring much information in their worlds. It is very likely that this occurs because of the level of complexity of the information. When the information is broken down into smaller bits of information children with autism can often understand the information.

Information that is close to what a child understands is said to be assimilated. In other words the information does predict future success and failure but it is slightly different from the information that is known. In this case the child is able to generalize and expand on an already predictive relationship between and environmental event and an outcome.

If information is in opposition to what the child knows accommodation occurs. The child has learned that a predictive relationship between two events does not work. The child learns a new predictive relationship. The child adapts or progresses developmentally by improving his or her ability to predict outcomes in the future.

Piaget did not believe that reinforcement was necessary to motivate a child to act (Rosenblith & Sims-Knight, 1985). A behavioral perspective would agree that reinforcement in not necessary to motive a child to act. A child acts in the world because of deprivation and aversion. A child acts in the world because he/she *needs or desires* something. In other words a child's set point for sensory stimulation needs to return to equilibrium. Reinforcement occurs when a behavior increases in the future because it was successful at achieving its end. The ideas of Piaget and the developmental literature that has developed out of his work should not be seen as in opposition to behavioral principles. Information about developmental milestones can inform the therapists as to typical development and provide insight into typical behavioral patterns and how they develop.

Research on the perceptual development of infants suggests that the major senses of vision and audition are intact and functional at birth. Newborns are most easily stimulated by complex and continuous sounds. Infants will look toward stimuli they see out of the corner of their eyes and exhibit saccadic eye movements. Saccadic tracking movements are jerky and discontinuous until about six to eight months of age. At that time they become smooth and sustained. Attention is first focused on high contrast external contours of objects (Rosenblith & Sims-Knight, 1985). This is likely a result of the patten recognition feature detectors in the visual cortex. In other words that child pays attention to what they can see clearly. Attention at this point is controlled by sensory abilities. As the sensory organs of the eyes and visual pathways to the visual cortex are used in responding and moving about in the world the system becomes more refined. As our eyesight improves aspects of the visual world that a child focusses on

become “boring” because that information has been processed repeatedly and the child is said to habituate.

Infants learn a great deal about language before they understand or can produce words. Infant language production starts with cooing and then moves on to babbling. They move from being able to discriminate single-syllable sounds such as “ma versus “pa” to being able to discriminate larger combinations later in development such as consonant/vowel, consonant/vowel/consonant/vowel combinations. Typically developing children also recognize changing intonation of syllables and can discriminate between statement and question intonations (Rosenblith & Sims-Knight, 1985). As a child vocalizes they improve their ability to coordinate mouth and tongue muscles along with the sophisticated ability to coordinate breathing and control over the vocal cords. Use of these structures develop the motor strip of the frontal cortex and language areas from sensory intake to motor output. Interference along any part of the information processing chain will cause specific challenges for a child. This will be discussed further in the appendix of the book in a chapter entitled Implications of Diffuse Neurological Dysfunction.

By the first month of life babies start to predict the occurrence of a second event from cues in the environment. This was described earlier as the result of classical learning. For example, a child will show anticipation of being fed when hearing footsteps coming into the room. Babies also start to exhibit what Piaget calls primary circular reactions within the first month of life. They will explore their sensory and physical world through the repetition of behavior. The rhythmic repetition of an individual behavior will occur rapidly and then slow in frequency as the child habituates

to a new experience (Rosenblith & Sims-Knight, 1985). In essence the child is learning to process new sights and motor movements. A typically developing two month old may show this rhythmic repetition for a few days. We may see these rhythmic patterns last for months or years in children with autism.

By 2 months infants start to scan multiple features of objects. Newborns are considered to be nearsighted and there is controversy over whether newborns can see objects focused on the fovea (Rosenblith & Sims-Knight, 1985). Children with autism often focus for extended periods of time on insignificant parts of objects and have a difficult time integrating multiple features. The area of the occipital cortex involved in organizing the projections from the fovea is very large and complex. It is believed that perception of information coming from the fovea may develop later than projections from the visual non-fovea periphery. This is possibly a more striking delay in some children with autism. Many children with autism look at objects out of the corner of their eyes and hold objects very close to the eyes. Looking at objects out of the corner of the eye removes the object from the fovea. If the occipital cortex is not completely organized to take in and integrate visual information from the eyes direct eye contact and directly looking at objects may provide less information to a child with autism than averting the eyes. The problem is that averting the eyes will also delay the development of the visual cortex causing further problems. For this reason we develop a systematic plan for making eye contact and facial referencing functional. As a child begins to focus information on the fovea, the fovea and corresponding fields in the visual cortex begin to develop and differentiate.

By the second and third months of life a newborn starts to demonstrate true perceptual processing in being able to detect similarity in the form of perceptual invariants. They begin to know the difference between their mothers and strangers. They can imitate simple same class movements and show recognition of familiar events within a twenty four hour period (Rosenblith & Sims-Knight, 1985).

By three months they have enough control over airflow to make vowel like sounds. Back and forth vocal interactions can occur at this time in typically developing infants (Rosenblith & Sims-Knight, 1985). Many of these skills continue to be delayed in children with autism. Treatment must focus on the ability to form and integrate perceptions along with coordination of muscle movements to speak and behaviorally demonstrate understanding of perceptions. At three months typically developing children have the ability to do non-verbal imitations. The ability of an infant to reliably disengage from a stimulus develops between 2 and 4 months of age (Johnson et al., 1991). At this level of development a child can attend to a stimulus, engage in an alternative stimulus and then reengage in the first stimulus reliably. Here the child demonstrates the ability to shift attention from on object to another.

By four months infants can coordinate visually guided reaching and are more responsive to environmental events. Secondary circular reactions start to occur where the infant makes something happen again through their actions. This is the first obvious sign of purposeful learning as a result of consequences. Babbles are modified and gestures as well as facial expressions are used to convey needs and feelings at this age. (Rosenblith & Sims-Knight, 1985). At this age it becomes clear that learning by consequence is

occurring and the child not only can predict events that will occur from previous events but also can start to control those events through their own actions.

By 4-6 months infants can see objects in depth and discriminate amongst objects tactile, auditory and visual characteristics (Rosenblith & Sims-Knight, 1985). Children with autism often have a difficult time discriminating between objects. Object discrimination abilities must be broken down and trained though matching exercises. Auditory, tactile and visual perception should never be taken for granted in a child with autism. It is clear that a typically developing child at this age can perceive the three-dimensional nature of objects. It is not necessarily clear that children with autism can perceive objects in the same way that typically developing children do. For this reason we would probe matching exercises and begin programs at a level that a child can perceive objects.

By 6-7 months of age infants start to organize perceptions based on common attributes and configurations of attributes (Rosenblith & Sims-Knight, 1985). After object similarity has been determined with programs we would move on to matching of nonidentical objects and eventually to categorizing the objects. Many children with autism are struggling with these issues at a much later age. It is not uncommon to see 3 and 4 year old children with autism struggling with these isses.

By 8 months of age intentional behavior becomes more apparent and the infant is beginning to develop object permanence. They can now search for something that is out of sight. They may at this age still make errors such as looking for an object where it usually is instead of where they last saw the object. Imitation becomes intentional. An infant will imitate unfamiliar actions and start to learn about the environment through

imitation of others (Rosenblith & Sims-Knight, 1985). At this age typical children exhibit intentional two-way communication (Greenspan, 1998). Children with autism usually have a hard time with imitation and learning from imitation of others. We need to brake down imitation tasks to the simplest form to begin to teach imitation. Object cued imitation is usually one of the easiest tasks. From there we move to non-object cued gestural non-verbal imitation. Eventually we move into verbal imitation. Many children with autism are working on these issues during the first year of therapy at three to four years of age.

By 10 months of age a typically developing child will start to communicate through gestures (Rosenblith & Sims-Knight, 1985). Many children with autism struggle with developing a communication system. Breaking down and teaching PEC, sign language, gestures or verbal language as appropriate helps to provide an avenue for continued learning.

By 12 months of age a child becomes more interested in novel aspect of the environment. They pay more attention to the distinctive features of objects they encounter and manipulate. Objects are seen as discrete and separate from the self. Infants at this age start to do mini experiments to see how objects change under different conditions. They can now start to solve more complex problems and use means to achieve an end (Rosenblith & Sims-Knight, 1985). Typically developing children may do experiments with physical objects for ten minutes to a few hours. A child with autism may do the same experiments for months or years. The length of time that a child devotes to repetitive actions in this matter strangely enough is not consistently predictive of outcome.

At 12 months of age a typically developing child can give someone an object when it is requested. The child can imitate face and hand gestures and hold up their arms or feet when they are being dressed. A child will look for and find hidden toys and show affection to familiar people. At this age a child can put blocks into a box, pick up small objects with a pincer grasp, point to desired items and hold a spoon. A typical child at this age can pull themselves to a standing position and stand alone for a few seconds, crawl on all fours and sometimes walk. They can usually imitate sounds, recognize there name and follow simple one step instructions. Babbling is usually strong and varied with variations in pitch. They can recognize familiar people from a distance of 20 feet and watch small objects move from a distance of 10 feet (Lovaas, 1984). Each of these developmental tasks is tackled one by one with a child with autism as they master earlier developmental milestones.

At 12 to 16 months of age a child's ability to solve contingencies in their environments can include novel behaviors that have not been tried. At this point they still have to physically try the solutions they come up with and they often use a trial and error style when solving problems. At this age a typically developing infant will be able to respond to a small number of words even if they are presented in isolation. Intonation and stress are used to convey intent and emotions, and an infant can begin to comprehend words out of context (Lovaas, 1984). Understanding intonation and stress is often difficult for a child with autism to master. Much of this relies on the ability to integrate information from multiple senses into a perceptual gestalt. These higher level integration skills are often a challenge and each sensory perceptual system has to be trained separately before integration can occur.

By 18 months of age a child can usually remove some of their clothing such as shoes and socks. They can raise a cup with two hands and drink from it without spilling. They can imitate complex actions such as sweeping the floor or hammering a nail. They usually prefer to be near adults and will alternate between dependence and independence. By 18 months of age a typical child can usually scribble with a crayon and build a tower of three blocks after observing a demonstration. They are starting to explore objects more with there hands than their mouth. They can push large objects and do two things at a time such as carry a chair across the room. They can climb onto and off of an adult chair. They often walk with their feet slightly apart and usually crawl down stairs backwards. By 18 months children can usually speak 6 to 20 words that can be easily recognized. A child at this age will echo the last word said to them. They can usually point to two to three body parts on themselves or a doll. They will often be able to point to a distant object and retrieve a ball that is rolling away (Lovaas, 1994).

By the end of the second year a typically developing child is starting to use language symbolically, can start to solve problems without physical trial and error means, can classify two classes of objects at the same time, and is demonstrating mature object permanence (Rosenblith & Sims-Knight, 1985).

Words are used first as holophrases where a single word conveys the meaning of an entire thought. They are often context dependent and the meaning of the single word can vary based on intonation. Knowledge of word meaning usually develops in a systematic fashion moving from words that refer to people, to objects and finally to actions that are meaningful to the child. Words are usually used in an under-extended manner and then in an over extended manner. Combination of words often also develop

in a standard order (agent + action, action + object, agent + object, possessor + possessed, demonstrative + noun, attribute + noun, location + object, action + location, negation, question. (Rosenblith & Sims-Knight, 1985).

By two years of age a typical child can often feed themselves with a spoon and they are proficient at chewing food. They usually need a lot of attention from their caregiver and may cling to the caregiver when they are tired or afraid. They will often play next to other children in parallel play. They may become very possessive of their toys and may throw temper tantrums. They can remove a wrapper from a small piece of candy, build a tower of six blocks, draw a line across a piece of paper and pick up an object as small as a crumb. They can often run easily with changes in speed and directions, walk up stairs holding on to a railing putting both feet on each step. They can kick a large ball and throw a small ball (Lovaas, 1994). In therapy a child's behaviors and abilities are compared to what a typical child can do and we try to progress the child from one developmental milestone to another. Each child with autism will have different strengths and weaknesses. There is no way to say that a child with autism is usually at any particular level in relation to any of these milestones. For that reason continued evaluation of the child's functional, social, adaptive, verbal and motor skills is necessary.

By 36 months a child can eat with a spoon and fork, wash their hands and be able to put on pants with elastic waist bands. They may like to help with adult chores and generally be cooperative. They will seek out and play with other children and share their toys. You often see an increased affection for younger children. They can draw circles with a crayon on a piece of paper, paint with a large brush, and draw the figure of a man which includes a head and 1 to 2 features. A typical child at 36 months will be able to

build a bridge out of three blocks and pile nine blocks on top of each other. They can alternate their feet when walking up stairs, walk on tiptoes, jump off a bottom stair and stand on one leg for a moment. At this age they can often ride a tricycle for at least six feet (Lovaas, 1994).

At 36 months a child can tell someone their full name, sex, and age, when asked. They begin to ask who, what, and where questions and use pronouns such as I, me, and you correctly. You can often engage them in short conversations as they talk about experiences and themselves. Their vocabulary is becoming very large but there may be some minor articulation errors and occasional stuttering. They enjoy listening to nursery rhymes and stories and often ask for them to be repeated many times. At this age they can match two to three primary colors (Lovaas, 1994).

By the time a typical child is 48 months they can eat with a spoon and fork without spilling and dress and undress themselves with the exception of tying their shoes and proficiency with buttons and snaps. They understand how to take turns and prefer to be with other children instead of adults. A child at this age can draw lines connected at right angles and has good control of a crayon. They can thread beads onto a string and pile over 10 blocks on top of each other. A child of 48 months can stand on one foot for 8 seconds, hop forward two yards, and walk proficiently on a line. They climb, swing, and slide on playground equipment and enjoy a variety of ball play. They can run on their toes and bend down and touch their toes without bending their knees (Lovaas, 1994).

A typical child at 48 months can tell you their address, count by memory up to 20 and often knows and can recite many nursery rhymes. Their conversations are connected and they can talk about their recent experiences. They can ask why, what, when and how

questions and enjoy jokes. Their speech is grammatically correct with only a few sound substitutions (Lovaas, 1994).

By 60 months of age a typical child can use a knife and fork, wash and dry their face, and dress and undress proficiently. They select their own friends and are protective of those younger than them. They understand rules in games and understand the importance of playing fair. A child at five years of age can demonstrate a sense of humor and fears of animals or physical dangers often emerge. Children at this age speak fluently with only minor errors and can tell someone their full name, age, address and phone number. If they hear a word they do not understand they will often ask for the meaning and start to use the word in the future (Lovaas, 1994).

By five years a child can often draw a house with a roof, doors, widows and chimney and a man with head, arms, legs, and a trunk. They can match 10 colors and copy patterns made with 10 blocks. They are starting to be able to write capital letters. They can now move rhythmically to music, hop forward on one foot with ease and understand rules and scoring in ball games (Lovaas, 1994).

A though understanding of these basics of typical child development and other typical childhood milestones provides caregivers and therapists with general guidelines related to what adaptive skill or milestone should probably come next. Children with autism have unique strengths and weakness as a result of their unique neurological conditions. A child's neurological status will set timelines and limits on attaining adaptive skills. Therapists and caregivers should become familiar with all of the adaptive skills that a child will need to learn and be familiar with the child's individual neurological challenges.

One child may have more difficulty with motor functions. Another may have problems with receptive or expressive language. Yet another may have problems accurately perceiving the environment through hearing but perceive quite well with their eyes. Any combination of neurological strengths and weaknesses may be present. In general we want to work on the child's strengths and try to remediate their weaknesses.

In the chapters to follow we will try to give guidance on when to focus on adaptive skills at the different stages of therapy. Each child will be different and it is important to keep in mind the general sequence of adaptive growth within each of the domains of gross motor, fine motor, social skills, daily living skills, and communication. In general progressions within a particular domain are much more consistent than progression between the domains. For example a child in the motor domain will in most cases crawl before they walk. In the social domain a child will usually show affection to a familiar person before they will show interest in a child of the same age. Moving across domains usually involves the child's neurological strength and weakness and just because a child is at one year for gross motor activates does not necessarily mean they will be at one year for socialization. Becoming very familiar with the Vinland Adaptive Behavior scales (2005) and the Bayley Scales if Infant and toddler Development (2006) or other texts that chronicle adaptive skills is very helpful to assess a child's adaptive development and plan a systematic progression of adaptive skills.