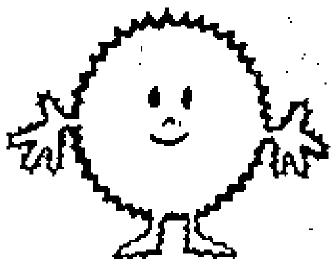
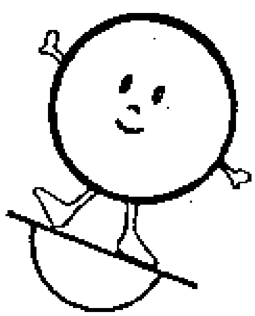
THE SENSORY GANG

Ms. Tactile



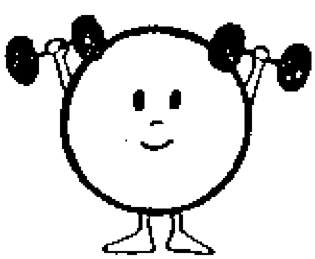
People say I am so touchy-feely! I can't help it! From head to toe and all over, my skin keeps me "in touch" with the world. Even inside my mouth I feel things – light touch, deep pressure, hard or soft, sharp or dull, vibration, temperature and ohhhhh ... the pain!

Mr. Vestibular



I keep everything "right with the world"! Because of me, you can deal with gravity when you are moving, no matter the direction or speed. Even when standing or sitting still, I am very important because of my sense of balance. Posture and muscle tone depend on the signals I interpret from the inner ear.

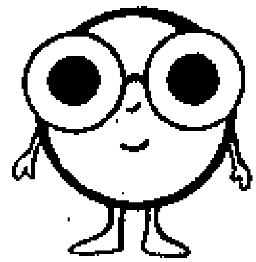
Ms. Proprioception



I do more that just push and pull, flex and stretch, pry and press! Information coming from my joints, muscles and tendons helps me adjust my body position for smooth movements with just the "right amount" of pressure. People say I am important for good "motor planning" when this information is accurate.

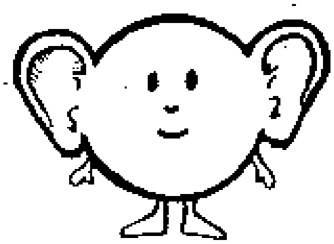
We three, Ms. T, Mr. V, and Ms. P,
are a pretty tight group. Some say we
are the foundation of the sensory system gang.
Who and what we stand for is even greater
when the rest of the gang is integrated!

Ms. Visual



I've got my eyes on you! I am on the lookout to deliver valuable details about what I see. Color, contrast, line, shape, form and movement have a part in how you perceive the world. My messages (with the collaboration of my friends) help determine what to pay attention to and what to ignore as well as help direct your actions and movements.

Ms. Auditory



Do you hear what I hear? I don't mean to whine but I can get your attention too. Listen to me, please, I'm all ears. It's not just about volume – consider also tone, pitch, rhythm and sequence of sounds. Processing me can be difficult but it is necessary if I am to be understood. If I don't have the others, help out, I'm just noise ... sigh.

Mr. Gustatory

Ah, to savor the "sweet taste of success," or was it bitter or salty? Maybe sour or spicy? Taste buds and saliva are the grounds for my great sensory contributions. I often get no respect but one thing's for sure, I know "what I like!" By the way, I am intricately linked with Ms. Olfactory.

Ms. Olfactory

Although some consider me not as refined as my other sensory friends, I go way back in time – kind of a survival thing. Strong memories are associated with certain smells. I subjectively consider the odor, especially when Mr. Gustatory is around. Remember, the "nose knows" and ... "Don't forget to stop and smell the roses."

Chapter 1

SENSORY PROCESSING

Sensation, that is, what we can see, hear, feel, smell, and taste, gives us information about the environment around us and about ourselves. It helps us understand the world and how to act on and within it. If we compare our bodies to a computer, our central nervous system or brain is the central processing unit (CPU) that receives, interprets, organizes, and sends messages to the rest of the body. Our central nervous system or brain helps us to regard, disregard, seek out, or avoid sensation to maintain or increase feelings of comfort, excitement, rest, and positive interactions with objects and people. It also influences how we try to avoid that which is painful, uncomfortable, or stressful. Whether it's cold outside, we have a stomachache, our shoes are too tight, or the food smells putrid, the way we interpret and perceive those sensations helps us determine what actions we take. Further, the results of those actions and associated feelings contribute to our sense of well-being, whether positive or negative.

Our interpretation of sensation is individual. As a result, reactions to a given sensation (behavior) can be very different among people even when they experience the same sensory information. For example, you may love Mexican food, but your spouse finds it too spicy and upsetting to his stomach. Your brother likes loud rock-and-roll tunes and you prefer soft classical music. Although each person's brain directs and is in charge of this interpretation, much of the process occurs at an automatic level without cognitive awareness of what is taking place.

The complexity of the central nervous system seems quite abstract. Yet, neuroscientists can show evidence that sensory input evokes physiological changes in the body. Sometimes we observe these changes in persons who seem to react strongly to everyday sensory input. For example, a child who smells a teacher's perfume may feel

Other changes may be less obvious although still detectable as in the increased heart rate of a child who clings to you after hearing the neighbor's dog barking loudly.

Even before a child is born, her brain, or central nervous system, is working to organize sensory information. This flow of sensory information may be subtle or intense, frequent or sporadic, or fleeting or long-lasting. For example, to the unborn baby, movement and position changes within the mother's body, the temperature of the amniotic fluid, the feel of a thumb within the mouth, and the sounds of the outside world are all information bits that may contribute to the developing central nervous system. This is why some mothers play classical music or read aloud while pregnant to stimulate growth and development of the fetus' sensory nervous system.

Dr. A. Jean Ayres (1979), an occupational therapist, defined sensory integration as "the organization of sensation for use" (p. 5). The typically developing central nervous system involves ongoing, dynamic interplay and comparison of information from all sensory systems. The outcomes of this process are seen in the responses we make to given situations and reflect multiple contributing factors.

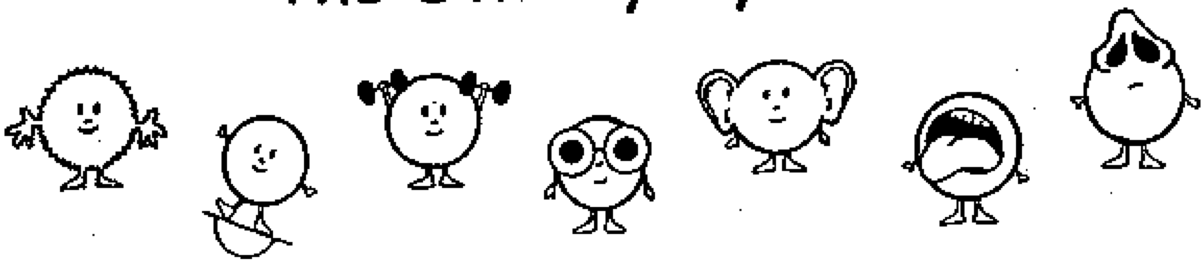
Consider the perspective of one student in a classroom where cooperative learning groups are used to teach social studies content. As all four groups plan and develop their projects, our student can hear the children's voices from all groups to some degree. Focusing on the verbal direction of his group leader and moving to the floor where a variety of materials can be spread out, he realizes that he needs his colored pencils to work on a map. Balancing on his knees and right hand, he reaches into his desk to retrieve his pencil box with his left hand. At that moment a friend directs a question to him, pointing to a graph in the social studies book. As our student looks at the book, he shifts his weight and continues the search for the pencil with his left hand. Feeling the clasp of the pencil box and pushing just hard enough to pop it open, he moves his fingers over crayons, an eraser, paper brads, and other miscellaneous objects until he feels the pencils bundled together by a rubber band. The series of adaptive responses demonstrated by the student in this situation reflect the effective integration of different types of sensation.

In contrast, given the same classroom and learning activity, another student may find it impossible to filter out the noise from other groups, making it difficult to focus on the task or be an effective contributor to the cooperative group assignment. The sensory input in the environment may be overwhelming to this specific child to the point that he withdraws and covers his ears. This response is an attempt by the student to alleviate some discomfort, but it limits his learning possibilities through interactions with peers and manipulation of materials. As a result, the effective integration of sensation necessary for an adaptive response has not occurred.

The previous examples illustrate the link between the sensory input and behaviors that result accordingly. Exactly how that link occurs and the words chosen to describe the process may be expressed in different ways by different individuals or groups of people who attempt to identify and explain behavior using a sensory processing perspective (Miller & Lane, 2000). In other words, a neuroscientist uses words that are intended to refer to a specific neurophysiological action whereas an occupational therapist may use the same or similar term in a more global manner. As the theory of sensory processing continues to evolve and the scientific community learns more about how the central nervous system works, additional terminology will emerge.

While it is beyond the scope of this book to give a comprehensive presentation of sensory integration theory, we will examine some of the hypothesized components of the process in a simplified manner to help bring about understanding and insight into the behaviors you observe. The information that follows is an attempt to explain some of the components of sensory processing and how we can use that understanding to make "sense" of our own behaviors and those of others, including children with Asperger Syndrome.

The Sensory Systems



The individual sensory systems' (tactile, vestibular, proprioceptive, visual, auditory, gustatory, olfactory) receptors, or specialized cells, throughout the body provide the starting points for delivering messages to the central nervous system (see Table 1.1). Some parts of the body have an increased density or number of these receptors compared to other parts of the body. Your mouth and hands, for example, have more receptors in the same amount of body surface than your back or leg, providing more sensory messages for processing. Passive and active experiences and interactions with the environment provide sensory input that is delivered throughout the central nervous system. As messages travel along neural pathways, specific regions of the brain compare or combine information from other areas. Figure 1.1 illustrates the sensory reaction that may occur as a child touches a slimy substance such as Gak™, Floam™, or Bugs n' Goo™. Other children happily anticipate playing with the slimy substance, while the boy in the middle of this example appears anxious and even nauseous at the mere thought of having to touch the material.

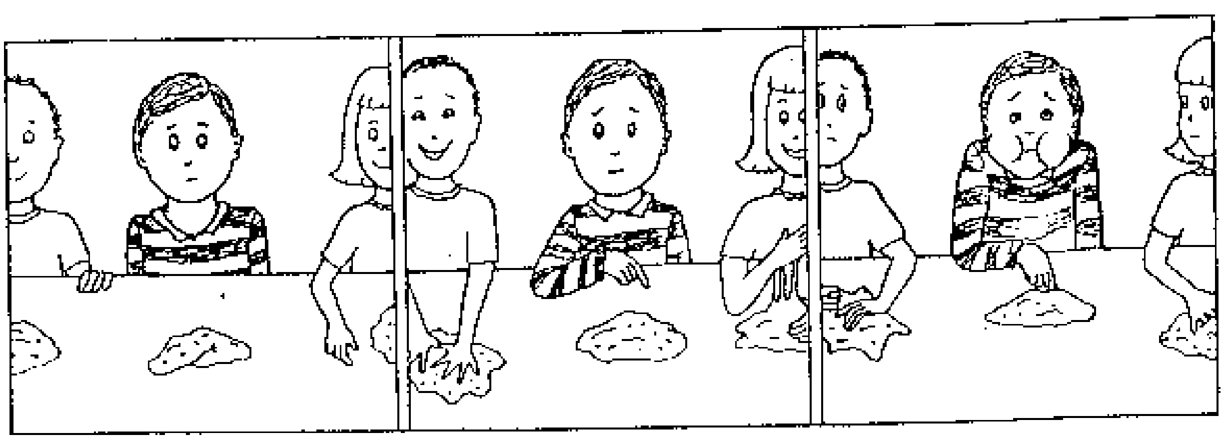
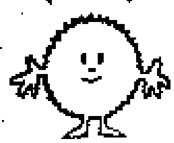
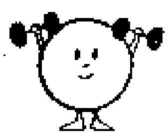
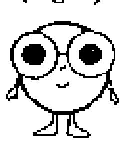
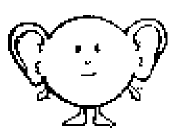


Figure 1.1. Sensory reactions to a slimy substance.

Table 1.1

Location and Functions of the Sensory Systems

System	Location	Function
Tactile (touch) 	**Skin** – density of cell distribution varies throughout the body. Areas of greatest density include mouth, hands, and genitals.	Provides information about the environment and object qualities (touch, pressure, texture, hard, soft, sharp, dull, heat, cold, pain).
Vestibular (balance) 	**Inner ear** – stimulated by head movements and input from other senses, especially visual.	Provides information about where our body is in space, and whether or not we or our surroundings are moving. Tells about speed and direction of movement.
Proprioception (body awareness) 	**Muscles and joints** – activated by muscle contractions and movement.	Provides information about where a certain body part is and how it is moving.
Visual (sight) 	**Retina of the eye** – stimulated by light.	Provides information about objects and persons. Helps us define boundaries as we move through time and space.
Auditory (hearing) 	**Inner ear** – stimulated by air/sound waves.	Provides information about sounds in the environment (loud, soft, high, low, near, far).
Gustatory (taste) 	**Chemical receptors in the tongue** – closely entwined with the olfactory (smell) system.	Provides information about different types of taste (sweet, sour, bitter, salty, spicy).
Olfactory (smell) 	**Chemical receptors in the nasal structure** – closely associated with the gustatory system.	Provides information about different types of smell (musty, acrid, putrid, flowery, pungent).

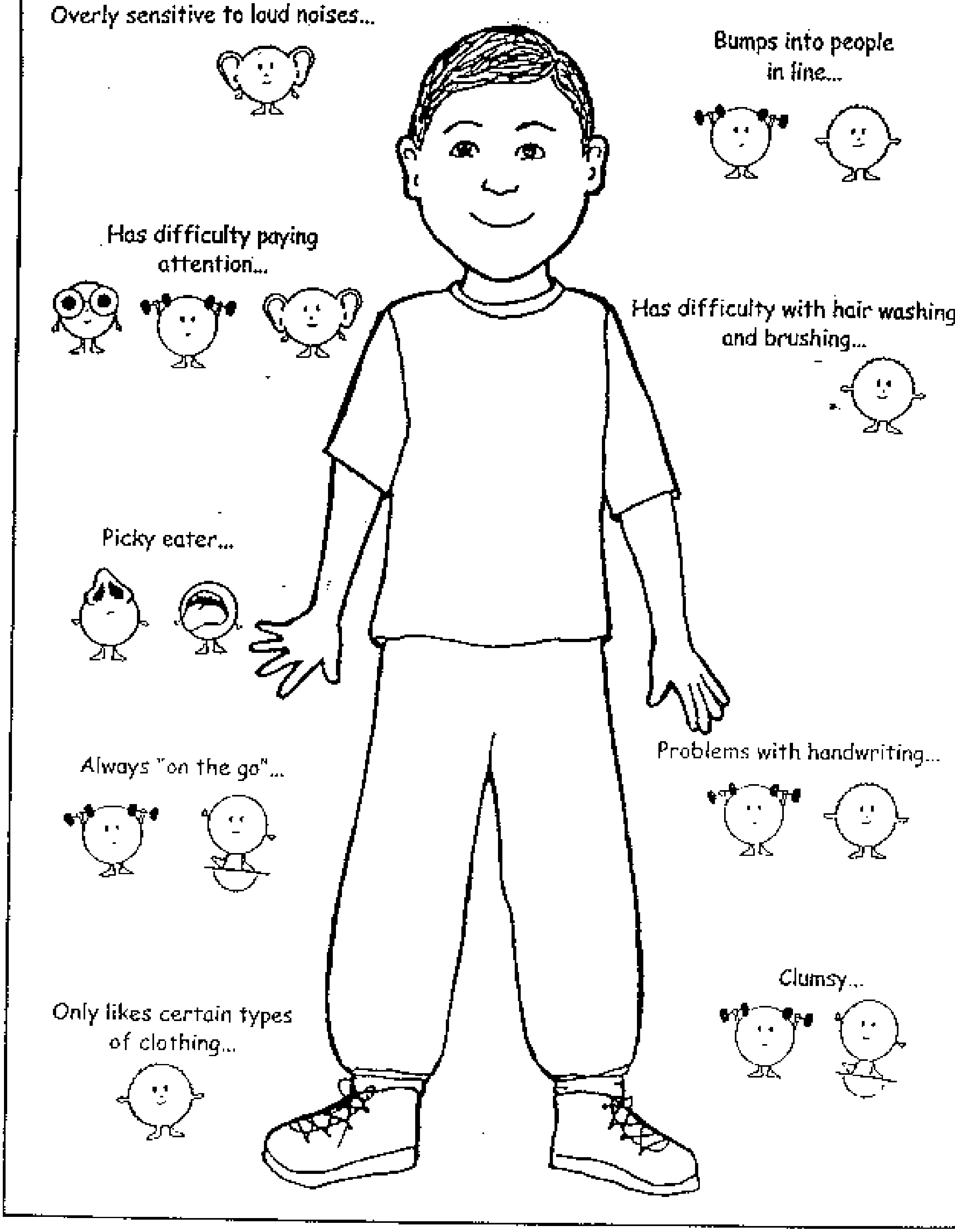


Figure I.1. Sample of sensory characteristics of the typical child with Asperger Syndrome.

the SENSORY GANG, we have tried to reduce the complexity of this topic. The SENSORY GANG appear throughout the book providing information in a user-friendly fashion. We hope you enjoy the SENSORY GANG and that they help you understand the needs of the child or youth with AS.