SLK Guidebook and Assessment Forms

Using the SENSORY LEARNING KIT

Millie Smith, M.Ed., TVI

AMERICAN PRINTING HOUSE FOR THE BLIND, INC.

Louisville, KY

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In keeping with our philosophy to provide access to information for people who are blind or visually impaired, the American Printing House for the Blind provides an electronic version of this book for large print and braille readers.

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AMERICAN PRINTING HOUSE
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Foreword

Sensory Learning Kit

Jane N. Erin, Ph.D., The University of Arizona

Almost every event in our daily lives, from making a cup of coffee to riding a bicycle, involves the use of several senses to accomplish a task or to enjoy ourselves. Students with disabilities that include sensory differences may not integrate information from existing senses to interact with their world, but objects and materials with specific sensory appeal can help lead them toward greater interaction. As educators, our role is to learn how a child responds to sensory information and to reward him with effects that will encourage more interaction.

The new *Sensory Learning Kit* combines the appeal of texture, color, and sound with opportunities for interaction with materials and devices that can be shaped into play or functional routines. The materials are useful in communicating not only the sensation but also the meaning of sensory information. By itself, the sudden sound of music may elicit a physical response and a startle reflex, but it does not influence learning unless the child is involved in producing it. Materials like the active learning switches in the Sensory Learning Kit can encourage initiative and understanding of purpose, beginning with awareness and active responses that will become part of the child's learning routine.

Many of us remember the *Sensory Stimulation Kit*, the original kit of sensory materials produced by APH in 1978. As teachers, we welcomed the array of materials that had a wide range of sensory characteristics: penlights with colored lenses, fabric mitts, a vibrator, and sound cylinders offered opportunities for creative teachers to develop new activities that engaged their students. However, in spite of the specific lesson plans that accompanied the kit, materials could still be used passively by people who were not familiar with the importance of active learning and student choice. Without guidance, caregivers might stroke a child with a feather duster or shine the flashlights into his eyes without considering the importance of interaction and functional use of materials. In addition, the accompanying lessons did not fully tap the potential of the materials for encouraging communication, especially in relation to the likes and dislike of the learners.

APH has undertaken and met the challenge of making a good kit even better. Part of the reason for the new and improved version is the involvement of Millie Smith, an extraordinary teacher (retired) from the Texas School for the

Blind and Visually Impaired, who has integrated the materials into a purposeful context of assessment and instruction. The protocols developed by Ms. Smith and the foundational materials for their use will ensure that educators understand how and why they promote learning. For students who respond randomly or inconsistently, the devices and routines in the new Sensory Learning Kit will offer new opportunities to interact with materials to receive a predictable result.

The combination of Ms. Smith's skills as a seasoned teacher and Ms. Tristan Pierce's capability as a product developer has resulted in exciting new opportunities for students to learn to interact with their world. The use of simple switches offers the chance to activate a radio, a vibrating pad, or other devices. The word "kit" seems modest in describing the breadth of the options for conceptual and applied learning provided here. The foundational reading and assessments help teachers to answer the following questions: Where do I begin? How do I engage this child in the world? What do I do next? The guided construction of routines includes motivating materials to promote learning for children whose progress cannot be charted on a written exam or a developmental scale. The Sensory Learning Kit is a treasure trove that will be welcomed by teachers who want to create new learning through student involvement.

About the Author

Mildred J. Smith is a private consultant working with students who have visual and multiple impairments. Millie, as she is known by anyone who has met her, is a caring and dedicated professional who just can't bring herself to completely retire. After more than thirty years teaching she could spend her days relaxing on her farm in Texas, catching up on years of neglected recreational reading, and traveling around the world. In reality Millie does all that, and still finds time to conduct workshops, give private consultations, and write the books that accompany the Sensory Learning Kit.

After teaching high school English for two years, Millie returned to school and completed her Master of Education in Visual Impairment and Emotional Disturbance from the University of Texas at Austin. Her graduate internship was working as a specialist in school programs for emotionally disturbed students at Children's Psychiatric Hospital at Austin. Like many vision teachers, Millie started out as an itinerant teacher of visually impaired students, working in the Dallas Independent School District. Millie returned to Austin and began teaching at the Texas School for the Blind and Visually Impaired (TSBVI). During her twenty-seven years at TSBVI she worked as a resource teacher for academic visually impaired students, a classroom teacher, and as an outreach teacher trainer. She has taught classes focusing on visual problems of exceptional children at the University of Texas at Austin and sat on the Advisory Board of the Special Education Department, Program for the Visually Handicapped.

Millie has shared her experience and knowledge with families and teachers by writing numerous articles and through her book, *Teaching Students With Visual and Multiple Impairments: A Resource Guide*, co-authored with Nancy Levack and published by the Texas School for the Blind and Visually Impaired, 1996.

Millie has been honored and recognized by her peers as the 2000 co-recipient of the AER Bledsoe Award for Teaching Students with Visual and Multiple Impairments and the 2001 recipient of the AER Division 3 Virginia Sowell Award.

Working with Millie these past three years has been both a pleasure and a crash course in visual and sensory impairments. Even though the process required long workdays, those days also contained enjoyment, respect, inspiration, and the occasional foray to the fossil beds and to local cultural venues; and she never missed a deadline. Thanks, Millie.

Tristan Pierce, Multiple Disabilities Project Leader

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Message to Readers

This book, the *SLK Guidebook and Assessment Forms*, is part of the Sensory Learning Kit (SLK) and should be used in tandem with the other components of the Kit: *SLK Routines Book* and a collection of tangible items provided for intervention strategies.

- Adaptable Stick Switch
- Adaptable Tactile Switch with snap-on plates
- bell bracelet
- combination penlight/flashlight with colored lenses
- ice bag
- massager
- mirror
- multicolor metallic pinwheel
- personal music player
- personal fan
- Power Select control unit
- Scallop Switch
- tactile roller with roller covers
- vibrating pad

Substitute intervention items may be included in your kit due to the occasional unavailability of commercial items. Such items have been selected to serve a similar function.

Your kit was not designed to be used by unattended children. Children should always be supervised by an adult when using items in your kit.

This book has a combination soft/hard cover and is spiral bound. It contains one CD with a self-adhesive case.

We hope your students/clients benefit greatly from using the SLK and that you enjoy using it as much as we enjoyed producing it.

Tristan Pierce
Project Leader

Millie Smith
Author

Introduction

Philosophy

The Sensory Learning Kit (SLK) is offered to teams consisting of families and professionals for their use in the development of skills that enhance the quality of the lives of learners with the most significant challenges. Each learner is unique. A great deal of collaboration will be needed in order to determine exactly how these materials should be applied for a given individual. Understanding key points related to the use of this material is essential.

- In order to have a high quality of life, every individual, regardless of ability or age, must have daily access to
  - some control over people and events (agency).
  - something to look forward to (anticipation).
  - somebody to do things with (participation).

- Learning for individuals with significant challenges requires a special relationship between the learner and the helping partner.
  - Both individuals must feel safe.
  - Both must be physically comfortable.
  - Both must be able to understand the non-verbal communications of the other.
  - Both must feel positive about the interaction.

- Learners with the most significant challenges live the highest quality lives when they are skillful consumers of the help provided for them (Groenveld, 1991; Heim, 2000).

- Communication skills are an essential part of acquiring meaningful, satisfying, and empowering help.

- Participating in every activity to the maximum extent possible, however little that might be, enhances quality of life.

- Even with the most challenged learner, too much help and too few expectations foster passivity and boredom.

History

The SLK is a revision of the Sensory Stimulation Kit produced by the American Printing House for the Blind in 1978. Based on the prevailing wisdom of the time, the original product was designed to facilitate the

development of basic sensory processes in very young visually impaired and moderately multiply impaired children. Due to medical advances since the original kit was created, teachers are serving more students with severe neurological challenges. Recognizing this, APH met with a group of educators with experience in visual and multiple impairments. These educators recommended that the Kit be updated to serve this population better.

Purpose

Interventions are social experiences. The most valuable learning is that which has to do with the relationship between the learner and his or her partners in learning (Chen, 1999). The purpose of the interventions included in the SLK is to provide sensory experiences that stimulate curiosity and to motivate interactions that help develop skills. Specific tools contained in these materials may be used to help teachers develop instructional components such as daily schedules, lesson plans, and alternative assessments for students with the most significant challenges.

Target Population

This kit is designed to focus on the needs of learners who are in the 0 to 2-year range of cognitive development. This includes all infants with visual impairments, toddlers with visual impairments and mild developmental delays, early elementary students with visual impairments and moderate to severe delays, and students of any age with visual impairments and profound delays. Multiple impairments, including auditory impairment, autism, and severe motor impairments may be present. For many of these learners, the 1 to 2-year stage of cognitive development can be enhanced by using the activities in this kit. However, emphasis at this level should be on experiences occurring in natural, social environments.

Use

These materials should be used carefully. If essential information is overlooked, interventions could be harmful. If interventions are not designed and implemented properly, learning may be compromised.

Learning partners—families, friends, teachers, and specialists—need to proceed in the following order:

- read the guidebook carefully,
- use the assessment forms to determine where and how to begin, and
- teach using the appropriate level activity.

Contents

The Sensory Learning Kit includes:

- the *SLK Guidebook,* which is divided into three main parts—Introduction, Learning and Teaching;
- the *SLK Assessment Forms,* which consist of five tools to be used sequentially;
- the *SLK Routines Book,* which includes an introduction, routine templates, and worksheet for modified routines; and
- an assortment of tangible items to be used during assessment and when teaching routines.

Tools related to the above are included in the appendices of this book.

Clarification of Terminology

These materials are designed to build basic cognitive and communication skills. They are not intended to be used to remediate sensory processing deficits. Hopefully, team members will combine helpful approaches and techniques that reflect areas of their specific expertise. Approaches used with learners who have the most significant challenges may include aspects of some of the following.

Learning Approaches

Approach
Developmental

Description
Development of sensory, motor, cognitive, communication, and social abilities result in higher performance in daily activities. Goals and objectives are framed in terms of milestones based on the chronological development of typical children (Furano, O'Reilly, Hosaka, Inatsuka, Allman, & Zeisloft, 1979).

Advantages
Developmental curricula give teachers and specialists a predictable scope and sequence of skills that allow them to choose goals and objectives. Progress can be clearly measured by observing the achievement of successive skills.

Disadvantages
Some learners do not develop in typical patterns. Curricula may include very few skills at the earliest levels of development. Increments of development based on the behavior of typical learners may be too broad. Materials and

activities may be appropriate for young learners, but not for older learners at the same level of development. Progress cannot be measured for the learners with the most significant challenges because their learning occurs in smaller increments. Progress reflected by expanded application rather than incremental development is not addressed.

Approach
Sensory Integration

Description
The term is used widely to refer to intervention strategies used primarily by occupational therapists to improve performance and adaptive behavior related to taking in sensory information, integrating it, and planning movement (Bundy, 1991).

Advantages
Highly skilled specialists provide valuable information about sensory needs to the team of learning partners. These specialists, usually occupational therapists, may also carry out or supervise activities designed to help the learner take in and integrate sensory information.

Disadvantages
Some learners do not receive services of occupational therapists. Empirical support for the efficacy of sensory integration interventions is mixed (Bundy, 1991; Chambers & Sugden, 2002; Haring & Romer, 1995).

Approach
Sensorimotor Learning

Description
Teachers use the term frequently when referring to the stage of experience-based learning first described by Jean Piaget. During the first two years of life, infants and toddlers learn through interactions with objects and people. Repetition and slight modifications of actions are important aspects of this learning (Miller, 1993).

Advantages
Progress in learning is measured by observing criteria-referenced interactions with people and objects. Frequency and duration of alert states and the emergence of new object schema are examples of what may be observed.

Disadvantages
Learning partners must be very skilled in their ability to recognize motor responses in learners who have severe motor impairments. Learners with the most severe challenges are rarely given the opportunity to initiate responses before they are automatically manipulated through tasks (Chen, 1999).

Approach
Neuro-developmental Therapy (NDT)

Description
This approach focuses on the improvement of posture and movement. Sensory feedback is generated as the learner is moved by a NDT therapist at key points during activities. Through specialized handling and positioning, the learner is provided with the opportunity to experience more "normal" movement.

Advantages
Used widely with learners with cerebral palsy, this approach helps abnormal tone and movements become more normal. The execution of movements becomes easier.

Disadvantages
In order to be helpful, techniques must be applied by skilled providers with a wide experience base (Finnie, 1997).

Approach
Sensory Stimulation

Description
These techniques are designed to enhance the quantity and quality of sensory experiences available to a learner in order to modulate arousal (Wilbarger and Wilbarger, 1991; Progrund & Fazzi, 2002).

Advantages
Sensory input is provided effectively to help the learner achieve and maintain alertness.

Disadvantages
Opportunities for meaningful interaction with media may not be present. Materials chosen and introduced by others may be unpleasant to some learners, causing them to withdraw or become upset.

Approach
Functional

Description
This approach uses curricula based on ecological domains—domestic, vocational, recreation and leisure, and community. Acquisition of skills in these areas maximizes independence in work and living environments beyond school (Orelove and Sobsey, 2000).

Advantages
Learners develop skills in natural contexts, giving them the opportunity to practice skills they will use in post school environments.

Disadvantages
Learners with the most severe impairments do not have the potential to develop independent skills in the curricular areas addressed.

Approach
Behavioral

Description
Desirable behaviors are increased by rewarding them and undesirable behaviors are decreased by discouraging them (Krumboltz & Krumboltz, 1972; Oliver, 2004; Pogrund & Fazzi, 2002; Skinner, 1976).

Advantages
Learning partners using this approach become aware of the relationships between certain behaviors and antecedent and consequent events.

Disadvantages
Reward systems can be artificial and sometimes assume a level of abstract reasoning beyond the ability of learners with the most significant challenges. Underlying central nervous system issues related to behavior may be undervalued.

Sample Intervention

Mary is nine years old. She has cortical visual impairment, profound cognitive delays, and cerebral palsy. Mary didn't seem to respond to any of the lights, colors, textures, or sounds that were part of her educational environment. She was drowsy most of the time and seemed to go to sleep when the teacher tried to work with her. Mary's team began their intervention by doing an Arousal State Profile. They found that Mary was alert only 25% of the time she spent at school. Mary's drowsiness was largely a result of chronic under-stimulation and withdrawal due to stress when meaningless stimuli were provided randomly.

A state of alertness is necessary for learning. The team decided to build up Mary's cognitive stamina by increasing the amount of time she was alert. They began by doing a Sensory Response Record assessment to determine what kind of sensory input Mary enjoyed most. Mary's team spent several days carefully offering her different sensory experiences in each of the sensory channels. They watched for changes in her muscle tone, skin color, and breathing. They discovered that Mary's muscle tension increased and she breathed lighter and faster when she experienced pleasure. Flushing of the skin and perspiring indicated her displeasure. After about a week, they had developed an Appetite List for Mary of the things she liked. These items are called appetite items. They also had an Aversion List of things she didn't like, called aversion items.

The team took items from the Appetite (like) List and made "routines." The first routine they wrote for Mary was putting on hand lotion. Ray, the teacher, did this routine with Mary.

1. Ray told Mary what was going to happen by presenting the object cue for the activity. The cue for this activity was the opened lotion bottle. Ray let her smell it first, then helped her feel it.

2. Ray pushed Mary in her travel chair to where this activity took place. He transferred her to the wedge and waited a couple of minutes to allow Mary to get used to her new position.

Ray lets Mary smell the lotion and then helps her feel the bottle with her hands.

3. Ray put lotion on his own hands and began to massage Mary's hands. After several minutes, Ray stopped and waited. He treated Mary's first

action as a signal to start again. The first time he stopped and waited, she moved her hands a little; he started massaging again. After many days of this, she began to understand that if she did something, the massaging would start anew. Moving her hands became her favorite signal.

4. Ray told Mary that lotion time was finished by wiping her hands with a warm wash cloth. He gave her about fifteen seconds to process this and then transferred her back to her travel chair.

The educational team was thrilled that Mary had accomplished the first communication objective targeted in her IEP, an objective that had been pursued for several years without progress prior to this sensory based intervention.

Learning

Sensorimotor Learning

Jean Piaget called children under two years of age sensorimotor learners. What he meant is that they learn about their worlds by sensing it and acting on it. The sensory part is seeing, touching, hearing, tasting, smelling, and moving. The motor part is using muscles to respond to the sensory source by exploring it and manipulating it to make it do something. A sensorimotor experience includes both a sensory event and a motor response. The very best learning takes place when these two things happen together—when a sensory event is taken in and muscles respond. This tends to happen in two phases. For example, a baby sees something she likes, maybe the glasses on your face.

- She gazes at the glasses. This is the passive phase.
- Then, she is likely to try to grab these miraculous light-reflecting glasses. If she can get them in her mouth to explore them, she will. This is the active phase.

Together, these two phases make up a sensorimotor experience. The result is high quality learning. Our knowledge of our world comes from the accumulation, interpretation, and organization of thousands of these experiences. If there is sufficient experience at this level, the child will begin to understand that objects continue to exist when they are not immediately part of the sensorimotor experience. This is called object permanence. Now the child is beginning to be what Piaget called a preoperational thinker. This kind of thinking opens up the world of symbols, imitation, and imagining (Furth, 1970; Oekerman, 2000).

Sensory Processing

Sensorimotor learning emphasizes active learning, the experimentation phase of cognitive development Piaget defined as the basis for all subsequent development. The complete sensory processing story is much more complicated. A complete volume would be needed to describe just the basics of this process. In fact, there would be a volume explaining the process from the cognitive psychology point of view (the nature and development of knowledge) and another from the neuroscience point of view (the structure and function of the central nervous system). Sensory processing is described in the literature in terms of facts, as we know them today, and in terms of theories about the process as it relates to individuals with and without various kinds of disorders. How our sensory organs take in information about the environment, how our brains process this information,

how we physically and emotionally respond to it, and how we adapt and change as a result is nothing short of miraculous. Every event in the environment evokes clusters of interrelated responses that involve a whole person—mind, brain, and body. Winnie Dunn (2000) offers this example:

> For example, when a person reaches for a cup, the sensory receptors in the joints and muscles provide information about the arm's location in space; the visual receptors report on the closing distance between the cup and the person's hand; and the tactile system sends information regarding the texture and weight of the cup (sensory input). These data are incorporated into maps of the self and the environment, producing accurate current movement (interpretation of sensory input leading to organizing and executing a motor response) and enabling the next reaching task to be more routine. When errors occur in the motor action (as determined by sensory feedback), the nervous system adjusts its maps to improve the performance next time. (p. 37-38)

Before the process described above begins, one of the distance sensory channels—vision, hearing, or smell—must alert the person to the presence of the cup. Next, the person must decide whether or not he desires the cup. This is an emotional or affective decision based on the sensory appeal of the object or its contents and the feelings generated by the social relationship aspects of the context. If the qualities in both areas are primarily positive, the person forms the goal or intention of obtaining the cup. This is called ideation (Bundy, Lane & Murray, 2002). Ideation is followed by motor-planning, the cognitive process of using information about the body and the environment to plan how to move to achieve the goal; initiation of the response; and execution, carrying out the planned action. The initiation of a response is an extremely important part of sensorimotor learning for learners with motor impairments that can prevent them from executing the entire response described in Dunn's example.

Reception, Transmission, and Interpretation

Perhaps the biggest challenge to sensorimotor learning for learners with severe impairments is the absence of opportunities for quality interactions with objects and people in the environment. Even when quality experiences are available, sensorimotor learning is complex. Problems may relate to sensory intake (reception), transmission of input from receptors along nerves, or to cerebral processing (interpretation). For example, a learner may not benefit from visual information about objects and people in her environment because she has an eye abnormality that prevents reception of visual input. She may have perfectly normal eyes, but a tumor has impaired

transmission of electrical impulses along the optic nerve. Or, she may have a brain injury that impairs the interpretation of impulses received in the occipital lobe of the cortex. She may even have some combination of all three.

When quality experiences are available, a learner becomes aware of media (objects and people in the environment) because certain physical properties of the media—light rays, molecules of air, dense matter, sound vibrations, etc.—come into contact with her body. Sensory receptors are located throughout her body—skin, muscles, eyes, ears, nose, and tongue. The interaction of the physical properties of the media and the receptors in the body cause chemical and electrical signals to move from cell to cell along nerve fibers to the brain. Once there they go to different specialized areas. Richard Restak (1984, 2003) provides the following description of the arrangement of the brain:

> The spinal cord receives all our information from the skin and muscles. It sends out motor commands for movement.
>
> The brainstem, the extension of the spinal cord, receives information from the skin and muscles of the head and neck and is responsible for moving these muscles. The brainstem also contains the centers for our senses: hearing, balance, all of them except smell and vision. These two exceptions connect directly with the limbic system and the cerebral cortex respectively, which is why smell and sight have such powerful effects on us.
>
> The cerebellum and the basal ganglia together coordinate and modulate all body movement.
>
> The diencephalon (thalamus, hypothalamus, amygdala, and other structures) serves as a relay station for forwarding information (sensation) and movement. It also contains (within the hypothalamus) important control areas for integrating bodily processes that normally lie outside our awareness: body temperature, blood pressure, heart rate, respiration, and so on.
>
> The cerebral hemispheres concern themselves with our highest conceptual and motor functions. (p. 20)

According to Mesulam (2000), five cerebral networks seem to make up primary function.

1. A right hemisphere-dominant spatial attention network.

2. A left hemisphere-dominant language network.

3. A memory-emotion network involving the hippocampus and amygdala.

4. An executive network in various parts of the cortex.

5. A face-and-object identification network in the lateral and temporal cortices.

See Appendix A for a description of the sensory channels and the parts of the brain associated with the processing of information related to each channel. See Appendix D for a more complete description of the structure of the brain.

Sensory Experiences and Cognitive Development

Technologies like Positron Emisson Technology (PET) scans and Magnetic Resonance Imaging (MRI) reveal that, at birth, the brain is the most immature of all our organs (Restak, 1984, 2003). It continues to grow and develop for many years. It actually doubles in size in normally developing infants in the very first year of life (Kotulak, 1996). The growth of the brain occurs as a result of the enlargement of existing neurons and the building-up of thousands of neurological connections between these neurons (Huttenlocher, 1994; Mix, Huttenlocher, & Levine, 2002). These connections, or pathways, are established as children participate in sensorimotor experiences. When these experiences are repeated, connections strengthen. This is practice. A person plays the piano better after years of practice because neurological pathways related to the playing of a specific piece of music are very well established. A baby brings his hands together at midline better after he has practiced that action hundreds of times. A neurological pathway develops over time and makes things easier and more efficient (Greenough, 1987; Sprenger, 1999).

The frequency and quality of the infant's early sensory experiences determine how much growth and refinement will occur (Greenough, 1987). Children deprived of rich and frequent sensory experiences develop brains 20% to 30% smaller than normal for their age. They suffer corresponding impairments in cognitive skill acquisition. This effect has generally been studied in children from impoverished backgrounds (Campbell and Ramey, 1994; Kruger, Hugo, & Campbell, 2001). Children with significant sensory impairment at birth are also at risk in the area of cognitive development because, without intervention, the quantity and quality of their sensory experiences may be significantly diminished (Dunn, 2000). They cannot access many of the ordinary sensory events in their environments that a typical child would be able to access. If a visually impaired child has a mobile over her crib that is too far away or has objects on it that provide insufficient contrast, it is the same as if it were not there (Barraga, 1976; Vervloed, Ormel, & Schiphorst, 2001). Those children most at risk are those with

visual impairments, hearing impairments, severe motor impairments, and especially those with some combination of these impairments. Whether or not children and students with these challenges have adequate sensory experiences for cognitive growth is dependent upon the quality of the intervention provided for them by families and professionals.

Minimizing Stress

Stress affects health and learning adversely (Liu, Diorio, Tannenbaum, Caldji, Francis, & Freedman, 1997). There are some very significant factors that produce stress in our lives.

- One of the most stressful features of life is not knowing what is going to happen next. All of us alleviate as much of this stress as possible by arranging our lives in routines. Almost all of us have a series of very familiar, predictable routines that we engage in from the moment we get out of bed in the morning. We feel a surge of distress when one of our routines is disrupted. If you doubt this, think about what happens to you when your car won't start. Learners with severe disabilities spend a great deal of time not knowing what is going to happen to them next. Their lives often feel like a swirl of unpredictable events. Most of us soothe ourselves when we can't avoid something unpleasant by thinking about a pleasant experience we know is coming up soon. We have the ability to order our lives so that we don't have more unpleasant experiences than we can tolerate and we do have enough pleasant things to look forward to. Learners with severe disabilities do not have this ability. They are dependent on others to provide this order.

- Another stressful feature is the inability to control people and events. Very high levels of stress are typically found in people who are highly dependent upon others to take care of their basic bodily needs and to control basic operations in their environments. Learners with severe disabilities are at risk for not being able to make their wants and needs known to the people who control them and their worlds. Their primary experience may be one of being manipulated by others through a series of experiences they do not understand and may even find aversive.

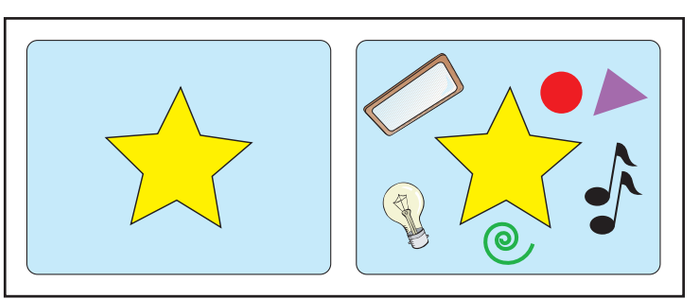
- Loneliness also produces stress. Most people have a profound need to spend a significant portion of their lives participating in pleasurable activities with other people. Learners with severe disabilities typically spend large amounts of time in isolated physical arrangements. When other people interact with them, these interactions tend to have very low social content. Things like changing, feeding, medicating, and positioning could have high social content, but because of the time constraints partners experience, these things are often done expediently rather than socially.

In a program designed to enhance learning by providing frequent and high-quality sensory experiences, care must be taken to make sure these experiences minimize rather than accelerate stress levels. Sensory experiences initiated and carried out by others produce less stress when they are provided in a very predictable way that allows the learner to know what is going to happen next. Sensory experiences initiated and carried out by others produce less stress when partners pace their interactions so that the learner has a chance to initiate and lead the partner through the interaction. Sensory experiences initiated and carried out by others produce less stress when learners know that they are going to be socially engaged with caring partners who know how to communicate with them and who are willing to do so.

Maximizing Alertness

All of us have a finite, limited amount of cognitive energy available to us at any given moment. We are usually clear about where we want our attention to be focused. Sometimes maintaining the focus of our attention is extremely difficult. We may be bombarded by different demands simultaneously. Something more urgent may come up that pulls our attention away from our desired target. Or, we may simply be too tired to attend. All of these factors influence sensorimotor learning.

- Sensorimotor learners are often not sure where to direct their energy. Their learning environments may be full of items placed there to provide passive stimulation. These items tend to be things like mobiles, lights, mirrors, background music, etc. When learners do not have the option of initiating specific interactions, they may shift attention randomly from one thing to another. This is certainly better than having nothing with which to pay attention, but it does not help the learner build the skill of focusing and maintaining attention with one significant item or event.



Focusing on the star in the left box is easy. Keeping your attention on the star in the right box is more difficult with the other items competing for your attention.

- Every environment is crowded with sensory events. Most of them are meaningless clutter which we tune out. Learners with severe disabilities are typically much less efficient at tuning out clutter. When many sensory events are occurring simultaneously, attention to any one event may be difficult.

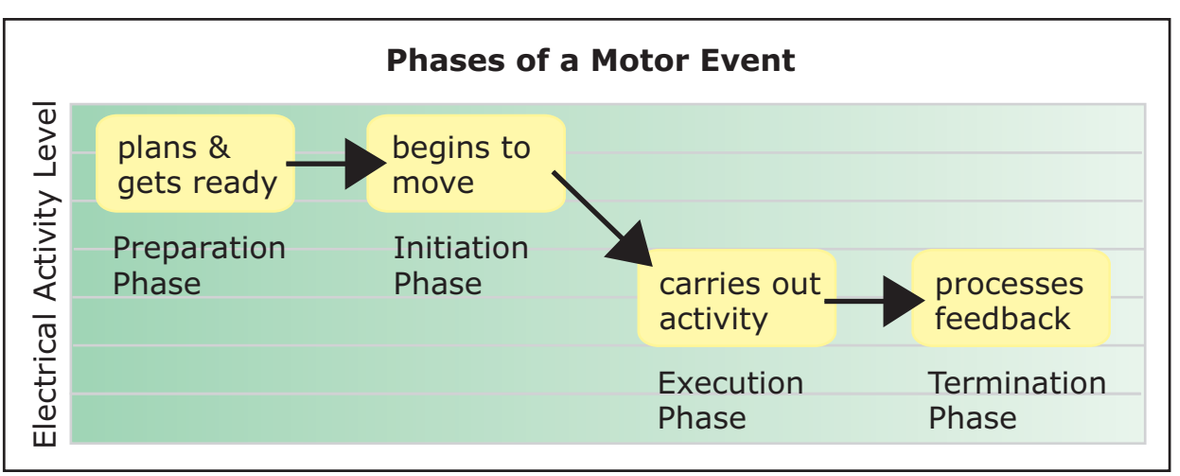
- Sensorimotor learners often have urgent sensory issues that compete with their ability to put cognitive energy where partners want it to be. Sometimes these competing sensations come from their bodies. They may be dealing with side effects of medications, seizures, chronic illness, or other things that consume cognitive energy. They may be in an uncomfortable position or one that demands a great deal of energy to maintain. Sensations from an extraneous source may overpower their ability to focus their cognitive energy on a more subtle or more meaningful sensation.

Consistency in sensorimotor experiences allows partners to control as many of these variables as possible so that the learner can pay attention to the media and events that are part of the learning experience. *No learning can take place without focused attention on the particular sensory attributes related to a specific skill.*

Challenges

Motor Impairment

The motor part of sensorimotor learning is challenging when children have severe motor impairments. What is motor learning for these students who can move very little? Most of us were taught to facilitate participation by



Participation is possible on some level for most learners during the Preparation and Initiation Phases.

moving their hands for them. This was called hand-over-hand instruction. There is something obviously problematic about this approach. How does a child learn anything if somebody else's brain is doing all the planning and somebody else's muscles are doing all the work?

Event-related brain potential research has shed new light on the process of motor planning and execution. There are several phases to every motor event. The electrical activity in the brain can be measured during each phase. A motor event begins with a preparation phase during which the person plans and gets ready. The electrical activity in the brain is very high during this phase. Next is the initiation phase (beginning to move) which is accompanied by very high cortical activity. The execution phase (carrying out the activity) is next; and surprisingly, brain activity levels drop significantly. Finally, there is a termination phase (processing feedback) with relatively quiet levels of brain activity (Deecke, 1996; Amorim, Lang, Lindinger, Mayer, Deecke, & Berthoz, 2000). This is such good news. The two most important phases cognitively are preparation and initiation and they are the two phases in which participation is possible at some level for most learners. Learners can prepare to do their part if they know two things:

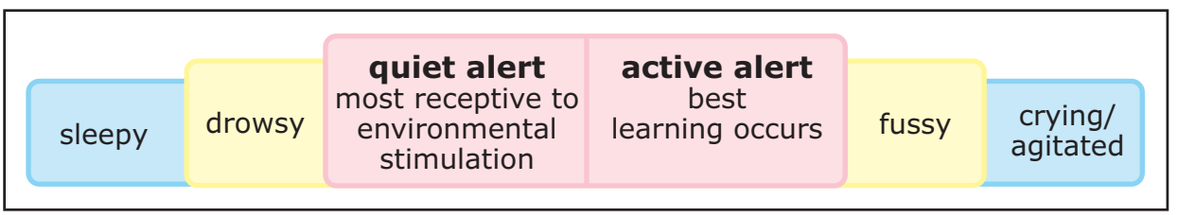
- what is going to happen next, and
- that somebody is going to wait for them to do what they can do.

If a learner can intentionally tense a muscle, blink an eye, open or close a mouth or hand, lean a head forward or backward, or extend an arm or leg a tiny bit, he can initiate. After this initiation, partners can go ahead and facilitate the execution phase by helping his hands (Adamson, et al., 1994). Helping the learner with the part of the task he cannot finish on his own facilitates the emergence of new skills (Vygotsky, 1978; Progrund & Fazzi, 2002; Sacks & Silberman, 1998). Structuring experiences using the instructional strategy of routines helps ensure that these elements will be in place.

Arousal States

Learners who do not seem to respond to their learning partners' attempts to communicate, don't seem to recognize the significant people in their worlds, engage in little purposeful movement, and respond minimally to the sensory events in their environments present a significant challenge. We know that learners with sensory loss and atypical sensory processing are highly at risk in regard to these characteristics. We also know that many of these learners can gain skills that allow them to interact with objects and communicate with people when appropriate interventions are applied. When these interventions occur early in life, permanent cognitive delays can be minimized. Many

teachers and parents do not know what these interventions are (Brown, Helmstetter, & Guess, 1986; Corn & Koenig, 1996; Miles & Riggio, 1999; Sacks & Silberman, 1998). As a result they may become discouraged.



Arousal States

One of the most promising interventions is the manipulation of arousal states. All people, regardless of age or ability, constantly experience a range of arousal states. Typically, these include sleepy, drowsy, quiet alert, active alert, fussy, and crying/agitated. We are the most receptive to stimulation from the environment in the quiet alert state. We see this state demonstrated frequently in infancy when the child is alert, eyes wide open, watching and soaking up the stimulation around him. The best learning occurs in the active alert state (Rainforth, 1982; Cantero, Atienza, Gomez, Salas, 1999). Many learning opportunities are lost when learners are drowsy or agitated during interactions with their learning partners. In a study, at-risk infants showed variations from normal state cycles suggesting underlying neurological disorganization resulting in irritability and reduced opportunities for learning due to decreased time in the quiet alert state (Rosett, Snyder, Sander, Lee, Cook, Weiner, & Gould, 1979; Cooper & Shallice, 2000). Learning partners can increase the learning potential of any interaction significantly by helping the learner achieve a quiet alert arousal state. In order to do that, learning partners must be able to

- recognize the learner's arousal states.
- predict when typical arousal states are going to occur.
- identify positive and negative response modes.
- use positive sensory experiences to calm, arouse, and orient the learner.

Recognizing the learner's arousal states is largely a matter of remembering to maintain awareness of this important factor. There are significant individual differences in how these states manifest from learner to learner. Most people would describe sleep as closed eyes, slow rhythmic breathing, and no movement. Sleep states for some include partially opened eyes and some movement. Partners must know the arousal state characteristics of the learner with whom they are involved.

Descriptions of Typical Arousal States (Als, Tronick, Lester, & Brazelton, 1977; Snell & Brown, 2002)
Asleep • Eyes closed, rhythmic breathing, and/or little or no movement • No evident response to sensory events in the environment
Drowsy • Heavy eyelids, repeated opening and closing of the eyes, and/or unfocused stare • Random movements of the face or limbs • Some vocalization • Intermittently oriented to sensory events in the environment for a short time
Quiet Alert • Open eyes and focused attention on some sensory event in the environment • Attention may be visual, tactual, or auditory
Active Alert • Observable interaction with the object or person stimulating attention • Some intentional voluntary movement even though it may be very limited
Fussy • Inability to maintain orientation and mild distress
Crying/Agitated • Grimace, frown, cry, or scream • Breathe irregularly • Show increased tension in body tone • Engage in self-injurious behavior

Many of the arousal state descriptions refer to the eyes. Remember that learners without vision may be focusing their attention even though their eyes are closed. Sensory stimulation perceived by the learner to be too intense or unpleasant may result in avoidance behavior. One effective way of shutting down the sensory system is to disengage intentionally by closing eyes, putting the head down, fisting hands, and perhaps vocalizing or engaging in self-stimulatory behaviors to mask out the unpleasant stimuli. Withdrawal can look a lot like drowsy or asleep. Partners need to be very

careful to distinguish between these states. In terms of intervention, withdrawal needs to be treated like agitation.

There are two types of interventions related to matching learning opportunities and alert states. One has to do with predicting when alert states typically occur and providing sensorimotor learning activities at those times. The other has to do with manipulating states by using calming and arousing sensory stimuli to bring the learner into the desired alert state. Combinations of both approaches are often used. Some research in newborns indicates that arousal states are the mechanism by which newborns control the amount and type of stimulation they receive. Arousal states are "manifestations of different dynamic organizing and control systems" (Ashton, 1976). In this theory, the environment doesn't regulate the state; but rather, the internal organization of the central nervous system regulates the receptivity to the environment. The intervention suggested by generalizing this research on normal newborns to the population of learners with profound impairments, is the Arousal State Profile (Rainforth, 1982). If arousal states are primarily internally driven rather than externally influenced, the most important information to have is a picture of when alert states typically occur in the learner. This can be determined by recording arousal states over a period of time. Then one can establish a profile showing when the learner is typically unavailable for learning and when the learner is alert and typically available for learning. If a learner is typically alert for forty minutes just after bathing, quality sensorimotor activities can be planned for that part of the day. If a learner is typically drowsy for an hour after feeding and agitated for a half-hour before feeding, those times can be ruled out as times for activities with high learning potential. A tool for profiling arousal states (Arousal State Profile) is included in the assessment section of this guide.

Establishing an Arousal State Profile is a very good way to start an intervention for a learner who is drowsy or agitated a great deal of the time. However, there are problems with using the state profile intervention exclusively. Many learners do not have consistent profiles. Seizure activity, medication changes, irregular sleep patterns, colds, and a variety of other factors interrupt neurological patterns that seem to be well established in normal newborns. Some learners just don't have enough alert episodes. They are unavailable for learning unless we do something to increase the amount of time they are alert. Research with individuals suffering from closed-head trauma and recovering from coma indicates that selected external environmental stimulation does increase levels of attention or alertness (Eames and Wood, 1984; 2003). Structured sensory activities have been used successfully to increase the awareness and arousal levels of children recovering from severe head trauma (Smith and Ylvisaker, 1985). Using these approaches with learners with profound impairments has had similar results.

Instruction should take place during naturally occurring alert episodes as determined by the state profile. State manipulation should be used to increase the frequency and duration of alert episodes. In state manipulation, the partner uses selected sensory stimuli to bring the learner into the quiet alert state by eliciting an orienting response. Once oriented, the learner should be ready to engage actively with the stimulus in a true sensorimotor learning activity. When learners are drowsy, partners should provide sensory experiences that arouse the learner's sensory neural system. Learners who are fussy need calming experiences. When the learner is close to the quiet alert state, a specific stimulus is provided to give the learner an opportunity to orient. As the learner pays attention to the specific stimulus provided by the partner, her heart rate and blood flow change to create the physiological conditions associated with quiet alert (Luria, 1963, 2002). When that stimulus is something that motivates a desire to interact, the learner is ready for active alert or sensorimotor learning. Great care must be taken to make sure that activating or arousing stimuli are presented appropriately. "Sudden or intense stimuli tend to elicit cardiac acceleration associated with startle or defensive responses..." (Rainforth, 1982). Startle responses are not conducive to learning and must be avoided.

Stimuli that elicit negative responses are to be avoided also. In order to use a state manipulation intervention safely and successfully, partners must do two specific assessments to determine the type and intensity of the learner's responses to environmental stimuli. These are the Appetite/Aversion List and the Sensory Response Record. Tools for these assessments are included in the Assessment Section of this book. After doing these assessments, partners will have a list of sensory appetites (things the learner likes) and a list of sensory aversions (things the learner does not like). Only items from the Appetite List should be used for orienting and for activity routines. Use of items from the Aversion List may promote agitation or withdrawal. Even sensory appetites can cause startle responses if they are not presented correctly. The presentation of the selected stimulus must match the learner's interaction style. The Sensory Response Record can be used to get information about the learner's preferred sensory channels, the intensity of responses to various stimuli, the length of time needed to process input before a response is seen, and the presence or absence of intentional behavior with the stimulus. With this information, partners can begin to use selected stimuli to attain and maintain alert states.

Sometimes partners have a difficult time determining whether a response to a specific stimulus is positive or negative. Learners with the most profound impairments respond in atypical ways. Positive responses to stimuli such as visual fixation, smiles, reaching, and vocalization are easy to recognize. Typical negative responses might include frowning, crying, or pushing away. It is much harder to interpret responses like changes in breathing patterns, muscle tone, skin temperature, tongue thrusting, lip movement, or eye

blinking. When responses to stimuli consist of the latter, these assessments must be done with the person who knows the learner best. Often parents know how to interpret certain facial expressions or movements that might go unnoticed by someone less familiar with the learner. Partners must identify the learner's unique response modes and determine which are indicators of positive responses to stimuli and which are indicators of negative responses to stimuli. Learners with profound impairments have very little control over what happens to them. Partners have a moral and ethical obligation to make sure the interventions they apply are at least neutral if not pleasurable.

Response Delays

One of the most challenging aspects of sensorimotor intervention is the appropriate pacing of input. Learners with profound impairments often have compromised sensory neural systems. They do not process sensory input typically. Response delays are common. A response delay is a longer-than-normal period of time between the presentation of a stimulus and the manifestation of a response to the stimuli. Learners with profound impairments frequently have response delays of up to fifteen seconds or more. Fifteen seconds is a long time. Right now, look at the second hand on your watch and count fifteen clicks. Most people asked to estimate when fifteen seconds have passed are closer to five seconds. Sometimes partners simply do not wait long enough for responses. In order to know what the learner is responding to, pacing must be adjusted to allow time for a response to appear before another stimulus is introduced.

Sensory Overload

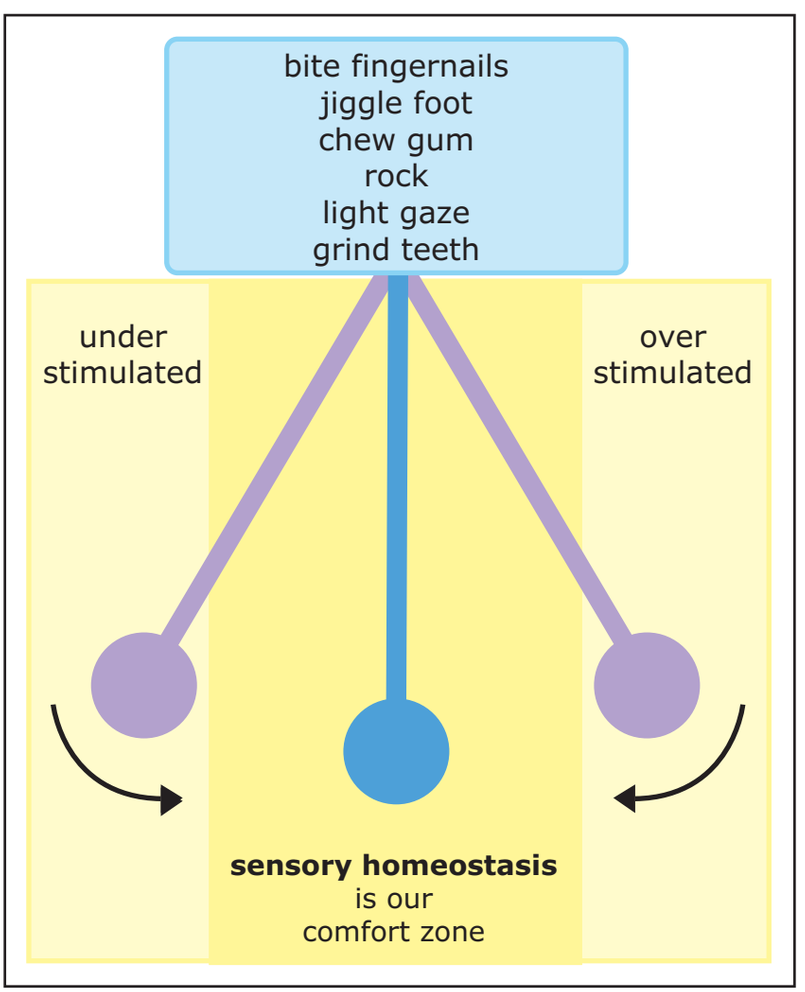
Many learners with sensory loss and neurological impairments have unique needs related to sensory input. They may become distressed by a source of stimulation that is too intense or lasts too long. They may require a certain amount of recovery time before they can tolerate another, different stimulus. Overstimulation may result in agitation or withdrawal. Partners may assume the learner is unresponsive, when in reality, material has been presented inappropriately. Many partners stop trying to teach when they believe the learner is not responding to their attempts to provide learning opportunities.

All sensory events are multi-sensory. It is physiologically impossible to control completely how sensory channels will be stimulated by a given event. Learners with the most impaired sensory neural systems seem to do best when partners can provide sensory input sequentially. For example, a learner might look at bells, then listen to them, and finally touch them. Cross-modal processing is very difficult for many learners with neurological impairments (Mesulam, 2000). They also do best when the pacing and intensity of input is carefully matched to their unique processing needs. Multi-sensory stimulation, experiences that are designed to stimulate several sensory

channels simultaneously, and sensory bombardment, the rapid presentation of one stimulus after another, are generally undesirable (Dunn, 2000).

Self-Stimulatory Behaviors

Every person has a certain point at which he feels comfortable with the amount of sensory stimulation he is receiving. This is called sensory homeostasis. We do many things to regulate sensory input to keep ourselves in this comfort zone. If we are at a boring movie, we may start to daydream or watch the people around us. If we are on a carnival ride that is too much for us, we may close our eyes and cover our ears. We all engage in a wide variety of behaviors we call "self-stimulation" that serve the same regulatory function. Some of us play with rubber bands or paper clips, bite our fingernails, cross our legs and jiggle a foot, twist our hair, bite the inside of our cheeks, or pop our chewing gum. When we are doing these things few of us are aware that we are regulating our sensory neural systems. In fact, we



are either doing something that arouses our under-stimulated system or something that calms our over stimulated system. Learners with profound impairments do exactly the same thing when they engage in self-stimulatory behaviors. Often their behaviors look unusual or have an intensity that becomes an interaction barrier. Like us, learners who rock, flick their hands, gaze at lights, twiddle strings, suck on their fingers, chew on their clothing, and grind their teeth, are trying to regulate their sensory neural systems. These behaviors may start as a result of a variety of factors. One contributor is an environment that is incompatible with the sensory needs of the learner, either overstimulating or under stimulating. Many of these behaviors appear in infancy and early childhood. If interventions can be put in place very quickly to give the learner the kind of sensory input his system is craving in more socially acceptable ways, these behaviors may decrease (Brambring, 1992; Harring & Romer, 1995; Miles & Griggio, 1999; Progrund & Fazzi, 2002). The neurological patterns being built up are still soft wired. After the behaviors have been present for about two years or longer, they become hard wired. At that point it is very difficult to eliminate them. This is one of the reasons appropriate early intervention is important. If self-stimulatory behaviors become hard wired, interventions can be applied to decrease the frequency and intensity of the behaviors and to provide an acceptable alternative to the stereotypical input in the most normalized ways possible. When behaviors are still transitory, interventions based on arousal state manipulation can decrease or replace self-stimulatory behaviors with appropriate participatory behaviors. For example, a learner who mouths his own hand for long periods of time can be encouraged to explore orally a rich variety of objects. Since mouthing indicates a sensory neural readiness for intense tactual input, objects can be chosen for their interesting tactual qualities. Even if his mode of exploration is oral, he is still learning about the objects. Partners must make sure that the variety of and interest in the objects are sufficient to motivate exploration. Otherwise the self-stimulatory behavior will just transfer from the hand to one or two objects. When self-stimulatory behaviors are hard wired, state manipulation can decrease the frequency and intensity of these behaviors.

Occupational and physical therapists should be key partners when setting up sensory based learning opportunities. A learner who becomes very agitated when his teeth are brushed, an activity which cannot be avoided, may engage in less self-stimulatory behavior during the activity when predictable events designed to help him achieve sensory homeostasis occur just before and just after tooth brushing. A physical or occupational therapist may suggest that the learner be swaddled in a blanket for a while before brushing and go lie on a vibratory pillow afterwards if the therapist knows that these sensory events will have a calming effect on the learner's stressed system. The following Self-Stimulation Worksheet can be useful in designing interventions of this type.

Self-Stimulation Worksheet

Student: _____ Date:_____

Copy as needed or use the electronic version on the accompanying CD.

Behavior	Sensory Channel	Alerting Calming	Alternate Activity	Sensory Input Intervention

Sample Self-Stimulation Worksheet

Student: *Mary* Date: *4/23/03*

Copy as needed or use the electronic version on the accompanying CD.

Behavior	Sensory Channel	Alerting Calming	Alternate Activity	Sensory Input Intervention
Teeth Grinding	*Proprio-ceptive*	*Calm*	*Chew tube provided by O.T.*	*Do deep pressure activity (use large ball to compress joints) before stressful activities.*

Teaching

Intervention

Attempts to provide children with a variety of rich sensorimotor experiences may do more harm than good if certain factors are not considered. There has been a lot of material in neurology, child development, and behavioral journals for the last several years about the relationship between stress and learning. It seems that stress hormones inhibit memory function, and that prolonged stress can actually break down some neurological pathways. Young children with multiple and severe impairments experience an abnormally high amount of stress as a result of having limited or no control over when, how, and what kinds of sensory input they receive. When interactions with others around these sensory events are associated with demands, stress levels can be even higher. As demands increase, so does stress (Gunnar, Brodersen, Nachmias, Buss, & Rigatuso, 1996; Miles & Riggio, 1999; Sacks & Silberman, 1998).

Sensory experiences that result in learning are those that are accessible to the sensory impaired learner. To provide experience and reduce stress, one should choose events the child enjoys and give the child maximum control by responding to his signals to continue or to stop the event. The best way to invite motor responses to sensory events without creating stress is to follow the child's actions. We must join, not demand. We do this by watching to see what the child is doing and then gently beginning to do it with him, matching his pace and level of intensity. After a while we might pause and wait to see if the child will do something to invite us to "go again." When a bond of trust is established, we can expand on the initial child-initiated response and invite a new behavior (Janssen, 2003). Using routines is a very good way to structure sensorimotor learning experiences to avoid stress and enhance learning. The successful interaction between the learner and the partner during routines makes this instructional strategy rewarding for both participants while empowering the learner, a key element of the SLK.

Routines

After completing the appropriate assessments, partners are ready to begin teaching. Depending on the intervention level, the desired outcomes of this teaching are to help the learner

- be alert more of the time,
- interact intentionally with the people and objects in his world, and/or
- participate in activities at the highest possible level.

The possibility of achieving all of these outcomes can be greatly enhanced by using routines. Routines are widely agreed upon as the best instructional strategy for students with severe disabilities (Chen, 2000). Use of routines allows partners to provide instruction that minimizes stress and maximizes alertness.

Daily Schedules and Routines

A typical daily schedule includes many different activities. A routine is a special activity in the daily schedule that has been chosen because

- important skills are being worked on during the activity,
- the activity can occur frequently—one or more times daily,
- the learner enjoys the activity or, at least, some aspect of the activity,
- a partner is available for interaction with the learner during the activity, and
- the activity can be structured so that it happens the same way each time.

Not all activities in the daily schedule will be routines. But learning efficiency can be greatly increased when some activities are designed as routines. Teams of partners will want to make sure that learners have four or more well-designed routines in their daily schedules.

Showing a pencil to the learner.

Learner holds the pencil.

Assisting learner by putting pencil in sharpener.

Learner places pencil in sharpener.

Designing Activities as Routines

In order for an activity to be considered a routine, it must be designed according to certain criteria that enhance learning efficiency. Routines contained in this kit have been written to help partners provide instruction that meets the following criteria.

- There must be clear communication to the learner that the activity is beginning.
- The activity must be broken down into key steps, and the steps must occur in the same sequence each time.
- Rigorous consistency must be maintained by using the same materials, same place, same person, and same time.
- The pacing of the activity must be maintained at the learner's optimum level from beginning to end without interruption.
- There must be clear communication to the learner that the activity is finished.

Partners will need to try their best to adhere to these criteria. Of course, there will be times when interruptions occur and consistency is compromised. The criteria have to be maintained many more times than not, or the activity is no longer a routine. Learners with the most severe challenges will usually participate in individual routines with their learning partner. They also may participate in group routines with other peers and partners. Young children often participate in group routines at "circle time." Older students may participate in group routines during vocational tasks such as assembly lines or jobs requiring tool sharing.

Memory Development

The consistency provided by partners in a routine is a key element in the development of "procedural memory." This memory allows the learner the comfort of knowing what is going to happen so that he can use his cognitive energy for more challenging aspects of a task (Blaha, 1991; Ward, Shu, Wallace & Boon, 2002). In order for the learner to memorize the sequence of a routine, the pace of a routine must be appropriately maintained. If the partner goes too fast, the learner does not have enough time to process what is happening. If the partner goes too slowly or stops for periods, the learner may lose orientation to the routine. The length of a routine is determined for the most part by the number of steps contained in it. A routine should have only as many steps as the learner can remember. The whole point of a routine is to provide instruction in a way that allows the learner to know what is going to happen next. If there are too many steps in a routine, the learner cannot remember the step sequence.

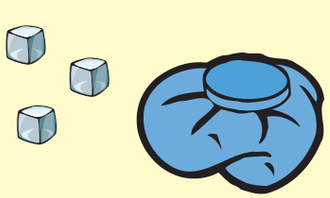
Contexts

Routines must make sense to the learner. She must be given the opportunity to understand that she is playing a game, doing a chore, grooming, making a craft object, eating, exercising, working, etc. Every item chosen from the Appetite List must be paired with an activity in a meaningful context. For some students, initially, the meaningful part of a routine will be the recognition that a familiar event is about to occur. For instance, when a learner remembers the smell of the lotion that is always a part of her massage activity, the presentation of that lotion allows her to anticipate with pleasure that she is about to have her hands rubbed.

Age Appropriate and Functional

There has been a great deal of emphasis for several years on "functional" skills and "age appropriate" activities for students with disabilities (Falvey, 1995; Corn & Koenig, 1996; Sacks & Silberman, 1998). For example, sorting is a cognitive skill addressed in most curricula. An advocate of functional, age appropriate learning would address this skill in an activity that would be part of the learner's life in non-school environments, using functional activities that would be done by typical peers of the same approximate chronological age. Rather than sorting a set of shape blocks, the teacher might have a young learner sort articles of clothing or an older learner, grocery items. This approach is still considered best practice for students with more moderate impairments in many schools. One problem has been that some educators concluded that all media used by learners had to be functional in order to be appropriate. In some settings very young children with moderate disabilities were doing chores while their typical peers were playing with toys.

Ice Bag Routine Development

Beginning goal of routine	Possible outcomes through routine development
	
Orients and maintains alertness to the texture and or temperature of the ice bag.	Develops vocational skills: • filling bag with ice cubes in nurse's office • making weights for toss game by pouring beans, rice or gravel into bags

Age-Appropriate Ice Bag Routine

Functional programming is designed to make learners as independent as possible in work and living environments. Learners with severe and profound impairments rarely develop independent functional skills. Another approach is needed for this population (Ferguson, 1985; 1995). The emphasis of the SLK is that media and activities should dignify the learner. Using media that effectively orient and maintain alertness is dignifying if a learner struggles with these issues. Media and activities should be, whenever possible, things that would be appropriate for typical learners of the same approximate age range. If useful media are notably different from that found in the environments of typical peers, it may be that the materials can be used in a routine in such a way that the topic of the routine dignifies the learner even though the media would not. For instance, an older student who orients and maintains alertness best when presented with colored lights might be the product tester in a flashlight assembly line in a vocational setting.

Target Skills

Specific skills are taught in routines. Teams of learning partners need to work together to identify about five priority skills which the team feels are most important at a given time. The team can then decide when and where to address these skills in the learner's routines. Communication, cognitive, social, motor, and sensory skills are learned most efficiently when they are targeted in routines. In the sample intervention mentioned in the opening of this guidebook, Mary learned the communication skill of signaling her partner for more during the lotion activity. Many objectives in IEPs are not achieved because instruction of the skill does not take place in a context where meaning and motivation are strong enough and where there are enough opportunities for practicing the skill. Routines are powerful contexts for skill learning.

When learners are familiar with the steps of a basic routine and know what to expect, they are less stressed and more motivated. They can then concentrate their available energy on the more challenging aspects of the routine that build skills.

See Mary's Sample Routine in the Routines Book.

Partial Participation

A good understanding of the philosophy of Partial Participation can greatly enhance sensorimotor learning (Ferguson, 1985; 1995). This philosophy emerged partly as a response to the problem that sensory media available to learners with severe disabilities might be very limited.

- The learner may not have access to a variety of environments. The more severely disabled a learner is, the more likely it is that she spends all of her time in one or two small environments like a bedroom at home and a self-contained classroom at school.

- The media available in these environments tends to be much more limited than it would be for typical learners. Learners with severe disabilities may interact primarily with their grooming and feeding items, their therapy items, and toys. Since there are only so many toys manufactured for children at early developmental levels, they may interact with the same things year after year.

Many partners assume that certain activities that would involve interactions with a wider variety of media and people are inappropriate because the learner cannot currently or potentially participate in the activity independently.

Programs for learners with disabilities emphasize developing independence. This is a very appropriate emphasis for learners with mild to moderate disabilities, but it can't be the primary emphasis for learners with the most severe disabilities. When we change the emphasis for these learners to learner-guided interdependent interactions with caring communication partners, a whole world of educational opportunities opens up. Interdependence as an educational goal places value on the skills that allow the learner to participate with others at the highest level possible. Using a partial participation approach, the learner uses his present competencies to participate in the activity and his emerging competencies to participate at higher and higher levels as time goes by. His learning partners facilitate all of the responses helping the learner to move beyond his current ability. Any age-appropriate activity can be included in the daily schedule regardless of the learner's ability to perform independently.

As a result of having a wider variety of activities to participate in interdependently, media and social context are no longer limited to toys, care items, and therapy materials.

Learning Environments

Space

Sensorimotor learning is more efficient when the learning takes place in a well-planned and managed environment.

- Access to a variety of learning spaces helps maintain alert states for most learners. Partners will need to determine the appropriate number of environments carefully. The goal is to enhance interest in the environment by allowing the learner to experience difference and change.

If there is too much change, some learners may become stressed. Stress indicators are typically agitation or withdrawal. For learners who are highly challenged by the transition from home to school, moving around to different environments at school may be too much. If the transition from home to school is stimulating in a positive way, but alertness diminishes as the school day goes on, a change in school environments may be very helpful.

- Stress is lowered because predictability is enhanced when activities occur in designated, distinct spaces. If a learner never knows where his wheelchair is parked or all activities happen in the same place, space gives no cues about what is going to happen. If movement to a certain area with distinct sensory qualities is always followed by the same activity, the learner knows what is about to happen and has a chance to get ready to participate at the highest possible level. Lamps, aquariums, textured floor coverings, ticking clocks, and colored furniture are examples of location cues that allow the learner to know where he is and what is about to happen there.

- Location cues can't move around the room. Keep unique features constant. Consistency helps anticipation by strengthening memory associations between cues and activities. It also minimizes the distraction that the cue might create. The more familiar the ambient cue is the less cognitive attention it demands.

- Ambient cues should be as subtle as possible so that they don't compete for attention with media used in the activity.

- Large spaces with intense ambient sensory qualities like high noise levels, lots of movement, or strong smells may be very challenging for learners with severe disabilities. Grocery stores, cafeterias, gymnasiums, and hallways are examples of environments that may overload the learner and cause some stress. Tolerance for these environments may have to be built over time. A graduated exposure method may be helpful. Using this approach, a routine would require the learner to go into a hallway for a specific purpose for a short time during a quiet period rather than during class changes. Exposure would gradually expand.

Adapted sensory learning spaces are available to some learners. The degree of adaptation in these spaces varies a great deal. So does their popularity. Some of the adaptive spaces concentrate more heavily on sensory learning. They may be rooms or parts of rooms that contain high concentrations of light displays, textured materials, color wheels, fans, chimes, bubble machines, and other sensory media. Sometimes these areas contain media, like fiber optic light displays, that are very sophisticated and expensive.

Other adaptive spaces have a motor emphasis. These tend to have barrels, ramps, steps, big foam bolsters, wedges, and swings. Some adapted spaces have a combination of these media. Proponents of this kind of programming point out that many common environments do not contain media that have the qualities required to sustain attention and motivate learning. They argue that adapted spaces containing special media create the conditions under which learning can take place because consistency is maintained, distractions are minimized, and motivation is high. Critics of this kind of approach point out that the presence of media doesn't ensure high quality sensory learning. Given a choice between spending lots of money on stuff or people, they would rather have highly trained learning partners who can create a meaningful sensory learning experience with common objects containing interesting sensory properties. Most of these critics would concede that high quality learning can take place in adapted spaces if routines emphasizing intentional active participation are implemented in these environments.

Materials

Partners must decide what sensory media to make available to the learner and they must also decide how the leaner is to interact with the media.

- All learners, whether they have disabilities or not, habituate to media after repeated exposure to it. Something that is very interesting initially, and for a period afterwards, eventually may not even elicit an orienting response. Access to a wide variety of media is more helpful than the provision of a limited number of special items. When abundant media are available to the learner, the likelihood of habituation is decreased.

- Items from the learner's Appetite List will be the media used to develop the initial group of core routines. In order to do this, each item from the Appetite List must be paired with a topic that is meaningful to the student. Partners can use the Routine Templates as a starting point for programming. Prior to use, all Routine Templates will need modification according to the specific sensory needs determined by the assessment of the learner. They are intended to be used as guides for planning instruction.

- In addition to the exploration of sensory media during participation in routines, learners may benefit from exposure to sensory media in an environment where they interact with the media independently (Bishop, 2003; Corn & Koenig, 1996; Haring & Romer, 1995; Miles & Riggio, 1999; Progrund & Fazzi, 2002; Sacks & Silberman, 1998). Dr. Lilli Nielsen (1992) has developed several techniques for developing intentional behavior with objects in this way.

Social Influences

Trust

The single most important aspect of facilitating learning for students with severe disabilities is creating a bond of trust. Learners must know that their partners will make their environments safe and comfortable, touch them and interact with them respectfully, and understand and respond to their attempts to communicate.

Safety and Comfort

Ensuring safety for learners with severe disabilities is largely the same as it would be for any learner. Toxic substances and sharp objects have to be kept out of reach. Small items that could cause a choking hazard have to be removed. Heavy items that could topple over have to be secured. We all know the drill. One of the most intense aspects of safety is cleanliness. Not only do walls, furniture, floors, and facilities have to be clean, but materials have to be cleaned on a regular basis as well. Learners with severe disabilities tend to do a lot of oral exploration. That means that their learning media need to be cleaned more frequently than media in other settings. This is especially true if it is to be shared with other learners. Cleaning procedures should be established by partners based on advice from nursing staff associated with their programs and from manufacturers.

Making the environment comfortable for the learner with severe disabilities includes some unique issues.

- Positioning arrangements must fit. Adjustments must be checked on a regular basis to make sure that wheelchairs, standers, sidelyers, and other equipment are appropriately fitted and maintained. Settings, knob tightness, screws, etc., tend to loosen over time or with multiple users.

- Adaptations that make positioning arrangements more comfortable should be applied whenever possible. These may include simple things like pillows or more sophisticated things like sculpted body molds.

- There are some lighting issues related to teaching learners who spend a significant amount of time supine. It is not pleasant to try to see objects or people above the face when this requires looking directly into ceiling lights. When in doubt, partners should lie down and try to look at things from the learner's point of view. Eliminate lighting problems without compromising the learner's illumination needs.

- Postural security adds to comfort and learning efficiency. Learners who are worried about falling over have to spend too much cognitive energy

on trying to maintain their positions. Occupational and physical therapy partners can show other team members how to position the learner for optimum stability while simultaneously supporting the use of voluntary movements.

- Multisensory stimulation is an often used, but somewhat ambiguous term. For learners with severe disabilities who typically have trouble with sensory processing, intense stimulation of many sensory channels simultaneously may not be comfortable. It may be more helpful to think of multisensory input as making sure that the learner gets quality sensory information about media in more than one channel consecutively rather than simultaneously.

- Learners who are tactually defensive may need a variety of modifications in order to make them more comfortable in interactions with people and objects. Physical and occupational therapy partners should inform and guide the team of partners in regard to the best ways to touch, present objects, dress, brush teeth, feed, etc.

Respectful Touching

Learners who depend upon others for their care are touched every time they need to be moved, have their noses wiped, get changed, eat, put on clothing, take medicine, participate in an activity, and many more things. Perhaps the most disrespectful possibility is that needs exist in these areas that no one notices or responds to. But how we respond is also important. In order to trust their partners, learners need to know what the partner is going to do before they are touched. Partners must have a habit of informing the learner prior to the initiation of an interaction that involves touch.

- Identify yourself first. Make sure the learner knows who is about to touch her. The sound of your voice in greeting may be enough. You may want to wear something distinctive that the learner can touch before you touch her. Make sure every partner has an identification cue.

- Tell the learner what you are going to do. You may do this verbally, but since many learners will not understand the language you use, tell them in another way as well. Many partners use object cues for this. Show the learner an object that is part of the event that is about to happen before touching her to proceed. Choose the object that is the most important to the learner. Use that object each time so the learner associates that object with the specific activity it represents.

- Tell the learner when you are finished. A standard finished cue for a young child might be a goodbye hug or a goodbye song; for an older learner, a squeeze on an arm or leg. Any of these things will work if

they are used consistently but care should be taken to make them socially appropriate.

Facilitating the learner's participation in activities respectfully is especially important. Many of us were trained to assist learners using a method called hand-over-hand. We put our hands over the learner's hands and manipulated them through operations with objects. Many times this was done very respectfully, but too often the learner's hands were grabbed and put in or on things without any meaningful preparation. Some learners became tactually avoidant. They pulled their hands back and resisted touching things. Others became tactually passive. They rarely initiated interactions with objects and simply waited to have their hands manipulated. There is a way of facilitating participation that is much more respectful and effective. This method is called hand-under-hand. It is more respectful because the learner has control of his own hands at all times. The method requires the partner to put his hands under the learner's hands. The partner's hand should be slightly to the side so that the learner can touch the object with his thumb and first finger. The idea is to allow the learner to feel the partner's hand and the object at the same time. At any point, the learner can initiate participation in the action or pull away to stop participation. These are the choices all individuals without disabilities have. (Adamson, Bakeman & Smith, 1994; Miles & Riggio, 1999; Snell & Brown, 2002)

Responding

Responding is more important than demanding. Responding builds trust. Trust lowers stress. Dr. Jan van Dijk (Janssen et al., 2002) has pioneered many of the strategies that promote the building of a secure relational base with learners. Some of the important issues he writes and trains about are the following:

- The learner must be comfortable in his environment before work proceeds.

- Familiar trusted partners should be present as new partners begin work with the learner.

- The learner's interests and abilities determine the media and activity used.

- The partner adjusts her emotional level and communication level to those of the learner.

- The partner begins by joining the learner in what the learner is doing. This tells the learner, "I see you; I accept you; I value your company." It also tells the learner that he can control the partner's actions with his behavior. If the learner stops what he is doing, the partner stops. If the learner begins again, the partner begins again. When the learner begins starting and stopping in order to affect the behavior of the partner, he has learned his first lesson in communication. The learner understands that he can use his body to send messages that another person understands and to which he responds.

- The partner offers new information as the interaction continues.

- If the learner accepts the new information, the partner may stop her part of the interaction and wait to see if the learner signals in some way that he would like the partner to continue.

- Gradually, after a sufficient amount of child guided interaction, the partner can begin to add more and more information, expand topics, and encourage the learner to participate in new ways.

Work done by partners and learners founded on a bond of respect and trust minimizes stress and frees up cognitive energy for skill acquisition. It also tends to make everybody much happier.

Encouragement

With a respectful, trusting relationship well in place, partners can ask more of the learner. The best way to ask is encouragement. Encouraging the learner implies that all the support the learner might need will be available as he tries to do what he can. The learner is always praised for the effort she makes. Learners respond to requests that feel encouraging by trying their best because they value their relationship with the partner and because they know they will not be punished for falling short. This approach helps to make things like reinforcement programs and behavior modification programs unnecessary or, at least, less necessary in the area of skill acquisition. It is possible to change behavior with reinforcers, but, in the long run, things like food and stickers do not work nearly as well as sharing attention with a respected partner.

Teaming

When the focus of learning is sensorimotor and learners have multiple disabilities impairing the function of their motor and sensory systems, teams of partners must share their skills in order to provide successful interventions. Each member of the team has pieces of essential knowledge about the learner, but no one member has all the information needed. A

learner with severe disabilities depends on her partners in some unique and vital ways.

- She depends on them to talk together to share information, not annually, but on an on-going basis throughout the year.

- She depends on them to establish a cooperative core team that includes a significant member of her family.

- She depends on them to call in additional ancillary team members when special issues arise.

- She depends on them to function efficiently. They may need to assign team roles like recorder, phone liaison, or facilitator.

- She depends on them to work out a communication system. This might be a special team notebook where everyone can read notes left for each other, or an electronic listserv.

- She depends on them to get additional training related to her needs, as it becomes available.

Each team member needs to be aware of and appreciate the contribution of the other members of the team.

- Family members are the only long-term team members. They give the team an understanding of where the learner has been and where they hope the learner will go in the future. They know the learner better than any one else. Their input in determining response modes, positive and negative responses, and appetites and aversions is invaluable.

- If the learner is in a school setting, classroom teachers are the team members who interact on a regular basis with every other team member. They are the center of team activity.

- Teachers and teaching assistants, like family members, spend a great deal of time with the learner. Their extensive knowledge of the learner plays a vital role in assessment. They are the team members primarily responsible for the direct implementation of instruction.

- Occupational and physical therapists assess motor and sensory functioning and determine needs related to educational performance. They share information with other team members and implement modifications and strategies that enhance the learner's ability to participate in all activities throughout the day. They provide special

adaptive equipment and they provide therapy as needed. Therapy is usually integrated into daily activities and may be provided by the therapist or carried out by another team member with the therapist's guidance.

- Speech language pathologists assess communication functioning and determine needs. They share information with other team members and implement modifications and strategies that enhance the learner's ability to communicate in all activities throughout the day. They may provide special materials and adaptive equipment. Therapy is usually integrated into daily activities and may be provided by the therapist or carried out by another team member with the therapist's guidance.

- Teachers of the visually impaired and hearing impaired assess vision and hearing functioning and determine needs. They share information with other team members and implement modifications and strategies that enhance the learner's ability to use vision and hearing and to use compensatory skills in all activities throughout the day. They may provide special materials and adaptive equipment. They are responsible for learning related to the use of the senses to acquire skills in activities and may work directly with the learner at times. They also work with other team members who spend more time with the learner to help them implement modifications and address sensory needs in activities.

- School nurses train team members to do certain procedures related to medical, elimination, and nutritional needs. They administer medications and coordinate and share medical information about illnesses, surgeries, medication changes, seizure activity, and treatments.

- Administrators support team members by providing time to meet together, access to training and resources, materials and equipment, adequate staff, and supervision. Inevitably issues come up that require the guidance of an administrator. This guidance is easier to give and certainly better received when administrators are involved with teams on a regular basis.

- Psychologists may be called upon to provide help on a number of different issues. Some may relate to serious behavior issues like self-injurious behaviors.

- Nurses and doctors, music therapists, behavior specialists, adaptive physical education teachers, orientation and mobility instructors, inclusion facilitators, vocational coordinators, job coaches, mental health/mental retardation caseworkers, commissions for the blind and deaf caseworkers, and others are also valued members of some teams.

The Role of the TVI

When a visual impairment is one of the learner's disabilities, the role of the teacher of the visually impaired (TVI) is extremely crucial. Without the hard work of the TVI, progress in the development of cognitive, motor, social, and communication skills can be severely impeded by the presence of a visual impairment (Hubel, 1988). With the help of the TVI, environments and media can be modified, use of the impaired visual channel can be maximized, and compensatory strategies can be taught so that cognitive, motor, social, and communication development can proceed in the best possible way. When serving learners with severe impairments, TVIs provide the following:

- Assistance to the family in finding quality eye care professionals who have experience with severe disabilities
- Assistance to eye care professionals related to information about functional vision, response modes, appetites and aversions, positioning needs for best use of vision, familiar cues and signals, and stress reduction techniques
- Coordination of vision issues with family, school, eye specialists, commission caseworkers, orientation and mobility instructors, and others
- On-going assessment of visual functioning
- On-going assessment of best sensory channels and best media for learning
- Recommendations for modifications and strategies related to vision loss
- Direct diagnostic teaching during routines and other activities to try out recommendations
- Monitoring of the modifications and strategies implemented by other team members during activities
- Collaboration with other team members to design and carry out interventions to assure maximum alertness and participation
- Collaboration with other team members to make sure that interventions are designed to lower stress and to promote trust
- Collaboration with team members to make sure that the learning environment is safe and comfortable

Assessment Forms

The Sensory Learning Summary, the Sensory Response Record, and the Level and Strategy Guide are the primary information gathering tools in the assessment section of the SLK Guidebook. Two additional tools are available for optional use. The Arousal State Profile and the Appetite/Aversion List may contain helpful information for completion of Part II, Intervention Strategies, of the Level and Strategy Guide. Partners may find that they have enough information for some learners without using these tools. The Arousal State Profile should be used for any learner for whom extending the frequency and duration of quiet alert states is a goal. The Appetite/Aversion list should be used where teams want to emphasize the significance of mid-brain (emotional) responses to media for learners who are likely to withdraw or become fussy as a result of stimulation.

All of the assessment forms are available on the SLK CD. The forms contain many automatic fields, saving the recorder valuable time. For example, one of the five tools (Appetite/Aversion List) will be filled out completely, automatically using data entered previously on the Sensory Response Record.

Assessment Introduction

Philosophy

Interventions are most effective when teams work together to assess needs and evaluate progress. Learners with significant challenges often have motor, sensory, communication, and cognitive impairments. When individuals representing different disciplines assess needs and submit recommendations in isolation, the chance of implementing a focused, effective, holistic intervention is severely compromised (Holbrook & Koenig, 2003; Orelove & Sobsey, 1996; Progrund & Fazzi, 2002; Sacks & Silberman, 1998).

Purpose

The Sensory Learning Kit contains assessment tools designed to help teams coordinate focused, effective, holistic interventions to provide quality sensorimotor learning experiences for learners with significant challenges. It does not contain tools for discipline specific eligibility assessments.

Content

This section contains five items for sequential use.

1. **Sensory Learning Summary (SLS)**
   This is a summary of the learner's individual sensory learning needs based on currently available information.

2. **Arousal State Profile (ASP)**
   A range of arousal states are recorded during structured observation, to give a profile of typical patterns of arousal.

3. **Sensory Response Record (SRR)**
   Information about responses to a variety of media in each sensory channel are recorded during structured presentations.

4. **Appetite/Aversion List (AAL)**
   This list identifies appetite items that elicit positive orienting responses and aversion items that elicit negative orienting responses.

5. **Level and Strategy Guide (LSG)**
   This tool helps determine the appropriate level at which to begin teaching and to identify what specific strategies to use for teaching.

Use

Assuming a body of diagnostic information exists, the first tool contained in the kit, the **Sensory Learning Summary**, helps team members share current information. Two structured observation tools are then implemented to make sure the team has good information about typical arousal states and responses to sensory media. The **Arousal State Profile** can be used as part of an alternative assessment developed by local school districts when it is used to evaluate progress in the ability of students with the most profound challenges to achieve and maintain alert states. To accomplish this, teams redo the assessment at prescribed intervals and compare results to the original profile. Information from the **Sensory Response Record** gives teams a rich source of information about specific modifications. TVI's can use the SRR as part of their Learning Media Assessments. The SRR may also be used in Individual Education Plan development to establish present levels of functioning, set target levels for goals, and document changes for progress reports. The **Appetite/Aversion List** and the **Level and Strategy Guide** help teams focus interventions on specific activities and objectives. The Level and Strategies Guide can also be used as part of an alternative assessment. The effectiveness of interventions can be demonstrated by the progress learners make from one level to the next.

Assessment Tools

These pages are designed so that they can be photocopied and completed by hand. These same pages are available on the SLK CD for convenient computer use.

Sensory Learning Summary (SLS)

Procedures

Use information from the team of learning partners, medical reports, and current assessments to complete Part I: Medical Needs and Part II: Sensory Functioning Needs.

Learner:	Summary completed by:	Date:

Part I: Medical Needs

1. Medical Conditions	Source of information

2. Current Medications	Source of information
Allergies to medications	

3. Issues	Source of information
Nutritional	
Hydration	
Elimination	
Respiration	
Sleep	
Seizure	
Allergy	
Other	

Part II: Sensory Functioning Needs

Vision

Source of information

4. If the learner has a documented vision loss, describe the following:

- Medical diagnosis
- Corrective lenses/visual aides
- Medications
- Therapies

5. Has a vision specialist recommended modifications? If so, describe.

- Lighting
- Contrast
- Size
- Clutter
- Distance
- Color
- Field

  Right _____ Left _____ Mid _____ Top _____ Bottom _____

- Other

6. Are there specific cautions for the presentation of visual stimuli?

7. Are there specific positioning needs related to visual attendance?

Hearing

Source of information

8. If the learner has a documented hearing loss, describe the following:

- Medical diagnosis
- Hearing aides or other sound amplification devices
- History of ear infections

  Medications _____ Tubes _____

9. Has a hearing specialist recommended specific modifications?

- Presentation distance
- Clutter
- Frequency

  High _____ Mid _____ Low _____

- Loudness

10. Are there specific cautions for the presentation of auditory stimuli?

11. Are there specific positioning needs related to auditory attending?

Touch

Source of information

12. If there is an impairment that restricts tactual exploration of the environment, describe it below.

    - Medical diagnosis
    - Orthopedic or congenital abnormalities related to touch
    - Medications
    - Therapies
    - Devices/equipment

      Helpful:

      Not Helpful:

    - Specific recommendations

13. If the learner avoids or responds negatively to touch input, describe the stimulus and response.

    - Light touch

    - Deep touch

14. Has an occupational or physical therapist determined that the learner is tactually defensive?

15. Is the learner currently receiving sensory integration therapy?

16. Have specific modifications for tactual input been recommended? Describe below.

Type
Receptivity
Pacing
Pressure
Texture
Temperature
Other

17. Are there specific cautions for the presentation of tactual stimuli?

18. Are there positioning needs related to tactual attendance?

Vestibular/Proprioceptive

Source of information

19. If the learner has documented movement disorders, describe them below.

    - Medical source

    - Medications

20. If the learner becomes fussy, agitated, or withdrawn when moved, describe the typical conditions that trigger these behaviors.

21. Are there specific cautions for moving the learner?

22. Are modifications needed related to movement of the learner?

    - Speed

    - Direction/angle

    - Duration

Gustatory

Source of information

23. Are there any cautions for the presentation of gustatory stimuli?

24. Are there any positioning needs related to gustatory stimulation?

25. Are there allergy issues related to gustatory stimulation?

Olfactory

Source of information

26. Are there any cautions for the presentation of olfactory stimuli?

Arousal State Profile (ASP)

Procedures

Complete Parts I and II of the SLS before beginning this assessment. If issues related to nutrition, hydration, medication, elimination, or sleep emerge, the team of learning partners must act as quickly as possible to resolve these issues. If some are not immediately remediable, such as changing long standing sleep irregularities, the assessment may proceed.

Determine who will be the arousal state recorder. Ideally, the recorder should be a partner who will not be interacting with the learner during observation periods so that attention can be focused on identifying arousal states.

Remember, this is an observation tool designed to allow you to make changes that will give you more useful information. Some partners choose to record seizure activity and episodes of self-stimulatory behaviors in addition to the typical arousal states. This could be very helpful information.

Consistency must be maintained from observation to observation and from recorder to recorder in order for information to be useful.

You may want to use some sort of device to help you remember when it is time to record. If you use something that beeps or dings, you may influence the learner's state. A vibrating timer may help.

You may want to record the actual time for about every third observation. The other two can be assumed to have occurred at the designated interval.

1. Determine when you will observe the learner. You want to cover as many of the important parts of the day as you can. You will record arousal states for those observation periods on at least **three different days** in order to see if there is a consistent pattern. Some learners will require more days than others.

2. Determine the recording interval. Some learners change arousal states very quickly, others more slowly. Decide how frequently you will record arousal states based on the state patterns of the individual learner. Intervals of five minutes are typical. Intervals longer than fifteen minutes or shorter than one minute do not tend to yield very reliable information.

3. Identify the arousal states of the learner and develop a code. If more than one recorder is involved in building the profile, everyone must agree on what typical characteristics of each arousal state are for the individual learner being observed. For instance, if a learner typically sleeps with eyes open slightly, make sure that everyone recognizes this sleep pattern. If a learner closes his eyes and slumps forward to withdraw when agitated, make sure everyone knows to code this as agitated, not drowsy or asleep.

4. Note the significant factor(s) from Part I of the SLS that may be influencing arousal states.

5. Record the code for the arousal state observed at the designated time. States may have changed during the interval. Just record the arousal state present at the moment of recording. This tends to yield more consistent information. If you wish, you may also record what is going on at the time of the recording. Be brief. You might write something like "Mom washing hair" or "lying on mat, music playing."

   - After a **minimum of three days of data collection** (not necessarily consecutively), use different colors to highlight quiet and active alert states. If there is a consistent pattern, use these times to plan priority instructional activities.

   - If certain arousal states are related consistently to certain people, activities, or places noted under Comments, try to determine what characteristics of these things may be contributing to the learner being alert, drowsy, or agitated. For instance, do voice qualities—such as volume, or tone—or touching styles—such as rhythm or pressure affect the learner?

6. Determine the percent of alert states. You can do this by counting the number of observations and the number of quiet and active alert states for each observation period.

7. The total of all observations can be used as a baseline for measuring the success of your state manipulation intervention to increase the frequency and duration of alert states.

8. For instance, you may have done 100 observations and the learner may have been alert for 20 of those or 20% of the time.

Learner:	Recorder:

1.

Recording Periods			Date:
1.	2.	3.	Day: 1 2 3
4.	5.	6.	

2.

Recording Interval:

3. Arousal State Descriptions

State	Code	Description
Sleep	S	
Drowsy	D	
Quiet Alert	QA	
Active Alert	AA	
Fussy	F	
Crying/agitated	CA	

4. Factors from Part I of SLS that may be influencing arousal states include:

5. Observations

Photocopy the following pages to record your observations. The electronic version may be used on the SLK CD.

Observation Day One

Copy form as needed (minimum three times).

Observation Period (circle one): 1 2 3 4 5 6 Date: _____
Recorder: _____ Recording Intervals: _____

Time	Code	Comments

Observation Day Two

Copy form as needed (minimum three times).

Observation Period (circle one): 1 2 3 4 5 6 Date: _____
Recorder: _____ Recording Intervals: _____

Time	Code	Comments

Observation Day Three

Copy form as needed (minimum three times).

Observation Period (circle one): 1 2 3 4 5 6 Date: _____
Recorder: _____ Recording Intervals: _____

Time	Code	Comments

Percentage of Alert States

Day	Observation Period	Observation Date	Number of Arousal States Recorded	Number of Quiet and Active Alert
TOTALS				

Percent Alert	Col. 5 ÷ Col. 4 =	

Sensory Response Record (SRR)

Procedures

The best results are obtained when teams of learning partners collaborate to share their information about the learner. Complete parts I and II of the SLS before beginning this assessment.

1. *Presentation Periods*
   Decide when and where the assessment should take place. Use the Arousal State Profile to determine what conditions and times are best. Enter this information in the Presentation Periods boxes.

2. *Presentation Structure*
   Decide how long the presentation session should last. Use the Arousal State Profile to determine how long alert states typically last. Enter this information in the Length of Session box.

   Decide how long the presentation of each item used during the session should be. Don't assume there was no response if you have not allowed enough time for response delays. Enter this information in the Duration of Presentation box.

   Decide what the pacing of the presentation of the items should be. Responses will be atypical if too many items are presented or if presentations of items are too close together. Enter this information in the Time Between Presentations box.

3. *Appetite Item Menu*
   An appetite item is a term used in the Sensory Response Record to refer to a list of items, objects and devices that can be used to present specific stimuli to the learner in each sensory channel. Appendix J contains a list of items matched with the primary sensory channel associated with the presentation. An aversion item is identified when a child has a negative response to an item. Determine what specific stimuli to present to the learner in each sensory channel. Enter this information in the Appetite Item Menu section. Make sure you present at least four different items in each channel—vestibular/proprioceptive, gustatory, olfactory, tactual, visual, and auditory. For more information on the sensory channels, see the appendices. For ideas about what kinds of stimuli might be used in each sensory channel see Appendix J, Appetite Item Menu. If you know that presentation of items in a particular sensory channel may be problematic, do not do it. For instance, presentation of gustatory items may increase saliva flow. This may not be advisable for a learner who has trouble swallowing. Collaboration with speech/language pathologists and physical and occupational therapists is essential at this point in this assessment.

These partners may know how to position the learner so that it is safe to present gustatory items. Do not proceed without planning for these contingencies. Some learners may be susceptible to certain kinds of seizures related to sensory events. If, for example, the learner is light sensitive, avoid bright or flashing lights when assessing the visual channel. If vibration around the head or face causes seizures do not use a massager in these areas when assessing the tactual channel.

4. *Response Modes*
Describe the response modes of the learner. Indicate which are positive responses and which are negative. Collaborate with team members to determine physiological indicators of distress in those learners who have the most minimal response modes. Blueness of the fingernails; a white line around the lips; rapid, shallow breathing; flushing; hiccuping; and other things may be indicators that the assessment should stop immediately. Enter this information in the Response Modes section.

5. *Cautions and Modifications*
Use Part II of the SLS to note specific cautions and modifications related to the presentation of items. Enter pertinent information in the Cautions and Modifications section.

6. *Observation Record*
Begin the observation by describing the stimulus presented in the Item column of the Observation Record.

   - Record the code for the sensory channel related to the item in the Channel column.

   - Record a plus for a positive response or minus for a negative response in the Appetite/Aversion column.

   - Record the number of seconds between the initial presentation of an item and the response to it in the Delay column.

   - In the Intensity column, indicate the strength of the orienting response with 1 for minimal response, 2 for medium response, and 3 for strong response. The characteristics of minimal, medium, and strong responses will vary from learner to learner. Each team must recognize the gradation typical for the learner being assessed. If the learner's negative response to an item was strong, it should not be presented again. If a negative response was minimal to medium, the item might be repeated at a later time.

- Check one of the following four codes in the Responses column.

  — ES (extended state): As a result of lack of attention to the stimulus, the learner remains in one of the extended states—sleepy, drowsy, fussy, agitated. Or, as a result of attention to the stimulus, the learner moves to one of the extended states.

  — QA (quiet alert): The learner turns his head to aim his eyes or ears at the stimulus. The learner quiets or increases his movements or vocalizes as a result of his attention to the stimulus. The learner's muscle tone or breathing changes as a result of his attention to the stimulus. The learner's facial expression changes in response to the stimulus.

  — AA (active alert): The learner moves any part of her body to try to interact with the stimulus. Visual orientation and tracking is not included. Opening the mouth and reaching with the head, lips, or tongue are included. Even minor movement of the fingers, hands, arms, feet, or legs when these movements are an effort to reach is included. Remember, a reach for some learners may be a tensing of the muscles of the shoulder or upper arm or the leaning forward of the torso or head.

  — PP (partial participation): The learner demonstrates one or more of the following behaviors:

    responds to the stimulus by signaling his desire for the event to continue or stop,

    responds to cues from his partner to interact with the stimulus in certain ways,

    indicates that he is anticipating the recurrence of an event with the stimulus.

- Enter the total number of checks for each code in the Total box at the bottom of each code column.

- Use this Total information as a baseline from which progress in the development of intentional behavior with objects and people can be measured.

Sensory Response Record (SRR)

Learner:	Recorder:

1. Presentation Periods

Date and Time	Place	Presenter

2. Presentation Structure (Use information from Arousal State Profile and Sensory Learning Summary.)

Length of session:	Duration of presentation:	Time between presentations:

3. Appetite Item Menu

Sensory Channel	Code	Items
Vestibular/Proprioceptive	VP	
Gustatory	G	
Olfactory	O	
Tactual/Proprioceptive	TP	
Auditory	A	
Visual	V	

4. Response Modes (Complete all three.)

Positive:
Negative:
Distress signals:

5. Cautions and Modifications

Cautions	Modifications

6. Observation Record:
   Channels VP, G, O, TP, A, V
   Appetite (+) Aversion (-)
   Amount of delay in seconds
   1-3 Intensity (3 being greater)
   Responses ES, QA, AA, PP

Item	Channel	App/Avr	Delay	Intensity	Responses ES	QA	AA	PP

Sensory Response Record (SRR) · Learner:_____

Item	Channel	App/Avr	Delay	Intensity	Responses ES	QA	AA	PP
TOTAL								

Sensory Response Record (SRR)

Appetite/Aversion List (AAL)

Date_____

Procedures

1. List items that elicit positive orienting responses in the appetite column. Use information from the ASP, the SRR, and your previous knowledge of the learner's preferences to complete this list.

2. List items that elicit negative orienting responses in the aversion column. Use the same sources mentioned above.

APPETITE/AVERSION LIST

Appetites	Aversions

Appetite/Aversion List (AAL) · Learner:_____

Levels and Strategies Guide (LSG)

Determination of Intervention Level

Procedures

Use the Delay and Intensity sections of the SRR, the ASP, and the AAL to complete the LSG.

1. Determine the appropriate intervention level for the learner. If more than 20% of the total codes entered occur at a level earlier than the level with the most codes, start the intervention at the earlier level. When responses at the earlier level fall below 20%, move to the next level.

2. Determine preferred sensory channels by entering the total number of appetite items for each channel from the SRR.

3. List the top ten appetite favorites using the Intensity information from the SRR.

4. Use the information from the Delay column of the SRR to enter average response times for each channel in the Response Delay grid.

5. Describe any ambient environmental conditions that influenced the learner's ability to orient to stimuli during assessment. These influences may be either positive or negative. For example, best orienting responses may have been in low noise environments. Or, orienting to stimuli other than olfactory may have been difficult in environments where strong odors were present.

6. Describe any social conditions that influenced the learner's arousal states. For example, the learner was consistently drowsy when no people were present. Or, the learner may have been very alert during group activities with verbal peers.

7. In light of the information gathered in this assessment, the team of learning partners may determine that one or more referrals are advised. If the learner does not have documented impairments in the visual and auditory channels, but failed to respond to stimuli in one or both of these channels, further evaluation by a specialist in these areas should be conducted. Information from this assessment should be shared with the specialist so that they understand that responses in the channel specified were abnormal compared to responses in other channels.

Intervention Level Chart

Date_____

This information is on the Observation Record (in the SRR). Non CD users may wish to copy relevant information to this chart. CD version will complete automatically.

ES=Extended State QA=Quiet Alert AA=Active Alert PP=Partial Participation

Channel	Appetite Item	ES	QA	AA	PP
Vest./Proprioceptive					
Olfactory					
Gustatory					
Tactual/Proprioceptive					
Vision					
Auditory					
Totals					

1. Enter the total number of items on the Observation Record (in the SRR). Then enter the total number of each response level. Figure up the percentage. CD version will compute automatically.

Total Items	Extended State	Quiet Alert	Active Alert	Partial Participation
Percentage				

2. Enter total number of appetite items for each channel from the Observation Record (in the SRR). CD version will complete automatically.

	Vest/Proprio	Olfactory	Gustatory	Tactual	Visual	Auditory
Appetite Totals						

3. List the top ten appetite favorites from the SRR. CD version will complete column one automatically.

Appetite Item	Comments
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

4. Enter average delayed response times from the SRR. CD version will complete automatically.

Channel	Average Response Time
Vestibular/Proprioceptive	
Olfactory	
Gustatory	
Tactual	
Visual	
Auditory	

5. Environmental factors related to learner's orienting responses

- Lighting
- Temperature
- Odors
- Noise level
- Visual clutter
- Positioning
- Movement
- Other

6. Social factors related to learner's orienting responses

    - Presence or absence of peers
    - Presence or absence of adults
    - Direct attention of peer
    - Direct attention of adult
    - Preferred peers
    - Preferred adults
    - Others

7. Recommended referrals

    - Visual
    - Auditory
    - Gross motor
    - Fine motor
    - Communication
    - Medical
    - Nutritional
    - Sleep
    - Dental
    - Psychological

END

Sample Assessment

Sample Sensory Learning Summary (SLS)

Learner: *Mary J.*	Summary completed by: *Ray S.*	Date: *1/26/03*

Part I: Medical Needs

1. Medical Conditions

	Source of information
Cerebral palsy, hydrocephaly, seizure disorder, gastrostomy, respiratory distress syndrome	*Transdisciplinary clinical evaluation conducted at May Children's Hospital, 8/02.*

2. Current Medications

	Source of information
Intal and Tegretol daily Allergies to medications	*P. and J. Jones (parents), 1/26/02*

Information regarding each of the following is logged daily by parents and school staff.

3. Issues	Source of information
Nutritional *Gastrointestinal distress is caused by seizure medication. Use six cans of Pediasure daily via tube. Supplement with oral feeding as tolerated.*	*Nutritional evaluation: May Children's Hospital, 8/02*
Hydration *Frequent diarrhea causes chronic dehydration. Pinch test and mucus checks are needed daily.*	*Same*
Elimination *Medication may be required for frequent diarrhea.*	*Same*
Respiration *Suctioning, postural drainage, and percussion are needed three times daily.*	*Bronchopulmonary evaluation: May CH, 8/02*
Sleep *None*	
Seizure *Clonic-tonic seizures are controlled at present.*	*Neurological evaluation: May CH, 8/02*
Allergy *None*	
Other *Shunt*	*Same*

Part II: Sensory Functioning Needs

Vision

Source of information *Clinical vision evaluation: Dr. R. Mott, 8/12/02 and FVE and LMA: E. Wilson (TVI), 10/02*

4. If the learner has a documented vision loss, describe the following:

   - Medical diagnosis
     Cortical visual impairment, optic nerve atrophy
   - Corrective lenses/visual aides
     None
   - Medications
     To evaluate decrease in dizziness possibly related to blurred vision, doctor suggests change from Phenobarbital to Tegretol.
   - Therapies
     None

5. Has a vision specialist recommended modifications? If so, describe.

   - Lighting: *Use normal ambient lighting with bright object lighting provided by over-shoulder source. Avoid glare.*
   - Contrast: *High contrast is essential.*
   - Size: *Do not enlarge media. Suspected field deficits*
   - Clutter: *Background clutter interferes with attention to specific media.*
   - Distance: *Near (3-16 inches) is required for small objects and unfamiliar objects. Mid (16 inches to three feet) is preferred for familiar medium sized objects, faces. Distance (three to about eight feet) is mainly used for the detection of movement of large objects, people.*
   - Color: *Use high contrast black/white spectrum and red/orange spectrum. Avoid blue/green.*
   - Field: Suspected loss.

     Right _____ Left _____ Mid ___✓___ Top _____ Bottom ___✓___
   - Other: *Delayed responses to visual media (about 15 seconds)*

6. Are there specific cautions for the presentation of visual stimuli?
Present media from side with movement in upper field. Maintain presentation for at least 15 seconds.

7. Are there specific positioning needs related to visual attendance?
Backward tilt, side-lying, and supine further limit visual fields. Postural discomfort and insecurity limit visual attention.

Hearing

Source of information *Audiological: May CH, 8/26/02*

8. If the learner has a documented hearing loss, describe the following:

   - Medical diagnosis
   Serous otitis media

   - Hearing aides or other sound amplification devices
   None

   - History of ear infections
   Parents report history of infections.

     Medications _*Intal*_ Tubes _____

9. Has a hearing specialist recommended specific modifications? *No*

   - Presentation distance

   - Clutter

   - Frequency

     High _____ Mid _____ Low _____

   - Loudness

10. Are there specific cautions for the presentation of auditory stimuli?

11. Are there specific positioning needs related to auditory attending?

Touch

Source of information *V. Patel, OT and D. Owens, PT: May CH, 8/02*

12. If there is an impairment that restricts tactual exploration of the environment, describe it below.

    - Medical diagnosis
      Cerebral palsy
    - Orthopedic or congenital abnormalities related to touch
      Spastic quadriparesis
    - Medications
      Diazepam discontinued on 8/01 due to excessive drowsiness.
    - Therapies
      PT and OT use neuro-developmental therapy (NDT) approach.
    - Devices/equipment

      Helpful:
      Use specific supports to facilitate participation in routine activities.

      Not Helpful:
      Hand splints and ankle-foot orthoses (AFOs) limit movement.
    - Specific recommendations
      Use of splints and AFOs should be evaluated further. OT/PT observation of activities at home and school should be used to determine appropriate positions and supports.

13. If the learner avoids or responds negatively to touch input, describe the stimulus and response.

    - Light touch
      Light pats and brushes increase traction in upper extremity flexors. Discomfort is probable. Aversive responses are typical.

    - Deep touch
      Any type of input that provides compression of joints results in pleasurable responses.

14. Has an OT or PT determined that the learner is tactually defensive?
    No

15. Is the learner currently receiving sensory integration therapy?
    Yes

16. Have specific modifications for tactual input been recommended? *Yes*
    Describe below.

Type
Receptivity
Pacing: *Slow, rhythmic preferred*
Pressure: *Deep preferred*
Texture
Temperature
Other

17. Are there specific cautions for the presentation of tactual stimuli?
Avoid light touch and startle responses caused by sudden introduction of media to skin.

18. Are there positioning needs related to tactual attendance?
Comfort and postural security increase attention.

Vestibular/Proprioceptive

Source of information *Patel, Owens, 8/02*

19. If the learner has documented movement disorders, describe them below.

    - Medical source
    Dizziness and nausea, possible medication side-effect

    - Medications

20. If the learner becomes fussy, agitated, or withdrawn when moved, describe the typical conditions that trigger these behaviors.
Two to three minutes of intense withdrawal or fussiness after movement–usually related to changes in position

21. Are there specific cautions for moving the learner?
Slow pace, specific cueing, recovery time

22. Are modifications needed related to movement of the learner?

    - Speed: Slow
    - Direction/angle: *Parents feel side-to-side movement is worse.*
    - Duration

Gustatory

Source of information *S. Genetti, SLP*

23. Are there any cautions for the presentation of gustatory stimuli?
    Swallows O.K. but shows no chewing or movement of food with tongue.

24. Are there any positioning needs related to gustatory stimulation?
    Sitting is best.

25. Are there allergy issues related to gustatory stimulation?
    P. Jones reports rashes related to citrus.

Olfactory

Source of information *P. and J. Jones*

26. Are there any cautions for the presentation of olfactory stimuli?
    J. Jones reports fussiness and agitation related to strong smells.

Sample Arousal State Profile (ASP)

Learner: *Mary J.*	Recorder: *Ray S.*

1.

Recording Periods			Date: *2/4/03*
1. *7:45-8:45 am*	2. *10:00-11:00 am*	3. *1:00-2:00 pm*	Day: (1) 2 3
4.	5.	6.	

2.

Recording Interval: *Every 5 minutes*

3. Arousal State Descriptions

State	Code	Description
Sleep	*S*	*Eyes closed, rhythmic breathing, intermittent small movements of extremities*
Drowsy	*D*	*Slow opening and closing of eyes, low tone*
Quiet Alert	*QA*	*Eyes open, still head, intense facial expression noted by slight tightening of muscles around lips*
Active Alert	*AA*	*Eyes open, lots of head movement as tone increases in extremities, some tongue thrusting*
Fussy	*F*	*Eyes closed, tongue sucking*
Crying/agitated	*CA*	*Eyes closed, skin flushed, shallow breathing, some vocalizing*

4. Factors from Part I of SLS that may be influencing arousal states include:

Movement for positioning

Respiratory difficulties

Medications

5. Observations

Photocopy the following pages to record your observations. The electronic version may be used on the SLK CD.

Observation Day One

Copy form as needed (minimum three times).

Observation Period (circle one): (1) 2 3 4 5 6 Date: *2/4/03*
Recorder: *Ray S.* Recording Intervals: *every 5 minutes*

Time	Code	Comments
7:45	*F*	*L. bringing M. into building from bus*
	D	*Entering cafeteria*
	S	*Greetings-L. manipulating hand, not sure M. is really asleep?*
8:00	*QA*	*B. changing diaper*
	QA	*"*
	QA	*Suctioning*
8:15	*F*	*B. putting M. in wheelchair*
	S	*R. feeding M. her cereal*
	S	*" (Not sure she is really asleep, maybe withdrawal?)*
8:30	*S*	*L. arranging M. for tube feeding*
	QA	*L. singing to M.*
	QA	*L. talking to M.*

Observation Day One

Copy form as needed (minimum three times).

Observation Period (circle one): 1 (2) 3 4 5 6 Date: *2/4/03*
Recorder: *Ray S.* Recording Intervals: *every 5 minutes*

Time	Code	Comments
10:00	*D*	*Prone on wedge (percussion treatment)*
	D	"
	S	" *(musical aquarium near hand)*
10:15	*S*	"
	D	"
	F	*Moving to wheelchair*
10:30	*F*	*Suctioning*
	D	*Switch toy*
	D	"
10:45	*D*	"
	D	"
	D	"

Observation Day One

Copy form as needed (minimum three times).

Observation Period (circle one): 1 2 (3) 4 5 6 Date: *2/4/03*
Recorder: *Ray S.* Recording Intervals: *every 5 minutes*

Time	Code	Comments
1:00	*QA*	*In wheelchair, B. sitting with her playing bells to music*
	D	*Music playing*
	D	"
1:15	*D*	"
	F	*Suctioning*
	F	*Music playing*
1:30	*F*	*Moving to changing table*
	F	*Changing*
	QA	"
1:45	*F*	*Moving back into chair*
	F	*Going to gym*
	F	*Waiting for P.E. teacher*

Percentage of Alert States

Day	Observation Period	Observation Date	Number of Arousal States Recorded	Number of Quiet and Active Alert
1	*1*	*2/4/03*	*12*	*5*
	2	*2/4/03*	*12*	*0*
	3	*2/4/03*	*12*	*2*
*2**	*1**	*2/5/03*	*12*	*1*
	*2**	*2/5/03*	*12*	*3*
	*3**	*2/5/03*	*12*	*1*
*3**	*1**	*2/6/03*	*12*	*0*
	*2**	*2/6/03*	*12*	*5*
	*3**	*2/6/03*	*12*	*2*
TOTALS			*108*	*19*

Percent Alert	Col. 5 ÷ Col. 4 =	*20% (17.6)*

*Sample Assessments only show Day One Observation Periods 1, 2, and 3.

Sample Sensory Response Record (SRR)

Learner: *Mary J.*	Recorder: *Ray S.*

1. Presentation Periods

Date and Time	Place	Presenter
2/19/03 8:35	*Classroom, in wheelchair*	*Ray*
2/20/03 10:35	*Classroom, prone on wedge*	*Ray*
2/20/03 1:00	*Classroom, supine on mat*	*Ray*

2. Presentation Structure (Use information from Arousal State Profile and Sensory Learning Summary.)

Length of session:	Duration of presentation:	Time between presentations:
5 to 10 minutes	*15 seconds (at least)*	*15 seconds (at least)*

3. Appetite Item Menu

Sensory Channel	Code	Items
Vestibular/Proprioceptive	VP	*Side-to-side rocking, front-to-back rocking, hammock swing, water bed*
Gustatory	G	*Cereal, pudding, lollipops, Twizzlers*
Olfactory	O	*Input limited to mild odors associated with some items in other channels*
Tactual/Proprioceptive	TP	*Vibrating pad, lotion, tactile rollers, wax paper*
Auditory	A	*Bells, music player, singing, wind chimes*
Visual	V	*Mirror, pinwheel, helium balloon, faces*

4. Response Modes (Complete all three.)

Positive: *Open eyes, increase in head movement*
Negative: *Closed eyes, tongue sucking*
Distress signals: *Flushing, shallow breathing, maybe some vocalizing*

5. Cautions and Modifications

Cautions	Modifications
Fussy after moves *No citrus* *Response delays* *Breathing and drainage issues*	*Allow about 3 min. recovery time.* *Slow pace, 15' presentation* *Minimize supine positioning.*

6. Observation Record:
   Channels VP, G, O, TP, A, V
   Appetite (+) Aversion (-)
   Amount of delay in seconds
   1-3 Intensity (3 being greater)
   Responses ES, QA, AA, PP

Item	Channel	App/Avr	Delay	Intensity	Responses ES	QA	AA	PP
Bells	*A*	*+*	*6′*	*1*		✓		
Mirror	*V*	*+*	*15′*	*3*		✓		
Side-to-side rocking	*VP*	*-*	*0′*	*3*	✓			
Music player	*A*	*+*	*4′*	*2*		✓		
Pudding	*G*	*-*	*5′*	*1*		✓		
Pinwheel	*V*	*+*	*15′*	*1*		✓		
Vibrating pad	*TP*	*+*	*3′*	*2*		✓		
Front-to-back rocking	*VP*	*-*	*0′*	*2*	✓			
Tactile roller with plush cover	*TP*	*+*	*4′*	*3*		✓		
Cereal	*G*	*+*	*6′*	*1*			✓	
Lotion	*TP*	*+*	*3′*	*3*			✓	
Hammock swing	*VP*	*-*	*0′*	*1*		✓		
Lollipop	*G*	*-*	*7′*	*1*		✓		
Wax paper	*TP*	*+*	*4′*	*3*			✓	
Helium balloon	*V*	*+*	*15′*	*3*		✓		
Water bed	*VP*	*-*	*0′*	*1*		✓		
Singing	*A*	*+*	*5′*	*2*		✓		

Sample Sensory Response Record (SRR) · Learner: *M.J.*

Item	Channel	App/Avr	Delay	Intensity	Responses ES	QA	AA	PP
Twizzler	*G*	*+*	*6'*	*2*			✓	
Wind chimes	*A*	*?*	*?*	*?*			*?*	
Faces	*V*	*+*	*15'*	*3*		✓		
Strong odors	*0*	*-*	*3'*	*1*	✓			
TOTAL					*3*	*13*	*4*	*0*

Sample Appetite/Aversion List (AAL)

Date *2/20/03*

Appetites	Aversions
Bells	*Side-to-side rocking*
Mirror	*Hammock swing*
Music player	*Pudding*
Pinwheel	*Front-to-back rocking*
Vibrating pad	*Lollipop*
Tactile roller with plush cover	*Water bed*
Cereal	*Strong odors*
Lotion	
Wax paper	
Helium balloon	
Singing	
Twizzler	
Faces	

Sample Appetite/Aversion List (AAL) · Learner: *M.J.*

Sample Levels and Strategies Guide (LSG)

Intervention Level Chart Date *2/20/03*

This information is on the Observation Record (in the SRR). Non CD users may wish to copy relevant information to this chart. CD version will complete automatically.

ES=Extended State QA=Quiet Alert AA=Active Alert PP=Partial Participation

Channel	Appetite Item	ES	QA	AA	PP
Auditory	*Music player*		✓		
	Bells		✓		
	Singing		✓		
Gustatory	*Cereal*			✓	
	Twizzler			✓	
Olfactory					
Tactual/Proprioceptive	*Vibrating pad*		✓		
	Tactile roller with plush cover		✓		
	Lotion			✓	
	Wax paper			✓	
Vision	*Mirror*		✓		
	Pinwheel		✓		
	Helium balloon		✓		
	Faces		✓		
Vest./Proprioceptive					
Totals		*0*	*9*	*4*	*0*

1. Enter the total number of items on the Observation Record (in the SRR). Then enter the total number of each response level. Figure up the percentage. CD version will compute automatically.

	Total Items	Extended State	Quiet Alert	Active Alert	Partial Participation
	21	*3*	*13*	*4*	*0*
Percentage*		*14%*	*62%*	*19%*	

*Does not equal 100% because wind chimes was left blank.

2. Enter total number of appetite items for each channel from the Observation Record (in the SRR). CD version will complete automatically.

	Vest/Proprio	Olfactory	Gustatory	Tactual	Visual	Auditory
Appetite Totals	*0*	*0*	*2*	*4*	*4*	*3*

3. List the top ten appetite favorites from the SRR. CD version will complete column one automatically.

Appetite Item	Comments
1. *Lotion*	*Extended fingers*
2. *Wax paper*	*Tried to move face against paper*
3. *Twizzler*	*Sucked*
4. *Helium balloon*	
5. *Tactile roller with plush cover*	
6. *Faces*	
7. *Mirror*	
8. *Vibrating pad*	
9. *Singing*	
10. *Music player*	

4. Enter average delayed response times from the SRR. CD version will compute automatically.

Channel	Average Response Time
Vestibular/Proprioceptive	*0′*
Olfactory	*3′*
Gustatory	*6′*
Tactual	*3.5′*
Visual	*15′*
Auditory	*5′*

5. Environmental factors related to learner's orienting responses

- Lighting: *No visual responses are noted in dim light or bright glare.*
- Temperature: *Fussy/agitated states are associated with cool ambient temps.*
- Odors: *Fussy/agitated states are associated with strong ambient smells.*
- Noise level: *Very withdrawn response may be related to the high noise levels in the gym and cafeteria.*
- Visual clutter: *There are no responses to specific media against cluttered background.*
- Positioning: *Needs recovery time when moved. Visual responses are good in supine, maybe because ceiling provides clutter free background.*
- Movement: *Does not like it! Likes watching it.*
- Other

6. Social factors related to learner's orienting responses

   - Presence or absence of peers: *Very non-responsive in group activities*
   - Presence or absence of adults: *Doesn't like to be physically manipulated*
   - Direct attention of peer: *Need to check this out.*
   - Direct attention of adult: *All QA and AA states occurred with direct interaction of adult.*
   - Preferred peers
   - Preferred adults: *Really likes L.*
   - Others

7. Recommended referrals

   - Visual
   - Auditory: *Ask teacher of the auditorily impaired (TAI) to do functional screening for concerns related to high frequency, volume.*
   - Gross motor
   - Fine motor
   - Communication
   - Medical
   - Nutritional
   - Sleep
   - Dental
   - Psychological

END

Appendices

Appendix A

Understanding the Sensory Systems

By Judith van Naerssen, OTRL, M.S., CLVT

At birth, the neural pathways that control basic bodily functions such as respiration, circulation, and gross temperature control are generally operational. Many neural pathways however develop over time and all are determined in large part as a result of experiences in our natural environments.

Our central nervous system is constantly receiving input from external and internal receptors and experiences. At all times, while simultaneously directing our body to adapt to and meet constant internal and external demands and changes, the nervous system seeks to maintain a condition of internal constancy called "homeostasis." As teachers, therapists and caregivers, we need to be aware that the application of sensory input can have powerful impact upon the body's efforts to maintain homeostasis. Sensory input that is often used in developmental and educational programming can have positive impact, but it can also cause very undesirable and potentially harmful results.

The structure and functioning of the human brain is determined by the information it receives and uses. The central nervous system is filled with neurons and networks that are exquisitely sensitive to incoming and internally elicited stimuli. Some synapses become strong and permanent networks, while others that are unused or infrequently used, essentially die. Throughout development, prolonged pruning of synapses occurs and fixes the overall quality of all abilities. Experience determines which connections are preserved and ultimately how the brain is wired for thinking, perceiving, and acting. As long as a lot of synapses are present, the brain remains plastic. Once they are gone, the critical period for skill development is over and improvement for the most part does not occur. For many abilities, the critical window is open until adolescence, but for some, it is shut off in just the first few months or years of life (Eliot, 1999).

According to Eliot (1999), the magnitude of typically occurring synaptic sorting is enormous. Children lose in the order of 20 billion synapses a day between early childhood and adolescence (Eliot). The elimination of stray synapses and the strengthening of survivors is what allow our mental processes to become efficient and mature. It also explains why with age,

mental processes are less flexible and less creative. Although the brain is plastic, it is never as malleable as in childhood. This is a fundamental premise upon which early intervention for special needs populations and early childhood education programs are founded.

Both children and adults use and coordinate information obtained from all the sensory channels. This is true for those with or without compromised bodily functions. Sensory input/stimulation significantly impacts the internal process of sensory processing and integration.

Sensory integration is a dynamic process. As such, it promotes self-organization while the individual is interacting within the immediate environment. J. Ayres, the pioneer in the field of sensory integration, said as early as 1979 that "sensory integration sorts, orders, and eventually puts all the individual sensory inputs together into a whole brain function" (Smith, Blanche, and Schaaf, 2001, p.9). This process allows increasingly more complex behaviors to develop. "When the functions of the brain are whole and balanced, body movements are highly adaptive, learning is easy, and good behavior is a natural outcome" (Smith et al., p.9). According to Lewkowicz and Lickliter (Smith) the interaction among sensory systems is what enables development.

The central nervous system recognizes and sorts all the input and once integrated and determined to be meaningful, it allows for a self regulated, organized and adaptive response to the situation encountered. When it cannot make sense, or when overloaded, maladaptive behavior often is observed (e.g., temper tantrums, inattention, inability to sit still in a class, aggression, refusal behaviors, etc.).

It is the mechanisms and systems of the central nervous system that ensure order and accuracy in our physiologic responses. Regulation is a term that refers to the internal neurologic adjustments that control the basic operation of all bodily organs. The manner in which the brain manages this determines a person's state of order and organization. Regulation lays the foundation for all behavior; both involuntary and voluntary so it is important to understand the dynamics of neural processing in order to facilitate attention, adaptive responses and learning (Smith).

Adaptive behavior, a term coined by J. Ayres, refers to the ability to respond actively and purposefully to new circumstances (Smith). Adaptive behavior is influenced by experience and repetition, and with training can be positively and effectively influenced. Sensory integrative theory states that through the repetition of meaningful input and experiences, neural circuitry can be molded and this in turn can allow for increasingly more complex behaviors to emerge.

Milestones in childhood development are well documented. These sequential skills generally occur at predictable times because of changes within the central nervous system. It is myelinization, the process by which nerves are covered in a fatty substance, that is needed for speedy conduction of electrical impulses. Myelinization allows for maturity of the nervous system and the emergence of increasingly complex skills. Myelinization begins in utero in the spinal cord, but not until the last prenatal month in the brain. It is a very slow process and it occurs at different rates in different areas of the brain. It occurs along with dendritic growth of neurons, synaptic pruning, and other critical processes that occur during the wiring of the brain. While all these neurologic changes occur, behavioral outcomes are also critically influenced by a child's life experiences. There are critical periods during the wiring of the nervous system. Once a given region of the brain has passed its refinement period in development it is very difficult to rewire it. The critical periods for vision, hearing, touch, smell, and taste end much earlier than those for complex skills like language and emotional behavior. All critical periods begin in the first 4 years of life and after that it is harder to alter the circuitry (Eliot, 1999). While it is a known fact that the flexibility of the nervous system decreases with age, it does remain plastic throughout life and it can restructure itself based on what is learned (Ratey, 2001). The amount, type, and frequency of sensory information received by the nervous system can potentially determine its future state (Ratey).

In order for teachers and caregivers to influence learning positively and promote adaptive and increasingly more complex skills and behavior, it is critical to have a basic understanding of the development of the various sensory systems and also how the central nervous system operates. This is very important when working with the population who may be compromised neurologically, physically, and/or emotionally and for whom the SLK is designed.

To promote learning in this population, it is essential to begin by assisting the learner into a quiet, alert, homeostatic state. Often the learner is unable to do this for him or herself. Giving such assistance helps to organize the central nervous system and in turn paves the way for learning to occur. Since the nervous system responds to sensation, it is often possible to achieve homeostasis by manipulating or working with individual or combined sensory systems. Manipulation of the various sensory systems can help in promoting and maintaining alertness and awareness. When utilizing sensory input for such purposes, it is essential to have a good understanding not only about each of the sensory systems, but it is imperative that one be knowledgeable about any precautions which may need to be considered.

Types of Sensory Systems

Our senses feed our brains and they tell us about situations within and outside of the body. They allow us to know if all is well, if we are safe, satisfied, or bored. Our senses drive our activity and adaptive behaviors. Normally the sensory systems work together and when in concert allow us to learn and live productively. The basic senses can be divided into two categories: near and the distance receptors. Near senses include the tactual, proprioceptive, vestibular, taste, and smell receptors. The distance receptors include those of the visual and auditory systems.

Development of the Near Sensory Systems

The Tactile, Kinesthetic and Proprioceptive Systems

Our sense of touch plays a critical role in how we reach out and interact with the world around us and also how we tolerate being touched. Both of these factors significantly impact the later development of tactual discriminatory abilities, motor skills, social interactions and emotional well being. At birth, this system, like all the other sensory systems is immature and has a lot of changes ahead. The tactual system is however more neurologically mature than the visual, hearing and taste systems.

Touch includes several different somato(skin)-sensory abilities with their own specialized receptors in the skin and specific neural pathways. These include cutaneous touch, temperature, and pain.

When fully mature, the tactile receptors ultimately send electrical input to the somatosensory cortex located on each side of the brain. These areas are laid out and represent an orderly map of the body's surface. Before birth, and as early as 5.5 weeks after conception, the embryo begins to register response to touch in the area of the lip and nose, and by 12 weeks the embryo responds to touch over the entire body except the top and back of the head. These two areas remain insensitive until after birth (Eliot, 1999). Shortly before term, the electrical activity is close to adult level and it functions much faster than the visual and auditory systems. At birth, infantile touch is not equivalent to adult touch since it is operational at the spinal cord and brainstem level only. Like the rest of the nervous system, the neural tract for touch follows the same developmental sequence of maturing from lower levels, to thalamic, to cortical levels. When it reaches the thalamic level where a lot of relaying of information occurs with other areas of the nervous system, the infant begins to have a dim awareness of the touch experience (Eliot).

Of all the senses at birth, touch gives the most detailed information even though it is still not mature. It is not until 6 months that it is fully

myelinated. Electrical response to touch in the somatosensory cortex grows stronger and faster during the first year of life. At 1 year it is processing 4 times faster than at birth and by 6 years it is doubled that and close to adult level of performance (Eliot, 1999). It grows more precisely with time and therefore there is an increasing sense of understanding and awareness as to the specific point of touch.

Reflexive movement of body parts and the touch of caregivers are the infant's first sources of tactile stimulation. These experiences allow the infant to be aware of the world outside of his body. For the infant, the mouth is the most sensitive area of touch. This is true even up to 5 years of age (Eliot, 1999). During the first few days of life, touch on the infant's cheek evokes mouth opening, lip wrinkling, and sucking movement allowing survival feeding responses. Newborns also use the tactile receptors within the mouth to detect shape and form and with this input studies show they develop the first abstract perceptions of objects (Eliot). By the age of 6 months hands are exploring objects but prior to this, infant hands are less talented than the mouth in regard to tactile perception. It is not until 6 months that they detect texture in the hand. At 2 years-old the left hand generally is better at tactile object detection and it appears the right hemisphere of the brain is specializing and is being used to determine shape and spatial properties (Eliot). Studies show that there are sexual differences in touch recognition: girls are more sensitive to touch than boys as newborns; boys tend to be more lateralized than girls in their touch perception; by mid-childhood (6-11 years) boys non-dominant side, usually the left, is considerably more sensitive to touch, and girls tend to be more symmetrical in touch sensitivity (Eliot).

As fine manipulative skills emerge, and more isolated finger skills appear, tactile perception improves. Increasing tactual, kinesthetic, and proprioceptive input allow neural tracts to get streamlined thereby allowing the child to detect finer detail and information more efficiently from objects and the environment at large.

Touch is known to play a critical role in psychological development. This was demonstrated in the classic Harlow monkey studies at the University of Wisconsin. Harlow's work showed that more than nourishment, tactile contact bonds the infant to the mother. Other mammal studies have confirmed this finding and it appears that physical contact is vital to growth and development. Massage has been shown to be important to growth and development and well being in infants and adults. Among many positive findings, massage has been shown to improve the clinical course of assorted medical conditions, lower anxiety and stress, improve mood, enhance sleep pattern, increase attention, and even improved the mood and sociability of sexually and physically abused individuals (Eliot).

Impairment in tactual processing is often evident in blind and visually impaired persons. Ayres first described impairment in the tactual system as "tactual defensiveness." It was described as a discomfort to touch and was demonstrated as a desire to avoid or escape. Tactual defensiveness is a self-protective, escape mechanism. When allowed to continue, central nervous system development is compromised, and the individual often is deprived of critical learning about the self and the environment. Left unattended, there can be life long negative impact.

Touch has a pervasive impact on central nervous system processing and adaptive behavior. The type and amount of tactile input needs to be given special consideration as an intervention tool especially when working to establish homeostasis, to heighten body image, spatial perception, environmental awareness, as well as adjustments of mood, alertness, and attention in the visually and multiply challenged populations.

In addition to touch, proprioceptive, and kinesthetic receptors are also activated with any body movement. Proprioceptors are not touch receptors. They are located beneath the skin in the muscles and tendons and provide us with the sense of position and movement of body parts. Proprioceptors and the vestibular system are intimately related. Kinesthetic receptors, which are specialized receptors in joints, give information about limb positioning. All together these receptors provide essential information to the central nervous system. When all these sensations, along with vestibular, and visual input are paired, they give us a sense of body scheme, they help guide and direct movements, control posture and balance, and give us information about the body and its action in space.

While blind children do not have visual input to motivate movement, their daily routines need to be filled with movement opportunities in order to promote optimal development of brain and nervous system.

Development of the Vestibular System

Perception of body movement, which is generally subconscious, is detected by the vestibular receptors that are housed within the inner ear. The receptors are located there in the semicircular canals and the otolith organs. They detect changes in direction of gravity pull and motion and allow us to adaptively respond by adjusting body posture and maintaining balance. The receptors in the otolith detect linear motion, head tilts, and the body's position with respect to gravity. The semicircular canals detect head turns. Receptors convert this movement input into electrical signals that travel over the vestibular nerve to the brainstem where information is routed to a number of locations. This includes information to the eyes that are then

guided to automatically move to compensate for the head positional change. This input allows visual fields to remain stable. The electrical impulses also travel down the spinal cord to assorted muscles that control posture. In addition, input goes to the cerebellum where it integrates with visual and proprioceptive input and all influence balance responses. Some information also goes from the inner ear to the cerebellum and influences gross and fine motor coordination. Most of this neural activity occurs subconsciously. There is some input which goes up to the thalamic centers and from there to the cortex allowing some degree of conscious awareness of movement and balance.

The vestibular and the auditory systems start developing together but the vestibular system begins to myelinate and develops faster. Differences are seen as early as 5 weeks in utero. The vestibular nerve is the first fiber tract to start myelinating in the entire brain. This myelination occurs about the end of the first trimester. By the fifth gestational month, the vestibular apparatus is nearly full size, the pathways to the eyes and spinal cord have started to myelinate and, overall the system is remarkably mature. There are however some vestibular pathways that are very slow to mature and are not complete until puberty. This is a very vulnerable system because of its rapid early development in utero. Like the auditory system it is very vulnerable to harmful affects of drugs (Eliot, 1999).

After touch, the vestibular system is the next most precocious sensory system (Eliot, 1999). It is intimately tied to early motor reflexes that are so critical to survival. It underlies many of the brainstem level reflexes including the asymmetrical tonic neck reflex (ATNR), the traction reflexes in the neck and hands, and many of the eye reflexes.

In normally developing infants, it is common to see a lot of self-initiated bouncing and rocking around 6-8 months when this system is at its peak of sensitivity. This input is so beneficial and has far reaching impact. Studies have shown that it can stimulate motor development, has impact on behavioral states, and is particularly effective in calming and or rousing alertness levels and among many other attributes, vestibular input also has been shown to increase visual alertness. The maturation of this system, which for most is complete by 7 years, is critical to postural stability, orientation in space, ocular control, general postural control and balance (Eliot, 1999). Vestibular stimulation impacts the nervous system quickly and has far reaching neurological effects. This input can have major influence on performance and adaptive behavior. Any major deficiency in movement experiences can interfere with development of the vestibular system and central nervous system circuitry, and in turn can, significantly impair development and learning.

Development of the Gustatory System

The sense of taste develops early along with touch, smell, and the vestibular senses. Like smell, it is a chemically based sense. It detects and converts environmental molecules into electrical signals. Taste is an even more basic sense than smell. It is divided into four categories: sweet, sour, bitter, and salty. Recently a fifth category, umani, has been detected (Eliot, 1999). Umani refers to full flavor appreciation and involves a combination of taste and smell. It may explain why foods taste bland when you have a cold.

Taste impacts the brainstem in the medulla. It helps to trigger brain stem level reflexes for feeding including salivation, swallowing, and tongue movements. It also sends impulses to the pons and thalamus in the upper brainstem. From these areas it goes onto the amygdala and hypothalamus that contribute to feelings and motivation to eat. Information also goes to the limbic system that deals with pleasure feelings associated with food. The cerebral cortex receives sensory input as well and this explains our conscious perceptions related to eating. Taste has pervasive impact on the entire nervous system.

Taste buds continue to develop after birth. At birth however an infant can detect a number of flavors but they are especially drawn to sweet. Sour and bitter evoke strong reactions and aid in survival. Infants generally are indifferent to salt. Taste perception changes over time and around 4 months the infant can detect saltiness and by 2 years fully identify bitter. Understanding what is edible is a learned behavior (Eliot, 1999).

Because of its interrelatedness with assorted locations throughout the nervous system, it is important to include taste when working with students for whom this kit is designed. Taste can have significant impact on alertness and interactive behaviors.

Development of the Olfactory System

Odor is an important component of appetite. Detection of noxious odor permits us to avoid danger while pleasant smells support nutrition, emotional bonding, and social interaction. Our sense of smell, along with touch and taste, comprise our near senses. At the outset of life these near senses are more important to survival than sight and hearing. Smell and taste are fairly well developed at birth because the nerves are well myelinated. While not a lot is understood about this sensory system, the olfactory cortex is known to lie in a phylogenetically older region of the brain. It is thought to mature before touch, vision and hearing. At birth it is thought that infants can detect and localize nearly as many odors as adults. Among interesting facts known about this sensory system are the following: females are more sensitive to odor at all ages; by age 3 years most persons

are able to identify good from bad smells, and by 6-7 years olfactory preferences and aversions appear to be adult-like (Eliot, 1999).

Incorporation of this sensory system should not be overlooked when planning interventions to impact the alertness, mood, and general learning. The olfactory system provides a lot of information about the environment both physically and socially. A keen sense of smell can become a real asset for a blind or visually impaired child. It is important to incorporate daily activities such as cooking, cleaning, or walks outside to allow the learner to heighten their awareness of assorted environmental odors. Smell can give them temporal and spatial cues as well as motivate movement.

Development of the Distance Sensory Systems

The Visual Sense

At birth the visual system is primitively developed, and its most significant development occurs after birth. Neurologically, the visual system is slow to evolve. At birth, light contrasts are detected and over the next several months fixation and tracking skills emerge. By 6 months the infant has depth perception, color awareness, ability to shift visual attention between objects, and coordinated eye movements. By one year of age, near and distance acuity are good, binocular vision is stronger as are focus and accommodation. After a year, children realize that others can see and they begin to use words like "look and see." By 2 years most children are pointing to pictures, imitating actions, and look for missing parts and items.

While most development in this system occurs after birth, sub-cortical visual structures are well developed and control most visual behaviors of the first 2 months. Between birth and 6 months, control of eye movement shifts from predominately sub cortical to cortical control (Eliot, 1999). Until then tracking is slow, saccadic movements are jerky and they tend to fall behind the target. With myelinization and addition of cortical controls, movements become smoother, more accurate, and anticipation of movement begins to influence total behavior and reactions to environmental challenges.

Parents and professionals working with the visually and developmentally challenged need to have a good understanding of the sequences of visual development and must be aware that the experiences and activities which they offer are critical to the development of this system. Visual experiences must be offered to encourage synaptic activity and neurologic competition; this in turn promotes development of circuitry in the visual system.

When there is visual impairment, there is little incidental learning through this system. Depending on the impairment, the child may need to be taught

to fixate, track, detect form, shape, outline and/or symbols. Rich sensory input and graded activities must be carefully selected when promoting use of the visual sense.

Development of the Auditory System

The two distance senses follow different paths in their maturation: vision emerges later in development but matures quickly, while hearing begins early and matures gradually. Like vision, hearing can be influenced by experience. Early experiences with speech and music are important to the shaping of higher brain functions including language, emotions, and cognition.

Newborns are sensitive to sounds, and this is illustrated in their changes in activity level, forehead wrinkling, breathing rate and rhythm changes, head and eye localization to sound source and inhibition of sucking. This occurs because of the vibration to the eardrum and the three inner ear bones. The cochlea converts this vibration into electrical impulses and then the impulses are sent on through all the brain stem relay stations before going on to the cortex.

There are significant differences in the processing of auditory and visual input. Routing of impulses is different; the visual system has distinct routes which are divided between sub-cortical and cortical tracts; the brain does not segregate the two sides of the body for hearing as it does with the visual sense; and finally auditory information is interpreted in the auditory cortex while visual input is processed separately for color, shape, motion, and spatial components before it is assembled for object recognition (Eliot, 1999).

Our sense of hearing is our first access to the world outside of our immediate reach. At birth infants are generally insensitive to quiet sounds and have a limited range of tones that they can perceive. At a month they respond to loud noise with crying or startling. Discrimination of low frequencies is better than high. They respond to approaching sound by becoming quiet or reducing activity. By 2 months they respond to human voice with similar behaviors and they accept loud noise. They also make sounds for physical pleasure and auditory stimulation. By 4 months they pay attention to voice tone, and they combine the visual and auditory systems by turning to look for sound source. At 6 months, they respond differently to familiar and strange voices, and by a year, understand simple words. They listen carefully and recognize and turn to their name.

Attention is of primary importance in the development of auditory discrimination. Children attend and seek sounds that are useful or contain needed or wanted information. When auditory input does not exceed the level of pleasant sensation, the child may remain on the level of mechanical sound reception. Auditory acuity would be developed but would not contribute to auditory perceptual ability.

When working for auditory awareness, it is advisable to begin with gross sound before expecting discrimination of detailed sound differences. Children with vision and developmental impairments should be encouraged to reach out and contact the source of sound. Objects used to produce sound with visually impaired children should also have additional perceptual qualities to make the experience more grounded and tangible. Generally the richer the stimulation, the more potential for meaning. Caregivers must be attentive however to individual needs and avoid over stimulation. Searching for auditory source and clarification can promote adaptive behavior since the search brings meaning to the sensory input. It can lead to vocal play and development, social connectedness and environmental exploration.

Conclusion

Children who have visual impairments accompanied with developmental disabilities have complex sensory needs that require well thought out programming. It is important to consider the ramifications of loss or impairment in a single sensory system and to look at the impact both on the development of the central nervous system as a whole as well as on overall developmental performance. When utilizing sensory activities it is imperative that the caregiver be sure the activity is meaningful to the learner. An activity that is meaningful to a person can be instrumental in promoting neural activity. In turn, meaningful activities may promote sense of self, and awareness of location in space in relation to position, gravity, to others and to objects. By offering such basic understanding of self, the learner is being offered the chance to develop a more mature and firmer foundation upon which to explore, make choices, take action, and learn.

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Appendix B

Sensory Channel Characteristics

By Millie Smith, M.Ed., TVI

Sense
Touch

Organ (Receptors found in)
Skin

Processing (Beyond reflexive level)
Tactile input travels straight to the amygdala where it is scanned for pain (Charney, 2002). The function of the amygdala is to interpret emotional information very quickly and to alert the system to danger. After that, it goes to the thalamus for more sophisticated processing of distinct characteristics and finally to the cerebral cortex for meaning interpretation. In the cortex, tactual and proprioceptive information is integrated as it moves along neural pathways in the dorsal column (Blanche and Schaaf, 2001).

Sensation
Pressure
- Light
- Deep

Speed
- Brief
- Lingering

Temperature
- Cold
- Hot
- Neutral

Texture
- Soft
- Smooth
- Rough
- Hard

Size
Shape

Sense
Smell

Organ
Nose

Processing
Olfactory stimulation activates electrical impulses that travel along nerve fibers directly to the amygdala. Olfaction is the only major sensory channel that has no known connection to the thalamus (Restak, 1984; 2001).

Sensation
Fragrant
Acid
Burned
Putrid

Sense
Taste

Organ
Taste buds in the tongue and pharynx

Processing
Gustatory stimulation activates electrical impulses that travel along mixed nerve bundles carrying information about texture and temperature as well as taste. Some input goes directly to the amygdala for emotional alerting; then to the thalamus for more sophisticated processing of distinct characteristics; and finally to the cerebral cortex for meaning interpretation (Barr & Kiernan, 1993).

Sensation
Sweet
Sour
Salty
Bitter

Sense
Sound

Organ
Outer, middle, and inner ear

Processing
Vibration is sensed by bones in the middle ear and by hair cells in the inner ear. Input is converted to electrical impulses that travel along the auditory nerve to the thalamus for processing of distinct characteristics and to the cerebral cortex for meaning interpretation. If the cortical interpretation involves danger, the amygdala is signaled (Barr & Kiernan 1993).

Sensation
Pitch
- High tone
- Low tone

Intensity
- Loud
- Soft

Timbre
- Sharp
- Muted

Tempo
- Fast
- Slow
- Continuous
- Intermittent

Sense
Sight

Organ
Eye

Processing
Light stimulates chemicals in the retina that activate electrical impulses that travel down the optic nerve to the thalamus for processing of distinct characteristics and to the cerebral cortex for meaning interpretation (Restak, 1984; 2003). If the cortical interpretation involves danger, the amygdala is signaled.

Sensation
Brightness
Color
Contrast
Size
Shape
Distance
Dimension

Sense
Vestibular

Organ
Inner ear

Processing
When the head moves, gelatinous material in the inner ears stimulates cilia structures on the hair cells of the semicircular canals. Electrical input travels along the vestibular branch of nerve cells bundled together with auditory nerve cells. Vestibular input is received in many parts of the brain. The amygdala is immediately alerted to dangers of falling and responses are stimulated. More sophisticated cortical processing involves information about relative position and stasis (Barr & Kiernan, 1993).

Sensation
Movement Tempo
- Slow
- Fast
- Intermittent
- Continuous

Movement Direction
- Up and down
- Back and forth
- Side to side
- Circular

Static Position
- Sitting
- Standing
- Sidelying
- Prone
- Supine

Tilt (Position relative to horizon)

Sense
Proprioception
Note: "...because the differentiation between proprioception and kinesthesia is not functionally accurate, clinicians should consider the two senses under one sense: proprioception." (Blanche and Schaaf, 2001)

Organ
Skin, muscles, and muscle spindles around major joints

Processing
When the body moves, information about the length and tension of muscles is relayed along spinocerebellar tracks to the cerebellum—the part of the brain responsible for the coordination and modulation of all body movement. There it integrates with vestibular information to help control posture relative to gravity. From the cerebellum, proprioceptive information goes to

the somatosensory cortex where it integrates with tactual information to aid in the interpretation of touch information and the modulation of refined movements (Barr & Kiernan, 1993).

Sensation
Static position of parts of the body moved by skeletal muscles
Velocity of movement—imposed or voluntary

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Appendix C

Sensory Arousal Manipulation Guide

By Millie Smith, M.Ed., TVI

All people have a certain point at which they feel most comfortable in terms of optimum arousal—not too much or too little. This is called "homeostasis." It is the point of sensory neural equilibrium that corresponds to the cognitive state of alertness. The amount of stimulation resulting in stasis for one individual may be insufficient or overwhelming to another. A sensory experience that one person finds calming may be stimulating to another. Responses may vary for one individual depending on variables related to health, environmental, and emotional issues. The following tools represent general trends in responses. Specific interventions should be based on Sensory Learning Summary information.

Sensory Channel
Vestibular/Proprioceptive
The same activity, swinging, rocking, bouncing, etc. may be alerting or calming depending on how it is done.

Typically Alerting Stimulation
Fast, intermittent movement
Changes in positioning
Upright position

Typically Calming Stimulation
Slow, rhythmical movement
Static, well-supported positioning

Sensory Channel
Tactile

Typically Alerting Stimulation
Light
Cool
Rough
Hard
Fast input

Typically Calming Stimulation
Deep
Warm
Soft
Smooth
Slow input

Sensory Channel
Auditory

Typically Alerting Stimulation
Loud
Sharp
High pitch
Fast
Intermittent

Typically Calming Stimulation
Soft
Muted
Low pitch
Slow
Continuous

Sensory Channel
Visual

Typically Alerting Stimulation
Bright light
Red, pink, orange, violet
Glare
Movement
High contrast

Typically Calming Stimulation
Dim light
Blue, green
Non-reflective surfaces
Static environment
Muted contrast

Sensory Channel
Gustatory

Typically Alerting Stimulation
Salty
Bitter
Sour

Typically Calming Stimulation
Sweet

Sensory Channel
Olfactory

Typically Alerting Stimulation
Smells tend to evoke very strong responses.

Typically Calming Stimulation
This channel should be used for specific activity related cueing only.

Appendix D

How the Special Needs Brain Learns

Submitted by Judith van Naerssen, OTRL, M.S. CLTV

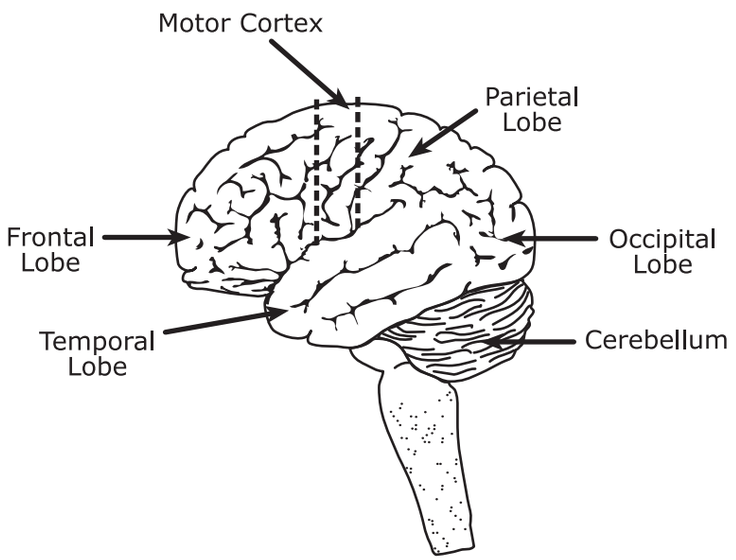

Figure 1: This diagram shows the four major lobes of the brain (cerebrum) as well as the motor cortex and the cerebellum.

Some Exterior Parts of the Cerebrum

Structure
Frontal Lobe (often referred to as the executive control center)

Function
Personality, curiosity, planning, problem solving, higher-order referred to as thinking, and emotional restraint

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Structure
Temporal Lobe

Function
Interpretation of sound, speech (usually on the left side only), and some aspects of long-term memory

---

Structure
Occipital Lobe

Function
Visual processing

Structure
Parietal Lobe

Function
Orientation, calculation, and certain types of recognition

Structure
Motor Cortex

Function
Control of body movements

Next, look at the inside of the brain and at some of its major structures (see Figure 2 below). Following Figure 2 is a list of the functions of some of the interior parts of the brain stem, limbic area, cerebrum, and cerebellum.

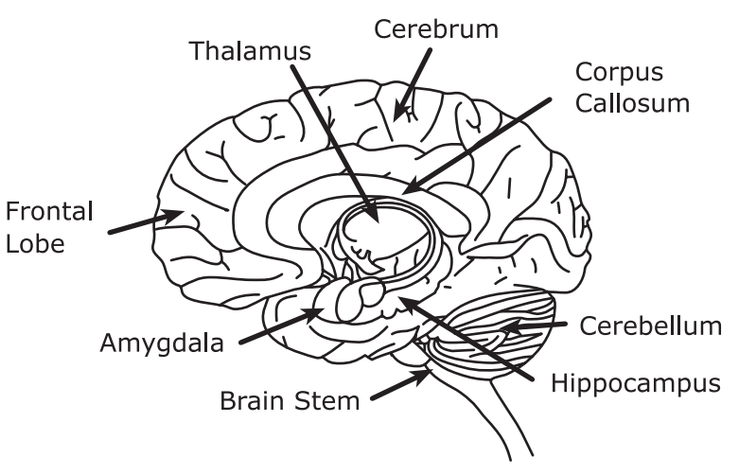

Figure 2: A cross section of the human brain.

Some Interior Parts of the Brain

Structure
Brain Stem

Function
The oldest and deepest area of the brain, this is often referred to as the reptilian brain because it resembles the entire brain of a reptile. Here is where vital body functions (such as respiration, body temperature, blood pressure, and digestion) are monitored and controlled. The brainstem also houses the reticular activating system (RAS), responsible for the brain's alertness.

Structure
Limbic Area

Function
Above the brain stem lies the limbic area, whose structures are duplicated in each hemisphere of the brain. Three parts of the limbic area are important to learning and memory.

Thalamus- All incoming sensory information (except smell) goes first to the thalamus. From here it is directed to other parts of the brain for additional processing.

Hippocampus- Named for the Greek word for a sea monster resembling a seahorse, because of its shape, it plays a major role in consolidating learning and in converting information from working memory via electronic signals to the long-term storage regions, a process that may take from days to months. This brain area constantly checks information relayed to working memory and compares it to stored experiences. This process is essential for the creation of meaning.

Amygdala- Attached to the end of the hippocampus, the amygdala (Greek for almond) plays an important role in emotions, especially fear. Because of its proximity to the hippocampus and its activity on PET scans, researchers believe that the amygdala encodes an emotional message, if one is present, whenever a memory is tagged for long-term storage.

Structure
Cerebrum

Function
The cerebrum represents over 80 percent of the brain by weight. For some still unexplained reason, the nerves from the left side of the body cross over to the right hemisphere, and those from the right side of the body cross over to the left hemisphere. The two hemispheres are connected by a thick cable, called the corpus callosum, composed of over 250 million nerve fibers. The hemispheres use this bridge to communicate with each other and to coordinate activities.

The hemispheres are covered by a thin but tough laminated cortex (Latin for tree bark). The cortex is composed of six layers of cells meshed in approximately 10,000 miles of connecting fibers per cubic inch! Here is where thinking, memory, speech, and muscular movement are controlled.

Structure
Cerebellum

Function
The cerebellum (Latin for little brain) coordinates every movement. Because the cerebellum monitors impulses from nerve endings in the muscles, it is important in learning, performance, and timing of complex motor tasks, including speaking. The cerebellum may also store the memory of rote movements, such as touch-typing and tying a shoelace. A person whose cerebellum is damaged cannot coordinate movement, has difficulty with speech, and may display the symptoms of autism.

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Sousa, D. A. (2001). *How the special brain learns.* Corwin Press: Thousand Oaks, CA.

Appendix E

Seizures and Epilepsy: What Is What?

By Judith van Naerssen, OTRL, M.S. CLTV

Seizures occur when brain cells fire abnormally. They generally occur suddenly, and there is a wide variety in type, duration and severity. Symptoms vary when different areas of the brain are involved. When the brain misfires, the person having a seizure may experience periods of altered awareness including unconsciousness, also involuntary movement, muscle spasm, or convulsion. A seizure may be manifest only by a brief loss of awareness (absence seizure).

Seizures indicate there is abnormal brain activity. It is essential that efforts be taken to determine the cause. To do so, eyewitnesses should record all behaviors demonstrated and report them to family members and appropriate medical personnel. To determine the cause, type and appropriate treatment of seizures, physicians will take detailed personal and family histories, conduct a thorough physical and then may conduct laboratory tests, spinal taps, EEGs, video monitoring, and/or imaging techniques including MRI, CT, and PET scans.

In some cases, the cause of a seizure is unknown. Assorted conditions which may provoke them can include: brain tumors or central nervous system infections, head injuries, strokes, abnormally low blood sugar, electrolyte imbalance, repetitive rounds of flashing lights, medications, and drug usage or withdrawal.

After thorough investigation of seizure activity, treatment should follow. If metabolic disorders or infections are the root of the problem, these conditions must be treated. If the underlying cause is not known or cannot be fully treated, anti-seizure medications, surgery, or dietary and lifestyle changes may be prescribed.

Seizures are discrete events but not all are manifestations of epilepsy. In 1981, the Commission of the International League Against Epilepsy proposed an international classification and terminology of seizures (Santilli, 2001). It divided seizures into two main categories that included: generalized and partial seizures; a third category is unclassified seizures. Seizures in this category are not classified because of incomplete data (Santilli).

Non-recurrent seizures may occur in conjunction with assorted acute metabolic conditions, medical and neurological illnesses. Once the illness is treated effectively these seizures do not recur. Occasionally, single seizures of unknown origin occur, and then are never experienced again.

Epilepsy is a chronic disorder in which there are *recurrent*, *unprovoked seizures*. According to the Epilepsy Foundation of America it is second only to mental retardation, as the most common developmental disability and the most prevalent neurological disorder after a stroke. It is a disorder that affects approximately 1 of every 100 persons in the USA. Although it can affect anyone at any age, 50% of cases develop before age 25. Persons with epilepsy may experience more than one type of seizure. In some cases, the person with epilepsy or others may be able to predict the oncoming of a seizure. Epilepsy is neither a disease nor a sign of low intelligence. According to the Epilepsy Foundation of America, 85% of people with epilepsy can achieve control of their seizures and lead successful lives.

References

N. Santilli. (2001). Students with seizures. 2nd edition Epilepsy Foundation of America.

Resources

http://www.epilepsyfoundation.org

http://www.epilepsy.com

http://www.WebMD.com

http://.www.Dr.Koop.com

American Academy of Pediatrics

American Epilepsy Society

Epilepsy Foundation of America

Seizure Chart

Seizure Type
Generalized
Tonic Clonic
(Also called Grand Mal)

What It Looks Like
A sudden cry, fall, rigidity, followed by muscle jerks, shallow breathing, bluish skin, possible loss of bladder or bowel control, that usually lasts a couple of minutes. Normal breathing then starts again. There may be some confusion and/or fatigue, followed by return to full consciousness.

What It Is Not
Heart attack
Stroke

What To Do
Look for medical identification. Protect from nearby hazards. Loosen ties or shirt collars. Protect head from injury. Turn on side to keep airway clear unless injury exists. Reassure as consciousness returns. If single seizure lasts less than five minutes, ask if hospital evaluation is wanted. If multiple seizures, or if one seizure lasts longer than five minutes, call an ambulance. If person is pregnant, injured, or diabetic, call for first aid at once.

What Not To Do
Don't put any hard implement in the mouth. Don't try to hold the tongue; it can't be swallowed. Don't try to give liquids during or just after a seizure. Don't use artificial respiration unless breathing is absent after muscle jerks subside or unless water has been inhaled. Don't restrain.

Seizure Type
Absence
(Also called Petit Mal)

What It Looks Like
It resembles a blank stare, beginning and ending abruptly, lasting only a few seconds, and is most common in children. It may be accompanied by rapid blinking, and/or some chewing movements of the mouth. The individual is unaware of what's going on during the seizure, but quickly returns to full awareness once it has stopped. This may result in learning difficulties if not recognized and treated.

What It Is Not
Daydreaming
Lack of attention
Deliberate ignoring of adult instructions

What To Do
No first aid is necessary, but if this is the first observation of the seizure(s), medical evaluation should be recommended.

Seizure Type
Simple Partial

What It Looks Like
Jerking may begin in one area of body, arm, leg, or face. It can't be stopped, but patient stays awake and aware. Jerking may proceed from one area of the body to another, and sometimes spreads to become a convulsive disorder. Partial sensory seizures may not be obvious to an onlooker. The person experiences a distorted environment, sees or hears things that aren't there, and may feel unexplained fear, sadness, anger, or joy. The person may have nausea, experience odd smells, and have a general "funny" feeling in the stomach.

What It Is Not
Acting out
Bizarre behavior
Hysteria
Mental illness
Psychosomatic illness
Mystical experience

What To Do
No first aid is necessary unless seizure becomes convulsive, then apply first aid as shown above. No immediate action needed other than reassurance and emotional support. A medical evaluation should be recommended.

Seizure Type
Complex Partial

What It Looks Like
Usually starts with blank stare, followed by chewing, followed by random activity. Person appears unaware of surroundings, may seem dazed and mumble, unresponsive, and actions are clumsy, not directed. He may pick at clothing, pick up objects, and/or try to take clothes off. He may run or appear afraid, and struggle or flail at restraint. Once a pattern is established, the same set of actions usually occur with each seizure. Seizures last a few minutes, but post-seizure confusion can last substantially longer. There is no memory of what happened during seizure period.

What It Is Not
Drunkenness
Intoxication on drugs
Mental illness
Disorderly conduct

What To Do
Speak calmly and reassuringly to patient and others. Guide gently away from obvious hazards. Stay with person until completely aware of environment. Offer to help getting home.

What Not To Do
Don't grab hold unless sudden danger (such as a cliff edge or an approaching car) threatens. Don't try to restrain. Don't shout. Don't expect verbal instructions to be obeyed.

Seizure Type
Atonic seizures

What It Looks Like
A child or adult suddenly collapses and falls. After 10 seconds to a minute individual recovers, regains consciousness, and can stand and walk again.

What It Is Not
Clumsiness
Normal childhood "stage"
Drunkenness

What To Do
No first aid, but doctor should be consulted.

Seizure Type
Myoclonic seizures

What It Looks Like
Sudden, brief, massive muscle jerks that may involve the whole body or parts of the body. May cause person to spill what they were holding or fall off a chair.

What It Is Not
Clumsiness
Poor coordination

What To Do
No first aid needed, but should be given a thorough medical evaluation.

Seizure Type
Infantile Spasms

What It Looks Like
These are clusters of quick, sudden movements that start between 3 months and 2 years. If a child is sitting up, the head will fall forward and the arms will flex forward. If lying down, the knees will be drawn up, with arms and head flexed forward as if the baby is reaching for support.

What It Is Not
Normal movements of the baby
Colic

What To Do
No first aid, but doctor should be consulted.

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Appendix F

Cortical Visual Impairment

By CVI Synergy West*

Cortical visual impairment (CVI) is a neurological visual disorder. It is the fastest growing visual impairment diagnosis today. Neurological visual disorders are defined by disturbed or reduced vision due to various brain abnormalities. CVI is not an ocular disorder, which is defined as a loss of vision due to pathology of the eye(s). The two types of visual disorders (ocular & neurological) can coexist.

Medically, CVI may be defined as bilaterally diminished visual acuity caused by damage to the occipital lobes and or to the geniculostriate visual pathway. CVI is almost invariably associated with an inefficient, disturbed visual sense because of the widespread brain disturbance.

For educational purposes, CVI is defined as a neurological disorder, which results in unique visual responses to people, educational materials, and to the environment. When students with these visual/behavioral characteristics are shown to have loss of acuity or judged by their performance to be visually impaired, they are considered to have CVI.

A student whose visual functioning is reduced by a brain injury or dysfunction may be considered blind for educational purposes if visual function is equal to or less than the legal definition of ocular blindness.

History

Visual impairment was defined in the past by loss of acuity (how far we see) and also by the severity of visual field loss (blind area). This definition was originally designed for characterizing visually impaired adults who required social assistance and not for children with visual impairment caused by various eye conditions. Even though it did not accurately represent visual abilities, the definition was widely accepted, but it adversely influenced our thinking about visual impairment. Services were developed worldwide for only those people with visual problems fitting this definition while others with obvious visual difficulties who required intervention were excluded.

During the last several decades, our understanding of vision has markedly improved. It is now realized that vision is not a single sense but a combination of complex senses which have evolved over millions of years. Almost the entire brain is involved in the process of seeing. In different locations there are specialized areas for distance vision, recognition of faces, objects, colors, contrast, and movement. There are also areas of the brain that coordinate visually-directed movements, and process visual information to achieve perceptions of directionality and depth. CVI is caused by

widespread damage to the brain, which affects most of the specialized visual centers, resulting in a damaged, inefficient visual sense. When only a small visual area is affected, it can result in a specific visual disorder, but not in CVI.

Because in the past everyone who was considered to be visually impaired had to have reduced or absent visual acuity, the medical definition of CVI also emphasized loss of ability to see in the distance (reduced acuity). It was hoped that once the correct diagnosis was made, children with CVI would be managed appropriately by a variety of professionals, including educators.

While acuity testing is difficult in the young and disabled for physicians, it can be even more difficult for teachers. Also, there are many children with visual problems similar to CVI, except they have normal acuity. This visual condition is called "cortical visual dysfunction" (CVD). The educational management of children with CVI and CVD is similar. It is now known that with time the visual acuity of children with CVI tends to improve. Therefore the diagnosis of CVI could change to CVD over time. Both groups require remedial education, which necessitates an increased number of specialized teachers.

CVI is suspected by:

- a normal or close to normal eye examination;
- a medical history which includes neurological problems; and
- the presence of unique visual/behavioral characteristics.

Four major causes of CVI

- Asphyxia
- Brain maldevelopment
- Head injury
- Infection

Unique visual/behavioral characteristics of CVI

- Normal or minimally abnormal eye exam (CVI may co-exist with optic nerve atrophy, hypoplasia or dysplasia and ROP.)

- Difficulty with visual novelty (The individual prefers to look at old objects, not new, and lacks visual curiosity.)

- Visually attends in near space only

- Difficulties with visual complexity/crowding (Individual performs best when one sensory input is presented at a time, when the surrounding environment lacks clutter, and the object being presented is simple.)
- Non-purposeful gaze/light gazing behaviors
- Distinct color preference (Preferences are predominantly red and yellow, but could be any color.)
- Visual field deficits (It is not so much the severity of the field loss, but where the field loss is located.)
- Visual latency (The individual's visual responses are slow, often delayed.)
- Attraction to movement, especially rapid movements
- Absent or atypical visual reflexive responses (The individual fails to blink at threatening motions.)
- Atypical visual motor behaviors (Look and touch occur as separate functions (e.g., child looks, turns head away from item, then reaches for it).
- Inefficient, highly variable visual sense

---

*CVI Synergy West, May 16, 2003, Vancouver, BC
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Maryke Groenveld, Ph.D.
Jim Jan, M.D.
Linda Mamer, Ph.D.
Carey Matsuba, M.D.
Christine Roman Lantzy, Ph.D.

Look and touch occur as separate functions.

Appendix G

Cerebral Palsy

By Judith van Naerssen, OTRL, M.S. CLTV

What Is It?

According to United Cerebral Palsy (UCP National), cerebral palsy (CP) refers to a chronic condition that can affect the entire body or specific body segments or parts. It is caused by damage to the brain during development of the central nervous system or at birth. Usually the sensory and motor nerves that specifically control muscles are not damaged. CP itself is not a progressive disorder but some of the disabilities caused by the brain damage may change over time.

Roughly 500,000 people in the U.S. have CP. It is one of the most common congenital disorders and is seen in 15-20 of every 10,000 births (Vitale, 2002). While it may be diagnosed at birth, in some cases it is not until age 2 or 3 years.

Classifications

Abnormal muscle control is one type of classification and includes:

Spastic—symptoms include an increase in muscle tone, reflexes, and over time joint contractures may develop.

Hypotonic—muscle tone is decreased and often muscles are weak and joints are unstable.

Athetoid—muscle tone tends to fluctuate and limbs are observed to move about in random patterns.

Ataxic—characterized by abnormal body movements that affect balance and controlled directed movement.

CP is also classified by the parts of the body affected and may include:

Hemiplegia—involvement is on 1/2 of the body and on the same side.

Diplegia—involves both legs or both feet.

Quadriplegia—all four extremities are involved.

Associated Problems Often Seen in Conjunction with CP

It is not uncommon to see any one or combinations of the following in persons with CP: seizures and assorted medical problems, mental retardation, visual impairment, hearing disorders, problems associated with swallowing and feeding including reflux, drooling, constipation, language and articulation impairments, dental problems, and delayed gross and fine motor development. Some persons with CP are more prone to falling and having accidents and also some are more prone to infection and long-term illness.

Management of CP

Typical medical management of CP may include: use of medications to control muscle tone, spasms, seizures, reflux, constipation, and other problems; physical therapy; occupational therapy; speech therapy; nutritional counseling; psychological services; vision related treatments including surgeries; optical correction; and vision stimulation and therapy; special education; large and small muscle surgeries and assistive devices including splints, braces, wheelchairs, gait aides, and augmentative communication devices.

References

Vitale, M. (2002 January 30). Cerebral palsy: What it is, what can be done. *Web MD library medical archives,* Article 10/1680.) Retrieved December 29, 2003 from http://aolsvc.health.web.md.aol.com/content/article10/1680_54163.htm

Resources

United Cerebral Palsy Association: http://www.ucp.org

National Information Center for Children and Youth with Disabilities: http://www.nichcy.org

Web MD: http://www.webmd.com

Appendix H

Hierarchy of the Development of Switch Use: For Consideration When Designing Routines

Adapted by Tristan Pierce, Multiple Disabilities Project Leader

Developmental Level
4-8 Months

Means-Ends Relationships
Repetitive actions for pleasure, no intended goal

Behaviors with Objects
Undifferentiated actions, object and action one and the same

Imitation
Imitates own repertoire of behaviors

Toy Examples
Animals that light up or produce sound by pressing (audible animals), toys that simulate rotary dial phone

Switch Types Examples
Switch is sound or visual response, pressure causes buzz, roller switch effects auditory and visual response

Environmental
Door bell/buzzer, automatic door, touch-on light

Developmental Level
8-12 Months

Means-Ends Relationships
Activation for a specific goal, intended action

Behaviors with Objects
Differentiated actions, functional relationships

Imitation
Modifies own actions, tries to imitate new behavior composed of familiar schemes

Toy Examples
Toys that simulate pushing or hammering (play construction sets)

Switch Types Examples
Pressure switch, roller switch next to toy so that switch and toy are seen together

Environmental
Button on automatic hand dryer, button on drinking fountain, electric can opener

---

Developmental Level
12-18 Months

Means-Ends Relationships
Exploration of different means for achieving goal

Behaviors with Objects
Combines objects to engage in presentational play, sequential actions

Imitation
Imitates novel behaviors, sees self perform

Toy Examples
Toys that simulate grasping and pulling (opening a toy safe)

Switch Types Examples
Pull switch, toggle switch, switch and toy separated by cord but both are visible to child

Environmental
Light pull cord, elevator button, stereo or VCR/DVD button, toaster

---

Developmental Level
12-24 Months

Means-Ends Relationships
Foresight in achieving goal, use same means for achieving different goals

Behaviors with Objects
Substitutes one object for another, pretends with absent objects

Imitation
Imitates novel behaviors, cannot see self problem

Toy Examples
Remote control toys, magnetic controlled toys

Switch Types Examples
Switch plate so that it is not visible to child, eyebrow, head light/wand, check switch directs movement of cursor

Environmental
Remote control TV, remote telephone, vending machine, microwave

Combined and adapted from
Langley, M.B. (1990). Toys as tools for teaching environmental control skills, *Rehabilitation technology*, NY Hawthorne Press.

Langley, M.B. (1985). Proposed hierarchy of the development of switch operation, *Topics in early childhood special education,* Austin, ProEd Inc.

Appendix I

Using Calendars

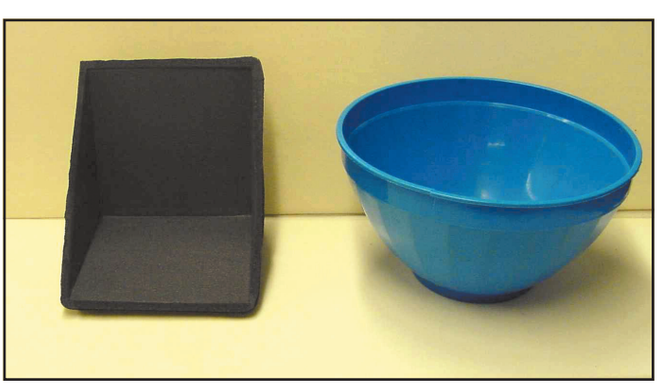
By Tristan Pierce, Multiple Disabilities Project Leader

The use of calendars is based on the work of Jan van Dijk at the Department for the Multihandicapped, Deaf and Deafblind at the School of the Deafblind in St. Michielsgewstel, Holland. Others have adapted his methods and integrated them in functional programming for students who have multiple disabilities.

The key objective of the van Dijk Method is to encourage the development of nonverbal communication as an essential foundation for language learning. Interactions are built upon the learner's spontaneous movements in order to teach him that he can use his body as a tool to affect and explore his environment. The van Dijk Method is based on a normal developmental model, with the assumptions that communication skills are acquired in a fixed sequence and that certain prerequisites for language development exist, including the development of social interactions and representational capabilities. Major areas of emphasis within the van Dijk methodology, which are incorporated into the Sensory Learning Kit's Routines, include the following:

- building a primary relationship
- developing dialogue/conversation through movement
- developing anticipation and higher level representational abilities
- teaching imitation

In the beginning a calendar consist of the anticipation box (basket or container) and the finished box (basket or container). The two boxes should be different in color, shape and texture.



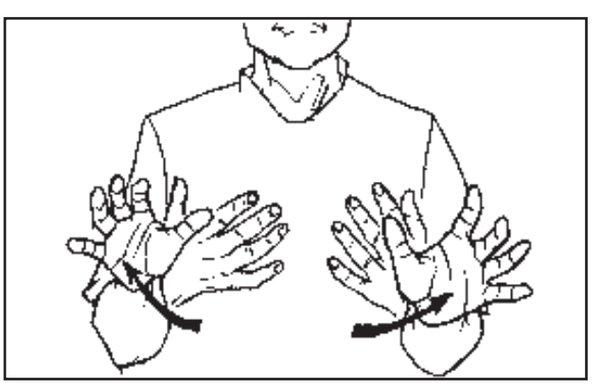
Black foam anticipation box and blue plastic finished box

When using calendars with the *SLK Routines Book*, introduce the object cue (e.g., Appetite Item: Massager) in the anticipation box at the Active Alert Level. Through repetition and memory building, the anticipation box and the appetite item begin to cue the learner that the activity is about to begin.

Black box with white massager

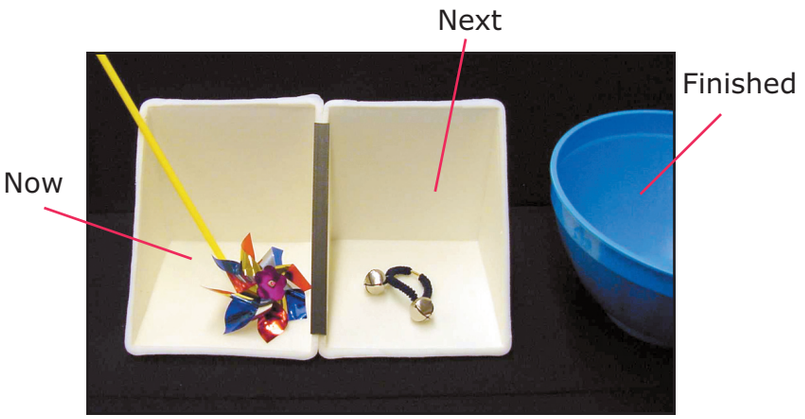
The end of the activity is represented by helping the learner to place the appetite item in the special finished box. Placing the appetite item in the finished box as soon as the activity is over and as close to the activity area as possible helps the learner associate this ritual with the ending of the activity. It gives the finished box meaning as a time piece. It is advisable to physically sign "finish" as well as saying it out loud to the learner just prior to placing the appetite item in the finished box.

Black anticipation box and blue finished box with massager



Sign "finish."

As the learner begins to understand time (anticipation, now, next, finished), multiple anticipation boxes can be set up in the consistent calendar area to represent the learner's daily schedule. Only add one additional box at a time, as the learner can accommodate.



Two white boxes with pinwheel, bell, and finished box

At the partial participation level the learner may be able to gradually use a portion or a symbol of the appetite item as the cue that the activity is about to begin. Not all learners will advance to symbolic representation but some develop detailed communication skills using tactile and/or picture symbols.

Symbols—bell, anti-roll device, massager head, fan blades, ice bag cap, foil on card

Shown in the photo above, the green tactile communication card shows the transition from the SLK bell bracelet to a symbol representing music class. The penlight's roll anti device, the massage attachment, the ice bag cap, and the removable blades from the SLK fan are portions of actual appetite items representing those specific activities are about to begin. The card wrapped in foil might be used as a symbol for the SLK Mirror Routine or to cue the learner that it is time for personal grooming.

For more information on using calendars and creating tactile communication symbols see References below.

Adapted from *Calendars for students with multiple impairments including deafblindness* and *Communication: A guide for teaching students with Visual and Multiple Impairments.*

References

Blaha, R. (2001). *Calendars for students with multiple impairments including deafblindness*. Austin, TX: Texas School for the Blind and Visually Impaired.

Conlin, K., Jahnel, K., Pierce, T., & Poppe, K. (2005). *Tactile connections: Symbols for communication*. Louisville, KY: American Printing House for the Blind.

Hagood, L. (1997). *Communication: A guide for teaching students with visual and multiple impairments*. Austin, TX: Texas School for the Blind and Visually Impaired.

Appendix J

Appetite Item Menu

By Millie Smith, M.Ed., TVI

Item

Air mattress (with electric pump)

Switch Introduction
See SLK Routines Book

Typical Primary Sensory Channel

Vestibular

Attributes

Mattress can be inflated and deflated to create an up and down sensation. This is a good trampoline substitution.

Item

Aluminum pie pan

Typical Primary Sensory Channel

Visual/Auditory

Attributes

Pan reflects light. When several tins are hung together, they make interesting sounds.

Item

Barrel

Typical Primary Sensory Channel

Tactual/Vestibular

Attributes

Inside of barrel can be textured. Speed of rolling is easily varied.

Item

Bubble wrap

Typical Primary Sensory Channel

Tactual

Attributes

Wrap can be used in specific area as location cue, as texture code, body wrap, or mat. When popped it provides auditory input. CAUTION: Do not use around face/mouth.

Item

Can crusher

Typical Primary Sensory Channel

Tactual/Proprioceptive

Attributes

Use materials providing variety of resistances — cans, milk cartons, water bottles, etc.

Item

Chains

Typical Primary Sensory Channel

Visual/Tactual

Attributes

Bright colors are available. Weight can be varied.

Item

Coin sorter (Battery operated) 

Typical Primary Sensory Channel

Auditory

Attributes

Sorter creates different sounds when coins are loaded and sorted.

Item

Dish soap

Typical Primary Sensory Channel

Tactual

Attributes

Bubbly warm water can be enjoyed in easily accessible tubs with or without dishes.

Item

Electric toothbrush 

Typical Primary Sensory Channel

Tactual

Attributes

Vibration is not very intense with battery operated types. Provides appropriate oral stimulation.

Item

Electric pencil sharpener 

Typical Primary Sensory Channel

Tactual/Proprioceptive/Auditory

Attributes

Vibration and sound are created when a pencil is pressed into the hole. Funnel can be used to guide pencil into hole.

Item

Faces

Typical Primary Sensory Channel

Visual

Attributes

The human face is a powerfully motivating target. It may be easier for the learner to see facial expressions like raised eyebrows and smiles if partners put on a little make-up.

Item

Flags

Typical Primary Sensory Channel

Visual

Attributes

Flags are age appropriate with brightly colored designs for older learners.

Item

Foot bath 

Typical Primary Sensory Channel

Tactual

Attributes

Bath bubbles and vibrates, and can be switch adapted.

Item

Gutter ball

Typical Primary Sensory Channel

Visual

Attributes

This is a low tech variation on adapted bowling. Use a short piece of gutter (so the ball stays in the learner's visual field) held at a downward angle; a brightly colored ball of a contrasting color; and targets (blocks, bowling pins—anything that makes a nice display when the ball hits it).

Item

Hair dryer 

Typical Primary Sensory Channel

Tactual

Attributes

Temperature settings and air flow speed can be varied.

Item

Hand puppets/gloves

Typical Primary Sensory Channel

Visual

Attributes

Bright colors and moving parts help stimulate visual regard of the learner's own hands and the hands of partners.

Item

Hand vac 

Typical Primary Sensory Channel

Auditory/Tactual/Proprioceptive

Attributes

Makes interesting sounds as it sucks up various materials.

Item

Helium balloons (Mylar® preferred)

Typical Primary Sensory Channel

Visual

Attributes

Varieties of patterns and colors are available. Slight movement caused by air currents attracts attention. CAUTION: Latex allergies, swallowing hazard.

Item

Inflatable pool

Typical Primary Sensory Channel

Tactual/Proprioceptive

Attributes

A small pool with a small amount of warm water can stimulate a lot of movement. Some positioning devices can be used in the pool. Pools can be used indoors with a garden hose adapter for sink faucets.

Item

Large stereo speaker 

Typical Primary Sensory Channel

Auditory/Tactual

Attributes

Sit or lie on speaker as music with strong base is played. Can be switch adapted.

Item

Lettuce

Typical Primary Sensory Channel

Tactual/Proprioceptive

Attributes

Tear it for salads.

Item

Light wand

Typical Primary Sensory Channel

Visual

Attributes

Creates fiber optic display of subtle light with movement.

Item

Lollipops

Typical Primary Sensory Channel

Gustatory/Tactual

Attributes

Variety of tastes available. Provides appropriate oral stimulation. (Multi-colored lollipops make great visual targets, especially when twirled.)

Item

Low basketball

Typical Primary Sensory Channel

Visual

Attributes

Cut a whole in the center of a large piece of brightly colored canvas. Use a strongly contrasting colored ball. The canvas can be held at any height or distance appropriate for the learner. Balls of different sizes and weights can be used. A hammock stand can be used to hold the fabric. This is great group game. Lots of balls make it better.

Item

Megaphone/Microphone 

Typical Primary Sensory Channel

Auditory

Attributes

Item is easy to make—good for vocalizing, singing, etc.

Item

Metal nesting pipes

Typical Primary Sensory Channel

Tactual

Attributes

The different size pipes cut in three-inch lengths are heavy, cool to the touch, and fit together.

Item

Milk jugs

Typical Primary Sensory Channel

Proprioceptive

Attributes

Use gallon jugs filled with varying amounts of water. Push jugs over to hear and feel water. Can be done in plant watering context.

Item

Mini tramp

Typical Primary Sensory Channel

Vestibular/Proprioceptive

Attributes

Various positioning arrangements are possible. Movement options include fast/slow, rhythmic/intermittent.

Item

Parachutes

Typical Primary Sensory Channel

Tactual/Visual

Attributes

A variety of games can be played making the material move and touch various parts of the body. Learners who don't tolerate light touch well can watch the visual display and feel the air currents

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Item

Paper shredder 

Typical Primary Sensory Channel

Visual/Auditory/Tactual

Attributes

Use a small one with a clear container, or no container, so paper can be seen and felt. Switch adaptable.

Item

Pendulum clock

Typical Primary Sensory Channel

Auditory/Visual

Attributes

Easy to visually adapt clock for contrast, size. Switch adaptable. Rhythmic movement can be very calming.

Item

Plant mister

Typical Primary Sensory Channel

Tactual

Attributes

Spray on various parts of body (never the face) as in playing a game. Bottle can be mounted against hard surface so that canister is pushed to create spray if learner cannot pull trigger. Device can be used for plant care, glass cleaning, art activities, and many other things.

Item

Rocking chair

Typical Primary Sensory Channel

Vestibular

Attributes

Speed can be varied to calm or arouse.

Item

Sand bags

Typical Primary Sensory Channel

Tactual/Proprioceptive

Attributes

Large zip lock bags filled with rice, sand, or gravel. They are heavy, and the learner can feel material in bag shift and move.

Item

Screen door spring

Typical Primary Sensory Channel

Tactual

Attributes

A door spring is smooth, cool, has ridges and curves, it expands and contracts.

Item

Singing

Typical Primary Sensory Channel

Auditory

Attributes

The auditory equivalent of faces. Brains are hardwired to pay attention to this medium from birth. Songs with simple melodies and repeating phrases are good. Remember age appropriateness—"Going to the chapel, gonna' get married" is as good as "Old McDonald."

Item

Slinky® (available in bright colors)

Typical Primary Sensory Channel

Tactual/Proprioceptive

Attributes

Slinky stretches when pulled; it is easy to grip.

Item

Slot cars 

Typical Primary Sensory Channel

Visual

Attributes

Speed can be regulated, bright colors used. Track provides predictable movement.

Item

Soda Bottles

Typical Primary Sensory Channel

Auditory/Tactual/Visual

Attributes

Fill clear plastic bottles with colored liquid. Shake, pour, etc. Liquid can be thickened with hair gel and colored with food coloring.

Item

Spin Art 

Typical Primary Sensory Channel

Visual

Attributes

Easy to maximize contrast. Movement enhances attention. Can be switch adapted.

Item

Sponge art

Typical Primary Sensory Channel

Visual/Tactual

Attributes

Dip large sponge in paint. Paint table tops, walls, etc. Sponges are easy to hold.

Item

Swivel chair

Typical Primary Sensory Channel

Vestibular

Attributes

Works like a big Sit 'n Spin®. Adaptive seating can be strapped into the chair. Spinning speeds vary to create desired affect.

Item

Toy train 

Typical Primary Sensory Channel

Visual/Auditory

Attributes

Speed of movement can be varied to match needs related to tracking ability.

Item

Travel book light

Typical Primary Sensory Channel

Visual

Attributes

Lid lifts to make light come on. Low intensity light has cause and effect potential.

Item

Twizzlers

Typical Primary Sensory Channel

Gustatory/Tactual/Proprioceptive

Attributes

Different flavors available. Can be chewed. Biting off piece is very difficult.

Item

Velcro fasteners

Typical Primary Sensory Channel

Tactual/Proprioceptive/Auditory

Attributes

Different sizes and colors are available. Pulling creates interesting sound.

Item

Vibrating ball

Typical Primary Sensory Channel

Tactual/Auditory

Attributes

Multisensory properties can be too intense.

Item

Water balloons

Typical Primary Sensory Channel

Tactual/Visual

Attributes

Bright colors are available. Water temperature is easily variable. Roll them down inclines. Irregular movement can generate visual attention. CAUTION: Latex allergies, swallowing hazard.

Item

Water bed

Typical Primary Sensory Channel

Vestibular

Attributes

Movement can be regulated to create desired affect.

Item

Wax paper

Typical Primary Sensory Channel

Tactual/Auditory

Attributes

A long strip makes a big target. When rolled on or crumpled up it makes interesting sounds.

Item

Wiggle pen

Typical Primary Sensory Channel

Tactual/Auditory

Attributes

Pen is not quite so intense. It can be color adapted.

Item

Wind chimes

Typical Primary Sensory Channel

Auditory

Attributes

Different tones are available. Intensity is easily varied by distance.

Appendix K

Item Adaptations

By Tristan Pierce, Multiple Disabilities Project Leader

Several items in the Sensory Learning Kit can be used together and/or adapted for the particular needs of a learner. Those listed below were recommended from field evaluators.

The partner's job can be made easier by using the fan to create continuous movement with the pinwheel. Many learners, particularly those with cortical visual impairment (CVI), may be attracted to the reflective movement. If the learner has seizures do not create continuous movement with the pinwheel; instead, slowly move the pinwheel around within the learner's visual field. See specific routine cautions.

The fan, primarily an item for the tactual sensory channel, can become a visual item by making the fan blades reflective. Simply cover the blades in aluminum foil. Colored LED flashlights, reflecting on the moving blades, make a stunning visual display. Never shine a led flashlight on or near a learner's face. (See routine cautions for the fan and the penlight.) If the learner has seizures do not make the fan blades reflective.

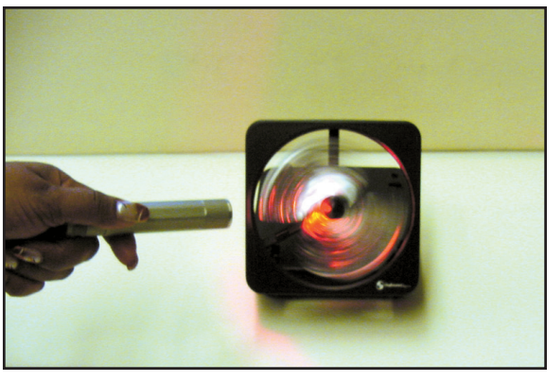
Place the bell bracelet on the vibrating pad and watch as it dances across the pad, encouraging reaching and visual tracking.

Just as touching an item might help a learner to see it, hearing the item may assist also. If the learner does not respond to the pinwheel, try wrapping the bell bracelet around it. Once the learner orients to the flashing metallic, the bells can be removed.

The tactile roller comes with blank roller covers so partners can try different textures in order to learn which textures are pleasant and which ones are disliked. There are many textures to try (e.g. foam paper, sand paper, paper with braille, foam sponges, soft terry cloth, bubble wrap, netting, etc).

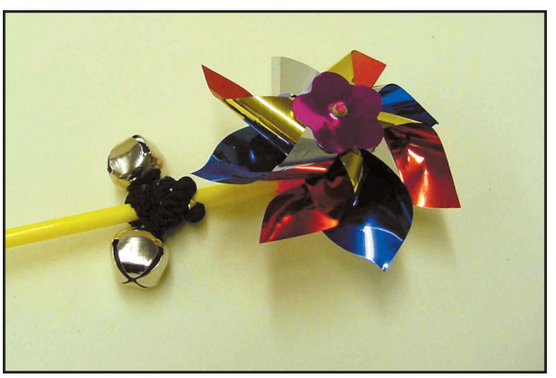
The adaptable stick switch can be made more visual by placing a 6-inch segment of a swimming noodle over the stick. Carve a hole in a brightly colored rubber ball and place it on top of the stick (miniature T-ball). Tape a metallic pom pom to the stick. Every time the learner swipes at it, the metallic strings dance.

Fan with pinwheel and foil blades



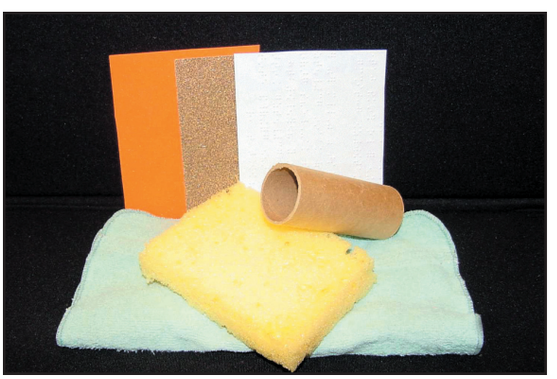
Fan with foil, blades moving, red LED light

Bell dances across the vibrating pad



Bell wrapped around pinwheel handle

Learner shakes pinwheel with bells attached to it



Washcloth, a foam sponge, foam paper, sandpaper, and braille paper for use with tactile roller

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The *Sensory Learning Kit* (SLK) was field tested at ten locations in eight states. The sites included residential schools for the blind, public schools, and one long-term pediatric residential facility for medically fragile technology dependent, and terminally ill children. Of the professionals who used the kit, 64% had 16 or more years experience teaching learners who have visual impairments, and 55% had 16 or more years experience teaching learners who have profound disabilities.

A total of 12 learners used the SLK. Their chronological ages ranged from 2 years to 37 years. Their functioning age ranged from 3 months to 24 months. Visual conditions included retrograde optic atrophy, optic nerve hypoplasia, cataracts, exotropia, retinopathy of prematurity, and cortical visual impairment. Other handicapping conditions were cognitive delays, double hemiplegia, cerebral palsy, epilepsy, microcepholic, scoliosis, encephalitis (herpes simplex), Trisomy 13, and Down Syndrome.

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Fifty-four percent of the learners had no prior experience participating in sensorimotor activities. A total of 81% showed acquired or improved functional skills after using SLK.

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