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Sensory Efficiency and Early Learners
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Developed for
Texas School for the Blind & Visually Impaired
Outreach Programs
Sensing, acting, learning
Sensorimotor routines for learners with visual and multiple impairments

Research-based strategies
- Jean Piaget’s three global stages
- E. J. Gibson’s “sensing” and “acting” systems
- Confirmation in new research in cognitive psychology (neo-Piagetian & constructivists), in infant development, and in neurology

Piaget
Sensorimotor 0-2 typical
- Exploring: using sensing and acting systems in the here and now to gain knowledge

Preoperational 2-7 typical
- Naming, categorizing, and predicting: using symbolic thinking about the past, present, and future to organize information about the world

Operational 7 up typical
- Reasoning: learning the underlying structure and rules of thinking about the world (semantics, math, logic, ethics, etc.)

Gibson
Action systems and sensing systems work together to allow infants to “discover what the world affords and what to do about it.”

Phase 1: 0-5 months
- Sensing. Acting is primarily oral. Grasp is reflexive.

Phase 2: 5-9 months
- Acting expands as ability to use hands emerges. Reaching, grasping, and fingering are used to gain information about properties of objects as they are banged, squeezed, thrown, etc.

Phase 3: 9 months +
- Ambulation expands opportunities for exploration. Acting becomes less random, more goal oriented.
Highly effective instruction for sensorimotor stage learners

Carefully designed activities that provide
- Repetition
- Consistency

Most effective instruction

Sensorimotor routines
- Highest percentage of goal achievement
- Most efficient use of accommodations
- Most reliable observation tool for data collection

Goal: to provide highly effective instruction that

Allows sensorimotor stage learners to
- Achieve basic cognitive, communication/social, and motor skills by

Participating in carefully designed activities that
- Maximize access to sensory information in
  - Experiences that combine sensing and acting systems

Sensing - Taking in information
- Tactual: 0-4 months primary source of information about world
- Visual: 4-9 paired with tactual for meaning,
- Auditory: 0-9 sounds paired with tactual and visual for meaning
- Gustatory
- Olfactory
- Proprioceptive
- Vestibular
Acting - Seeking more information

Exploration schemes

- Mouthing
- Raking/batting
- Shaking
- Banging
- Squeezing
- Throwing
- Dropping
- Taking out/ Putting in
- Taking apart/putting together

Exploratory procedures

- Lateral motion
  - Texture
- Pressure
  - Hardness
- Static contact
  - Temperature
- Enclosure
  - Shape/size/volume
- Unsupported holding
  - Weight
- Contour following
  - Exact shape
How sensory information becomes knowledge

Storing
- Sensory memory
- Working memory
- Long term memory
  - Episodic
  - Epistemological
- Procedural memory

Organizing
- Like/dislike
- Familiar/unfamiliar
- Potentials
  - What is it like?
  - What does it do?

What isn’t highly effective?
- Passive sensory stimulation alone
- Forced exposure to increase sensory tolerance
- Teaching sensory discrimination skills

Passive sensory stimulation is primarily sub-cortical

Providing sensory input passively in isolation can be helpful
- May pull the learner into alertness
- May strengthen ocular-motor behaviors
- Can be used to assess sensory channel characteristics

But it isn’t learning
- Orienting is often reflexive
- Does not contribute to knowledge about the source of stimulation (person, object, action)
Learning is active and cortical
- There are sensory areas in the cortex containing memories of sensing/acting experiences
- Sensation itself is not stored in the cortex, but sensation can be a powerful trigger for retrieval
  - Thoughts associated with the sensation are stored long term in the cortex
  - Related objects, people, actions, and places
  - Episodic and epistemological knowledge

Acting with very limited hand use?
**Preparation** - mental (many parts of brain)
- Ideation, intention
- Long term memory

**Initiation** - mental (frontal lobes) and muscular
- Muscles receive and react to first electric impulses from cranial nerves related to executive function

**Execution** - muscular and mental (cerebellum)
- Procedural memory

**Recovery** - mental (many parts of brain)
- Feedback, accommodation

**Forced exposure to increase sensory tolerance**
- All people find some sensory input unpleasant
- Avoidance of unpleasant sensory input is normal
- Repetitious exposure to aversive stimulation imposed by another does not increase sensory tolerance
  - Fight: resistance becomes aggression
  - Flight: shutdown or compliance becomes passivity
- If there are sensory-neural processing problems, a coordinated multi-disciplinary approach using sophisticated sensory regulation and modulation techniques is needed
Teaching sensory discrimination skills

- Discrimination skills are well developed early on
- Infants use subtle tactual information to discriminate differences in nipple attachments on bottles, etc.
  - Infants perceive color as well as adults at four months
  - Infants regulate mood based on inflection of parent’s voice
  - Processing speeds improve rapidly
- Visual acuities are not normal until about 2 years
- Discriminated attributes fuel cognitive growth
  - Matching, sorting, and naming are cognitive skills, not sensory discrimination skills

Using the Sensory Learning Kit to provide instruction

Three skill levels

- Quiet Alert (Attention): What is it like?
  - Acquiring sensory information about things passively
- Active Alert (Exploration): What happens when I __?
  - Acting to probe sensory potentials
- Partial Participation (Function): What do other people do with it?
  - Sensing and acting to achieve a specific goal

Skills at attention level

Cognition

- anticipation (associative memory, precursor to cause/effect)

Communication/social

- facial expression, vocalization, movements used to make things go away or come back (precursor to refuse/request)
- eye gaze and vocalizations used to maintain joint attention with partner (precursor to social communication)
Skills at the exploration level

Cognition
- Exploration schemes expand (behaviors are intentional, but used randomly)
- Object permanence and search
- Cause and effect (body/object)
- Imitation

Communication/social and motor from appropriate developmental curriculum and specialists in area

Skills at the function level

Cognition
- Means ends (problem solving, tool use, including adaptive switches)
- Spatial relationships (mapping, body to object alignment, object to object alignment for precise placement)

Good goal and objective resources at 0-2 level
- Carolina curriculum for infants and toddlers with special needs
- INSITE
- Functional Scheme (Nielsen)
- Communication matrix
- Child-guided assessment (van Dijk)

Deciding where to start - Step 1 (SLS)

Review existing information about physical and sensory functioning
- Assessment folder
- FIE reports
  - SLP, OT, PT, AT, V, A, etc.
- Medical reports
- Parent interview

Deciding where to start - Step 2 (ASP)

Look at arousal states
- If the learner shows typical levels of alertness, proceed to the next step
- If the learner shows atypically high levels of extended states (sleepy/drowsy/fussy/agitated), assess arousal states
  - Is there a typical pattern of arousal related to time of day?
  - Are there media, ambient environmental and social factors related to certain states?
Deciding where to start - Step 3 (SRR)
Look at responses to sensory input in each sensory channel
Assess channels related to
- positive and negative reactions to input (summary by channel in SLG)
- response delays (summary by channel in SLG)
- response levels: attention, exploration, function (summary by channel in SLG)

Designing instruction - Step 1 (App/Aver list)
Choose learning media items
- Items from appetite list with strongest responses
- Use items as topics for activities
  - Vibration becomes topic for “mat game” routine
  - Lotion becomes topic for lotion routine
  - Mirror becomes topic for grooming routine

Mary
Appetites
- Bells
- Music player
- Vibrating pad
- Paint rollers
- Lotion
- Wax paper
- Singing
Aversions
- Rocking
- Swing
- Pudding
- Lollipops
- Water bed
- All strong odors

Designing instruction - Step 2 (Lesson Plan Worksheet)
Decide

- Where the activity will take place
- How often it will occur (minimum 1x daily)
- Who will teach
- What materials will be used
- How the student will be positioned

Mary lesson plan

- Routine name: Lotion
- Location: classroom, big blue foam chair
- Object symbol: lotion bottle
- Partner: Ray
- Time: 8:30 and 1:45
- Level: Exploration
- Materials: Jergen’s Aloe E, now tub, finished basket

Designing instruction - Step 3 (LP Worksheet)

Script the step sequence

- Opening (use an object to label the activity)
- Write step sequence from learner’s point of view (don’t worry about independent performance)
- No more steps than the learner can remember
- Closing (clear signal that the activity is finished)
Mary’s lotion routine steps
1. Take bottle from now tub
2. Go to foam chair
3. Get in best position
4. Smell lotion
5. Touch bottle
6. Help squeeze
7. Get rubbed
8. Request repeat on other hand
9. Repeat 5,6,7
10. Put bottle in finished basket

Designing instruction - Step 4 (LP Worksheet)

Embed IEP objectives
- Look for steps in the routine related to communication, social, and motor skills
- Embed one objective for every three steps, at most (distributed trials)
- A sequence of repeating steps provides practice and is desirable

Mary’s lotion routine embedded IEP objectives

Objectives added sequentially over time
- Smell lotion
  - Cognition: show anticipation of next step by extending fingers
- Touch lotion
  - Motor: use lateral motion to explore texture of bottle
- Help squeeze
  - Cognitive: imitate motion of partner’s hand
- Request repeat on other hand
  - Communication: use non-conventional gesture to request desired action or object

Designing instruction - Step 5 (LP Worksheet)

- Plan accommodations, modifications, and supports
- Write as little as possible. If some acc/mod/sups are standard (hand-under-hand support) do not write them in. If they are unique to the step, make a note (foam grip on toothbrush)
Mary’s lotion routine acc/mod/sups

- Go to foam chair
  - One minute recovery time, no activity
- Get in best position
  - Pillow behind shoulders
- Smell lotion
  - Jergen’s aloe E only!
- Request repeat on other hand
  - Hold palm under Mary’s fingertips, wait at least 15 seconds

Designing instruction - Step 6 (LP Worksheet)

Plan documentation

- When
- Schedule (2 times weekly) or designated testing period
- Every time hard to do, may be less reliable
- Consecutive trial wording in IEP must be avoided
- What kind: yes/no (frequency) and duration

Take documentation on IEP steps only

Documentation for Tuesday and Thursday of one week

- Smell lotion
  - Show anticipation by extending fingers: - / +
- Touch bottle
  - Lateral movement: + 3s / + 4s
- Help squeeze
  - Imitate motion: - / +
- Request repeat
  - Non-conventional gesture: + / -
Designing instruction - Step 7 (Diagnostic teaching)

- Appointed partner goes through routine with learner providing maximum assistance
- Team members watch, in person or by video, to evaluate effectiveness of acc/mod/sups, pacing, etc.
- Team revises routine
- Teaching begins, team members continue observations, revise and expand as needed

Teaching

- Attention routines may stand alone, or may be done as a warm up for a higher level routine
- Learners with severe motor impairments participate by initiating steps of their routines
  - Initiation may be leaning toward item, extending fingers or tongue, looking back and forth between partner and item, vocalizing, etc.
  - Partners must expect a response and then wait for initiation
  - After the learner has done all he can do, the partner helps him execute the rest of the step

Graduating to the next sensorimotor level

- Begin instruction at the learner’s comfort level (the SSR level with the highest number of responses)
- When the learner is performing at a high level on several routines at his starting level, begin adding steps at the next level
- When the learner is doing well with those, add more
- High level of performance is indicated by
  - Anticipating next step in routine
  - Initiating appropriate action for level (exploration scheme or function)

Graduating to Preoperational

- Anticipation calendars are used with exploration level routines to begin the process of learning to use whole objects as symbols for activities
- Sequence calendars may be introduced at the function level
- When the learner can use several object symbols meaningfully in his calendar, he is ready to move on to preoperational level skills. (SAM: Symbols and Meaning)
Notes:
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Figure 1 TSBVI I

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Figure 2 IDEAs that Work logo and OSEP disclaimer.