Slide 1

Developmental Trends in Early Ideational Praxis and Motor Planning

Shelly J Lane, PhD, OTR/L, FAOTA
Carole Ivey, PhD, OTR/L
Teresa May-Benson, ScD, OTR/L, FAOTA

Slide 2

Praxis: Doing

- Interaction between person, task, environment
  - Individual cognition, sensory processing
  - Demands of task in terms of motor skill, timing, sequencing
  - Environmental affordances, options, supports

Slide 3

Sensation is core

- Perception of space
  - Body space
  - Near space
  - Distal space
- Perceiving time
  - Time, sensing change
  - Action relies on linking events past, present, future
    - Understanding now
    - Combining now with past experience
    - Predicting change, future
Object and body awareness
• Perceiving object affordances for action begins in infancy
• Movement through environment, acting on objects and environment \( \rightarrow \) multisensory calibration of body
• 7 months recognize mother by 'motor signature'

Why study praxis?
• Process of organizing movement, synchronizing with environment likely facilitates emotional regulation
• Thalamic- cortical loops
• Developmental process linked with gray and white matter changes rostrolateral prefrontal cortex

Aspects of Praxis
• Ayres
  – Process involving ideation, planning, execution of motor act
  – Ideation
    • Cognitive
    • Dependent on sensory integration
    • Grounded in knowledge of potential body actions
  – Planning
    • Behavioral organization
    • Timing, sequencing, preparing for movement
  – Execution
    • Doing
### Slide 7: Ideation

- Ideas ≠ novelty
- Recognizing **possibilities** from objects and environment
- Generating goals based on possibilities
- Involves knowledge of
  - Objects
  - Actions
  - Action-object interactions
  - Serial actions

### Slide 8

- Requires **conceptual knowledge** of
  - Tools
  - Objects
  - Actions
- Coupled with **experiential knowledge** of
  - How to use tools
  - What objects can do
  - What actions can be done on specific objects

### Slide 9: Knowledge of Object and Action Possibilities

- Recognizing affordances is related to knowledge of actions and objects
- Facilitates ability to decide what to do

*Children with praxis problems often have problems recognizing and acting on object affordances*
### Slide 10

**Planning: Motor Organization**

- Motor Planning
- Bilateral Coordination
- Projected Action Sequences
- Linking steps to achieve goal
- Involves sequencing, timing, integration of sensation

### Slide 11

**Poor ideation**

- "I don’t know what to do!"
- Apparent rigidity in actions relative to objects
- Restricted repertoire of play themes
- Limited imaginary play
  - Repeats what has been seen or done
  - Difficulty pretending
- Does not label actions or object properties

### Slide 12

**Poor Sequencing**

- Reduced quality, fluidity of movement
  - Pumping on swings
  - Jumping over ropes or through hoops
- Disorganized actions
  - Skipping/galloping
  - Set up and kick or throw a ball
- Resist repeating actions more than 1 or 2 times
- Difficulty with routines
  - Get ready for school
  - Changes between classrooms
### Praxis in preschoolers

- Ideation: no normative data
- Planning: little known

*This study established initial developmental guidelines for children aged 3-5 years in both ideation and planning*

---

### Participants

- Convenience sample (n=85), typical children recruited
- Ages 36 to 71 months
- Recruited from three Richmond Virginia metropolitan area preschools
- No children were excluded based on race, ethnicity, health, medical, or education

---

### Instruments

- **Motor Planning Maze Assessment (MPMA) (May-Benson, 2006)**
  - Three mazes examine planning
  - Administration: ~5 minute
- **Test of Ideational Praxis (TIP) (May-Benson, 2006)**
  - Shoe string
  - Directions: “Show me everything you can do with this string”
  - Time allotment: 5 minutes
Slide 16

Procedure

- Testing conducted individually
- MPMA followed by the TIP
- Performance videotaped for later scoring
- MPMA
  - Time, number of errors
- TIP
  - Total of all 'new' ideas

---

Slide 17

Demographics

<table>
<thead>
<tr>
<th>Gender (%)</th>
<th>Handedness (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>3 yr olds  (n=30)</td>
<td>27 (54.0)</td>
</tr>
<tr>
<td>4 yr olds  (n=28)</td>
<td>18 (64.3)</td>
</tr>
<tr>
<td>5 yr olds  (n=19)</td>
<td>13 (68.4)</td>
</tr>
<tr>
<td>Total      (n=78*)</td>
<td>47 (61)</td>
</tr>
</tbody>
</table>

*DOB for one 3 yr old not available; noted only 'age 3'

---

Slide 18

TIP Mean Scores
Slide 22

**MPMA Total Score**

<table>
<thead>
<tr>
<th>Score Range</th>
<th>Total Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>36-47</td>
<td>*</td>
</tr>
<tr>
<td>48-59</td>
<td>*#</td>
</tr>
<tr>
<td>60-71</td>
<td>*</td>
</tr>
</tbody>
</table>

Slide 23

**Conclusions**

- Ideational praxis is not well understood; empirical literature is lacking.
  - Has been identified ideation as central to praxis
- Ideation is cognitive; emergence may follow typical developmental sequence
- Younger children, little motor experience
  - Developing and experimenting with cognitive flexibility

Slide 24

- Found 3-5 year olds generated ~9-14 ideas
- Characterizing
  - 3's: repetitious; found a strategy and used it in multiple ways
  - 4's: greatest number of ideas; not bound by 'rules'
  - 5's: fewer repetitious approaches, but focus on doing it 'right' and following 'rules' for action
### Planning
- More discriminative aspect of praxis in early ages
  - Clear growth in accuracy and speed with age
- Parallel motor developmental gains
- Characterizing:
  - 3's: used same strategy on all three mazes
  - 4's: more thought, became more like 5's on harder mazes
  - 5's: overall an easy task

### Future Directions
- Additional normative data
- Discriminative validity
- Links between testing and observation of action and interaction with environment

### Select References


