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Unraveling the Mysteries of Motor Planning

COURSE OUTLINE

7:30 – 8:00 – Sign in & Continental Breakfast

8:00 – 9:00am:

I. Introduction

A. Objectives

- Define Motor Planning
- Understand neurological components of motor planning
- Broaden your repertoire for addressing motor planning
- Apply a variety of strategies to target motor planning skills

B. Motor Planning

- My first experiences:
 - Danny the twin who could not move
 - The one sided man

II. Definitions of Motor Planning

A. Motor Planning:

Motor planning is the ability to conceive, plan, and carry out a skilled, non-habitual motor act in the correct sequence from beginning to end. Incoming sensory stimuli must be correctly integrated in order to form the basis for appropriate, coordinated motor responses.

Moving through the world purposefully and successfully.

B. More Definitions

- Dyspraxia
- Apraxia
- Developmental Coordination Disorder
- Types of Motor Planning
- Ideomotor
- Ideational

III. Human History and Motor Activity

- A. History of human activity
- B. A Child's occupation
- C. The nature of Play
- D. Decline of Motor Skills

9:00- 10:15

IV. Systems Involved in MP

A. Brain Anatomy 101 – Motor Cortex; Motor Brain Parts

- Color your brain

----ACTIVITY – COLOR YOUR BRAIN----

B. Primary Cortex

- Homunculus
- Force of movement
- Direction of movement
- Extent and speed of movement

C. Premotor Cortex

- What does the premotor Cortex do?
 - Encodes
 - Selects
- Responsible for complex, task-related procession
- Prepares for movement

NOTES on Premotor cortex:

Sends signals BEFORE movement is initiated

Sensitive to SENSORY :

**Sensitive to CONEXT of movement - INTENT
Signals Correct vs. INCORRECT actions**

What are MIRROR NEURONS?

D. Going Deeper – Premotor LATERAL Cortex

- **Cue based**
- **External**
- **Lesions result in:**

E. Medial Premotor Cortex

- **Internal**
- **Movement sequences from memory**
 - **Divisions of Premotor Cortex**
 - **PMDc – guided reaching**
 - **PMDr – learning to association sensory stimulation with movements**
 - **PMVc – sensory guidance of movement**
 - **Tactile, visual, auditory; object in space and around body**
 - **PMVr – shaping hand during grasping**

F. Supplemental Motor Area

- **Programs complex sequences of movements**
- **Coordinates bilateral movements**
- **Selects movements based on remembered sequence**
- **Mental rehearsal/Mental imaging**
- **Kinematic and dynamic information**

G. Association Cortex

- **Prefrontal Cortex**
- **Posterior Parietal Cortex**

10:15 – 10:30 Break

10:30 – 11:30

H. Journey of Lesions:

a. Premotor Cortex

- **Apraxia**
- **Contralateral FM control**
- **Sensory Feedback**

b. Dorsolateral Prefrontal Cortex

- Figural Fluency Test
- Luria's Alternating Figure Test
- Visual Organization Test
- Copy/Free Recall

c. Orbitofrontal Cortex Lesion:

- Modulation of affective social behavior
- Working memory
- Smell discrimination
- Processing info from limbic, olfactory and memory systems

d. Supplemental Motor Area

- Decreased drive and motivation
- Decreased exploration
- Apathy
- Complex attention deficits
- Delayed habituation to external stimuli
- Alien hand syndrome

I. Sensory Systems

a. 3 Primary Systems

- Vestibular
- Proprioceptive
- Tactile

b. Sensory Feedback

- Somatosensory
- Kinesthetic
 - ♣ = body awareness in space

c. Feedback and Feed forward

d. Kinesthetic Learning = Motor Skill

e. Vision

- Vestibular system is linked to eyes and ears
- Lateral Premotor Cortex – relies on visual cues
- Visualization of movement in athletes, performers (SMA)

f. Bilateral Integration

- Communication of the two sides of the brain
- Coordinates movement between and across midline
- Develops hemispheric specialization
- Enhances body awareness in space
- Develops lead-assist relationship with hands
- Helps us to organize information

g. Motor Planning Sensory Ingredients

11:30 – 12:30 LUNCH

12:30 – 2:00pm:

V. WHAT we are Teaching

A. Motor Learning

- A process by which new motor patterns are
 - Introduced
 - Learned
 - Engrained

B. Three Stages of Motor Learning

- Cognitive
- Transitional
- Automatic

---GREEK LETTERS ACTIVITY---

C. What is Required?

- Cognition - Movement and IQ
- Sensory information
 - (feedback/feed forward)
- Practice, practice and practice
 - 10,000 hours

- 300 reps per hour = neuro changes
- Leads to automatic motor skill
- Skill becomes Automatic

VI. HOW We Learn

A. VAK Model

- Visual Learners
- Auditory Learners
- Kinesthetic Learners

- **Visual Learners**
 - Think in pictures (not words)
 - Remember what they see; better than what they hear
 - Need to see big picture first before learning details
 - ♣ Demonstrating
 - ♣ Showing pictures
 - ♣ Drawing diagrams

- **Auditory Learners**
 - Remember what they hear
 - Learn best by listening or talking out loud
 - ♣ Give verbal instructions
 - ♣ Simple, clear, to the point
 - ♣ Not too many instructions at once
 - ♣ Have them talk out movements to themselves

- **Kinesthetic Learners**
 - Learn by doing
 - Will often move their bodies as they listen or appear restless
 - when there is too much talking
 - Hands on learners, doers
 - Concentrate better when movement is involved
 - ♣ Follow you
 - ♣ Demonstrate

- **Active Learners**
 - Retains and understands best by doing something active:
 - ♣ discussing or applying

- **Reflective Learners**
 - Like to think quietly about new informatio

- **Global Learners**
 - Needs to see big picture first
 - Learns in large leaps
 - Absorb information randomly with seeing connection
 - Suddenly “get’s it”
 - May seem to not understand at first
 - ♣ Demonstrate entire concept or movement first

- **Sequential Learners**
 - Gain understanding in linear steps
 - Parts before whole
 - ♣ Organize learning in steps

2:00 – 2:15 break/discuss case study

2:15 – 3:00pm:

VII. HOW We (should) Teach – ‘Teaching on all frequencies’

A. Assess

- Learning Style
- Lesions
- Motivators
- Two Approaches
 - ♣ Top Down (task oriented)
 - ♣ Bottom up (processes oriented)

B. Strategies

- **Stepwise Progression**
 - ♣ Addresses ALL learning styles
 - ♣ Utilizes mirror neurons
- **Watch me, Follow me, Show me**

C. Other Comments:

1. Practice

- Neuroplasticity = High Reps
 - 300 repetitions of movement in one hour
 - High reps in small, successful increments
- The 10,000 hour theory
- Chaining
 - Forward chaining/backward chaining
- Chunking

2. Teach proper muscles

- Teaching proper muscles for proper job
 - Handwriting approach
 - Research on proportion and its affect on motor performance

3.. Neuroplasticity

- Cheryl Schilz's Vertigo
- A Blind man sees
- My post 25 year CVA patient

4. Sound/Auditory Feedback

- Sounds
- Stories
- Language
- Frequencies

5. The power of video

- Provides mental imagery (SMA)
- Mirror Neurons to the maximum?

6. Sequential Learners

- Check Lists
- Sequenced pictures
- Velcro Strips

7. Assess the Environment

- Benign Changes in the Environment
- Name a few:

3:00 – 4:00pm

C. Diagnoses/Special Considerations

1. Vision and Autism

- Seeing the Gestalt -
- Part to Whole
- Autism -
- Parts not whole
- Peripheral not central
- Details not Gestalt
 - Strongest learning system

2. Teaching the Child with Autism

- First and foremost must make it relevant
 - Why handwriting has no meaning
 - Intrinsic vs. extrinsic motivators
- Vision last, not first
- Assess impact of sensory information

- Strategy: sabotage

3. Learning Disabled Child

- Minimize Layers
- Sequencing; step by step

4. ADD/ADHD Child

- Prioritizing
- Organizing
- Sequential
- Define boundaries

- Teach movement within those boundaries
- Provide sensory feedback

D. Relevant = Motivation = Learning

- Accesses Limbic system for better storage
- Heightens sensory information for learning
- Definition of “motivation” “to motivate”
- Cup with coffee vs. Cup and dirty dishes fMRI
- Stories of motivation – HL toys, Herbiwriter, Magnadoodle kid

VIII. Taking a look at the Stars

1. Must allow for processing time

- Wait in silence

2. Pair sensory input with motor input

- Sound as trigger
- Model movement before teaching
- Use Stepwise progression

3. Activity must be relevant

- proper motivation lights up the brain

4. Must allow for SELF correction

5. The importance of SHOWING

- Modeling
- Videoing

6. Visual and verbal cues do not always work toward effectiveness

- Lesion in Lateral Premotor Cortex
- Use some other strategy

7. Emphasize learning movement sequences from MEMORY

8. Mental Rehearsal is important

- ♣ Show me phase
- ♣ Videoing

- ♣ Modeling
- ♣ Practicing Mental imagery

9. Supplemental Motor Area translates kinematic to dynamic

- ♣ Teaching distance and force through sound and movement

SUMMARY/CONCLUSION/ Case Study application

Anatomy-

Premotor cortex

Supplemental Motor Area

Motor Learning Process

Types of Learners

Neuroplasticity

Strategies for Teaching MP

Stepwise Progression

Mirror Neurons

4:00 – 4:30m Questions, post test and certificates

