Los Angeles Unified School District- Occupational Therapy and Physical Therapy

Motor Learning Applications in the School-based Setting

Optimal Circumstances for Motor Skill Acquisition

1. A match among the task requirements, environmental demands and the student's abilities.
2. The student understands what is to be achieved and is provided with clear information about the expected motor skill performance and outcome.
3. The student is encouraged to independently problem solve to find his or her own optimal movement strategies to perform tasks.
4. The student is provided with a task that is challenging (moving from independent to tasks requiring assistance).
5. In early stages of learning, feedback focused on movement outcome and critical features of task and environment (not motor performance).
6. In early stages of learning, feedback is summarized when movement performance is acceptable.
7. In later stages of learning, student is encouraged to self-evaluate own movement performance and outcome.
8. Student practices whole instead of part of task.
9. Randomized practice (different applications of skills) more likely to generalize to a variety of contexts.
10. For open tasks (adapting to changing circumstances), the task demand is varied during practice.
11. Student practices and is provided feedback about performance in natural setting and in varied daily routines.

References:

Cole, M., & Tufano, R. (2008). Applied Theories in Occupational Therapy: A Practical Approach. Hamden, CT: SLACK Incorporated.

Kaplan, M.T., & Bedell, G. (1999). Motor skill acquisition frame of reference. In P. Kramer & J. Hinjosa (Eds.), Frames of reference for occupational therapy (2nd ed.) Philadelphia, PA: Lippincott Williams & Wilkins.

Motor Learning Checklist

Student Name:

Student Date of Birth/ID Number:

Motor Learning Task:

Description of Initial Trial:

Phase of Motor Learning (check one)

Cognitive	
Associative	
Autonomous	

Is visual demonstration appropriate with the instruction? YES NO

What are the top 1-2 concepts you are going to cue for your student?

1.
2.

What is the goal of the movement for the child? (motivation)

Motor Learning Checklist

What is the most appropriate grading of the task? (Check one per row)

Discrete		Continuous	
Stationary		Dynamic	
Closed		Open	
One Step		Multi-Step	
Simple		Complex	

What practice type is most appropriate? (Check one per row)

Blocked		Random	
Constant		Variable	
Part		Whole	

Is the use of Mental Practice appropriate? **YES** **NO**

Is the use of a Simulator available/appropriate? **YES** **NO**

How will you use external focus in your treatment session?

What feedback schedule will be most appropriate? (check one)

Constant	
Summed	
Delayed	
Bandwidth	
Fading	

Design your treatment:

Motor Learning Checklist

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Modified Taxonomy of Adapting and Grading Motor Tasks

SIMPLE	MORE DIFFICULT
Discrete: Making a snip in paper	Continuous: Cut along a boundary to cut out a circle
Uni-manual: Grasp and release a small toy	Bimanual: Stabilize cup with one hand while releasing toy into cup with other hand
Stationary: Scribble on paper	Dynamic: Following a moving target on iPad with stylus
Closed: Student rolls ball across table to OT in pull-out session	Open: Student plays handball with peers on playground during recess
One Step: Write name	Multi-step: Write name and draw picture
Simple: Place ball in container	Complex: Pick up red ball and place in blue container

Additional Notes:

References:
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Motor Learning Applications in the School-based Setting

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Los Angeles Unified School District
OTAC Annual Conference 2018

Objectives

1.Participant will be able to identify at least 3 reasons why pediatric motor learning is different than motor learning for adults.
2. Participant will be able to grade motor tasks based on Gentile's Taxonomy of Movement Tasks.
3. Participant will be able to describe 6 practice types and describe how they would embed practice types into intervention.
4. Participant will be able to structure feedback during intervention to follow best practice as related to motor learning theory and current literature.

Theoretical Basis of Motor Learning

Motor Learning: A search for a task solution that emerges from an interaction of the individual with the task and the environment[1`]

Motor Performance: The observed behavior or skill. Used to measure learning.

Motor Control: The ability to regulate or direct the mechanisms essential to movement[1]

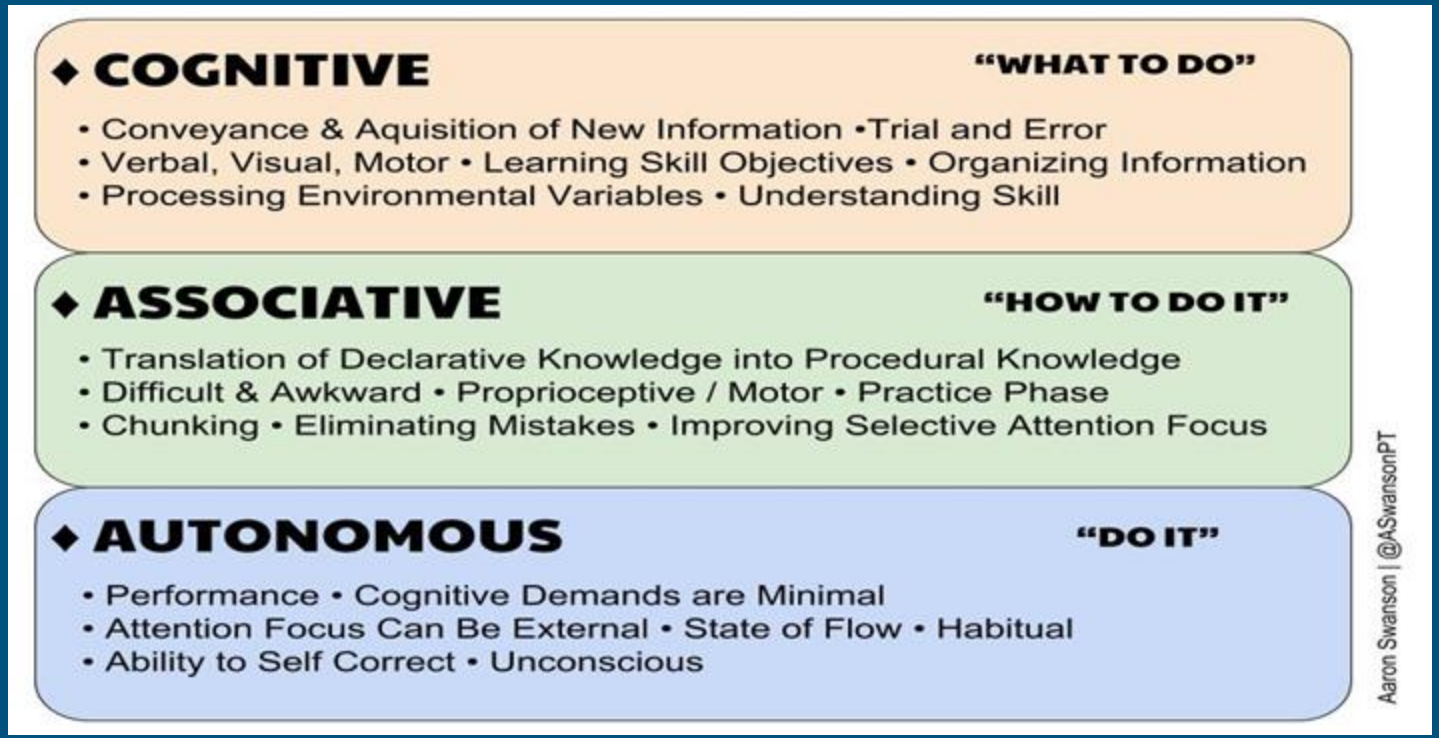
Retention: The continued possession of a learned motor skill over a period of time.

Generalizability: The ability to transfer a skill between different settings.

Differentiating for Pediatrics

- Prior level of function
- Cognition
- Age
- Child’s motivation
- Critical periods
- Perception
- Family interaction
- Fun
- Willingness to change

Phases of Motor Learning[2]



- http://www.aaronswansonpt.com/coaching-cueing-part-7-phases-summary/

Quiz Time!

You are working with a student who is attempting to form the letter A. He can't tell you where to start from (top to bottom) or what kinds of lines are used to form an A (diagonal line, horizontal line, diagonal line).

1. Associative
2. Autonomous
3. Cognitive

Quiz Time!

You observe a student in class taking notes while teacher is talking who can produce legible writing. Student was able to participate in classroom discussion during writing activity.

1. Associative
2. Autonomous
3. Cognitive

Quiz Time!

You are working with a student to produce the letters of her name. She can tell you which letters are large and small but demonstrates difficulty consistently sizing and organizing written work within the space allotted.

1. **Associative**
2. **Autonomous**
3. **Cognitive**

Grading Motor Tasks

Gentile’s Taxonomy of Movement Tasks (1987)

Terms:

Discrete, Unimanual, Stationary, Closed, One Step, Simple, Continuous, Bimanual, Dynamic, Open, Multistep, Complex/Serial Skill

Grading and Adapting Activity[2]

SIMPLE	MORE DIFFICULT
Discrete: Make a snip in paper	Continuous: Cut along a boundary to cut out a circle
Uni-manual: Grasp and release a small toy	Bimanual: Stabilize cup with one hand while releasing toy into cup with other hand
Stationary: Scribble on paper	Dynamic: Follow moving target on ipad with stylus
Closed: Student rolls ball across table to OT in pull-out session	Open: Student plays handball with peers on playground during recess
One Step: Write name	Multi-step: Write name and draw picture
Simple: Place ball in container	Complex: Pick up red ball and place in blue container

Break into groups

Come up with an activity you can grade up or down to address foundational skills for the school setting (ie. fine motor, visual motor, bimanual coordination).

1.Discrete vs Continuous

2.Unimanual vs Bimanual

3.Stationary vs Dynamic

4. Simple vs Complex

6 Therapeutic Practice Types[10]

1. Blocked Practice Vs. Distributed Practice
2. Constant Practice Vs. Variable/Random Practice
3. Mental Practice
4. Part Vs. Whole Practice
5. Internal Vs. External Focus
6. Simulator

1. Blocked vs Distributed Practice

Blocked Practice: Period performing movement greater than rest period.

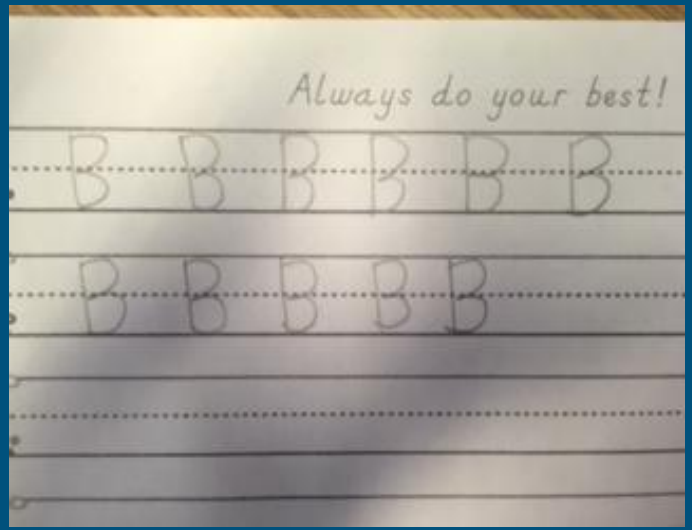
- May be better for novel learners with a discrete skill, but more research must be done (Campbell). Poole (1991) recommends that in initial learning constant and blocked practice may increase performance

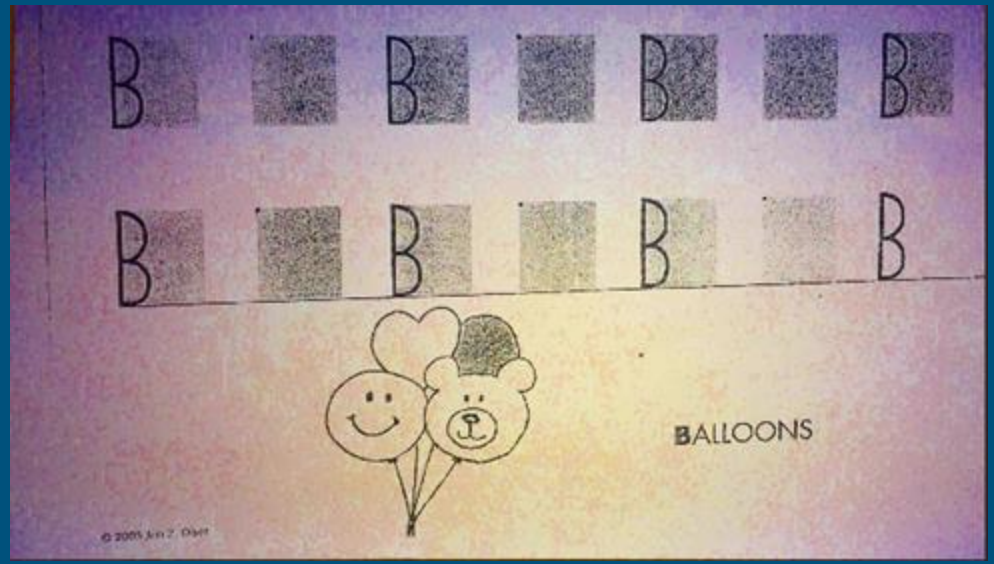
Distributed practice: Rest between trials is greater than time of trial and incorporates other aspects of skill (foundational components)

- Performance may suffer and be inconsistent, but learning will generalize more.

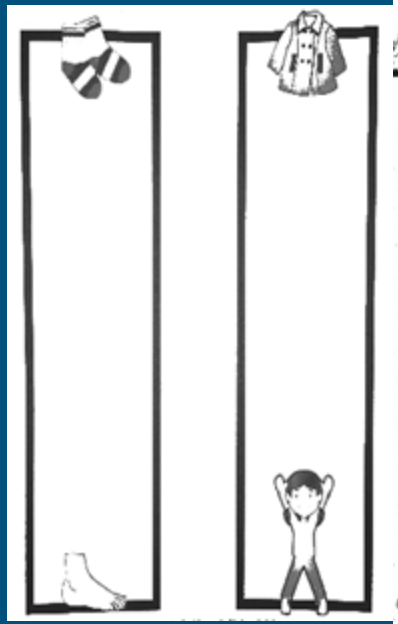
Blocked practice letter formation

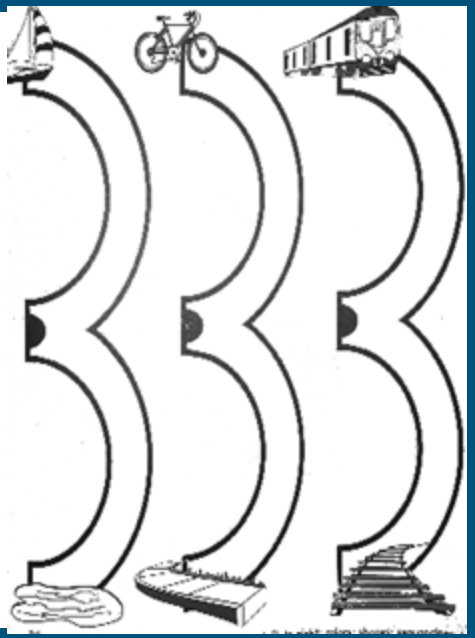
Blocked practice letter B





Distributed Practice Letter Formation





Distrubted Practice: Proximal Stability Circuit

2. Constant vs Variable

Constant skill- the conditions and environment are the same which allows for repetition of movement (a flight of stairs).

Variable skill- Performing the same skill but changing the characteristics or demands.

- Example: Reaching for a cup. Changing the shape of the cup, whether the cup is full or empty, the trajectory of the hand to the cup, etc.

-Intertrial variability: Conditions of the skill change based on successive repetition (i.e. drinking from the cup removes weight from the cup so the weight is always changing).[10]

Variable

Variable is better because it solidifies motor schemas in the brain to allow for adjustment of variables in everyday life that can be referred back to.[10]

** From Campbell.

Variable

Images from Google image

3. Mental Practice

Performing skill in imagination - no action involved

Effective in teaching skill and re-training timing and coordination

Superior results during transfer of learning

Requires cognitive processes and helps children problem-solve

50 physical practice trials combined with 50 mental practice trials are as effective as 100 physical practice trial

Mirror Neurons

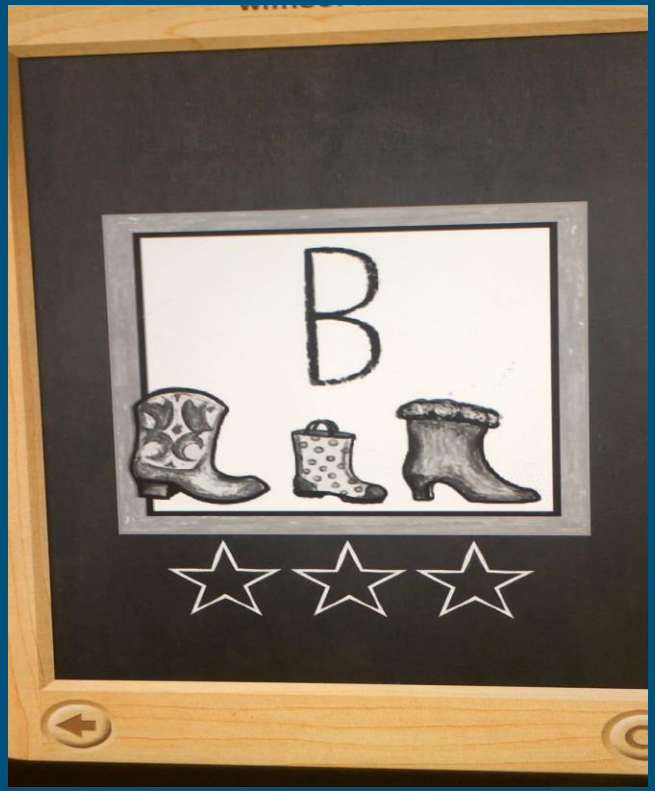
Mirror neurons are part of neural networks (in the inferior frontal, premotor, supplementary motor, primary somatosensory, and inferior parietal cortices) that are activated when a person performs an action or observes others' actions [5]

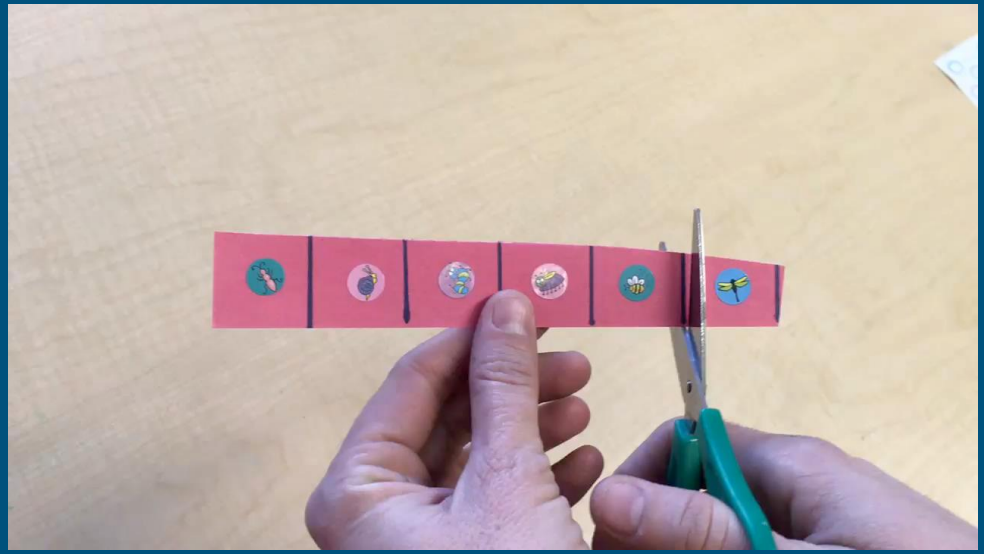
- A primary role of the mirror neuron system is to integrate motor actions with their cognitive and emotional content. When a student observes another person eating and deriving satisfaction, the association of the motor action with the cognitive intent of satiation and emotional experience of pleasure is learned.[6]

A growing body of research has suggested that people with ASD have deficits in the mirror neuron system, although the precise mechanism of impairment is not understood.[7]

- May display lack of fluidity in movement and difficulty anticipating next movement in a sequence[6]

Mental Practice Videos





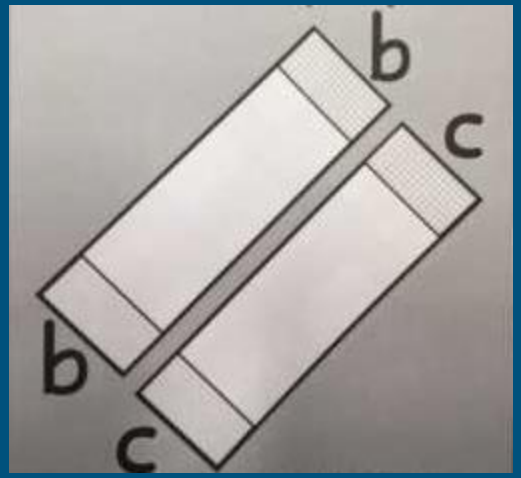
4. Part vs Whole

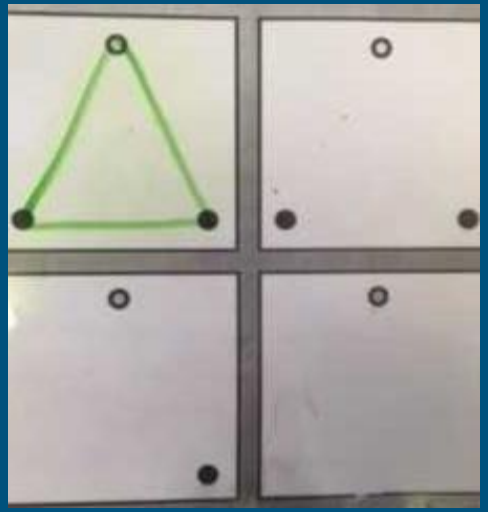
Complexity- number of tasks within the skill, attention demanded
Organization- how “separate” the skills are able to be spatially
Practice Parts- HIGH COMPLEXITY, LOW ORGANIZATION (easy to separate)

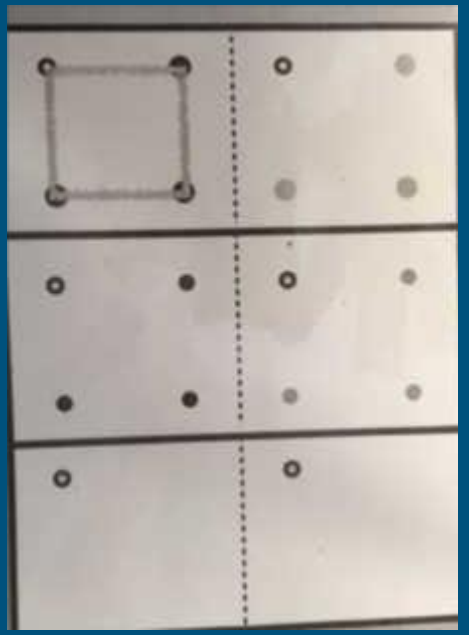
Three Types of Part Practice

- Fractionalization- where discrete skills are practiced separately
  - Effective when one part does not affect another part (putting socks on, then shoes)
- Progressive Part Practice- chaining discrete skills together logically
  - Backwards Chaining (climbing a ladder, finishing a drawing)
- Simplification- Slow motion
  - May be detrimental in some motor skills such as running as the characteristics of running change

Fractionalization

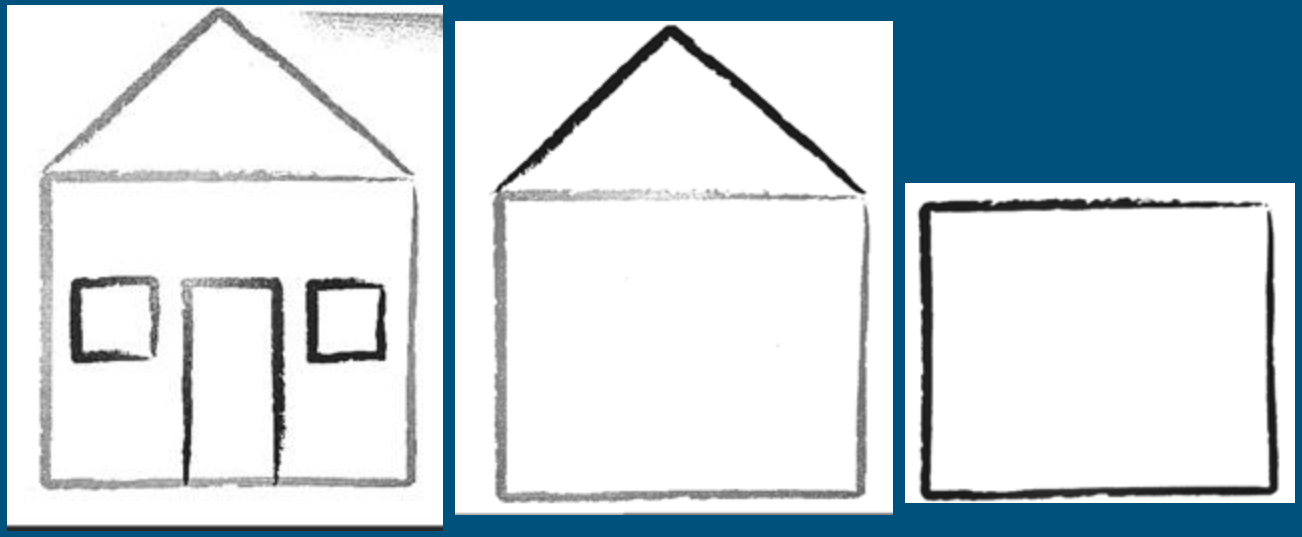






Progressive Part Practice

Backwards Chaining



5. External vs Internal Focus

McNevin et al 2000.[11]

- Patients who were instructed on form prior to a motor task (proper form of throwing, or proper form of weight shifting for a skiing simulation task) performed POORER than patients who were given external focus (hit the target) or no instruction at all.
- Use external cues
  - Following taped lines on the floor for scooterboard activity
  - Throw to a drawn target on the wall
  - Raise the surface or use a slant board for upright posture cueing
- OR when not imaginative, no cues at all (promotes their own ability to problem solve).

Internal Focus vs External Focus

Fine Motor

Internal: “Flatten the putty with your hands into a pancake, pull it apart with two hands, roll a ball with the tips of your fingers”

- This is how I want you to move your hands

External: “Make a pizza with meatballs”

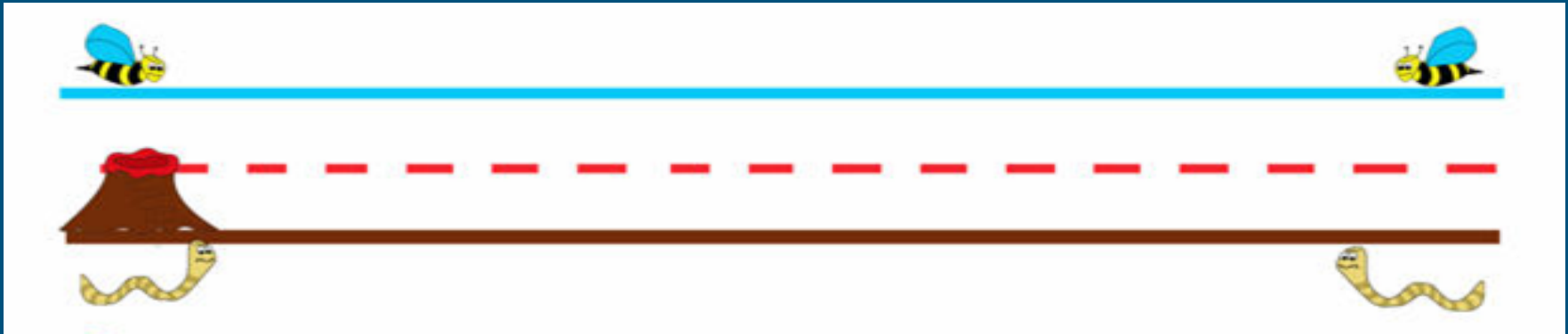
- This is the task you need to complete

External Focus

Bee letters fly from the sky to the ground

Lava letters run from the lava to the ground

Worm letters sit on the ground and dig their tails into the dirt to find worms



External Focus

From Google images

6. Simulator

The research:

A study found that children with cerebral palsy using a virtual reality exercise system were able to perform selective ankle exercises with greater range of motion and longer hold times than conventional home exercise.[9]

The implications?

QUIZ ON PRACTICE TYPES

Quiz Question #1

1. **A student is practicing the task of illustrating a drawing to demonstrate understanding of class content. What is the best type of practice?**

    A. Part
    B. Whole

Quiz Question #2

3. Your student has a goal for improved visual motor skills to copy with appropriate sizing. Which of the following is the best example of explicit focus?

A. Small letters run from the dotted line (lava) to the bottom line (ground).

B. Keep your elbow on the table and move just your hand to make small letters.

Quiz Question #3

Which of the following is the best example of distributed practice?

A. Making a vertical line with a marker
B. Sticking stickers along a vertical line, using a finger to draw a line in shaving cream, poking a straight line in putty with a golf T, sticking a wiki stick to a straight line template

Occupational Therapy and Teaching- Learning

“Although occupational therapists teach motor skills, most therapists are not trained as extensively in skill acquisition strategies as are physical educators and coaches. Mosey (1986) attributed this lack of attention to the teaching-learning process to the therapists’ desire to disassociate themselves from the image of being teachers” (Poole, 1991)

How is using a motor learning frame of reference to develop visual motor skills different than “teaching” a student to write?

Instruction during Motor Learning Interventions

Instruction (visual demonstration), clear and concise with 1-2 concepts; relate the movement to a goal (lean forward until you can see your toes); relate movement to what's been done before ("just like we did on the treadmill")

Demonstration and verbal instruction is better than just verbal instruction alone

Manual Assistance: Use for safety, to help confidence, or help student to feel movement. But take away quickly. Sometimes, no manual assistance is best.

Internal vs External- Flex hip and knee, dorsiflex versus (get the marble off the floor)

Chunking

Informing Motor Learning Interventions

- Knowledge of Results
- Knowledge of Performance

Informing Motor Learning Interventions: Feedback—FIX THIS SLIDE

Verbal

Summed

- **Constant**
- **Fading**
- **Bandwith**
- **Delayed**

- **Types of feedback Considerations**

- **Timing**

§ **Larin 2000- 50% of trials**

§ **Allow 12 seconds to allow child to give himself feedback**

Optimal circumstances for motor skill acquisition[3]:

1. A match among the task requirements, environmental demands and the student's abilities
2. The student understands what is to be achieved and is provided with clear information about the expected motor skill performance and outcome
3. The student is encouraged to independently problem solve to find his or her own optimal movement strategies to perform tasks
4. The student is provided with a task that is challenging (moving from independent to tasks requiring assistance)
5. In early stages of learning, feedback focused on movement outcome and critical features of task and environment (not motor performance)
6. In early stages of learning, feedback is summarized when movement performance is acceptable

Differentiating for Intellectual Disability

- Children with more severe intellectual disabilities are likely to have more severe motor delays (5,31 campbell)- FIX THIS
- Intellectual deficits impede motor learning, leading to slow and clumsy movements
- Cognitive Referencing ?
- Children with the intellectual skills typical of an 18 month old have been found to be capable of learning powered mobility

Differentiating for Intellectual Disability

- Compared to typically developing children, children with ID have been found to:[10]
  - learn a lesser number of things
  - need a greater number of repetitions to learn
  - have greater difficulty generalizing skills
  - have greater difficulty maintaining skills that are not practiced regularly
  - have slower response times
  - have a more limited repertoire of response

Treatment Applications for Children with Intellectual Disabilities[10]

- Instruction in natural environment, during natural routines
- Use of positive reinforcement
  - Effective reinforcers are activities that are desirable
  - OR a natural consequence of the movement (walk through obstacle course to get to toy)
- Fading of antecedent prompting so the student becomes naturally motivated to complete the task
- Backwards chaining is effective as it gives the student the reward of task completion each time.

Treatment Instruction Takeaways

- Perform first trial without instruction
- Allow time for error correction
- Provide a wealth of variable practice
- Don’t overly give feedback!
- Use hands/facilitation only when absolutely necessary!

Design an intervention

A preschool student demonstrates difficulty with proximal stability, fine motor, visual motor and bimanual skills needed to access his general education curriculum. His IEP includes the following goals:

He will demonstrate improved bimanual skills as seen by his ability to cut a circle within ¼ inch of the boundary.

He will demonstrate improved proximal stability and fine motor skill as seen by his ability to sustain an age appropriate grasp while coloring for 5 minutes.

He will demonstrate improved visual motor skills as seen by his ability to copy pre-writing shapes (circle, cross, vertical and horizontal lines).


THE LESS YOU DO, THE MORE YOU DO!
imgflip.com

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