

## **Activity-Focused Motor Interventions for Infants and Young Children**

Mary Jane K Rapport, PT, PhD  
Associate Professor  
University of Colorado Health Sciences Center  
Department of Pediatrics  
Department of Physical Medicine & Rehabilitation

## **Special Thanks**

to  
Joanne Valvano, PhD, PT  
and  
David Weil



## **Getting from here to there...**

- **Develop Activity-Related Goals**
- **Plan Activity-Focused Interventions**
- **Integrate Impairment-Focused Interventions**

## **The Challenge**

- Integrating the need for therapeutic intervention within everyday routines
- Applying concepts of motor learning and motor control to naturally occurring opportunities throughout the day
- Understanding our role as “change agent”

## **Motor Learning and Development**

- Information-Processing Perspective
- Dynamic Systems Perspective

Motor learning is “a set of internal processes associated with practice or experience leading to a relatively permanent change in the capability for a motor skill.” (Schmidt, 1988, p.375)

## **Information-Processing Perspective**

- Emphasis on cognitive processes associated with learning motor skills
- Learner plays an active role in processing information → motor learning

### Information Processing

- 3 stages:
  - stimulus identification
    - taking in and integrating information
  - response selection
    - determining motor response
  - response programming
    - processing the response in the CNS
- Reaction time – from stimulus or intent to move until initiation of movement

### Impact on processing

- Attention to relevant stimuli
- Stimulus identification
- Ability to recall sequence of actions
- Motor production deficits
- Developmental aspects
  - younger children take longer to process information
- Memory functions

### Other related theories

- Direct perception theory  
(Michaels & Carello, 1981)
  - Pure ecological approach
    - Biologic systems of the child “resonate” with the information in the environment
    - Muscle groups and joints act as units

### Dynamic Systems Theory

- Kelso, 1991; Scholz, 1990; Thelan, 1987)
- Control of movement shifts between the individual and the environment
  - Collective interaction between movement systems and environment
- Action
  - Accomplish a task or goal
- Motion
  - Controlling and coordinating the degrees of freedom (DF)

### Dynamic: systems change

- Intrinsic coordination must change for motor behaviors to change
- Control parameters
  - Qualitative or quantitative
  - Induce change in motor behaviors
- Stability
  - Resistance to change or to another motor behavior

### “Disequilibrium creates equilibrium”

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>• Preferred behavior = stable behavior</li> </ul> | <ul style="list-style-type: none"> <li>• Instability is critical for new motor behaviors to emerge</li> </ul> |
|--|---|

### Control Parameter

- Constraints are factors related to the:
  - performer
  - task
  - environment
- Interact with each other to influence emerging motor behavior

### Constraints limit outcomes

- Can be positive if restrict options to only positive
- Can be limiters by inhibiting possible outcomes

### Context

- How will I integrate interventions into everyday routines and activities?
  - Consider
    - Physical aspects of environment
    - Interaction between "change agent" and learner
    - Role of therapist as playmate and as instructor

### Motivation

- Encourages learning for improvement
- Individual
- Allow for creative movement
- Goal setting

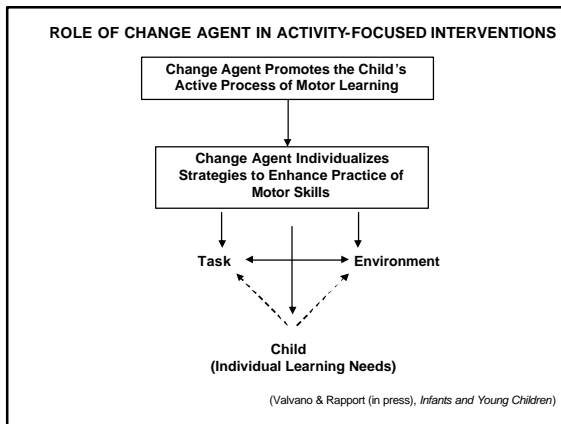
### Gentile's Approach

- If a goal and movement are successful, use repetition.
- If a goal is unsuccessful in spite of apparent good movement, help the learner in identifying relevant environmental conditions.
- If a goal is successful but the movement produced a surprise success, describe the movement to the learner.
- If both the goal and the movement are unsuccessful, encourage the learner and analyze further the task at hand.

(Gentile, 1972)

### Role of Therapist

- Interact with constraints:
  - Performer – child
  - Task – functional activity or action
  - Environment – distance, height, support, etc.
- Act as a *change agent* to assist the child to learn functional motor activities or skills



## What is the purpose of Activity-Focused Interventions?

Activity-Focused Interventions are directed toward learning motor tasks that will increase the child's participation in daily routines.

## Applying the theory of Activity-Focused Interventions to:

- goal-directed, verbally mediated practice by school-aged children
- developmental motor skills by infants and young children
  - within the context of everyday routines, activities, and places

## References

- Valvano, J. (2004). Activity-focused interventions for children with neurological disorders. *Physical and Occupational Therapy in Pediatrics*, 24 (1), 79-109.
- Valvano, J. & Rapport M.J. (in press). Activity-focused interventions for infants and young children with neurological disorders. *Infants and Young Children*.

## Steps in Activity-Focused Interventions

1. Develop activity-related goals and objectives
2. Plan activity-focused interventions
3. Integrate impairment-focused interventions with activity-focused interventions

Applying what we know and what we have learned to  
**Activity-Focused Intervention Model**

## Meet ... Kenzie

- 20 months old
- Diagnosis:
  - distal arthrogryposis
  - global developmental delay
  - proximal hypotonia
- Attends childcare daily

## STEP 1

### Develop Activity-Related Goals

## Activity Related Goals

- Address priorities of the child and their family
- Develop goal in collaboration with the intervention team
- Incorporate into the IEP or the IFSP

## Situation

- Kenzie attended childcare - in the toddler classroom
  - typical activity was floor play
  - motor skill: getting up and down from the floor frequently throughout the day
  - required assistance from teachers to get down to the floor and back up to standing

## Activity-Related Goal

Kenzie will move independently from the floor to standing and to standing from the floor during play with no external support.

## Measurable Goal

- Kenzie will move independently from the floor to standing and to standing from the floor during play, with no external support.
- Kenzie will come to stand from a seated position on the floor and go from standing back to the floor during play with no external support \_\_\_\_% of the time (or \_\_\_\_ out of \_\_\_\_ opportunities).

### Individual Learning Characteristics

- Strengths and Achievements
- Activity Limitations
- Impairments
  - Limitations in body structures and functions

### Looking at the individual

- Strengths and Achievements → FOCUS
- Activity Limitations → What is priority?
- Impairments → What is impact?

### Strengths and Achievements

- Functional ambulation
- Able to push up on all fours
- Able to use a chair or object for support in coming to stand
- Adequate activity level
- Interest in exploration and play

### Activity Limitation

- Independent transitions to and from standing
  - important for the typical routines of play

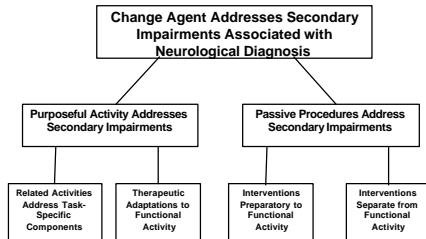
### Impairments

- Limitations in body structures and functions
  - Joint limitations at ankles (limited ROM)
  - Structural and functional limitations in trunk extension
  - Limitations in midrange control in lower extremities
    - Hypotonia or weakness
  - Limitations in motor planning

## STEP 2

### Plan Activity-Focused Interventions

**Intervention strategies  
to address secondary impairments  
(Activity-Focused Interventions)**



(Valvano & Rapport (in press), *Infants and Young Children*)

**Structure opportunities for  
practice of functional actions:**

- Modify the task, the physical environment and the performance environment (information, including feedback and guidance)
- Use principles of motor learning and development as a foundation for planning practice
- Adapt principles, if necessary, to meet individual learning strengths and needs of the child

**Principles of Motor Learning  
and Development**

- Allow self-exploration and repetition
- Use toys and play activities to promote exploration, and problem solving
- Use opportunities within the child's natural environment to allow for practice throughout the day

**Practice**

- Motor learning requires many trials
  - Is the activity part of a daily routine?
  - Does the daily routine occur frequently?
- Make practice fun and motivating
  - Is the child interested in the activity?
  - Is the activity functional?
- Make necessary adaptations to insure success
  - Do you need to adapt the task?
  - Do you need to adapt the environment?

**Adaptations to Principles of Motor  
Learning and Development**

- Physical guidance in the early phases of practice, helps the child "feel" the movement
- Task modifications might address limitations in ankle movement and trunk extension
- Environmental modifications may make use of table as a stable surface

**STEP 3**

**Integrate  
Impairment-Focused  
Interventions**

### Impairment-focused Interventions

- *Active* impairment-focused interventions
- *Passive* impairment-focused interventions

### *Active* impairment-focused interventions

- Activities that complement the target activity to address a task-relevant movement component
- Therapeutic adaptations to functional activity that address the movement component

### **Purposeful Activity Addresses Secondary Impairments**

- Related Activities Address Task-Specific Components
- Therapeutic Adaptations to Functional Activity

### *Active* Impairment-Focused Intervention

Related activity, structured by the change agent, that focuses on increased range of active trunk extension

### *Passive* impairment-focused interventions

- Procedures preparatory to functional activity
- Procedures not administered in the context of activity
  - separate from functional activity

### Passive Impairment-level Intervention

Example:  
Passive stretching of gastrocnemius muscle, to increase active and passive ankle dorsiflexion, which improve stability in transition to stand.



### Impairment level intervention

Example:

Passive stretching of back to increase active and passive spinal extension and improve trunk movement and stability necessary during transitions from sit to stand and stand to sit.

### How to integrate impairment focused interventions?

- Consider the goal
- Look for typical routines and activities that include the desired goal
  - Determine how to provide feedback within the context of everyday routines and activities
- Determine if there is a need for passive intervention
  - As preparatory or separate?

### Develop a plan

- Use principles of motor learning/motor control to develop a plan
  - Motor control impairments limit the ability to develop a movement plan to achieve an action.
  - How will these impairments be addressed?
    - Active intervention
    - Passive intervention

### Motor Learning Considerations

- The early phase of learning may be prolonged
- The requirement for guidance, especially physical guidance, may be increased

### When the desired activity or task varies...

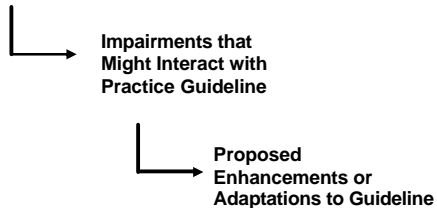
- Guidance may required to generalize from a previous experience to the new exemplar
  - guidance will be withdrawn as the child begins to get the idea of the movement patterns

### Importance of “wait” time

- Provide enough time to process the effects of the practice trial and the guidance or feedback received
  - For example, provide several seconds between trials to help integrate feedback into the performance.

### Steps to developing an activity-focused motor intervention

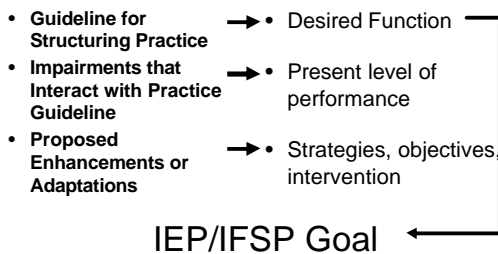
#### Guideline for Structuring Practice



### The thought process

Guideline for Structuring Practice	Impairments that Might Interact with Practice Guideline	Proposed Enhancements or Adaptations to Guideline	Application Example
Use toys to promote movement from sit to stand and stand to sit throughout play.	<ul style="list-style-type: none"> <li>• Limited ROM at ankles</li> <li>• Decreased strength in quadriceps</li> <li>• Limited back extension</li> <li>• Motor planning</li> </ul>	When presenting toys, focus on strategies in the environment and tasks which increase the child's access to the goal activity and success.	Toys were chosen that had surface features for easier contact. Toys were placed on an elevated surface to make them easier to reach. Stable surfaces were within reach.

### Applying this model to the IEP/IFSP:



### Your example

Guideline for Structuring Practice	Impairments (may interact with Practice Guideline)	Adaptations to Guideline	Application
Desired function	Present level of performance	Strategies, objectives, intervention	How will you help the child achieve the desired function?

### IEP/IFSP Goal(s)

- You know the desired function
- You know the impairments and present level of performance
- You have strategies and intervention ideas
- **Develop a goal** (with the team)

What are the objectives to reach this goal?

### Desired Function links to IDEA

- IFSP
  - Does the goal meet the developmental needs of the child or the needs of the family related to enhancing the child's development?
- IEP
  - Does the goal assist the child to benefit from their special education program? Will the child achieve "some educational benefit"?

### IDEA – Part C

“Occupational therapy includes services to address the functional needs of a child related to adaptive development, adaptive behavior and play, and sensory, motor, and postural development. These services are designed to improve the child’s functional ability to perform tasks in home, school, and community settings... to facilitate development and promote the acquisition of functional skills”

Sec. 303.12(d)(8)

### IDEA – Part C

“Physical therapy includes services to address the promotion of sensorimotor function through enhancement of musculoskeletal status, neurobehavioral organization, perceptual and motor development, cardiopulmonary status, and effective environmental adaptation...to prevent, alleviate, or compensate for movement dysfunction and related functional problems”

Sec. 303.12(d)(9)

### IDEA – Part B

- Occupational Therapy
  - Improving, developing or restoring functions impaired or lost through illness, injury, or deprivation;
  - Improving ability to perform tasks for independent functioning...

Sec. 300.24(b)(5)

### IDEA – Part B

- Physical Therapy ...  
Services provided by a qualified PT

Sec. 300.24(b)(8)

### Activity-focused Interventions

- Assist a child to learn motor tasks that will increase their participation in daily routines.

### Contact information

Mary Jane Rapport  
UCDHSC – JFK Partners  
4200 E. Ninth Ave., C221  
Denver, CO 80262  
303-864-5166  
rapport.maryjane@tchden.org