

# Impairments of Coordination: Examination & Intervention



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# Objectives



- Participants will be able to explain the following related to coordination
  - Components of coordination
  - Underlying factors contributing to motor coordination
  - Clinical examination components
  - Clinical examination techniques
  - Standardized outcome measures
  - General interventions

# Coordination



- Ability of multiple joints and muscles to work together to produce smooth, efficient, accurate, controlled movement
  - Sequence of muscle activation
  - Timing of muscle activation
  - Grading of force
  - Speed
  - Distance
  - Direction
  - Appropriate synergies
  - Easy reversal between opposing muscle groups
  - Proximal stability allows distal mobility

# Coordination



- Underlying requirements
  - Sensory information from the body and environment
  - Visual input
  - Vestibular input
  - Fully intact
    - Musculoskeletal system
    - Neuromuscular system

# Coordination



- Dexterity
  - Skillful movement
  - Fine motor control
- Agility
  - Speed
  - Smooth start & stop of movement
  - Ability to modify movement while maintaining postural control

# Coordination



- Intralimb
- Interlimb – bimanual
- Visual motor - Ability to integrate visual and motor abilities in the environmental context
  - Eye – hand – head ccoordination

# Coordination



# Coordination - Examination



- Before you examine coordination, must establish underlying functions
  - Range of motion
  - Strength
  - Sensation
  - Cognition
  - Language
  - Communication



# Coordination - Examination



- Gross motor movements
- Fine motor movements

# Coordination – Examination - Gross Motor



- Encompass
  - Posture
  - Balance
  - Extremity movements involving large muscle groups
- Activities include
  - Reaching
  - Kneeling
  - Standing
  - Walking
  - Running

# Coordination – Examination – Fine Motor



- Encompass
  - Skillful manipulation utilizing small muscle groups
- Activities include
  - Buttoning a shirt
  - Turning pages
  - Typing
  - Writing

# Coordination - Examination



- Specific tests evaluate movement capability in key areas
  - Reciprocal motion – opposing muscle groups
  - Movement composition – synergy
  - Movement accuracy – distance and speed
  - Fixation or limb holding – proximal stability for distal mobility
- Specific tests evaluate four areas of function
  - Transitional mobility
  - Stability
  - Dynamic postural control
  - Skill

# Coordination - Examination



- Progression of testing challenge
  - Unilateral
  - Bilateral symmetrical
  - Bilateral asymmetrical
  - Multi-limb

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- Ataxic Gait
  - Dysarthria and general ataxia

# Coordination - Examination

Test	Gross /Fine	General Type	Key Area	Motion	Observations
Finger-to-nose	Gross	Unilateral	Movement composition Movement accuracy	Shoulder abducted 90, elbow extended, bring tip of index finger to tip of nose	Tremor Dysmetria Accuracy
Alternate finger-to-nose	Gross	Unilateral	Movement composition Movement accuracy Reciprocating movement	Patient alternately touches tip of index finger to own nose and therapist finger	Tremor Dysmetria Accuracy Speed
Finger-to-finger	Gross	Bilateral symmetrical	Movement composition Movement accuracy	Bilateral shoulders abducted 90, elbows extended, bring tips of index fingers together	Tremor Dysmetria Accuracy
Finger opposition	Fine	Unilateral Bilateral symmetrical	Movement composition Movement accuracy	Touch tip of thumb to tip of each finger in sequence. Can increase speed.	Tremor Dysmetria Accuracy Speed
Finger opposition with slide	Fine	Unilateral Bilateral symmetrical	Movement composition Movement accuracy	As above, slide thumb to base of each finger	Tremor Dysmetria Accuracy Speed

# Coordination - Examination

Test	Gross /Fine	General Type	Key Area	Motion	Observations
Pronation/Supination	Gross	Unilateral Bilateral symmetrical	Reciprocal motion Accuracy - speed	Sitting, elbows flexed 90, arms close to sides. Turn palms up and down. Increase speed.	Speed Accuracy Dysdiadokokinesia
Foot or Hand tapping	Gross	Unilateral Bilateral symmetrical	Repetitive movement Accuracy - speed	Sitting tap hand on thigh or table, or foot on floor	Speed
Heel-on-shin	Gross	Unilateral	Movement composition Movement accuracy	Supine, place heel on opposite shin above ankle, slide along anterior tibia to knee and return	Tremor Dysmetria Accuracy
Fixation or position holding	Gross	Unilateral Bilateral symmetrical	Fixation	Raise both arms to 90, maintain position, eyes open, eyes closed	Accuracy
Functional Movements	Gross	Multi-limb	Reciprocal Movement Movement composition Movement accuracy	Bed mobility Transfers Walking and balance	Everything!



# Coordination – Standardized Outcome Measures



- Box and Blocks Test
  - Transfer as many blocks as possible in 1 minute
- Action Research Arm Test
  - 19 items – grasp, grip, pinch, gross movement
- 9-Hole Peg Test
  - Pegs moved from container to holes as quickly as possible
- Jebsen-Taylor Hand Function Test
  - Write, turn card, pick up small objects, simulated eating, stack as quickly as possible

# Coordination - Intervention



- Few techniques have been subjected to experimental testing

# Coordination - Intervention



- Repetition and practice of functional task-specific movement
  - Progress to tasks with increasing accuracy demands
  - LE tasks should be in weightbearing
  - Provide *intermittent* feedback
    - Knowledge of results – achievement of goal
    - Knowledge of performance – movement pattern
- Practice non-functional movements
  - Rapid alternating movements
  - Reciprocal movements
  - Tracing shapes and numbers

# Coordination - Intervention



- Timing problems – reaction, movement and termination time during function
  - Practice under external time constraint
  - Perform to music or metronome
  - Knowledge of results – time to complete
  - Verbal, visual, manual feedback
  - Sensory stimulation to facilitate recruitment of motor neurons may improve reaction time

# Coordination - Intervention



- Scaling problems – gradation of forces
  - Practice functional skills that require gradation of force – pick up plastic cup of water
  - Select tasks that require high accuracy, and therefore are usually performed slowly

# QUESTIONS?

