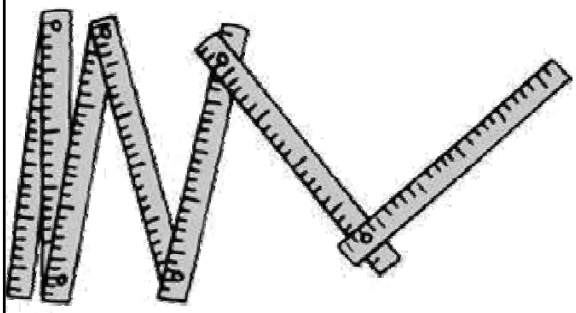
TESTS AND MEASURES PART II



Functional, Cost-effective and Time-efficient Assessment Tools

Why should we use tests & measures?

- Objective documentation
- Support (or contradict) subjective reports and observations
- Measurable goals
- Baseline to measure progress

✓ Explain reason for participation restrictions

✓ Guide goals and interventions

Review of Tests and Measures –Part I

- Timed Up and Down Stairs (TUDS)
- Timed Up and Go (TUG)
- Timed Floor to Stand
- Thirty-Second Walk Test
- Six-Minute Walk Test
- Modified Energy Expenditure Index (EEI)
- Pediatric Reach Test (PRT)
- Pediatric Balance Scale (PBS)
- Shuttle Run

Update on the 6MWT

Klepper, S.E., PT, PhD; Muir, N., DPT
Pediatric PT Journal, Spring 2011

- There are discrepancies in reported 6MWT results by different researchers. The discrepancies "may be due [to] in part to cultural differences among countries regarding physical activity (PA) and fitness. Because the 6MWT is a measure of submaximal exercise capacity, a sedentary lifestyle and low aerobic fitness may negatively affect a child's performance."
  - Physical activity, obesity
  - Environmental factors: income level; suburban vs. inner city sample
  - Test procedures
  - Track length

Update on the 6MWT

Klepper, S.E., PT, PhD; Muir, N., DPT
Pediatric PT Journal, Spring 2011

- Subjects: 74 students, 7-11 y/o, in NYC
- "Measured 6MWD values were lower at every age group compared with values reported or predicted by previous studies, with the *exception of Lammers, et al.*"

6MWT Results (in meters)	7	8	9	10	11
Klepper, Muir, 2011 (N=74)	527 ± 64		532 ± 80	497 ± 67	534 ± 85
Lammers, et al 2007 (N=212, 7-11 y/o)	488 ± 35	483 ± 40	496 ± 53	506 ± 45	512 ± 41

Tests and Measures – Part II

- Tests for body structure and function
  - for identifying **impairments** that may affect function
- Norms?
- Implications:
  - How does it affect your interventions?
  - Is the goal to correct the impairment, or to compensate for the impairment?

Tests for Body Structure and Function

- Legend:
  - S: Starting position
  - D: Directions
  - R: Result

Vision Screening[1]

Pursuits

Saccades

Near-Point Convergence

Vision Screening

Pursuits

- keeping eyes on the visual target as the target moves

- S: Student seated, head in midline.
- D: Instruct student to keep head still and "follow my finger with your eyes" as you trace an "H" shape, encouraging the student to look up, down, and side to side. Move your finger to the extreme ends of the student's gaze to ensure that you test full ocular range of motion. Keep finger ~16 in. from the student's face throughout test.
- R: Look for smooth movement of the eyes.

Vision Screening

Saccades

- eye movements by means of rapid, incremental jerks

- S: Student seated, head in midline.
- D: Hold 2 different colored pens ~12 inches apart & ~16 inches from the student's face. Instruct student to look at the appropriate pen when you say the color. Have student alternate rapidly from looking at one pen to the other. Be sure student fixates directly on target before moving eyes to the next target. Repeat with the pens held in four different directions: vertical, horizontal, diagonal with right side higher, & diagonal with left side higher.
- R: Note whether student is able to quickly switch visual focus from one target to the other.

Vision Screening

Near-Point Convergence

- S: Student seated, head in midline.
- D: Hold a pen upright ~16 inches from the student's nose. Instruct the student to keep his/her eyes on the top of the pen as you slowly bring the pen closer to the bridge of the student's nose. Ask the student to tell you when he/she sees two pens (or note when one eye deviates laterally).
- R: Record how far the pen is from the nose at that time: a normal value is 10cm or less.

Coordination[1,2]

Finger to Nose

Finger to Thumb

Rapid Alternating Movement

Heel to Shin

Coordination

Finger to Nose Test

- tests postural tremor, intention tremor and dysmetria

- S: Student standing.
- D: Ask student to raise arms out to the sides at shoulder level. Ask the student to slowly bring the index finger of the right hand to the nose, and return to the starting position; then bring the left index finger to the nose, and back to the starting position. Repeat 4 times with eyes open, and 4 times with eyes closed.
- R: Note if the student is able to bring the finger to the nose without under or over-shooting; note difference with eyes open and closed. Also, note presence of postural or intention tremor.

Coordination

Finger to Thumb Test

(Sequential Finger Movements)

- S: Student sitting.
- D: Ask the student to touch the pad of each finger to the thumb, starting with the index finger. Repeat 4 times on each hand. (Note: this test is appropriate for students aged 6 or older.)
- R: Note student's ability to bring the fingers together in isolation (ie: not bringing all four fingers to the thumb at once).

Coordination

Rapid Alternating Movement (Diadochokinesia)

- S: Student sitting.
- D: Ask student to tap his/her thigh, first with the palm, and then with the back of the hand, rapidly alternating this movement 10 times. Test with each hand separately, and then together.
- R: Note student's ability to maintain the rhythm and to move both hands together.

Coordination

Heel to Shin Test

- test for ataxia/dystaxia and dysmetria

- S: Student sitting or supine.
- D: Ask student to place the heel of the right foot on the left shin just below the left knee, and slide the heel along the shin from the knee to the ankle. Repeat 4 times on each side.
- R: Note if student is able to bring heel to shin without over or undershooting, and is able to maintain contact with shin as he/she slides heel toward foot.

Proprioception[1,2]

- Position sense
- Movement Sense (Kinesthesia)

Fingers

Toes

Arms

Legs

Proprioception

Fingers and Toes

- S: Student seated in a comfortable position, eyes closed.
- D: Support the hand or foot to be tested with one hand; with your other hand hold the digit to be tested on its sides, and wiggle it up and down. Randomly stop the movement with the digit in an up or down position and ask the student which direction the digit is pointing. Repeat 5 times. Avoid applying different pressures or using a different tone of voice on the up or down movement.
- R: Note the percentage of times the student correctly identifies the digit position.

Proprioception

Arms And Legs

- S: Student in sitting (for testing arms) or supine (for testing legs), with the eyes closed.
- D: Passively move the student's arm or leg through a small range of motion, then hold it in a static position. While holding the extremity in the static position, ask the student to duplicate the position with the opposite extremity. Alternately, after holding the extremity in the static position, you can return the extremity to the starting position, and ask the student to move the extremity back to the previous position.
- R: Note the accuracy with which the student can imitate the position. You may measure the joint positions with a goniometer to improve reliability.

Sensation[1,2]

Light Touch

Pressure

Sensation

Light Touch

- S: Student seated in a comfortable position, with his/her eyes closed.
- D: Use a piece of cotton or tissue to lightly touch or stroke the area being tested. Ask the student to indicate "yes" or "now" when the stimulus has been applied. Vary the time between touches.
- R: Note the percentage of trials in which the student successfully indicates a stimulus has been applied.

Sensation

Pressure

- S: Student seated in a comfortable position, with his/her eyes closed.
- D: Use your fingertip to apply firm pressure to the skin's surface. Ask the student to indicate "yes" or "now" when the stimulus has been applied. Vary the time between touches
- R: Note the percentage of trials in which the student successfully indicates a stimulus has been applied.

Reflexes[1,2]

ATNR

STNR

Reflexes

Asymmetrical Tonic Neck Reflex (ATNR)

- S: Student in supine.
- D, R: Observe movement of the arm on the face side as you passively rotate the head to one side. Repeat on the other side.

- S: Student in quadruped
- D, R: Observe flexion of the shoulder or elbow on the side opposite to the direction of passive head rotation. Repeat on the other side.

Reflexes

Symmetrical Tonic Neck Reflex (STNR)

- S: Student in supine.
- D, R: Note bending of the arms with passive cervical flexion; or flexion of the hips with passive cervical extension.

- S: Student in quadruped
- D, R: Note bending of the arms with passive cervical flexion; or flexion of the hips with passive cervical extension.

Tardieu Scale[3,4]

(Spasticity Measure)

- S: Student in supine, head in midline.
- D: Passive movement of the joint is evaluated at three velocities (V1, V2, and V3). Responses are recorded at each velocity (V) as X/Y, with X indicating the 0 to 5 rating, and Y indicating the angle at which the muscle reaction occurs.
- Velocities:
  - **V1**: move the limb segment as slow as possible (slower than limb dropping under gravity)
  - **V2**: speed of the limb segment falling under gravity
  - **V3**: move the limb segment as fast as possible (faster than limb dropping under gravity)

Tardieu Scale
(Spasticity Measure)

- Scoring:
  - **0** - No resistance throughout the course of passive movement
  - **1** - Slight resistance throughout the course of passive movement, no clear catch at a precise angle
  - **2** - Clear catch at a precise angle, interrupting the passive movement, followed by a release
  - **3** - Fatigable clonus with less than 10 seconds when maintaining the pressure and appearing at a precise angle
  - **4** - Unfatigable clonus with more than 10 seconds when maintaining the pressure and appearing at a precise angle
  - **5** - Joint is immovable

Tardieu Scale
(Spasticity Measure)

- Example: If, when extending the knee as slowly as possible (V1), a clear catch interrupts the passive movement at -70 degrees from full extension, followed by a release that allows further movement to -50 degrees from full extension, the Tardieu V1 would be reported as 2/-70.

Tardieu Scale vs. Ashworth Scale[3,4]

- Spasticity is defined as "a velocity-dependent increase in tonic stretch reflexes (muscle tone)."
- In a review of clinical assessments of spasticity in children with CP, Scholtes et al concluded that only the Tardieu Scale conforms to this definition of spasticity.
- Patrick and Ada compared Tardieu Scale and Ashworth Scale to laboratory measurements of spasticity and contracture of elbow flexors and ankle plantarflexors in 16 adults with hemiplegia
  - 100% agreement between the Tardieu and lab assessments for spasticity
  - 94% agreement between the Tardieu and lab assessments of contracture
  - 63% agreement between Ashworth and EMG for spasticity; Ashworth unable to detect contracture
  - Concluded Tardieu Scale is better able to identify the presence of spasticity and the presence of contracture because it takes into account the velocity of the stretch.

Early Clinical Assessment of Balance (ECAB)[5,6]

- D: The ECAB is a 13-item test developed for children 1.5-5 years of age diagnosed with CP. Procedures and scoring for the ECAB are very specific; view procedures and scoring sheets.
- Additional Info: developed by CanChild; has 2 Parts:
  - Part 1: Head and Trunk Postural Control (based on Movement Assessment for Infants)
  - Part 2: Sitting and Standing Postural Control (based on PBS)
- Is this applicable to school-based PT practice?

ECAB

- McCoy and Bartlett (1) administered the ECAB to 406 children with CP (138 Level I, 49 Level II, 51 Level III, 76 Level IV, 92 Level V; age range 1.5-5 years) to determine if ECAB scores differentiated children across GMFCS levels.
- ANOVA results confirmed statistically significant (p=0.05) differences in scores among GMFCS levels.
- Future research needed to determine reliability, standard error of measurement, and clinically meaningful change scores.

Equilibrium Reactions in Sitting

ECAB 5 EQUILIBRIUM REACTIONS IN SITTING

Place the child in sitting. If the child is unable to sit independently, support at the sides of the trunk as low as possible. Tilt the child to one side so as to shift the weight over one hip; push gently at one shoulder, push sideways at the hip, or encourage the child to reach for an object held out to the side at shoulder level. Observe the response of the head, trunk, and extremities on the non weight bearing side. The focus of attention is on the trunk and extremities. Repeat this procedure at least twice to each side.

(a) Left	(b) Right	
3	3	Child exhibits incurvation of the trunk on the non-weight bearing side, righting of the head, and abduction of the arm and the leg on the concave side of the trunk. Child must be able to sit independently.
2	2	Child exhibits incomplete trunk incurvation and incomplete extremity counterbalancing with some degree of head righting
1	1	Child exhibits minimal trunk incurvation with head righting but no extremity counterbalancing
0	0	Child makes no correction of trunk or extremities

Protective Extension - Backwards

ECAB 7 PROTECTIVE EXTENSION – BACKWARD

Place child in sitting. If child is unable to sit independently, support at the sides of the trunk as low as possible. Push child gently but rapidly backwards. Observe the child's ability to prevent a fall backwards.

(a) Left (b) Right

3	3	Child prevents a fall either by rotating the trunk and supporting weight on open hand or by extending both arms backwards and supporting on open hands
2	2	Child either rotates trunk and extends one arm or extends both arms backwards; however, weight is supported on fisted hands or child does not consistently prevent a fall
1	1	Child partially rotates trunk but does not extend elbow. Child may land on forearm
0	0	Child makes no attempt to prevent a fall

Protective Extension - Side

ECAB 6 PROTECTIVE EXTENSION – SIDE

Place the child in sitting. If the child is unable to sit independently, support at the sides of the trunk as low as possible. Push child gently but rapidly to one side. Observe the response of the child's arm on the side to which the child is pushed.

(a) Left (b) Right

3	3	Child prevents a fall with abduction of the arm, extension of the elbow, and support on open hand
2	2	Child abducts arm and extends elbow but supports on fisted hand or does not consistently prevent a fall
1	1	Child abducts arm but does not extend elbow. Child may land on forearm
0	0	Child makes no attempt to prevent a fall by abduction or extension of the arm

Choosing the Right Test

- Be picky!
- Choose tests that are:
  - ...pertinent to the complaint of parent or teacher
  - ...related to participation restrictions observed
  - ...appropriate to student's age, diagnosis, and other specific circumstances

Interpreting the Test Result

Decide whether you will use the result:

1. As data that can help direct recommendations and treatment
2. For measuring baseline and progress

Implications

- How do deficits in this area affect…
  - School Mobility
  - Classroom Mobility/Participation
  - Transportation
  - Toileting
  - Mealtime
  - Playground/Recess/PE
- In order to assist student achieve his/her IEP goals, what strategies would you employ with regards to these identified impairments?
  - Remediation
  - Compensation
- When would you use this test?

Documenting Basic Tests and Measures

- Relate! Relate! Relate!
- Write results under Part III. Individual Assessment
- Correlate results with actual school function and with reports and observations under Parts I and II

References

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