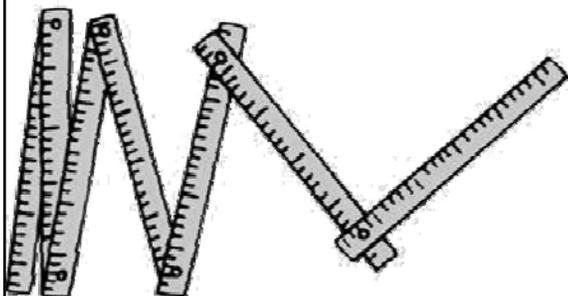


TESTS AND MEASURES



For
School Based
Physical
Therapy
Evaluations

Why should we use tests & measures?

- Objective documentation
- Support (or contradict) subjective reports and observations
- Measurable goals
- Comparison to the norm (if available)
- Baseline to measure progress



What tests are out there?

- Legend:
 - E: Equipment, materials needed
 - S: Starting position
 - D: Directions
 - M: Mean
 - C: Correlates to
 - N: Sample size
 - A: Additional information/comments



Timed Up and Down Stairs (TUDS) ¹

- E: Stopwatch, stairs (14 steps)
- S: Student wears shoes but no orthotics. Student stands 1 foot from the bottom of one flight of stairs (14 steps).
- D: Instruct child to “Quickly, but safely go up the stairs, turn around on the top step (landing) & come all the way down until both feet land on the bottom step (landing).”
- M: 8.1 sec (range 6.3-12.6 sec), age 8-14 yrs.
or 0.58 sec per step
- C: gait speed, stride length, fall risk, flexibility (ankle), fitness
- A: small sample; children with CP took 2x or more time to complete the task

Timed Up and Go (TUG) ^{1,2}

- E: Stopwatch, chair, tape or other marker
- S: Student is barefoot, sits with knees and hips bent 90°
- D: On “go” student stands up and walks 3 meters (9 ft 10 in) to a designated mark, turns around, walks back and sits on the chair.
- M: 5.2 sec (range 4.4-6.7 sec), 8-14 yrs. (N=27)
- C: gait speed, postural sway, functional mobility, balance; mobility functional skill and mobility caregiver assistance sections of the PEDI
- A: small sample, but result is similar to that found in a study with larger sample (N=180) from Pakistan

Timed Floor to Stand ³

- E: Stopwatch, tape measure, tape or other marker
- S: Student seated on floor in a cross-legged position.
- D: Student is asked to get up from floor, walk as quickly as possible for 3 meters (9 ft 10 in), turn around, walk back to starting line, and sit back down on the floor in cross-legged position.
- M: 6.6 sec (range 4.4-12.1 sec), age 5-22 yrs. (N=150)

Age (years)	Mean (seconds)	±SD
5-6	7.5	1.5
7-8	6.4	1.1
9-10	6.4	0.7
11-12	6.3	1.2
13-16	6.6	1.0
17-21	6.6	1.0

- A.: modification of TUG



Thirty-Second Walk Test ^{4,5}

- N: Tape measure, tape or other marker
- S: Demarcate a walking course using tape making sure to round off at the corners (-no sharp turns!)
- D: Instruct student to walk as if they are line leaders (walk not run), beginning when told and stopping when instructed (30 sec.). Measure the distance walked to the nearest inch. The student's forwardmost foot placement is determined by the most advanced part of the foot in contact with the floor (e.g. heel at heel strike, toes at midstance)



Thirty-Second Walk Test ⁵

- M: (N=302)

Age	Mean Distance (ft)	±SD
5	135.3	11.6
6	140.5	23.5
7	152.9	16.8
8	158.2	17.2
9	162.6	20.0
10	164.6	17.9
11	156.3	17.8
12	159.7	18.0
13	155.2	16.6
14	151.5	20.5
15	146.4	23.0
16	138.5	17.0
17	135.8	20.9

- A: Observation of gait can be noted. For secondary school students, the instruction is to walk a "natural and comfortable pace."



6-Minute Walk Test ⁶

- E: Tape measure, tape or other marker
- S: Mark a walking course in a large open space (gym, large corridor) with the tape, and place a cone or other marker at the starting point of each lap.
- D: At “go” student walks as fast as possible (without running) for 6 minutes. The therapist can provide verbal encouragement every 30 seconds. At the end of 6 minutes, measure laps completed and convert it to distance walked.



6-Minute Walk Test ⁶

- M: (N=328)

Age	Distance (in meters)
4	383 ± 41
5	420 ± 39
6	463 ± 40
7	488 ± 35
8	483 ± 40
9	496 ± 53
10	506 ± 45
11	512 ± 41

- C: exercise capacity at a submaximal level

Modified Energy Expenditure Index (EEI) ³

- E: HR monitor, tape or other marker
- S: Student wears a HR monitor.
- D:
 1. Student walks at a comfortable self-designated pace on a level pre-marked 50m lap course. HR and distance completed are recorded at the end of 3 min.
 2. Student walks at a fast self-designated pace on a level pre-marked 50m lap course. HR and distance completed are recorded at the end of 3 min.
- EEI = $\frac{\text{WHR}}{\text{Distance (in meters)} \div 3 \text{ min.}}$

Modified Energy Expenditure Index (EEI) ³

- M: (N=150)

Age	Comfortable walk	Fast walk
5-6	1.86 (+/- 0.19)	1.65 (+/-0.13)
7-8	1.73 (+/- 0.25)	1.56 (+/-0.15)
9-10	1.60 (+/- 0.23)	1.54 (+/-0.18)
11-12	1.46 (+/- 0.19)	1.40 (+/-0.15)
13-16	1.52 (+/- 0.24)	1.35 (+/-0.19)
> 16	1.56 (+/- 0.32)	1.40 (+/-0.23)

- Comment: EEI was modified by removing the resting HR from the equation. This improved the tests correlation to the 1-mile walk/run endurance measure.

Pediatric Reach Test (PRT) ^{7,8}

- E: Tape measure, paper, tape
- S: Student stands barefoot on a piece of paper that is taped to the floor. Tester traces students feet on the paper. One end of tape measure is secured to student's fingers while evaluator holds the other end. Record initial reading from tape.
- D: Student reaches one arm forward. Student is allowed to use whatever strategy he/she wishes as long as he/she does not touch the wall or take a step. Record final reading. Calculate final reading minus initial reading.

Pediatric Reach Test (PRT) ^{7,8}

- M: By age (N=116)⁷

Age	Mean Reach (cm)	Critical Reach (-2SD) (cm)
5-6	21.17	16.79
7-8	24.21	20.57
9-10	27.97	25.56
11-12	32.79	29.68
13-15	32.30	29.58

- By height (N=80)⁸
-7-16 y/o

Height (cm)	Mean (cm)	±SD
<130.2	23.07	4.34
130.2-148	30.66	4.45
148.1-168.5	33.61	5.18
>168.5	37.90	7.01

- C: forward weight shift, reach, postural control

Pediatric Balance Scale (PBS)^{9,10}

- E, S & D: The PBS is a 14-item test. Procedures and scoring for the PBS are very specific; view procedures and scoring sheets.

- M: (N=643)

Age	Mean	±1SD
4.0-4.5	49.5	5.76
4.6-4.11	51.2	5.07
5.0-5.5	54.0	2.52
5.6-5.11	53.3	3.20
6.0-6.5	53.8	2.49
6.6-6.11	54.4	1.89
7.0 & 13.7	55.2	1.74

- C: has a potential for discriminating between children developing typically and children with mild-severe disabilities
- A: takes 20 min. to administer

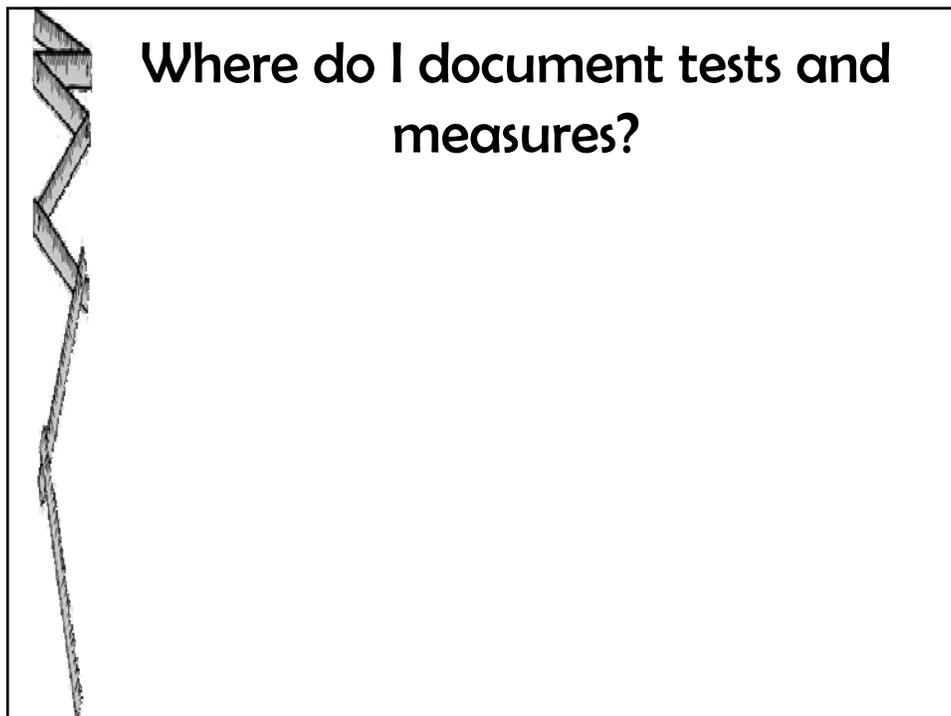
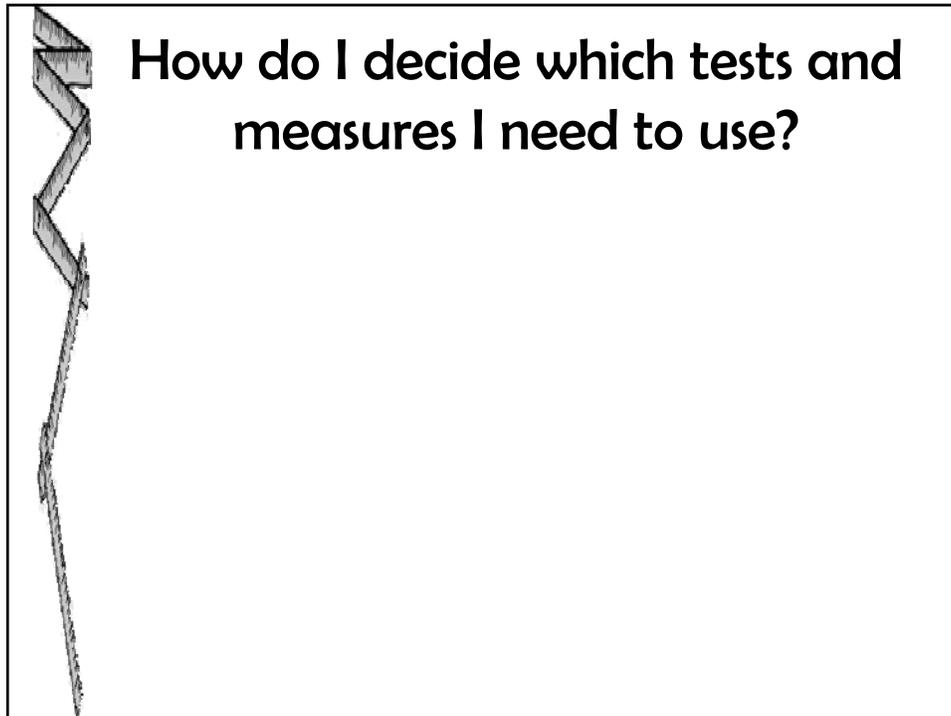
Shuttle Run³

- E: Stopwatch, tape measure, tape, 2 cones, 2 blocks
- S: Mark off 30 ft with 2 pieces of tape & cones; place 2 blocks at the line opposite to the starting line.
- D: At “go” student runs from starting line to the opposite line, picks up a block, runs back to the starting line, placing the block behind the line. The student repeats this for the 2nd block. Measure time to complete task

- M: (N=150)

Age (years)	Mean (seconds)	SD (+/-)
5-6	15.1	1.1
7-8	13.0	1.0
9-10	12.4	0.9
11-12	11.5	0.8
13-16	11.7	1.2
17-21	11.3	1.2

- C: speed and agility



References

1. **Timed Up and Down Stair Test: Preliminary Reliability and Validity of a New Measure of Functional Mobility.** Zaino, Christopher A.; Marchese, Victoria Gocha; Westcott, Sarah L. *Pediatric Physical Therapy*. 16(2):90-98, Summer 2004.
2. **Assessment of balance abilities in Pakistani children: a cultural perspective.** Habib Z, Westcott S, Valvano J. *Pediatr Phys Ther*. 1999;11:73-82.
3. **A physical performance measure for individuals with mucopolysaccharidosis type I,** *Developmental Medicine and Child Neurology*, 2006, Haley et al, 576-581.
4. **Standard Task Measurement for Mobility: Thirty-Second Walk Test.** Knutson, Loretta M.; Schimmel, Patricia Ann; Ruff, Andrew; *Pediatric Physical Therapy*. 11(4):183-190, Winter 1999.
5. **Age Expansion of the Thirty-Second Walk Test Norms for Children.** Knutson, Loretta M.; Bushman, Barbara; Young, Janice Clark; Ward, Gary; *Pediatric Physical Therapy*. 21(3):235-243, Fall 2009.

References

6. **The 6-minute walk test: normal values for children of 4-11 years of age,** *Archive of Childhood Diseases*, August 2007, Lammers AE, Hislop AA, Flynn Y, Haworth SG
7. **The Use of Functional Reach as a Measurement of Balance in Boys and Girls Without Disabilities Age 5 to 15 Years.** *Pediatric Physical Therapy*. 6(4):189-193, Winter 1994. Donahoe, Betsy MS, PT, PCS, et al.
8. **Effects of Measurement Method and Subject Characteristics on the Functional Reach Test in Typically Developing Children.** K Volkman, MS, PT, N Stergiou, PhD, W Stuberger, PhD, PT, D Blanke, PhD and J Stoner, PhD; Munroe-Meyer Institute at the University of Nebraska Medical Center, and University of Nebraska at Omaha
9. **Pediatric Balance Scale: A Modified Version of the Berg Balance Scale for the School-Age Child with Mild to Moderate Motor Impairment.** *Pediatric Physical Therapy*. 15(2):114-128, Summer 2003. Franjoine, Mary Rose MS, PT, PCS; Gunther, Joan S. PhD, PT; Taylor, Mary Jean MA, PT, PCS
10. **The Performance of Children Developing Typically on the Pediatric Balance Scale.** *Pediatric Physical Therapy*. 22(4): 350-359, Winter 2010. Franjoine et al.