



63RD CONFERENCE ON EXCEPTIONAL CHILDREN

Believing In Achieving

SHERATON FOUR SEASONS | KOURY CONVENTION CENTER | GREENSBORO, NC



Research Results from NYC Outcomes

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 PUBLIC SCHOOLS OF NORTH CAROLINA State Board of Education | Department of Public Instruction :: Exceptional Children Division

NOVEMBER 20-22, 2013

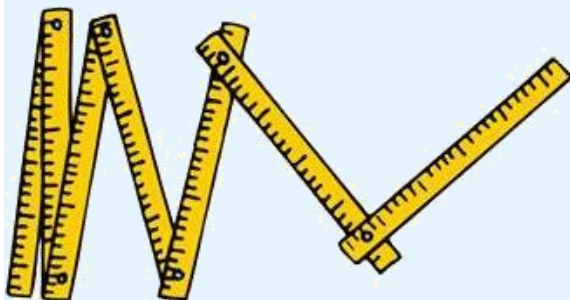
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Overview

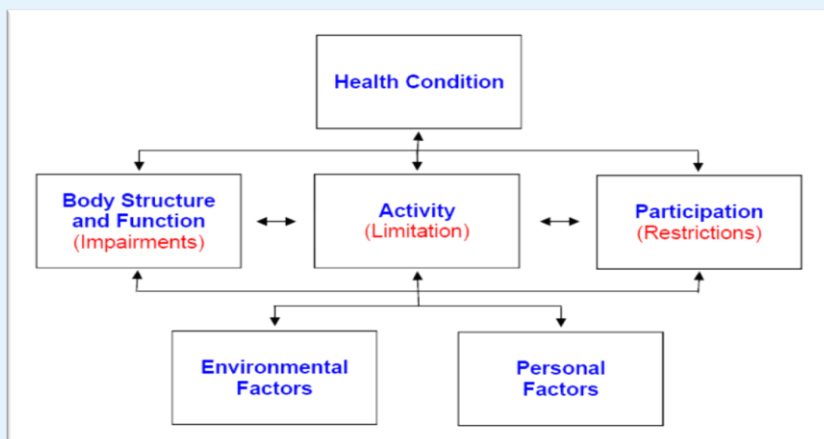
- ICF
- Preliminary data from NYC
- Comparison to previous data
- Lab
- Discussion
- Case Studies

MEASURE UP!



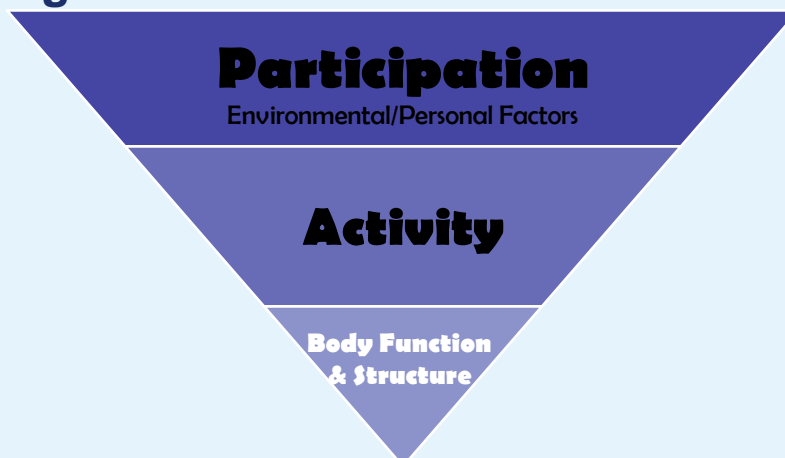
Expanding the
Norms of 5
Functional Gross
Motor Tests

ICF – International Classification of Functioning, Disability, and Health





Top-down Assessment Using the ICF Levels



ICF - Participation

- Tests and Measures
 - School Function Assessment (SFA)
 - Canadian Occupational Performance Measure (COPM)



ICF - Activity

- Tests and Measures
 - **Timed Up and Down Stairs (TUDS)**
 - **Timed Up and Go (TUG)**
 - Bruininks-Oseretsky Test (BOT-2)
 - Gross Motor Function Measure (GMFM)
 - Peabody (PDMS-2)
 - Movement ABC (MABC-2)
 - Test of Gross Motor Development (TGMD-2)
 - Functional Independence Measure for Children (WeeFIM)
 - **Timed Floor to Stand (TFTS)**
 - Pediatric Evaluation of Disability Inventory (PEDI)
 - Standardized Walking Obstacle Course (SWOC)
 - **30 second Walk Test (30sWT)**
 - **Shuttle Run (SR)**
 - And many others...



ICF – Body Function and Structure

- Tests and Measures
 - Manual Muscle Testing (MMT)
 - Range of Motion (ROM)
 - Tardieu Test
 - Energy Expenditure Index (EEI)
 - 6-Minute Walk Test (6MWT)
 - Pediatric Balance Scale (PBS)
 - Pediatric Reach Test (PRT)
 - Tests of Visual Motor Skills (TVMS-3)
 - Straight Leg Test
 - Ashworth Scale
 - And many others...



Challenges when Assessing Activity and Body Function & Structure Level

1. Lack of social context and relevance to actual school activities
2. Cost in time and materials to administer tests



Solution?

- Determine which tests:
 - Are functional and participatory
 - Can be conducted in the natural environment
 - Use equipment already available to the PT
 - Can be completed quickly



We Chose....

- Timed Up and Go (TUG)
- Timed Floor to Stand (TFTS)
- Timed Up and Down Stairs (TUDS)
- 30 Second Walk Test (30SW)
- Shuttle Run (SR)



Why did we choose these 5 tests?

- Easy and quick to administer
- Cost effective
- Mimic daily school activities
- Minimal equipment



Need to expand the norms:

- Sample sizes for prior studies are small
- Samples are not from a primarily urban population



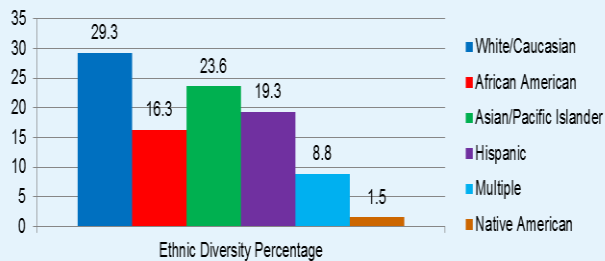
Pilot Study

- A pilot study was completed the summer before testing started to assure reliability of testers
- Based on the pilot study instructions for tests were modified

Sample

- 138 schools contacted, 26 agreed, 21 participated, 5 eliminated due to insufficient returns
- 1209-1483 students tested depending on the test
- 5 PT coordinated the study with 5 additional PTs on call to assist as needed

Sample



Study Protocol

- Meet with principal and principal consents to study
- Consent forms distributed
- Consent forms collected
- Consent forms reviewed to assure each subject met participation criteria
- Schedule created
- Students brought to testing area and sign Assent forms
- Height and Weight measured on test day
- All 5 tests completed at each school on either 1 or 2 days depending on number of participants
- Testing time was according to school schedule- students missed 1 period on the day of testing
- Each test was done twice and a mean score was obtained – instructions were only given prior to the first trial



Timed Up and Go



Timed Up and Go (TUG) ^{2,3}

- Assesses: Gait speed, transitions, functional mobility, balance...
- Equipment: Stopwatch, bench, tape or other marker, 2 cones (optional).
- Set Up: Place 2 pieces of tape 9ft 10in apart, with one strip in front of bench and opposite strip at least 3ft from wall.
- Starting position: Student sits on bench with knees and hips bent 90°, feet flat on floor, hands in lap.
- A demonstration was given prior to each group being tested
- Directions: "When I say go, stand up, walk to the line, turn around, walk back to the bench and sit down. Walk, don't run. 1,2,3 go."
- Scoring: Timed from "go" cue until student's bottom touches the bench.
- Redo: Student doesn't cross the line with both feet, runs, falls.



Preliminary NYC Norms for the TUG

Age	5yr	6yr	7yr	8yr	9yr	10yr	11yr	12yr	13yr	14yr
Mean	7.03	6.78	6.77	6.34	6.21	6.24	6.44	6.69	7.03	6.83
SD	1.27	1.17	1.16	1.17	1.01	0.96	0.89	0.92	0.97	1.04
N=	193	243	218	197	201	178	91	110	43	9
1483										

Previous Norms – TUG 4.25-6.19 sec (depending on age) 5-13 y/o
(N=180)



Timed Floor to Stand





Timed Floor to Stand ⁴

- Assesses: Transitions, balance, motor planning, coordination.
- Equipment: Stopwatch, tape measure, tape or other marker, 2 cones (optional).
- Set Up: Place 2 pieces of tape 3 meters (9ft 10in) apart.
- Starting position: Student sits on floor in a cross-legged position behind the tape, hands in lap.
- A demonstration was given prior to each group being tested
- Directions: "When I say go, stand up, walk to the line, turn around, walk back to the starting line, and sit back down with your legs crossed (9-14y/o), or criss-cross applesauce (5-8 y/o). Walk, don't run. 1,2,3 go."
- Scoring: Timed from "go" until student sits criss-cross on floor behind the tape with legs quiet.
- Redo: Student doesn't return to criss-cross position, both feet did not pass line, runs, falls.



Previous Norms - TFTS

- 6.6 sec (range 4.4-12.1 sec), age 5-22 y/o

Age (years)	Mean (sec)	+/- 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



Preliminary NYC Data for the TFTS

Age	5yr	6yr	7yr	8yr	9yr	10yr	11yr	12yr	13yr	14yr
Mean	8.92	8.55	8.40	7.90	7.97	7.95	8.08	8.22	8.86	8.27
SD	0.13	0.10	0.11	0.12	0.10	0.10	0.14	0.12	0.24	0.44
N=	191	237	208	194	200	175	96	108	39	11

6.6 sec (range 4.4-12.1 sec), age 5-22 y/o



Timed Up and Down Stairs





Timed Up and Down Stairs (TUDS) ²

- Assesses: Gait speed, stride length, flexibility, fitness...
- Equipment: Stopwatch, measuring tape, flight of stairs (14 steps).
- Set-up: Place tape one foot from the bottom step.
- Starting Position: Student stands behind the tape in front of the stairs.
- A demonstration was given prior to each group being tested
- Directions: "When I say go, quickly, but safely, go up the stairs, turn around on the landing, and come right back down. 1, 2, 3, go."
- Scoring: Time from "go" until both feet reach the bottom of the stairs.
- Redo: Student walks sideways, sliding down stairs, stops on the landing and needs cues to come down, falls.



Previous Norms - TUDS

- 8.1 sec (range 6.3-12.6 sec) or 0.58 sec per step
- Age 8-14 y/o
- N=27



Preliminary NYC Data for the TUDS

Age	5yr	6yr	7yr	8yr	9yr	10yr	11yr	12yr	13yr	14yr
Mean/ step	0.90	0.80	0.72	0.66	0.62	0.59	0.56	0.57	0.57	0.55
SD	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02
N=1467	194	241	213	194	200	175	93	103	43	11

8.1 sec (range 6.3-12.6 sec) or 0.58 sec per step



30 Second Walk Test





Thirty-Second Walk Test ^{5,6}

- Asses: Gait speed, endurance, functional mobility.
- Equipment: Stopwatch, measuring wheel, 4 cones, tape or other marker, open area with a perimeter of at least 200 ft.
- Set-up: Round off corners (place tape in arc starting 8 ft from the corner). Place a piece of tape on the floor for a starting position. Place a cone at each corner to demarcate.
- Starting Position: Student stands with feet behind the starting line.
- A demonstration was given prior to each group being tested
- Directions: "When I say 'go', walk around the gym, at a natural and comfortable pace (9-14 y/o) or like a line leader (5-8 y/o) until I say 'freeze'. Keep within the cones. Walk, don't run. 1, 2, 3, go."
- Scoring: At the end of 30 seconds, place tape at the most advanced part of the foot in contact with the floor. Measure the distance from the starting line to the end tape using the measuring wheel.
- Redo: Student runs, tandem walks, walks really slowly, falls, stop early.



Previous Norms – 30 SW

N = 302

Age (years)	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



Preliminary NYC Data for the 30SW

Age	5yr	6yr	7yr	8yr	9yr	10yr	11yr	12yr	13yr	14yr
Mean	127.92	140.11	141.78	149.62	152.37	162.86	159.07	151.63	148.85	146.18
SD	24.05	20.60	18.43	21.36	18.82	18.77	18.30	19.17	16.71	13.44
N= 1209	136	188	172	151	177	158	78	100	41	8



Shuttle Run





Shuttle Run ⁴

- Assess: Running speed, agility, coordination.
- Equipment: Stopwatch, tape measure, 4 cones, 2 blocks, tape or other marker.
- Set-up: Mark off 30 ft with 2 pieces of tape (~3 ft long), place a cone at the corners of the taped lines, and place 2 blocks behind one of the taped lines.
- Starting Position: Stand with feet behind the start line (the taped line opposite the one with the blocks). Student may stand in runner's stance.
- Directions: "When I say 'go', run, pick up a block, run back, put the block behind the starting line, then run, pick up the second block, and run back and put it behind the starting line. Don't throw the blocks. 1, 2, 3, go."
- Scoring: Time from 'go' until the second block is placed on the floor.
- Redo: Student throws the blocks, does not place the blocks behind the start line, needs cue to return for the second block, falls.



Previous Norms - SR

- 12.6 sec (range 9.0-16.7)
- Age 5-21 years
- N = 150

Age (years)	Mean (sec)	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



Preliminary NYC Data for the SR

Age	5yr	6yr	7yr	8yr	9yr	10yr	11yr	12yr	13yr	14yr
Mean	17.17	16.38	16.21	14.70	14.39	13.92	13.57	13.72	14.04	12.36
SD	0.25	0.12	0.14	0.13	0.11	0.12	0.19	0.23	0.26	0.44
N=	178	226	196	159	189	164	77	65	32	7
1293										

12.6 sec (range 9.0-16.7)



Let's try out the tests!

Survey: Participant Demographic Information
To be completed by Physical Therapist refer prior to testing
PARTICIPANT DEMOGRAPHIC INFORMATION AND TEST RESULTS

Consent Obtained Assent Obtained

Language of Consent _____

DOB: _____ Grade _____

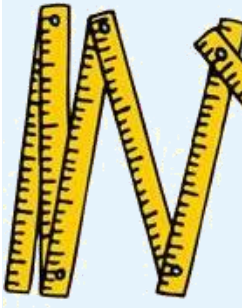
Gender Male Female

Anthropometrics: H₀: 1/0"=1.13 1/4"=1.25 3/8"=1.38 1/2"=1.5 5/8"=1.63 6/8"=1.75 7/8"=1.88
 BMI Rank: 1[under]=1-4% 2[healthy]=5-84% 3[over]=85-94% 4[obese]=95%

ID# _____

Ethnicity (Circle One)
 1 2 3 4 5 6 _____

Medical Alerts (Circle One)
 1 2 3 4 5 6 _____



Condition	Height	Ht. Conversion	Weight	BMI Percentile/Rank	Tester	Date
With Shoes	/8 in		.			
Without Shoes	/8 in		.			
With Shoes	/8 in		.			
Without Shoes	/8 in		.			

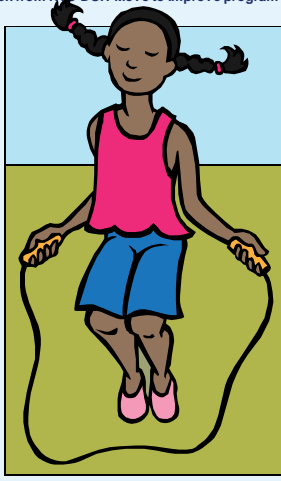
Test Results: # STAIRS _____ Hallway / Gym / Track _____

Inch conversion 1"=08 2"=17 3"=25 4"=33 5"=42 6"=5 7"=58 8"=67 9"=75 10"=83 11"=92


Date/Tester	TUDS	TUGS	TFTS	30-SecWT	Conversion	SR
Trial #1						
Comments						
# Trials						
Trial #2						
Comments						
# Trials						

True

Taken from NYC DOH Move to Improve program



False



Let's discuss....

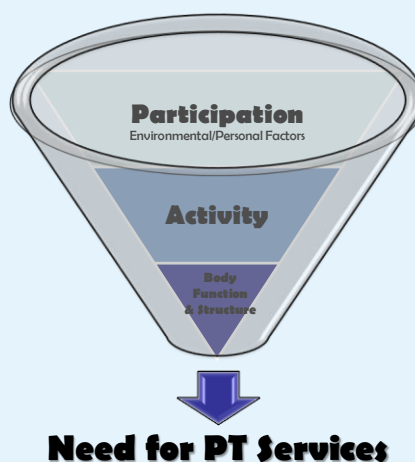


3 Ways of Utilizing the Tests

1. Determining need for services
2. Monitoring student's progress
3. Assessing efficacy of treatment

1. Determining Need for Services

- An evaluating therapist can use data gathered from the 3 ICF levels to determine appropriateness and need for PT services



1. Determining Need for Services

Case Study #1:

Johnny is a healthy, well behaved, 7 year old boy in a general education 1st grade class. He was evaluated by a school-based PT secondary to his teachers report that he is always left behind when walking between the classroom (1st floor) and gym (3rd floor). The PT observed Johnny during this transition and found that Johnny lags behind his class a full flight of stairs even with one verbal cue. Johnny uses a step to step pattern when descending the stairs. The PT then utilized the TUDS. Johnny performed the TUDS and went up/down a 14 step flight of stairs in 15.34 sec or 1.10 sec/step and walked 101.78 feet during the 30SW test.

- How would you interpret this data?
- What does Johnny need to succeed in the school environment?



2. Monitoring Student's Progress

- i. Choose an IEP goal that PT is addressing
- ii. Choose a standardized test and measure that is appropriate for the IEP goal
- iii. Measure baseline
- iv. Monitor progress on a regular basis



2. Monitoring Student's Progress

George (6 y/o) has an IEP goal of transitioning between his chair and the rug for circle time in a timely manner.

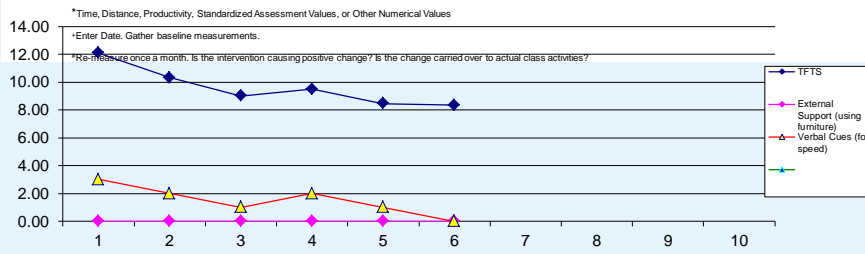
- Choose the Timed Floor to Stand
- Measure baseline data
- Set a goal
- Create a chart!
- Re-test George every 2 weeks



Evidence Based Practice

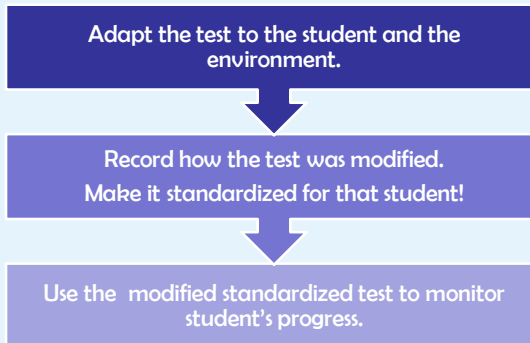
Name of Student: George

IEP GOAL:	George will be able to transition safely and independently to and from circle time, in time with his peers in order to be ready to learn.									
Outcome Measure*	BASELINE*	Month 2*	Month 3*	Month 4*	Month 5*	Month 6*	Month 7*	Month 8*	Month 9*	Month 10*
TFTS	12.09	10.32	9.00	9.50	8.45	8.34	GOAL MET			
External Support (using furniture)	yes	yes	yes	yes	no	no				
Verbal Cues (for speed)	3	2	1	2	1	0				
COMMENTS	TFTS 6 y/o Mean: 8.55 +/- 0.10			after winter recess						



2. Monitoring Student's Progress

- You can also make the test more relevant by following the steps below:



*Caution: Do not use available norms when interpreting results of a test that you modified.



3. Assessing Efficacy of Treatment

- i. Choose a therapeutic intervention that addresses student's IEP goal.
- ii. Choose a standardized test and measure that is appropriate
- iii. Measure baseline
- iv. Monitor progress on a regular basis



Documenting Tests and Measures

- Relate! Relate! Relate!
- Correlate results with actual school function
 - Ex. Johnny performed the Timed Up and Down Stairs in 1.10 seconds per step. This is significantly slower than the average 7 year old who walks up and down the stairs in .72 sec/step \pm 0.01 sec. This correlates to Johnny's difficulty when transitioning on the stairs between classes. His time on the 30 Second Walk test was 101.78 feet. The average 7 year old walks 141.78 feet \pm 18.43 feet in 30 seconds. Johnny walks significantly slower than others his age. This correlates to Johnny's difficulty in keeping up with his peers during hallway transitions.



Keep Up to Date

- New studies are always coming out, some with bigger samples; others pertain to performance of children with specific diagnosis, or from specific geographic area (e.g. rural vs. urban community).
- Always refer to the most up to date data that relates to the population you are testing!



A special thank you to the DOE PT's that assisted in the data collection and data entry...

- Liann Arnold-Lieban, PT
- Heaj Fico, PT
- Michelle Frohlich, PT
- Caren Goldberg, PT
- Debbie Salwen, PT
- Sujeeta Sippy, PT



Participating Schools

- 17 Elementary Schools
- 3 Middle Schools
 - 2 Staten Island
 - 3 Manhattan
 - 2 Bronx
 - 3 Brooklyn
 - 10 Queens



Thank you!



1. **Reliability and Validity of the Five-repetition Sit-to-stand Test for children with Cerebral Palsy.** Wang, Tze-Hsuan; Liao, Hua-Fang; Peng, Yi-Chun. *Clinical Rehabilitation*. 26(7): 664-671
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4. **A physical performance measure for individuals with mucopolysaccharidosis type I,** *Developmental Medicine and Child Neurology*, 2006, Haley et al, 576-581.
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6. **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.