Psychometric testing of M&P study measures

(note: most done within Move & PLAY study)

Definitions for words highlighted in blue ink can be found in our Glossary.

Description of measure	Results of psychometric testing
Muscle strength	

• Muscle strength measure developed for this study
• Assessed selected major muscle groups by observing the child moving while in different positions
• Muscle groups assessed were:
  • neck and trunk extensors and flexors (muscles that move the neck and trunk backwards and forwards)
  • hip extensors (muscles that move the hip back)
  • knee extensors (muscles that straighten the knee)
  • shoulder flexors (muscles that raise the arms forward)
	• A small sub-study was done to see if two therapists observing the child at the same time, could rate the child in the same way. This is called "inter-rater reliability"
	• We were able to show excellent reliability, meaning that the therapists' ratings were almost exactly the same (ICC=0.97; a perfect match would be "1")

Spinal Alignment and Range of Motion Measure[1] (SAROMM)	
• The SAROMM is used to measure range of motion (that is, flexibility around joints) • 4 items measure spinal alignment in the neck, upper back and lower back • 22 items measure range of motion and extensibility of all limbs	• "Inter-rater reliability" testing was done (2 different therapists rate the same child at the same time, to see if the same score is obtained) • "Test-retest reliability" testing was done also (the measure was done on 2 different occasions with the same child to see if the same score was obtained) • ICCs were above 0.80 for both of these tests, which shows very good reliability • "Validity" testing was done. Testing showed a significant contribution of Gross Motor Function Classification System (GMFCS) level and age to the SAROMM score (r^2 = .44)

Early Activity Scale for Endurance (EASE*):*	
• A new measure created by the research team • Parents rated their child's endurance (that is, how much energy the child has and how quickly the child gets tired during physical activity) • The measure started with 10 questions; these were later reduced to the 4 most useful questions.	• The shorter, 4-item measure was tested in a small sub-study to be sure it would be as reliable as the original 10 item measure • Parents filled out the short questionnaire on 2 occasions, on average about 3 weeks apart • Agreement between the 2 times was good (ICC=0.75) • Also compared it to one other activity measure (6 Minute Walk Test) to see if those scores were related to our EASE scores. We found a correlation of 0.52 with the 6 minute walk test
Early Clinical Assessment of Balance Measure (ECAB)	
• The ECAB is scored on a scale of 1-100 (higher scores mean better balance) • 13 assessment items using selected items from: -Pediatric Balance Scale (PBS) -items #1,5,6,7,10,13 -Movement Assessment of Infants-Adapted Automatic Reactions (MAI- AR) - all items except #6 • These 13 items were "weighted" to reflect their difficulty	• GMFCS level had a significant effect. Scores decreased as functional motor abilities decreased • ECAB scores correlated well with Gross Motor Function Measure scores (r= 0.95) • This provides some evidence of validity of the new measure. Further efforts on reliability and validity are underway

Child Engagement in Daily Life Measure

- A new measure developed by the research team
- 30 questions relating to:
    - **frequency of participation** in family/community life, leisure & recreational activities
    - **enjoyment** of participation in these activities
    - ability to do or help with **self-care activities** (feeding, dressing, bathing)
    - **ease of care-giving** for parent

Test-retest reliability:

- a small group of parents answered the questions at the 1st assessment and again, 3 weeks later
- 2 time periods were compared and ICC scores obtained
- ICC: a score that shows how good the match was. "1" is a perfect match and "0" means there was no match at all
    - Self-care section: almost a perfect match (ICC=0.96)
    - Participation and enjoyment: good match (ICC=0.70 for both)
    - Ease of caregiving: good match (ICC=0.76)
    - these results show this is a reliable measure for asking about these topics

Is the questionnaire a good measure of participation and self care?

- Rasch analysis done to find out the order of difficulty of the items in the questionnaire. This information helps with planning when children may be ready to try or learn new activities
- Results showed this questionnaire seems to be a good measure of participation and self-care

Sensitivity- to- change:

- Tested to show "change over time"; that is, change that would be expected as children develop new abilities as they get older
- Measure was done at the first and last assessments, one year apart
- Scores for Participation, Enjoyment and Self Care did change significantly over the one-year period in the way we expected
- Children were participating more, showing more enjoyment of their activities and self care abilities had improved
- This measure is good at showing change, when change is expected

Health Conditions	
• Used the World Health Organization's International Classification of Functioning, Disability and Health (ICF) to develop the questions about health conditions, from a functional point of view. The ICF is recognized as the best way to "measure" health and disability because it considers many factors related to a person's health • Developed a parent-administered instrument to measure problems with seeing, hearing, learning, communicating, controlling emotions, seizures, the mouth, teeth and gums, digestion, growth, sleeping, repeated infections, breathing, the skin, the heart and pain • For each item, participating parents were asked if their child had the problem (yes or no) and if "yes", to estimate the extent to which the problem affected their daily activities on an 8-point ordinal scale	Test-retest reliability: • Interviewed a small group of parents on 2 different days (at the first study visit and again 2 weeks later) to see if the answers they told us about their children's health would be the same each time • Answers matched very well, both for the number of health conditions and the impact of these conditions • This good agreement shows the questionnaire is reliable (reliability testing: number of conditions, ICC=0.80; for impact of conditions ICC=0.85; "1" would be a perfect match) Discriminant validity: • Tested to determine if the questionnaire would show the difference between groups of children (we grouped children using the 5 GMFCS levels) • Questionnaire was able to show significant differences in number and impact of health conditions between all 5 groups ($p<.001$) • This shows that the questionnaire is valid The Health Conditions questionnaire has sufficient reliability and validity for use in clinical practice and research.

Gross Motor Function Measure	**GMFM-66-B&C**
• **GMFM-66** widely used in clinical practice and research and is the "gold standard" to measure gross motor function in children with CP • Shortened version is the **GMFM-66**[2] ; it uses one of 4 sets of test items based on an individual child's ability • Developed a new, shorter method of using the GMFM**:** the **GMFM-66 B&C**[2] uses a "basal and ceiling" approach; the child is assessed using items that range between the easiest and most difficult levels of his or her abilities; scores can be obtained using as few as 15 items	• To find out if these shortened measures are as reliable and valid as the original, we tested the **GMFM-66 B&C and GMFM-66-IS**[3] **–** comparing them to each other and also to the original 66-item version • 2 assessments: (1) children were tested using both shortened versions and the full GMFM-66 (2) 2 weeks later, children were tested again with both short ones • On average, the GMFM-66 B&C used 16-17 items for testing, compared to the GMFM-66-IS, which used 32-33 items • The GMFM-66-B&C did take less time, on average, to complete (23 minutes compared to about 29 minutes for the GMFM-66-IS) • Scores obtained using either shortened version did not differ from scores using the original GMFM-66 • The majority of PTs who used both tests preferred using the GMFM 66 B&C (fewer items, items were more suitable to the individual child's abilities, difficulty in making decisions about which item set to test when using the GMFM-66-IS We assessed the 430 children in the Move & PLAY study using the GMFM-66 B&C: • GMFM-66 B&C scores were valid in showing differences in children by age and GMFCS level: ◦ effect of age: in general, scores were higher in older children (as would be expected) ◦ effect of GMFCS level: children classified as having higher motor function on the GMFCS scored higher on the GMFM-66-B&C Both shortened versions are valid and reliable. Both are appropriate for use in clinical practice and research to enhance efficiency of obtaining an estimate of gross motor functioning of children with CP. PTs found the GMFM-66 B&C preferable to use with preschool children and the measure was valid in showing differences in motor abilities related to age and GMFCS levels.

Service Questionnaire	
• Measure has 11 sub-scores: intensity of therapy service, amount of community recreation service, coordination of service, service meeting family needs, family centeredness of therapy, therapy focus on primary impairments, therapy focus on secondary impairments, therapy focus on activity, therapy focus on environment, therapy focus on self-care, and therapy focus on play	Test-retest reliability: • Data collected on a small group of children with CP • Parents completed the Service questionnaire via a phone interview by trained interviewers • Re-test data were collected through a phone interview, two weeks after the original assessment. • ICCs: .92 for total intensity of therapy services, .95 for amount of community recreation services, .88 for coordination of services, .61 for services meeting family needs, .86 for family centeredness of therapy services, .72 for therapy focus on primary impairments, .55 for therapy focus on secondary impairment, .95 for therapy focus on activity, .61 for therapy focus on environment, .74 for therapy focus on self-care, and .77 for therapy focus on play • This shows acceptable test-retest reliability except for secondary impairments

References:

1. Bartlett DJ, Purdie B. Testing of the *Spinal Alignment and Range of Motion Measure*: A discriminative measure of posture and flexibility for children with cerebral palsy. *Developmental Medicine and Child Neurology.* 2005; 47:739-743.
2. Brunton LK, Bartlett DJ. Validity and reliability of two abbreviated versions of the Gross Motor Function Measure. *Physical Therapy.* 2011;91:577-588.