

BACKGROUND

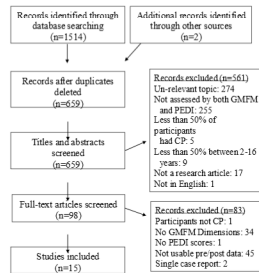
- Accurate assessment of children with cerebral palsy (CP) is crucial for program placement, treatment development, and goal establishment.
- Assessment measures of motor capacity tell us what a child is *capable* of accomplishing.
 - The Gross Motor Function Measure (GMFM) is a valid and reliable tool for measuring motor *capacity* in children with CP.
 - It contains 5 Dimensions: A-Lying and Rolling, B-Sitting, C-Crawling and Kneeling, D-Standing and E-Walking, Running & Jumping.
- Assessment measures of motor performance describes what a person *actually does* in his/her daily environment.
 - Pediatric Evaluation of Disability Inventory (PEDI) is a tool that uses parent/guardian reports to assess a child's function.
 - It contains 3 domains: Mobility, Self-Care and Social; each assessed with 2 scales, Functional Skills (FS), assessing *capability*, and Caregiver Assistance (CA), assessing *performance*.
- Clinicians looking to assess change are often limited by time to perform multiple assessment measures.
- A better understanding of how capacity and performance scores relate to each other will help clinicians interpret the results from one assessment tool in relation to another.



PURPOSE

This study aims to systematically review the literature reporting changes in capacity, capability, and performance in children with CP aged 2-16 by exploring the relationship between scores in the different domains of GMFM and PEDI assessments.

METHODS



Extensive literature search:

- Databases: PubMed, Psych Info, CINAHL, Sport Discus
- Search terms: Cerebral palsy, capacity, performance, Gross Motor Function Measure, Pediatric Evaluation of Disability, and MeSh terms.
- Dates: January 2000 - December 2017

Inclusion Criteria

- At least 50% of participants were children with CP aged 2 to 16 years
- Pre and post GMFM dimension scores were provided
- Pre and post PEDI scores were provided
- Study was a least a case-series design
- Full research article was available in English

Quality assessed with Downs and Black criteria.

Data were extracted from the studies and mean change scores recorded. Correlations between GMFM dimension and PEDI domain scores were calculated using Spearman Rho ($p < .05$)

The Relationship Between Motor Capacity and Performance in Children with Cerebral Palsy: A Systematic Review

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RESULTS

Fifteen articles were selected for the review, resulting in 21 study groups, including 495 children, for the data synthesis.

- Total GMFM-88: 17 groups, all positive mean change (1.2 to 11.4).
- PEDI Mobility: Functional Skills: 21 groups, 20 positive, 1 negative (-1.5 to 13.7); Caregiver Assistance: 10 groups, all positive (0.8 to 13.2)
- PEDI Self-Care: Functional Skills: 15 groups, 13 positive, 2 negative (-0.7 to 10.3); Caregiver Assistance: 10 groups, all positive (0.6 to 12.2)

Authors	Downs and Black Score	Sample (n)	GMFCS Levels	Intervention		GMFM-88 Dimensions Tested	PEDI Domains Tested
				Type	Length		
Begnoche et al. 2007	17	5	I-V	Traditional Therapy Combined with Partial Body Weight Treadmill Training	4 weeks	A, B, C, D, E, Total	MOBFS, MOBCA, SCFS, SCCA
Buckin et al. 2004	19	25	I-III	Selective Dorsal Rhizotomy vs Orthopedic Surgery	2 years	A, B, C, D, E, Total*	MOBFS*, MOBCA*, SCFS*, SCCA*
Chan et al. 2008	21	21	I-III	Selective Dorsal Rhizotomy	12 months	A, B*, C*, D, E*, Total*	MOBFS*, MOBCA*, SCFS*, SCCA*
Grecco et al. 2013	23	17	I-III	Treadmill Training	7 weeks	A, B, C*, D*, E*, Total*	MOBFS*, SCFS
				Overground Walking	7 weeks	A, B, C*, D, E*, Total	MOBFS*, SCFS*
Grecco et al. 2015	22	10	II-III	Gait Training	2 weeks	D, E*	MOBFS, SCFS
				Non-specified Weekly Therapy Intervention	24 weeks	A*, B*, C*, D*, E*, Total*	MOBFS*
Ko 2014	21	64	I-V	Bobath Neurodevelopmental Therapy (NDT)	6 weeks	A, B, C*, D, E*, Total*	MOBFS, MOBCA*, SCFS*, SCCA*
				Hyperbaric Air Therapy (HBA)	8 weeks	A, B, C, D, E, 88 global,	MOBFS*, MOBCA, SCFS*, SCCA*
Lusty et al. 2012	23	24	I-V	Hypnosis Oxygen Therapy (HTO)	8 weeks	A, B, C, D, E, 88 global,	MOBFS*, MOBCA, SCFS*, SCCA*
				Hyperbaric Air Therapy (HBA)	8 weeks	A, B, C, D, E, 88 global,	MOBFS* MOBCA*, SCFS*, SCCA*
Nordmark et al. 2000	22	18	II-V	Selective Dorsal Rhizotomy	6 months	A, B*, C*, D*, E, Total*	MOBFS*, MOBCA*, SCFS*, SCCA*
Odman et al. 2005	18	30	I-V	Move and Walk (conductive education)	14 days	A*, B, C, D*, E, Total	MOBFS, SCFS
				LEMO (learning motor skills)	14 days	A*, B*, C*, D*, E*, Total*	MOBFS, SCFS*
Sook Park et al. 2014	14	34/28	I-IV	Hippotherapy	8 weeks	A, B, C, D, E*, Total	MOBFS*, SCFS*
Vou-Vromans et al. 2005	18	55	I-II	Functional or NDT-based therapy	18 months	A, B*, C*, D*, E*, Total*	MOBFS*, MOBCA*, SCFS*, SCCA*
Wang et al. 2013	23	36	I-III	Patterned Sensory Enhancement (music) & No music	6 weeks	D*, E	MOBFS, MOBCA, SCFS, SCCA
Wright et al. 2005	22	9	II, IV, V	Conductive Education Programme	8 months	Effect size only; A*, B, C, D, E*, Total	MOBFS, MOBCA, SCFS, SCCA*
Wright et al. 2008	20	35	I-III	Botulinum Toxin Type A (BoNT-A)	2 months	D*, E*	MOBFS*, MOBCA*, SCFS, SCCA*

GMFCS: Gross Motor Functional Classification System; MOBFS: Mobility Functional Skills; MOBCA: Mobility Caregiver Assistance; SCFS: Self-Care Functional Skills; SCCA: Self-Care Caregiver Assistance
* Indicates significant change ($p < .05$ or effect size .8 or greater)

Correlations (N) Between Mean Change GMFM Dimension and PEDI Domain Scores

GROSS MOTOR FUNCTION MEASURE 88 (GMFM-88)	PEDIATRIC EVALUATION OF DISABILITY INVENTORY (PEDI)			
	MOBILITY: FUNCTIONAL SKILL (FS)	MOBILITY: CAREGIVER ASSISTANCE (CA)	SELF-CARE: FUNCTIONAL SKILL (FS)	SELF-CARE: CAREGIVER ASSISTANCE (CA)
TOTAL SCORE	0.842** (17)	0.683* (9)	0.139 (14)	0.783* (9)
DIMENSION A (Lying and Rolling)	.0280 (17)	0.444 (9)	-0.102 (14)	0.285 (9)
DIMENSION B (Sitting)	0.394 (17)	0.267 (9)	0.115 (14)	0.233 (9)
DIMENSION C (Crawling and Kneeling)	0.809** (17)	0.833** (9)	0.333 (14)	0.627 (9)
DIMENSION D (Standing)	0.569** (21)	0.294 (12)	0.044 (18)	0.112 (12)
DIMENSION E (Walking, Running, Jumping)	0.639** (21)	0.238 (12)	0.235 (18)	0.462 (12)

*Significant at the 0.05 level (2-tailed); **Significant at the 0.01 level (2-tailed)

- Dimension A:** 17 groups, all positive changes (0.100 to 9.0); moderate, non-significant correlation with PEDI Mobility CA
- Dimension B:** 17 groups, 15 positive changes (.6 to 14.5), 2 negative changes (-0.1, -1.7); no meaningful correlations
- Dimension C:** 17 groups, 16 positive changes (0.8 to 14.4), 1 negative change (2.0); Very strong, significant correlation with PEDI Mobility FS and PEDI Mobility CA; strong, non-significant correlation with PEDI Self-Care CA.
- Dimension D:** 21 groups, all positive changes (0.4 to 23.9); moderate, significant correlation with PEDI Mobility FS.
- Dimension E:** 21 groups, 20 positive changes (0.5 to 20.1), 1 negative change (-2.8); strong, significant correlation with PEDI Mobility FS, moderate, non-significant correlation was found for PEDI Self-care CA.

DISCUSSION

- More GMFM change scores correlated with PEDI functional skills change scores than caregiver assistance changes, a finding consistent with the idea of closer correlation between capacity and capability than with actual performance.
 - Controlled environment \rightarrow consistency \rightarrow performance
 - Standing, walking, running and jumping tasks (Dimensions D and E) may be influenced by other environmental and attentional demands
- Correlation between higher dimensions (C,D,E) on the GMFM and the PEDI scales indicated that change in these dimension areas is more likely to transfer into functional change within daily life.
 - Over 50% of participants were classified from Levels I-III (ambulatory)
 - These dimensions include aspects of greater and more functional mobility
 - Skills in the PEDI require complex motor planning and control, supporting that changes in lying, rolling and sitting will not alter performance on functional ADLs as much as changes in skills related to crawling and walking.

CONCLUSIONS

- In children with CP, correlations exist between measures of capacity and measures of capability and performance, although scores differ across areas.
- Correlations are higher with motor skills such as crawling, standing, and walking and are more consistently found for measures of capability than performance.
- Findings suggest that clinicians need to ensure emphasis on incorporation of skills into daily life for true performance change and should assess both motor capacity and performance to maximize the therapeutic effect on independent function.

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