Change in Gross Motor Function with Intensive Rehabilitation for Children and Youth with Acquired Brain Injury: A 10-year Retrospective Review

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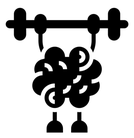
Background

Intensive physiotherapy shortly after acquired brain injury (ABI) facilitates important gains in functional gross motor skills.[1]

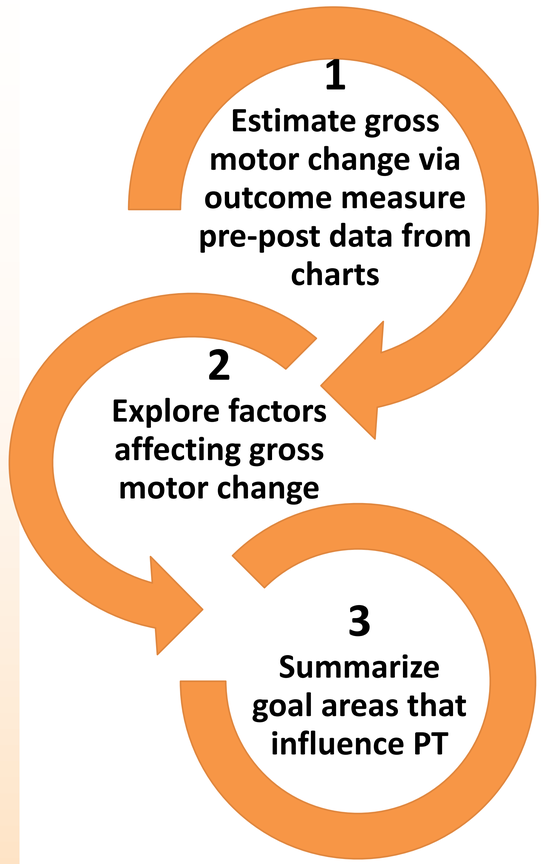
However, motor changes plateau over time, leaving children with ongoing balance and mobility concerns.[2]

New technologies are often explored as adjuncts to traditional physiotherapy (PT) to enhance these gains.[3]



The Gross Motor Function Measure (GMFM)[3] is used internationally to evaluate gross motor progress after ABI but GMFM change in inpatient PT is not well-documented, making it difficult to determine if adjunctive technologies are more beneficial than PT alone.

Research Objectives



Methods

Study Design: Retrospective chart review[4]

Inclusion Criteria:

- Inpatient ABI admission at Holland Bloorview Kids Rehabilitation Hospital between 01 Jan 2009 and 31 Dec 2019
- 5 to 18 years old
- Admission up to 6 months after ABI
- Minimum 6-week admission
- At least two GMFMs assessments completed OR one GMFM plus one of the following measures to give follow-up data:
  - Community Balance and Mobility Scale (CB&M)[5] x 2
  - 6-Minute Walk Tests (6MWT)[4] x 2, or
  - ≥ 1 set of scored Goal Attainment Scaling (GAS)[6]

Exclusion Criteria:

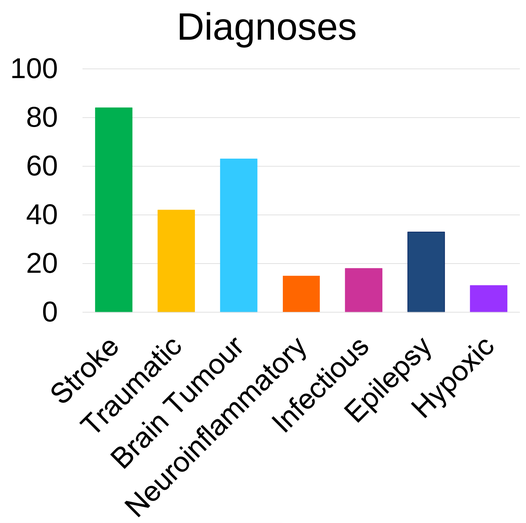
- Enrolled in a physiotherapy treatment-based research study during admission
- Readmission to acute care > 14 days

Results

- 266 eligible charts (546 screened)
- 88 children scored ≥ 95% on GMFM at admission

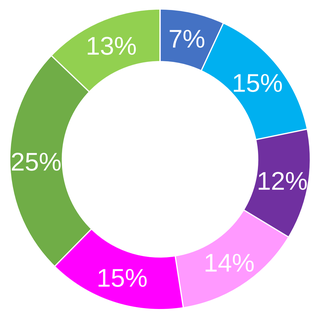
	GMFM	CB&M	6MWT
n	202*	89*	98*
Mean Age (years)	11.31 [3.84]	13.39 [2.81]	12.88 [3.24]
Mean Baseline Score	73.64% [27.98]	65.48% [15.88]	362.6m [141.9]
Mean Change Score	**18.03% [19.34]**	**17.85% [10.77]**	**142.3m [101.8]**

* Charts with outcomes repeated

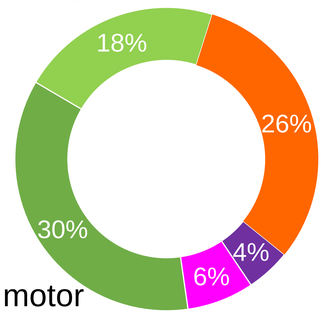


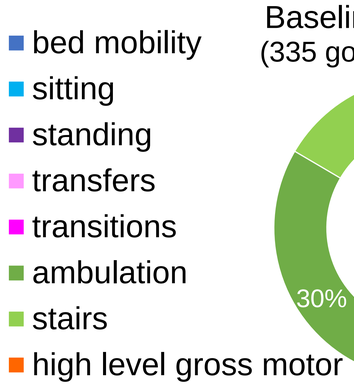
Gross Motor Goal Areas

Baseline GMFM < 50% (108 goals in 37 children)



Baseline GMFM > 50% (335 goals in 169 children)





Multiple Regression Results		GMFM Δ	CB&M Δ	6MWT Δ
	n	202	89	98
	R^2	0.7216	0.3348	0.3880
Factors Influencing Outcomes (p values)	Age	0.3323	0.1248	**0.0083**
	Sex	0.9457	0.9555	**0.0238**
	Diagnosis	0.0858	0.7584	0.5991
	Baseline Score	**0.0001**	**< 0.0001**	**0.0004**
	Time between Assessments	**0.0001**	0.2870	**< 0.0001**

Conclusions

- The GMFM detected gross motor change when children had greater mobility challenges to start
- However, the GMFM's known ceiling effect was often encountered when children were admitted with high level gross motor goals
- The CB&M detected change with higher level mobility concerns and showed no ceiling effect
- Lower baseline scores and more time between assessments were associated with larger change scores for GMFM, CB&M, and 6MWT
- Older males had greater change in walking speed (i.e., 6MWT) but there were no other age or sex differences detected

IMPLICATIONS: These clinically based outcome measure change scores can be used to compare traditional PT with new treatment adjuncts in children and youth with subacute ABI

References **1.** Dumas et al. The relationship between functional mobility and the intensity of physical therapy intervention in children with TBI. *Pediatr Phys Ther* 2004;16:157-64. **2.** Galvin et al. Predictors of functional ability of Australian children with ABI following inpatient rehabilitation. *Brain Inj.* 2010; 24(7-8): 1008-16. **3.** Storm et al. Minimum clinically important difference of gross motor function and gait endurance in children with motor impairment. *Biomed Res Int.* 2020; https://doi.org/10.1155/2020/2794036. **4.** Vassar et al. The retrospective chart review: important methodological considerations. *J Educ Eval Health Prof.* 2013;10:1-7. **5.** Wright et al. Reliability of the CB&M in school-aged children with ABI. *Brain Inj.* 2010; 24:1585-94. **6.** Turner-Stokes. GAS in rehabilitation: a practical guide. *Clin Rehabil.* 2009;23:362-370.