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Background

Intensive physiotherapy (PT) in the subacute stage of acquired brain injury (ABI) promotes motor recovery, but plateaus in recovery have a lasting impact on mobility and participation.¹⁻²

Transcranial direct current stimulation (tDCS) combined with motor skill practice has enhanced motor outcomes in children with cerebral palsy but has not been studied in pediatric ABI.³ tDCS during the subacute stage of recovery might be ideal due to the high potential for neuroplasticity.⁴



Figure 1. 1x1 tDCS unit (<https://soterixmedical.com>)

Research Question:

Is a 'PT+tDCS' protocol feasible in an existing inpatient pediatric ABI program?

Methods

Study Design: Randomized sham control feasibility trial⁵

Participants:

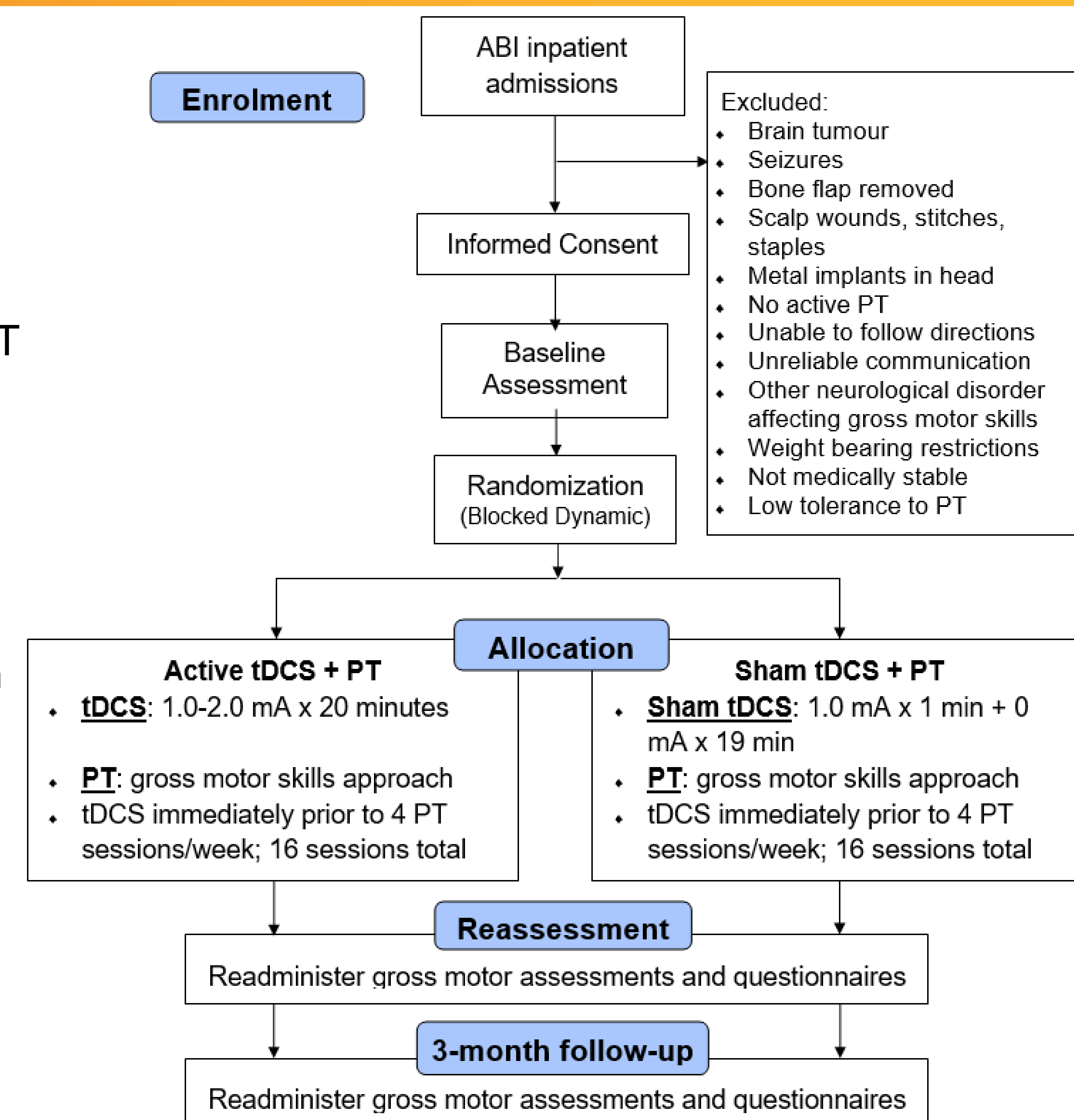
- Target sample size = 30
- 5-18 years old
- Moderate to severe ABI
- Inpatients on the Brain Injury Rehabilitation Team (BIRT) at Holland Bloorview Kids Rehabilitation Hospital
- JR screened admissions weekly in collaboration with BIRT PT and physician

Treatment:

- Anodal active/sham tDCS to bilateral primary motor cortices followed immediately by PT intervention
- 16 sessions over 4 weeks

Feasibility Indicators:

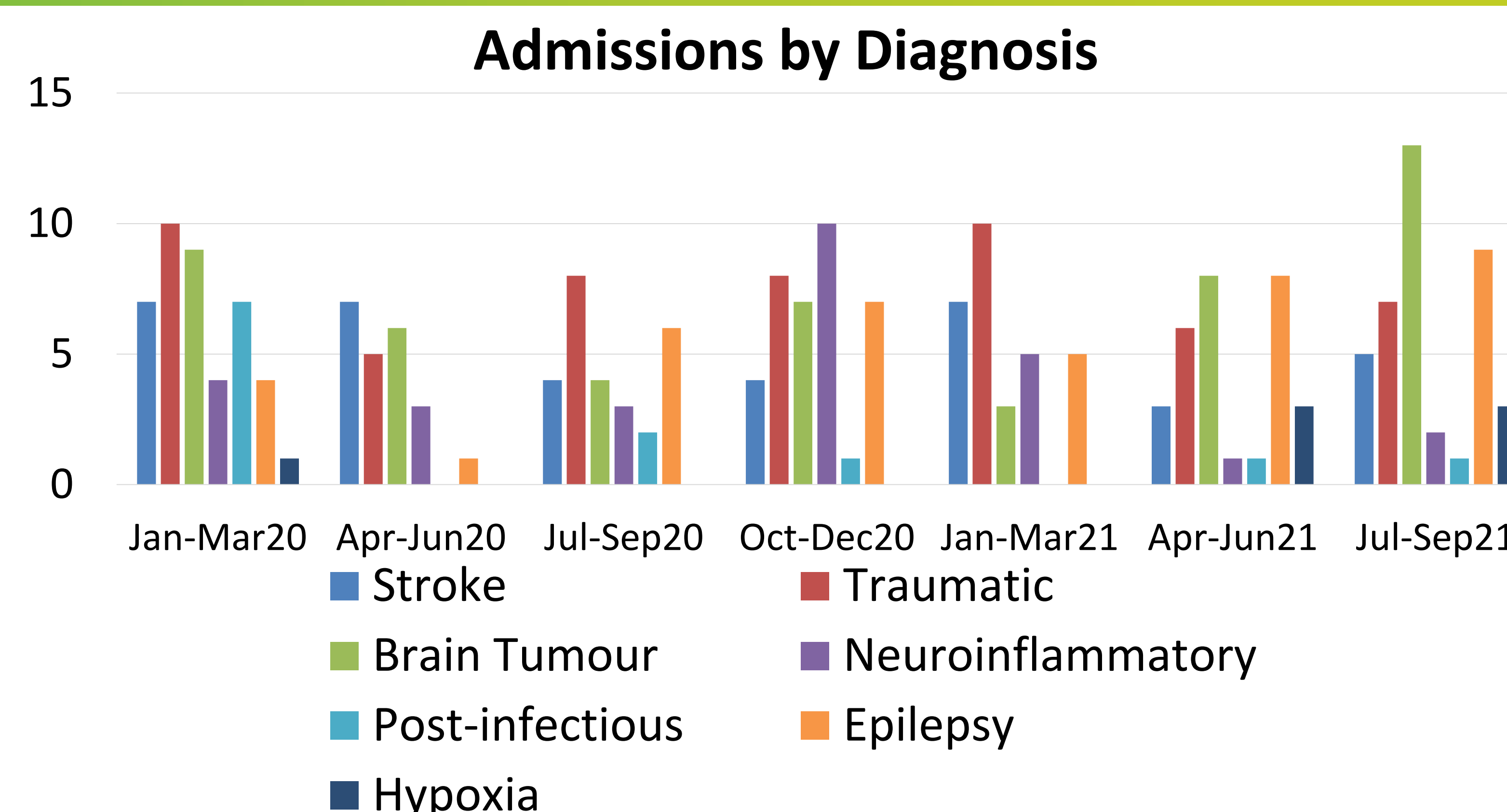
- Eligibility and recruitment rates
- Tolerance to tDCS
- Retention and adherence rates
- Change in gross motor function (core set of validated outcome measures)



Results

Table 1. Screening from Jan 1, 2020 to Sep 30, 2021.

Admissions	233
Mean Age (years)	8.9
Admissions 5-18 years	166
Met Eligibility Criteria	6
Enrolled	4
Completed Study Protocol	1



Program admissions who met eligibility criteria → **2.6%**

Eligible children who enrolled in the study → **67%**

Enrolled children who completed study protocol → **25%**

Table 2. Most frequent reasons for **STUDY EXCLUSION** in age eligible children

Reason	Total
Brain tumour*	37
Seizures	26
Communication and/or Behaviour Challenges	13
Short length of stay	12
No ABI PT goals	11
Bone flap removed, scalp incisions, etc....*	9
Decreased tolerance	9

*tDCS contraindication

Conclusions

- Study enrollment was far lower than expected
- The number of children admitted for rehabilitation after surgery for brain tumours or epilepsy contributed to **low study eligibility rates**
- Study **retention** was affected by changes in medical stability during admission
- Eligibility and retention may improve after discharge from inpatient rehab (i.e., once bone flap replaced, fatigue/tolerance improves, etc.)
- **Next step:** Evaluate the feasibility of a PT+tDCS protocol in outpatient children with 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): 1008-1016.
3. Saleem et al. Transcranial direct current stimulation in pediatric motor disorders: A systematic review and meta-analysis. *Arch Phys Med Rehabil.* 2019;100:724-738.
4. Nudo. Recovery after brain injury: mechanisms and principles. *Front Hum Neurosci.* 2013;7:987
5. Eldridge et al. CONSORT 2010 statement: extension to randomised pilot and feasibility trials. *BMJ.* 2016;355:15239.



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