The Early Motor Questionnaire (EMQ): An exploration of item structure by age

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Research Aims:

- Use large sample of parent-report EMQ data to:
  - **Develop age-independent scores**
  - Examine EMQ **stability over time**
  - Determine what factors influence motor development

Background

- Age is the strongest predictor of overall motor development
  - But skill onset varies significantly between children [1,2]
- Influences of age may mask impact of other factors on early motor development

Method

- 455 infants **ages 0.5 – 26 months** and their caregivers
  - recruited from 5 institutions
  - 167 families participated more than once at different ages
  - **total of 754 survey responses**
- Parent-completed EMQ with 3 sub scales
  - Gross motor **(GM)**
  - Fine motor **(FM)**
  - Perception-action **(PA)** development.
- Additional information collected
  - **gender** (n=754)
  - **birth weight** (n=521)
  - **parent perceptions** (n=283)

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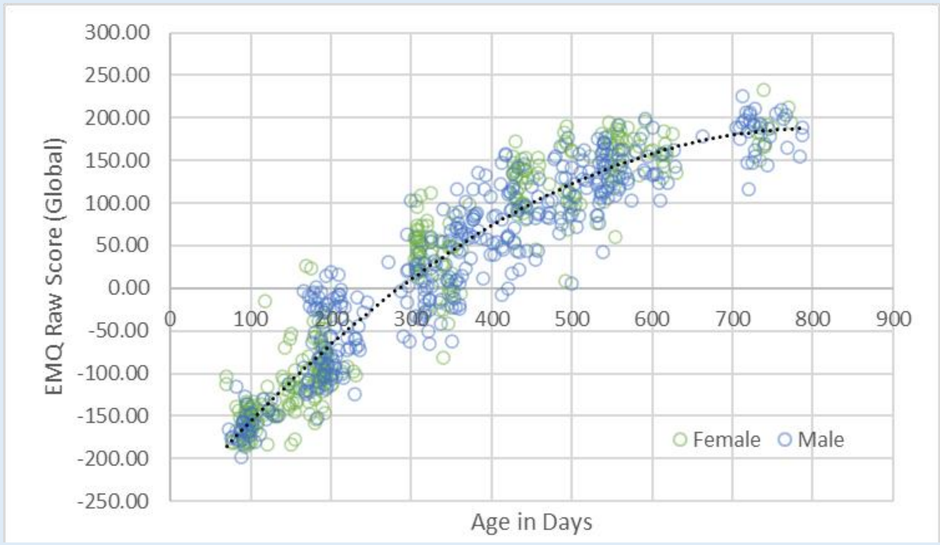
1) Polynomial trajectory of EMQ scores allows for calculation of standardized age-independent scores

$$y_{Global} = \left(\left(\frac{Obs_{Global} - \left((-0.0007 * age^2) + (1.107 * age) - 260.11\right) - 2.5619}{36.2596}\right) * 10\right) + 50$$

$$y_{GM} = \left(\left(\frac{Obs_{GM} - \left((-0.0003 * age^2) + (0.4719 * age) - 112.67\right) - 4.0798}{18.2196}\right) * 10\right) + 50$$

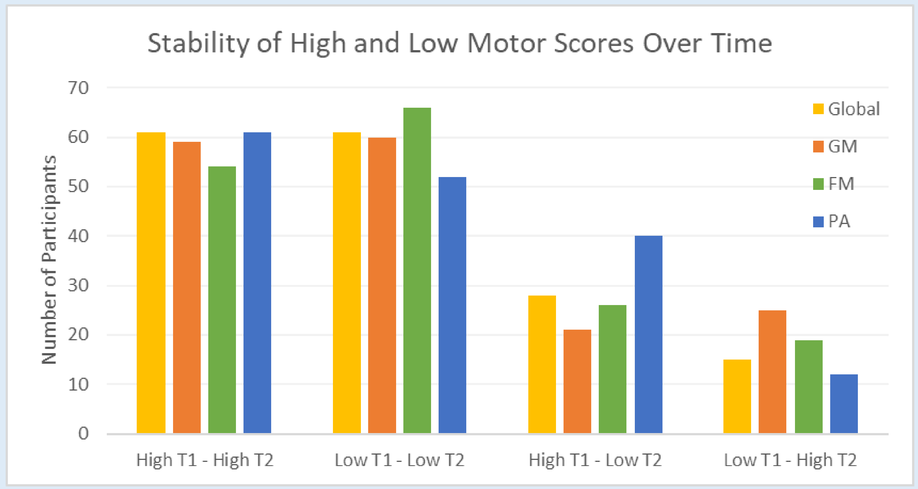
$$y_{FM} = \left(\left(\frac{Obs_{FM} - \left((-0.0003 * age^2) + (0.3903 * age) - 96.512\right) - 4.3476}{15.6245}\right) * 10\right) + 50$$

$$y_{PA} = \left(\left(\frac{Obs_{PA} - \left((-0.0001 * age^2) + (0.2448 * age) - 50.934\right) + 5.8595}{13.2185}\right) * 10\right) + 50$$



With our derived formulas, age-independent scores can be calculated for existing or future studies using the EMQ.

2) Age-adjusted EMQ scores are relatively stable over time



3) Gender and birth-weight may influence motor development

- Interaction between **gender and survey administration method on Global and GM scores**
  - Need to consider possible underlying effects of gender on other study variables in preliminary analyses
- **No effect of birth weight** in full-term children above 2500gm
  - But consistently reported in pre-term and low birth-weight infants[3]
- No effect of parent perceptions
  - **Confirming the absence of bias in parent reported motor development**

Future Directions

- Future planned analyses will study **impact of socioeconomic status** on motor development using age-independent scores
- Additional time points will be collected to explore the utility of age-independent scores in **characterizing the trajectory of motor development**

References

1. Adolph, K. E., Young, J. W., Robinson, S. R., & Gill-Alvarez, F. (2008). What is the shape of developmental change? Psychological Review, 115(3), 527-543. doi:10.1037/0033-295x.115.3.527
2. Libertus, K., & Smith, D.K. (2020). Milestones: Physical Development from Birth to Age 3. In J. B. Benson (Ed.), Encyclopedia of Infant and Early Childhood Development (2nd ed.): Elsevier.
3. De Kieviet, J. F., Piek, J. P., Aarnoudse-Moens, C. S., & Oosteriaan, J. (2009). Motor development in very preterm and ver low-birth-weight children from birth to adolescence: A meta-analysis. JAMA, 302 (20), 2235-2242. doi:10.1001/jama.2009.1708

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