VIRGINIA COMMONWEALTH UNIVERSITY

The Impact Of Increasing Sitting Ability And Age In Developing Early Problem Solving Skills

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Introduction & Purpose

- The development of infant motor function can support meaningful interactions with the environment.
- Problem solving, a cognitive process, is grounded in infants' everyday experiences. [1]
- Infants who are more stable sitters may be more capable of exploring objects. [2,3]
- The purpose of this analysis is to evaluate if there is change in early play-based problem solving skills in response to change in sitting ability.
- As sitting ability increases, the frequency of early problem solving skills may also increase.

❖ Participants

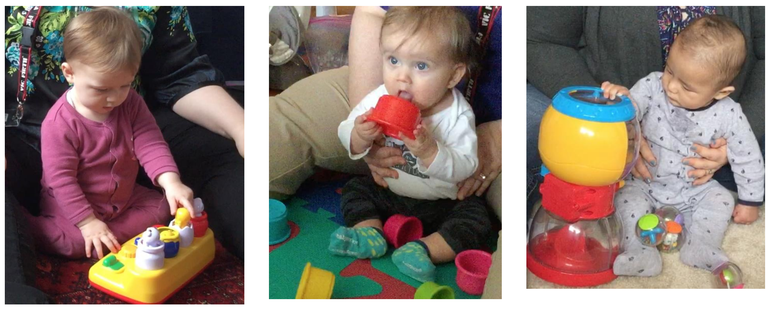
- 34 typically-developing infants
- 54.55% female infants, 9.09% of Hispanic origin
- Baseline enrollment range: 4.0-6.9 months
- Baseline mean age: 5.68 months
- Infants were enrolled at the onset of sitting
  - Sit arms free or propped minimum 3 seconds
  - Without the ability to move in and out of sitting
  - Younger than 7 months of age

❖ Assessment

- Assessment visits completed at baseline, after 3 weeks, and after 6-8 weeks.
- Assessments were video-taped to allow for scoring afterward.

▪ **Early Problem Solving Indicator[1] (EPSI):** measure of early problem solving used during play with 3 standard toys (cups, popup, gumball) (Figure 1)
  - Assessors presented each toy for 2 minutes while supporting the infant in sitting
  - Datavyu 1.3 was used by reliable coders to quantify the frequency of four behaviors (looking, exploration, function, solution).

Figure 1. Popup, cups, and gumball toy



▪ **Gross Motor Function Measure Sitting Scale[3] (GMFM-SS):** - standardized assessment of sitting skills in children
  - Assessors observed and tested infant's gross motor ability, based on GMFM Sitting Scale (GMFM-SS)

Results

❖ Analytic Plan

- Multilevel modeling was used to evaluate whether sitting ability uniquely predicts frequency of problem solving behaviors using the software program, SAS 9.4.
  - Time (level 1) was nested within infants (level 2).

▪ EPSI Variable: Weighted frequency was summed across all three tasks with a total time period of 6 minutes. [1]
  - looks, explores - 1 point • functions - 2 points
  - solutions - 3 points

▪ GMFM-SS Variable: Scores were summed to produce raw scores. [4]
  - 0 - does not initiate • 1 - initiates
  - 2 - partially completes • 3 - completes
  - Mean sitting ability at baseline = 15.618
    - Below average sitters = 1 SD below mean sitting ability at baseline
    - Average sitters = within -1 SD and +1 SD from the mean sitting ability at baseline
    - Above average sitters = 1 SD above mean sitting ability at baseline.

❖ Findings

- The final model indicated significant quadratic effects of age (γ_{20}=-10.72, t(85.4)=-2.98, p<0.01) and baseline sitting ability (γ_{02}=-.58 t(31)=-2.12, p=0.04) on EPSI score.
- No interactions between sitting and age were found.

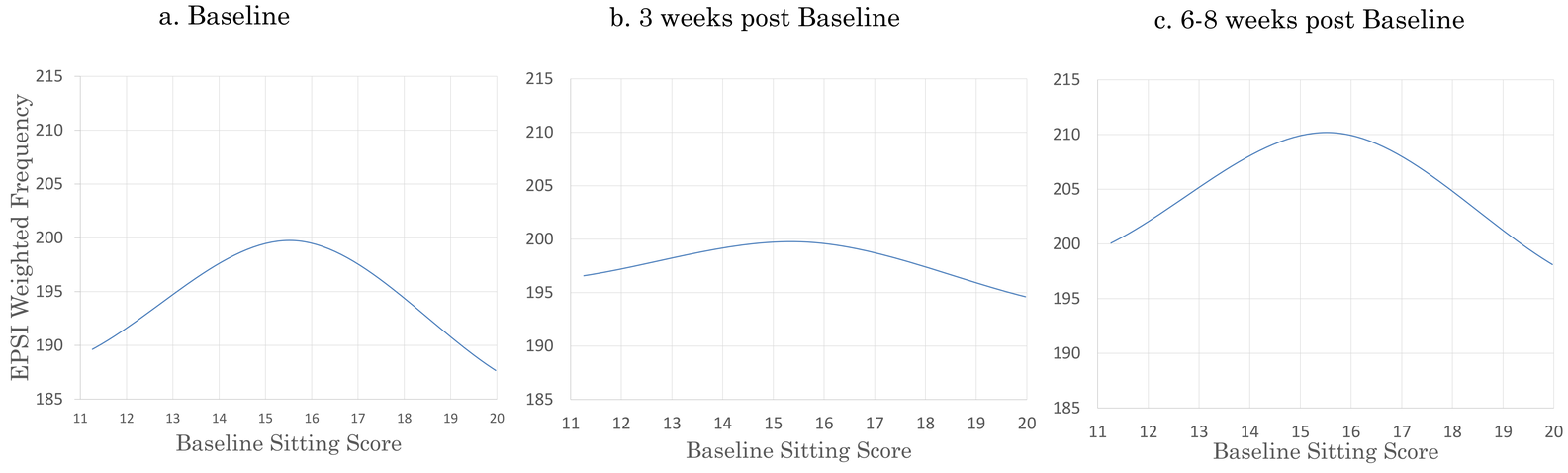
▪ **Age Effects** †
1. At baseline visit, there was a linear effect of age on EPSI score (γ_{10}=21.93, t(95.5)=2.89, p<0.01).
2. At 3 weeks post baseline, there was no linear effect of age on EPSI score (γ_{10}=5.77, t(95.6)=1.18, p=0.24).
3. At 6-8 weeks post baseline, there was no linear effect of age (γ_{10}=-13.54, t(87.7)=-1.73, p=0.09).

† These analyses were centered on mean sitting ability at baseline.

▪ **Baseline Sitting Ability Effects** † (Figure 2)
1. Below average sitters: there was no linear effect of baseline sitting ability on EPSI score (γ_{01}=4.87, t(30.2)=1.54, p=0.13).
2. Average sitters: there was no linear effect of baseline sitting ability on EPSI score (γ_{01}=-0.23, t(33.4)=-0.16, p=0.87).
3. Above average sitters: there was a linear effect of baseline sitting ability on EPSI score (γ_{01}=-5.32, t(34.3)=-2.31, p=0.03).

† These analyses were centered on mean age at the 3 weeks visit

Figure 2, a-c: Effects of Age and Baseline Sitting Ability on Problem Solving Behaviors



Discussion

- At baseline, infants may be more interested in sitting and playing with toys that at other time points.
  - Simple actions (banging, mouthing) may be repeated more often, but the quality of interaction may change with time.
- Unexpectedly, above average sitters decrease in their frequency of problem solving behaviors.
  - These infants may be less engaged with sitting and stationary play, once they are capable of locomotion.
- Future study may explore how position (sitting, standing, squatting) or locomotion (crawling, scooting, walking) changes how infants explore their environment.

References

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[4] Gross Motor Function Measure (GMFM). (n.d.). Retrieved October 16, 2017, from https://www.canchild.ca/en/resources/44-gross-motor-function-measure-gmfm

Acknowledgements

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