Early Growth in Math Skills Predicts High School Math Achievement

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AIM

- Previous research demonstrates the strong link between early levels of academic and attention skills and later achievement.
- This poster asks whether early growth in academic and attention skills predicts achievement measured as late as adolescence?

MODEL

- If an early skill matters for later achievement, then the children with the largest increases in that skill should be most successful later on.
- This leads to the expectation that $\beta_1$ in the following equation is positive and significant for skills that matter most:

$$ \text{Achievement}_{\text{LATER}} = \beta_0 + \beta_1(\text{Skill}_{\text{TIME-2}} - \text{Skill}_{\text{TIME-1}}) + \beta_2 \text{Controls} + \text{Error} $$

METHODS

- We use the NICHD Study of Early Child Care and Youth Development (SECCYD) dataset, a longitudinal study of 1364 children from birth through high school.
- The current study employed a subsample (n=924) of children who did not have missing data on key 54 month and 1st grade independent variables. To account for missing data, full information maximum likelihood (FIML) was used.
- Participants were 52% male. Participant ethnicity was 77% White, 12% Black, 6% Hispanic, and 4% other. The average income to needs ratio for the sample was 3.68 (SD= 2.87).

- Additional Covariates:
  - Cognitive functioning
  - Bracken at 36 months
  - Bayley at 24 months
  - Temperament (6 months and 1 month)
  - Externalizing and Internalizing (24 months)
  - Health (24 months)
  - Birth-weight
  - Gender
  - Ethnicity
  - Temperament (6 months and 1 month)
  - Mortality depression, education level, PPVT score
  - Family income and family structure
  - Home Environment (H.O.M.E at 36 months)

- Academic Skills:
  - Woodcock Johnson Psycho-Educational Battery- Revised (WJ-R)
  - Math: Applied Problems (54 months, 1st grade, 3rd grade, 5th grade, and age 15)
  - Language Skills: Letter Word Identification (Reading), Memory for Sentences (Memory), Incomplete Words and Picture Vocabulary (Vocabulary) (54 months and 1st grade).
  - WJ-R subtests were standardized to the national norms (M= 100, SD= 15)

- Attention and Impulsivity:
  - Continuous Performance Task (54 months, 1st grade)

- Subjects

LIMITATIONS

- As with any non-experimental, longitudinal, study, unobserved variable bias is of concern. However, because we related growth in our independent variables of interest to later outcomes, the risk of unobserved variable bias has been substantially limited.
- Because we use a lagged model (same measurements taken at different time points) to predict later math achievement, measurement error is of particular concern and warrants further analyses.

CONCLUSIONS

- Math learning between 54 months and 1st grade has surprising predictive power 8 years later.
- Gains in language and attention skills are not consistently predictive of later achievement.
- One standard deviation (SD) of growth in math ability between age 4.5 and 6 is related to a .35 SD gain in math achievement at age 15.
- These results suggest later math success may be improved with early grade math interventions.

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