

## Interactions between mental health and executive functions (#11959)

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### 1) Have any data been collected for this study already?

It's complicated. We have already collected some data but explain in Question 8 why readers may consider this a valid pre-registration nevertheless.

### 2) What's the main question being asked or hypothesis being tested in this study?

How do mental health and executive functions interact during development?

### 3) Describe the key dependent variable(s) specifying how they will be measured.

- Mental health will be measured by
  - o Center for Epidemiological Studies Depression Scale
  - o Child Behaviour Checklist
  - o Loneliness and Social Dissatisfaction Questionnaire for Young Children
  - o State Anger Items from the Spielberger State-Trait Anger Expression Inventory
  - o Children's Depression Inventory
- Executive function will be measured by
  - o Woodcock-Johnson Test
  - o Tower of Hanoi
- We will also include potential moderators in our analysis:
  - o Age
  - o Puberty
- We will investigate potential early risk factors
  - o Family finances
  - o Parent-child/adolescents interaction task (both mother and father)
- We will assess potential late risk factors
  - o Peer relationship questionnaires

### 4) How many and which conditions will participants be assigned to?

N/A

### 5) Specify exactly which analyses you will conduct to examine the main question/hypothesis.

We will use Latent Growth Models (LGMs) and Growth Mixture Models (GMMs) for our research questions.

Hypothesis 1. Mental health remains stable or decreases over time and mental health trajectories show individual differences.

- We predict a negative or non-significant slope intercept and significant slope variance in a univariate LGM.
- We predict the presence of different trajectories in the cohort, as indicated by GMMs. We will correlate the slope parameter for each individual with early and late risk-factors.

Hypothesis 2. Executive functions increase over time and trajectories show individual differences.

- We predict a positive slope intercept and significant slope variance in a univariate LGM.
- We predict the presence of different trajectories in the cohort, as indicated by GMMs. We will correlate the slope parameter for each individual with early and late risk-factors.

Hypothesis 3. Mental health and executive functions are linked cross-sectionally and longitudinally.

- We expect a positive correlation between intercepts of mental health and executive functions and between slopes of mental health and executive functions in the bivariate LGM. We also expect a positive residual correlation at each wave.

Hypothesis 4. Initial mental health predicts changes in executive functions over time and vice versa.

- We expect a positive relationship between the intercept of mental health and the slope of executive functions in the bivariate LGM.

- We also expect a positive relationship between the intercept of executive functions and the slope of mental health.

Hypothesis 5. The coupling between mental health and executive functions changes with age and puberty.

- We expect that coupling strength stays the same or increases around the onset of puberty and the beginning of adolescence.

**6) Describe exactly how outliers will be defined and handled, and your precise rule(s) for excluding observations.**

We will exclude scores above a univariate z-score of 5. Otherwise, we will not impose any exclusion criteria on the data provided by NICHD's Study of Early Child Care and Youth Development (SECCYD) in June 2018.

**7) How many observations will be collected or what will determine sample size? No need to justify decision, but be precise about exactly how the number will be determined.**

We will use data from phase 2-4 (1st grade, 3rd grade, 5th grade and age 15) of the SECCYD cohort. See <https://www.nichd.nih.gov/research/supported/seccyd/overview> for details.

**8) Anything else you would like to pre-register? (e.g., secondary analyses, variables collected for exploratory purposes, unusual analyses planned?)**

All of the data we are planning to use stem from an existing, publicly available dataset. The study was preregistered here before accessing the data (i.e. no data inspection or analysis has taken place prior to this preregistration).

We will use univariate and bivariate LGMs to answer our research questions (1-5) above. R's lavaan will be used for hypothesis 1-4. OpenMX and semtrees will be used for hypothesis 5. We will use MPLus to additionally estimate GMMs for hypothesis 1 and 2.