Helping Parents to Support Children's Math Learning (#12218)

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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?
The research evaluates the efficacy of inducing parents to hold a growth mindset in which math ability is viewed as malleable, with failure providing an opportunity for learning. The central hypothesis is that a growth mindset (e.g., viewing math ability as malleable or seeing math failure as productive) leads to parenting practices that enhance children's math learning via a motivational orientation that sustains children in the face of challenge. There are four specific hypotheses:

Hypothesis 1. When parents are induced to hold a growth mindset about math ability, they use parenting practices that facilitate children's math learning—namely, more autonomy-supportive (vs. controlling), mastery (vs. performance) oriented, and affectively positive (vs. negative) assistance with their children's math homework as well as more process (vs. person) language in talking about math performance with their children.

Hypothesis 2. The parenting practices around math ensuing from parents' growth mindsets about math ability lead to enhanced motivation and ultimately achievement in math among children.

Hypothesis 3. Scaffolding contexts (e.g., non-threatening opportunities to talk about math performance) support parents in enacting practices around math with their children that are in line with their growth mindsets, thereby strengthening the effects of such mindsets.

Hypothesis 4. Inducing parents to hold a growth mindset about math ability will be particularly effective for families at risk due to such factors as their socioeconomic background (e.g., parents' educational attainment), ethnicity, or children's achievement history.

3) Describe the key dependent variable(s) specifying how they will be measured.
Dependent variables are assess prior to the growth mindset induction (i.e., pre-intervention) and then three months later (i.e., post-intervention 1) and a year later (i.e., post intervention 2), although some methods (e.g., daily reports) are only used at one of the assessments. There are two sets of dependent variables.

Parents' practices and beliefs. Parents' practices around math are examined in two contexts: (1) Assisting children with homework (e.g., autonomy-supportive vs. controlling assistance) and (2) responding to children's performance (e.g., person- vs. process-oriented responses). Retrospective surveys, daily checklists, and laboratory observations are used. Parents' math-related beliefs (e.g., malleability mindsets and failure mindsets) are assessed with surveys. Child motivation and achievement.

Children's math motivation (e.g., math liking and growth beliefs) is assessed in individual interviews; teacher reports are also used. Children's math achievement is assessed with the Woodcock Johnson; teacher and record data is also being collected.

4) How many and which conditions will participants be assigned to?
The project is characterized by a 2 (Mindset: Growth vs. Control) x 2 (Scaffolding: Math Activities vs. Non-math Activities) design with three waves of data collection over 18 months (see above). Participants will be randomly assigned to each condition, within children's gender, grade (1st vs. 2nd), and school district.

5) Specify exactly which analyses you will conduct to examine the main question/hypothesis.
Hypothesis 1. Analyses will first examine whether the growth mindset induction enhances parents' beliefs (e.g., beliefs that failure is an opportunity for learning) and parenting around math (e.g., support of children's autonomy when assisting with homework). To this end, Mixed Model Multivariate Analyses of Variance (MANOVAs) including Mindset Condition, Wave, and Type of belief or parenting will be conducted. Growth curve modeling may be used instead or in addition to these analyses. Mediation analyses in the context of Structural Equation Modeling (SEM) will examine if the effects of the mindset manipulation on parenting are due at least in part to parents' mindsets; growth trajectories of parenting may be included in these analyses.

Hypothesis 2. The second set of analyses will examine whether the growth mindset induction and the parenting practices anticipated to ensue from the induction contribute to children's math motivation and achievement. The measures of children's motivation and achievement will be submitted to MANOVAs or growth curve modeling similar to those described above. These analyses will be followed by mediation analyses in the context SEM to test if the effects of the mindset induction on children's motivation and achievement occur via parenting practices; these models may include growth trajectories

(e.g., of children's motivation).

Hypothesis 3. To examine if the growth mindset induction has the largest benefits when parents are provided with a scaffolding context, scaffolding condition will be added to the MANOVAs or growth curve modeling described for testing Hypotheses 1 and 2. If as anticipated there are Scaffolding Condition x Mindset Condition interactions, these will be incorporated into the mediation analyses described above.

Hypothesis 4. To identify if the mindset induction is most effective for families at risk, we will add indicators of risk (e.g., parents' educational attainment and ethnicity as well as children's prior achievement) to the MANOVAs or growth curve models as moderators with a similar approach taken in the SEMs.

6) Describe exactly how outliers will be defined and handled, and your precise rule(s) for excluding observations.
We will exclude participants who do not speak English well enough to process the growth mindset or control condition information based on RA's observations recorded in notes in our data base or parents' communications with us about this as recorded in notes in our data base. Other extenuating circumstances (e.g., severe learning disabilities in children) will be taken into account if we feel that it invalidated the assessment.

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 are planning to have a sample of 600, but with attrition it will likely be somewhat smaller unless we have the time and resources to collect data from up to 650 families at our first data point. We are estimating somewhere between 10% to 20% attrition from the first to final wave. Some data, such as parents' daily reports and teacher reports will likely be available for only about two-thirds of the sample.

8) Anything else you would like to pre-register? (e.g., secondary analyses, variables collected for exploratory purposes, unusual analyses planned?)
We are filing this AsPredicted in the middle of our data collection as we had not thought ahead to do so before the data collection. All of the hypotheses, methods, and planned analyses are outlined in the NSF proposal we submitted for this project, which was before the data was collected.

Variables not identified here (e.g., parent and child math anxiety) were also collected for exploratory purposes in terms of moderators and mediators of the growth mindset induction.