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Boosting Parent-Child Math Engagement and Preschool Children's Math Skills: Evidence from an RCT with Low-Income Families

Based on BFI Working Paper No. 2023-48, "Boosting Parent-Child Math Engagement and Preschool Children's Math Skills: Evidence from an RCT with Low-Income Families," by Susan E. Mayer, Chicago Harris; Ariel Kalil, Chicago Harris; William Delgado, BU Wheelock; Haoxuan Liu, Chicago Harris; Derek Rury, Chicago Harris; and Rohen Shah, Chicago Harris

Information alone is insufficient for increasing low-income children's math test skills or parental engagement in math activities. The provision of materials in concert with messaging to dissuade parents from procrastinating is effective at increasing scores and parental engagement, as are digital math apps.

Children from low-income families have lower math test scores, on average, than their higher-income peers. These disparities are of concern in their own right and because early childhood math test scores tend to predict later outcomes. Evidence suggests that income-based achievement gaps are in part driven by unequal engagement from parents, with higher-income parents spending more time on math activities than lower-income parents. This study aims to uncover what drives these persistent gaps in achievement and parental engagement and, in turn, what policies and programs will effectively improve learning outcomes among low-income students.

The authors conducted a randomized controlled trial with 758 low-income preschoolers and their parents, who they separated into a control group and four treatment groups. The first treatment group received a set of math materials, the second received the same materials along with weekly text messages intended to overcome any tendency among parents to procrastinate doing math with their kids (referred to as "present bias"), and the third received the materials and weekly text messages promoting a growth mindset. Finally, the fourth treatment group received a digital tablet with math apps for children. The authors tested children's

math skills three times — before the intervention, upon the conclusion of the intervention, and six months afterwards — and surveyed parents regarding the amount of time that they spent doing math with their kids. They found the following:

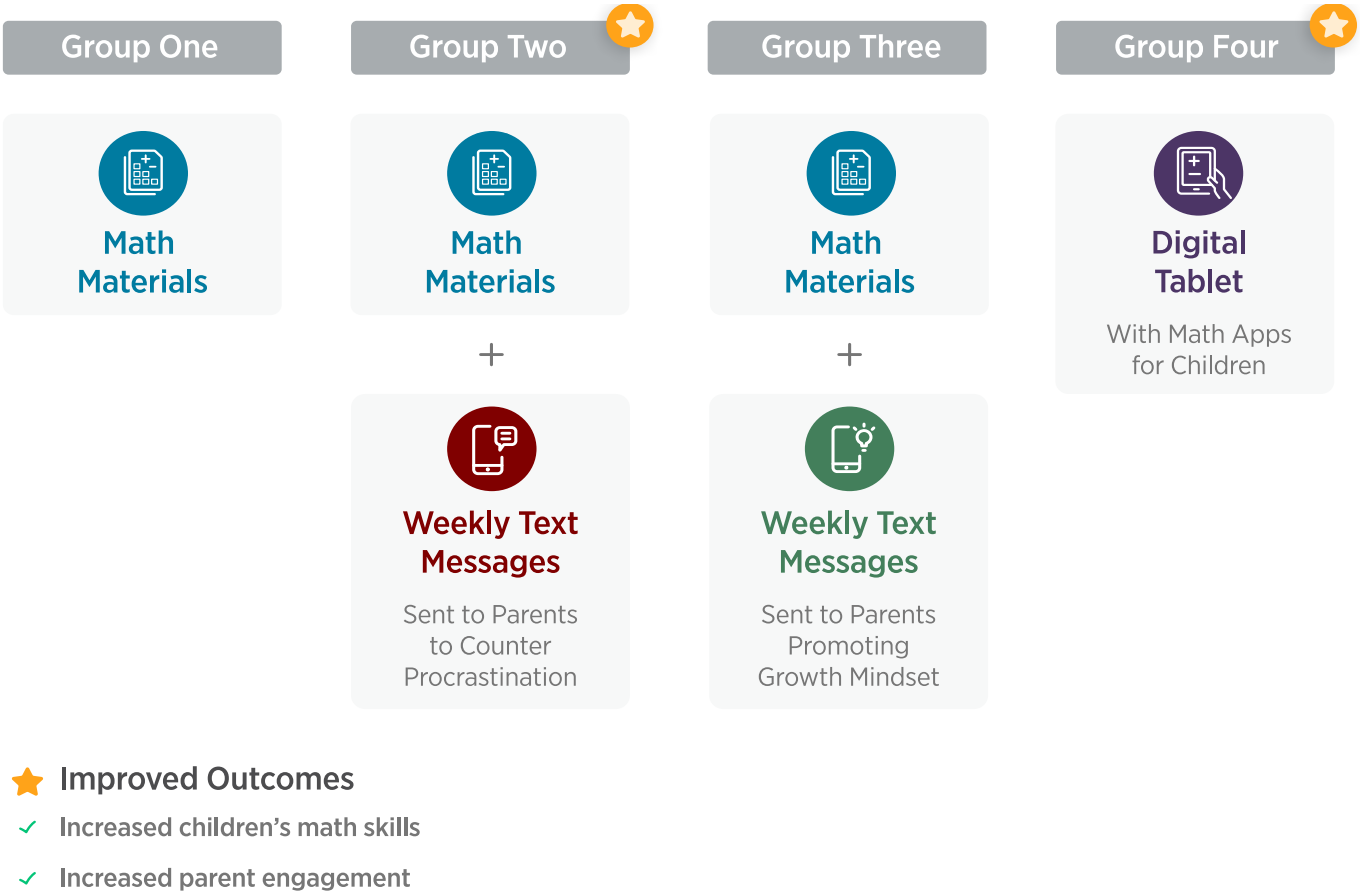
- Relative to the control group, both the math app treatment and the material plus procrastination treatment increased children's math skills six months after the intervention ended, while the other treatments did not increase children's math skills.

- The two treatments that improved math skills also increased the amount of time that parents reported having spent engaging in math activities with their children, while the two treatments that did not increase math skills also did not increase the amount of time that parents reported having spent on math. This suggests that increased parent engagement is a mechanism that leads to improved math skills.

- A considerable share of parents (17%) in the materials-only group reported losing the materials, and only 37% finished half of the activities included in the materials. This limited use suggests that the provision of materials alone is insufficient to help low-income families overcome learning gaps.

- The survey data show that most parents already exhibit growth mindsets, thereby reducing the benefits of interventions that aim to cultivate growth mindsets in parents.

Figure 1 • Distribution of Different Learning Materials and Communications to Four Groups of Low-Income Parents and Preschoolers



Note: Parents were randomized into five groups: a control group (not pictured above), and treatment groups that received a digital tablet with math apps for children; analog math materials for parents to use with children; analog math materials with weekly text messages to manage parents' present bias; and analog math materials with weekly text messages to increase parents' growth mindset. The star indicates effective outcomes six months after the intervention ended.

The upshot is that simply telling parents that they should engage in learning with their children, even if the materials for engagement are also provided, is unlikely to change their behavior. This is especially the case when parents are constrained by psychological stress or financial scarcity. The results also indicate that a potential barrier preventing parents from using math materials when they are available is present bias, or the tendency to procrastinate when a reward is delayed. Finally, the surprising effectiveness of the math app treatment on both parent engagement and test scores suggests a new, lost-cost avenue for improving children's math skills at home[1].

[1] See also "Nudging or Nagging? Conflicting Effects of Behavioral Tools," by Ariel Kalil, et al., for a Finding and links to the paper.

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