Using A Factorial Design to Understand Varying Effects of Parental Text Messaging Interventions

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Background/Context:

Evidence has shown that parental engagement over the summer is critical for students. Due to their relatively low cost and demonstrated effectiveness, text messaging interventions continue to grow in popularity as a way to provide information to students' families and to encourage particular behaviors, including at-home reading and school attendance (Doss, Fahle, Loeb, & York, 2018; York, Loeb, & Doss, 2018; Kim et al., 2019; Kraft & Monti-Nussbaum, 2017; Robinson, Lee, Dearing, & Rogers, 2018). These programs address parental decision-making by targeting misbeliefs about the value of summer reading, the importance and capacity for parents to support their child over the summer, as well as unconscious biases in parental thinking that shape their behaviors. Yet, in most interventions, the text messages are designed to test a single mechanism. For example, in Kraft & Monti-Nussbaum (2018), the authors investigate the effects of providing advice or "pro tips" about summer reading to parents; this provides parents with information about how to engage with their children's summer reading. In Doss et al. (2018) the authors test the effect of tailoring the messages to the parents based on each student's reading level compared with generic text messages. They find that information based on the student's reading level is more effective than undifferentiated messages

Research Questions

In this study, we address three specific informational gaps and misbeliefs among parents: goal setting to reduce present bias preferences, provision of instructionally differentiated information to correct parental misbeliefs about their child, and reinforcing particular values of reading. Specifically, we ask:

1) Within each of 3 factors, which types of text messages (goals vs. no goals, personalized information vs. not, instrumental vs. enjoyment vs. both) are most effective at improving student engagement with reading over the summer, parental engagement with summer reading, and student fall reading comprehension?
2) How do the effects of intervention components differ based on levels of other factors?
3) How do the effects of intervention components differ based on student socioeconomic status?

Participants/Intervention/Research Design

This study includes 5172 rising second and third grade students, from 4933 families, who attend thirty elementary schools in one large school district in the southeast. Over the course of 9 weeks during the summer, parents of these students received two text messages per week that encouraged parents to engage in reading-related activities with their children and to use a free reading app focused on personalized instruction.

Research Design

Families were assigned three different factors, using a 2x2x3 factorial design, with an additional small part of the sample reserved as a pure control, for a total of 13 evenly-sized groups. The first factor determined whether parents were asked to set a reading goal at the beginning of the summer or not. The second factor determined whether the text messages contained personalized and up-to-date reading and app information about the student or not. Finally, the third factor emphasized a specific reading value during the text messages: reading as entertainment, reading as building skills, or a combination of the two.

Data Collection and Analysis:

We collected data from the instructional reading app (e.g. time on the app, number of activities completed, accuracy of responses) to measure students' cognitive and behavioral engagement. Parent and student surveys will be administered in October to collect additional measures of parent- and student-reported reading engagement as well as measures of parental beliefs and behaviors. The school district will also provide student reading comprehension scores as well as demographic data. Additionally, for the students assigned to the goal-setting condition, any goals that are set by their parents will be available for analysis as well.

We fit following model, which was specified in the study's preregistration:

$$Y_{ij} = \beta_0 + \beta_1 Goals + \beta_2 Personalized + \beta_3 Value + \boldsymbol{X_{ij}\Gamma'} + \varepsilon_{ij}$$

where Y_{ij} represents either the student or the parent outcome for family *i* in randomization block *j* and treatment effects for all three factors are modeled concurrently. The model also includes a vector of covariates, including student demographics, a pretest measure, and a fixed effect for the randomization block. Standard errors are clustered at the family-level to account for the unit of randomization and the correlation of residuals among siblings.

Findings/Results:

Data collection is ongoing, but preliminary results for the app-based outcomes are presented in Table 1. Relative to the students whose parents received no text messages, students receiving text messages were 8.5 percentage points more likely to ever log in to the educational app over the summer ($p<0.001$) and accessed an additional 2.1 books on the app ($p<0.10$). Compared with students whose parents received only generic messages, students whose parents received text messages that periodically included reference to personalized information (such as student reading behaviors on the app) were 2.5 percentage points more likely to log in to the educational app ($p<0.05$), opened an additional 2.2 books ($p<0.001$) and spent an additional 4.6 minutes using the app ($p<0.001$). With regards to app outcomes, there were no significant differences between students whose parents were encouraged to set summer reading goals at the beginning of the summer. There were also no significant differences in student app outcomes based on the reading values emphasized in the text messages.

Future analyses will be run to look at the effect of different types of text messages on additional outcomes, including self-reported parental reading behaviors, student self-reported reading engagement, and student reading comprehension. Additional analyses will also leverage the factorial design to understand how the effects of different factors interacted with each other and with student socioeconomic status to yield differential impacts.

Conclusions/Recommendations:

Preliminary findings indicate that text messages to families can be an effective method for improving student engagement with an educational reading app and that personalizing messages with up-to-date student information may be the most effective types of message. Additional conclusions are still pending based on additional outcome data that is being collected and future analyses.

References

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Table 1

Preliminary Impact of Texting Conditions on Student App Outcomes

	Ever Logged Into App		**Time on App (Minutes)**		**Number of Books Opened**	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Assigned to any texting	0.0847***		2.772		2.144+	
	(0.0180)		(3.070)		(1.097)	
Assigned to goal-setting		-0.0101		1.262		0.315
		(0.0129)		(1.832)		(0.802)
Assigned to personalization		0.0253*		4.631*		2.241***
		(0.0129)		(1.856)		(0.837)
Assigned to instrumental-only		0.00970		-1.130		0.458
		(0.0157)		(2.235)		(0.994)
Assigned to entertainment-only		0.00909		-1.199		0.627
		(0.0158)		(2.276)		(0.949)

Notes: Standard errors in parentheses are clustered at the family level. + p<0.10 * p<0.05 ** p<0.01 *** p<0.001