Abstract Title Page
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Title: Addressing socio-economic disparities in non-cognitive and cognitive skills through summer book reading: Results from a longitudinal randomized experiment

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Abstract Body
Limit 5 pages single spaced.

Background / Context:
Description of prior research and its intellectual context.

Low-income children are at risk of falling behind in reading during summer recess. On average, summer vacation creates a 3-month gap in reading scores between middle- and low-income children (Cooper, Nye, Charlton, Lindsay, & Greathouse, 1996). Why do low-income children fall behind in reading during summer vacation?

One hypothesis focuses on children's access to books and opportunities to read during summer vacation. A number of studies suggest that children growing up in low-income and working-class families own fewer books and spend less time talking about books with their parents than children from middle-income families (Burkam, Ready, Lee, & LoGerfo, 2004; Entwisle, Alexander, & Olson, 2000; Lareau, 1989). Furthermore, many low-income parents lack both the financial capital and human capital (non-pecuniary resources) to buy books that are appropriately challenging and interesting for their children (Chin & Phillips, 2004). Given limited opportunities to read books independently and with their parents, many low-income children are at risk of falling behind in reading during summer vacation.

Although differential opportunities to read may explain why many low-income children are at risk of falling behind in the summer, there are important non-cognitive mechanisms that may underlie summer reading loss. Developmental psychologists and reading researchers have noted that giving children choice of reading materials can enhance intrinsic motivation to read both inside and outside of school. Enhancing intrinsic motivation to read is critical to preventing summer reading loss for several reasons. First, children with high intrinsic motivation are more likely to read on their own outside of school than children with low intrinsic motivation (Guthrie & Wigfield, 1999). Second, unless children are intrinsically motivated to read books, there is no guarantee they will read books independently during the summer in the absence of teacher encouragement, incentives program, or other external sources of support. Nonetheless, schools may play a key role in enhancing intrinsic motivation during the summer by giving children access to books and choice of reading materials. For example, in a recent 3-year experimental study, Allington et al. (2009) conducted book fairs at the end of the school and gave children opportunities to self-select books. The study found that children receiving books during the summer enjoyed larger gains on the FCAT than control children. However, virtually all studies comparing school and summer year learning have focused on cognitive measures like children's reading comprehension. We are aware of no studies to date that have examined seasonal comparisons of growth on both non-cognitive measures like intrinsic motivation and cognitive measures like reading comprehension ability. Yet it is important to measure improvement in intrinsic motivation, which may be a key mechanism underlying children's reading activities and comprehension gains during the summer months. Moreover, because non-cognitive skills such as motivation contribute to adult outcomes, it is important to examine whether intervention efforts have impacts on non-cognitive skills and cognitive skills (Heckman, 2008).

Purpose / Objective / Research Question / Focus of Study:

There are several goals guiding this study. First, we use an experimental design to examine the causal effects of giving children 10 self-selected books over two summers. Second, we examine whether treatment effects are moderated by children's family income (i.e., eligibility for free- and reduced-price lunch). As a result, we examine whether the magnitude of the treatment effects differ for children who are eligible for free- and reduced-price lunch and those who are not.

Setting:
Description of the research location.

In spring 2007, a total of 991 Grade 4 children received parental consent to participate in our study. All participating children attended public schools in Lake County, a mid-Atlantic school district with an ethnically and socio-economically diverse K-12 enrollment. With a total K-12 enrollment over 150,000 students, Lake County is organized into over 10 administrative sub-districts. We purposefully sampled students from two sub-districts with the largest number of schools receiving federal Title I dollars. Within the two sub-districts, we sampled 16 schools with the largest percentage of children eligible for a federal meal subsidy (i.e., free- or reduced-price lunch).

Population / Participants / Subjects:
Description of the participants in the study: who, how many, key features or characteristics.

As shown in Table 1, the sample was racially and ethnically diverse and comprised an approximately equal share of White, Black, Latino/a, and Asian children. In addition, low-income children and children whose primary home language was English comprised half the sample. At baseline, 75% of the children passed the state reading test and the sample mean on the Gates MacGinitie Reading Test of 43 was slightly below the national norm. In sum, the sample was ethnicity and socially diverse, permitting analyses of treatment effects based on children's family income status.

Intervention / Program / Practice:
Description of the intervention, program or practice, including details of administration and duration.

Children in the treatment condition received 10 self-selected books over two consecutive summer vacations. Children attended end-of-year book fairs at their schools and selected high-interest books selected by reading teachers. Children in the control group received 10 self-selected books during the school year after posttesting in September.

Research Design:
Description of research design (e.g., qualitative case study, quasi-experimental design, secondary analysis, analytic essay, randomized field trial).

In spring of Grade 4, children were stratified by school and class and then randomly assigned to receive 10 self-selected books during the summer or during the fall. Children in the treatment group received 10 self-selected books in the summer after grade 4 and the summer after grade 5. To rule out Hawthorne effects, children in the control group received 10 books in the fall after posttesting was completed. As a result, the counterfactual control condition includes children who received no books during the summer months and instead received their 10 books during the fall of the academic school year.

Data Collection and Analysis:
Description of the methods for collecting and analyzing data.

Student Demographic Variables. Student demographic data were obtained from district administrative files and included information on ethnicity, family income (eligibility for free- or reduced-price lunch), gender, the primary language spoken at home, and end of fourth-grade performance on the state reading and math test.

Gates–MacGinitie Reading Test (GMRT). Students were administered the GMRT on four occasions. We administered the Level 4/Form S in spring of Grade 4, Level 4/Form T in fall of Grade 5, Level 5/Form S in spring Grade 5 and Level 5/Form T in fall Grade 5. The GMRT was recently normed in 2005 and yields a total reading score based on a 48-item comprehension subtest and a 45-item vocabulary subtest. The Kuder–Richardson Formula 20 reliability coefficient for the GMRT Level 4 and Level 5 is above .95, and test–retest reliability is .92 for Level 4 and .89 for Level 5 (MacGinitie, MacGinitie, Maria, & Dryer, 2000).

Intrinsic Motivation to Read Subscale from the Motivation Reading Questionnaire. Across four times points, children were administered the intrinsic motivation to read sub-scale from the Motivation Reading Questionnaire (MRQ; Wigfield & Guthrie, 1999). The intrinsic motivation sub-scale includes three items based on children's preference for challenging reading material (I like hard, challenging books; I like it when the questions in books make me think; I usually learn difficult things by reading), four items based on children's curiosity for reading (If the teacher discusses something interesting, I might read more about it; I have favorite subjects that I like to read about; I read to learn new information about topics that interest me; I like to read about new things), and two items based on children's involvement in reading (I make pictures in my mind when I read; I enjoy a long, involved story or fiction book). Each item was scored on a 1 (very different from me) to 4 (a lot like me) scale. We administered the 9-item scale and Cronbach's alpha reliabilities were .74 in spring Grade 4, .79 in fall Grade 5, .81 in spring Grade 5, and .79 in fall Grade 6. From spring Grade 4 ($M = 3.18$, $SD = .53$) to fall Grade 5 ($M = 2.63$, $SD = .56$), mean scores on the intrinsic motivation subscale declined by approximately 1 standard deviation in our sample.

Book Ownership. To obtain information on children's access to books after each summer vacation, we asked children, "some homes have 0 books for kids while others have more than 50 books for kids. About how many books for kids do you have in your home?" Response options included 1 (0 to 10 books for kids), 2 (11 to 20 books for kids), 3 (21 to 30 books for kids), 4 (31 to 50 books for kids), and 5 (more than 50 books for kids).

Independent Book Reading During Summer Vacation. To obtain information on independent reading during summer vacation, we asked children "about how many books did you read during the summer?" Response options included 1 (0–1 book), 2 (2–3 books), 3 (4–5 books), 4 (6–7 books), 5 (8–9 books), or 6 (10 or more books).

Literacy Habits Survey. Children were administered an 8 – item literacy habits survey in the summer following Grade 4 (alpha = .73) and Grade 5 (alpha = .79). The 8 items asked children about how many times they engaged in literacy related activities (went to the book store, checked out books from the library, parents encouraged reading, read at home for fun, read at bedtime, read books, received help from a family member, talked about books with family member, and talked about books with friends). Each item was scored on a 4-point Likert scale (1=never or hardly ever, 2 = once or twice a month, 3 = once or twice a week, 4 = almost every day).

We used non-parametric tests (Kruskall-Wallis) to examine treatment effects on children's ownership of books and the number of books children reported reading during each of

the two summers. We used parametric tests to evaluate impacts on the literacy habits measure which was normally distributed.

To examine change in intrinsic motivation and reading comprehension over time, we employed a multilevel model to estimate both within- and between-person growth trajectories. At level 1, longitudinal data from four waves of data were used to estimate within person growth trajectories. We fit a level 1 growth model for student i at time j

$$Y_{tij} = \pi_{0ij} + \pi_{1ij}(TIME)_{ij} + \pi_{2ij}(SUMMER)_{ij} + \varepsilon_{ij}$$

where Y_{ij} is the outcome for student$_i$ at time$_j$; $TIME_{ij}$ is the occasion of measurement where time is coded as the month of the study so that time = 0 for June of Grade 4, time = 3 for September of Grade 5, time = 11 for May of Grade 5, and time = 15 for September of Grade 6; $SUMMER_{ij}$ is a time-varying dummy variable indicating whether the measurement occurred in the fall of grade 5 and grade 6 (summer = 1) or spring of grade 4 and grade 5 (summer = 0), and ε_{ij} represents the student-specific error term. In our level 1 within-person growth model, there are three fixed effects parameters of interest: (1) π_{0ij}, the initial score of student i at the spring of fourth-grade where TIME = 0 and SUMMER = 0; (2) π_{1ij}, the rate of growth for student i during the academic school year from September to May of Grade 5; and (3) π_{2ij}, the average effect of summer vacation (after grade 4 and 5) on growth trajectories.

In addition, we fit a level 2 model that predicted growth during the academic school year and summer vacation on the basis of children's income status, whether they received books during the summer or school year, and the interaction of income status and summer books. The fully specified level 2 model was written as

$$\pi_{0ij} = \gamma_{00} + \gamma_{01}(LOW\text{-}INCOME) + \zeta_{0i}$$

$$\pi_{1ij} = \gamma_{10} + \gamma_{11}(LOW\text{-}INCOME) + \gamma_{12}(SUMMERBOOKS) + \gamma_{13}(SUMMERBOOKS*LOW\text{-}INCOME) + \zeta_{1i}$$

$$\pi_{2ij} = \gamma_{20} + \gamma_{21}(LOW\text{-}INCOME) + \gamma_{22}(SUMMERBOOKS) + \gamma_{23}(SUMMERBOOKS*LOW\text{-}INCOME) + \zeta_{2i}$$

where the parameter γ_{13} indicates whether income status moderates the effect of receiving summer books on the rate of growth from spring Grade 4 to fall Grade 6. In addition, the parameter γ_{23} indicates whether income status moderates the impact of the treatment on the learning rate during summer vacation. We also included fixed-effects for Grade 4 classrooms and Grade 5 classrooms to account for the nesting of students within classrooms. The random effects for the level 2 models are ζ_{0i}, ζ_{1i}, and ζ_{2i} respectively.

Findings / Results:
Description of the main findings with specific details.

Table 2 displays the descriptive statistics for the reading ownership, summer book reading, and literacy habits measures. In the full sample, the descriptive statistics for both the treatment and control group reveal two findings. First, the percentage of students who reported reading 10 or more books declined over time, suggesting that the amount of book reading during

the summer decreased as children grew older. Second, children who received books during the summer reported reading more books after both summers and participated in more literacy activities at home after the first summer. Third, the summer book reading intervention had no impact on ownership and reading among middle-income children.

However, among low-income children, there was a positive and significant impact on the number of books children reported owning, summer book reading, and literacy habits. After the second summer, it is important to note that the mean percentage of children who reported reading 10 or more books was similar for low-income children in the treatment (32%), middle-income students in the treatment group (35%), and middle-income students in the control group (35%). The same pattern was true on the mean literacy habits score, which was similar for low-income children in the treatment group ($M = 1.80$, $SD = .54$), and middle-income children in the treatment ($M = 1.79$, $SD = .57$) and middle-income children in the control ($M = 1.81$, $SD = .54$). At the same time, however, it was clear that a larger percentage of middle-income students in the treatment group (48%) and control group (50%) reported owning 10 or more books than low-income students in the treatment group (29%). Nonetheless, the low-income children in the treatment group reported similar amounts of book reading and engaging in literacy habits as middle-income students in both the treatment and control group.

Results and interpretations for IGM model: Income status, summer books, and the interaction of income status and summer books as a predictor of reading growth. Preliminary individual growth models suggest several findings. First, the results indicate that low-income children enjoy larger gains during the school year than middle-income children. Second, the reading comprehension scores of all children decelerate during the summer relative to the summer and vocabulary losses are larger for low-income than middle-income children. Third, intrinsic motivation declines over time and declines faster during summer than the school year for all children. Fourth, there was no overall main effect or a treatment by income status main effect on reading growth during the summer. Finally, it appears that children who received books during the school year enjoyed larger reading comprehension gains than low-income children who received books during the summer.

Conclusions:
Description of conclusions, recommendations, and limitations based on findings.

The results of study indicate the children's intrinsic motivation declines from the end of fourth-grade to the beginning of sixth-grade. At the same time, the decline in motivation is slower during the school year than during the summer, suggesting that schools play an important role in maintaining children's intrinsic motivation to read. There is also evidence that income status moderates reading comprehension gains during the school year and summer months. Finally, the experimental results indicate that providing children choice of reading materials over 2 summers had no impact on growth rates during the school year or summer. Our conference presentation will probe the sources of variation in growth rates by income status and condition based on children's self-reported measures of book reading. We will also report prototypical fitted plots to display the main findings.

Appendices
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Appendix A. References
References are to be in APA version 6 format.

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Appendix B. Tables and Figures
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Table 1
Characteristics of the Sample at the Beginning of the Study

Child Characteristic	%	*M*	*SD*
Ethnicity			
White	22		
Black	25		
Latino/a	33		
Asian	13		
Other	6		
Low-income (eligible for free lunch)	49		
Female	52		
English is primary home language	49		
Spanish is primary home language	30		
At or above proficient - state math test	70		
At or above proficient - state reading test	75		
Gates MacGinitie Reading Test (NPR)		43.44	28.17

Table 2

Comparison of Treatment and Control Group On Measures of Book Ownership, Book Reading,
and Home Literacy Habits

Measures	Treatment (summer books)				Control (fall books)				p-value of difference
	n	%	M	SD	n	%	M	SD	
					Full Sample				
Fall 2007 Measures Own 50+ kids books	194	44.91			181	41.90			0.379
Read 10+ books	180	41.67			160	37.04			0.002
Literacy Habits	419		2.33	0.59			2.21	0.62	0.005
Fall 2008 Measures Own 50+ kids books	138	38.12			118	32.69			0.0451
Read 10+ books	122	33.80			105	29.17			0.0032
Literacy Habits	356		1.80	0.55	350		1.73	0.54	0.109
					Middle-Income				
Fall 2007 Measures Own 50+ kids books	107	48.42			111	50.45			0.587
Read 10+ books	88	40.00			87	39.37			0.105
Literacy Habits	218		2.31	0.57	214		2.23	0.58	0.180
Fall 2008 Measures Own 50+ kids books	81	43.78			88	46.81			0.757
Read 10+ books	66	35.29			65	35.33			0.545
Literacy Habits	186		1.79	0.57	182		1.81	0.54	0.804
					Low-Income				
Fall 2007 Measures Own 50+ kids books	87	41.23			70	33.02			0.088
Read 10+ books	93	44.08			72	33.96			0.0043
Literacy Habits	201		2.35	0.62			2.18	0.66	0.0098
Fall 2008 Measures Own 50+ kids books	50	28.74			37	21.02			0.0056
Read 10+ books	56	32.18			40	22.73			0.003
Literacy Habits	170		1.80	0.54			1.64	0.53	0.009