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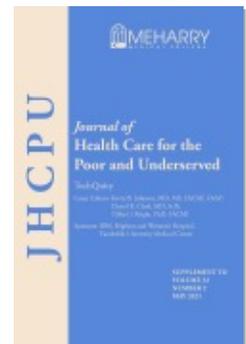
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## Clinic-Based School Readiness: A Qualitative Examination of a Text Messaging Intervention

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*Abstract:* School-readiness (SR) is associated with future educational and psychological success. Pediatrician-initiated SR text-messages are a promising application of technology to combat inequities in early education. To examine parent perceptions of a SR intervention, *Tips by Text (TbT)*, in a low-income pediatric setting, parents receiving *TbT* for three months or longer participated in focus groups exploring program expectations, parenting, and pediatrician trust. Demographic data were collected. Qualitative data were analyzed using iterative coding and theme analysis. Nine focus groups were conducted with 32 parents between May and July 2018. Parents reported *TbT* provided them with new teaching skills and increased family communication, and that their children demonstrated increased confidence, and acumen in SR activities. Parents shared the activities broadly and appreciated that messages came from a trusted source—their pediatrician. A tech-based SR intervention deployed in a pediatric setting is easily adopted, well-liked, and can increase SR in underserved children otherwise difficult to reach.

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The first five years of childhood are critical for a child's neuro-development, health, and well-being.<sup>1</sup> Poor education is a key driver of inequities and intergenerational poverty.<sup>2,3</sup> School readiness (SR) is a metric of a child's level of preparedness for kindergarten across five domains: cognitive development, physical development, language development, self-help skills, and social-emotional development.<sup>4,5</sup> School readiness at kindergarten entry is positively correlated with long-term health, academic success, and future economic benefits.<sup>6</sup> Additionally, a child's larger neighborhood and community support networks are influential in promoting continued literacy growth and reducing disparities in SR.<sup>7,8</sup>

High-quality early-childhood education (ECE) programs are evidence-based, cost-effective methods to improve SR.<sup>9-11</sup> While the number of ECE programs has increased in the past decade, access to affordable ECE programs is limited, and ECE enrollment remains significantly higher among high-income families.<sup>12,13</sup> In 2014, 48% of children whose parents had a graduate degree were enrolled in a preschool program compared with only 28% of children with parents without a high school degree.<sup>14</sup> The National Institute for Early Education estimates that at today's current rate of growth, it will take 20 years for state-funded preschool openings to serve just half of the eligible four-year-olds in the United States.<sup>13</sup>

Though lack of access to ECE is a critical barrier to SR in low-income communities, 40% of reduced SR can be attributed to family and home environmental factors.<sup>15</sup> Both quality and frequency of interactions between parents and children can enhance a child's cognitive, social, and emotional development.<sup>16</sup> Despite availability of home-based parenting programs promoting SR, many parents report that such interventions are time-consuming, overwhelming, and unsupportive.<sup>17</sup> Low-income parents particularly struggle to provide enriching environments due to the ongoing stress associated with poverty (e.g., low literacy, work demands, and poor physical and mental health).<sup>18-21</sup> These barriers can be further compounded by linguistic barriers, limited time for engagement, and lack of clarity around expected kindergarten skills.<sup>5</sup>

In 2019, the Pew Research Center found that 71% of low-income adults with a household income below \$30,000 owned a smartphone.<sup>22</sup> While a digital divide remains, mobile health (mHealth) interventions are increasingly used to promote health in underserved populations.<sup>23</sup> Text messaging is an increasingly common mode of communication between medical providers and patients, used to communicate appointment and immunization reminders and to reinforce health information.<sup>24</sup> Given widespread and growing use of mobile phones, text messaging offers a promising approach towards promoting SR in low-income families.<sup>25</sup>

Pediatric medical providers have near universal access to children under five years<sup>26,27</sup> and are considered by parents to be trusted sources of information on early childhood development.<sup>28</sup> For children without access to ECE programs, frequent physician visits and well-child checks present an underused opportunity to support early educational development and reduce inequities in SR.<sup>29</sup> Existing clinic-based literacy programs such

as Reach Out and Read (ROR) focus on increasing school readiness by providing free books and brief literacy guidance during well-child visits.<sup>30</sup> Now over 20 years old, ROR has shown to positively affect home literacy behavior, daily reading, and language development across multiple languages.<sup>31</sup> The mHealth intervention evaluation here offers the capacity to bring literacy outreach directly to the patient outside of the confines of scheduled wellness exams. This qualitative study examines parent perceptions of a SR texting intervention delivered to low-income parents in a clinical pediatric setting.

## Methods

**TipsbyText intervention.** TipsbyText (*TbT*, formerly Ready4K!) is an evidence-based text messaging program for parents of preschoolers designed to promote child literacy and increase parent-child interactions using a two-generation caregiver model that draws upon family strengths.<sup>25,32</sup> Previously implemented in multiple school districts nationally, the intervention breaks down complex literacy education into small steps that lighten the cognitive load for busy parents by supplying clear, achievable tips and strategies.<sup>17,25,32</sup> TipsbyText helps parents prepare children for kindergarten by delivering a light-touch intervention with limited amounts of easily used information over an extended period of time.

TipsbyText was administered over a seven-month period as part of a randomized controlled trial (RCT) among parents of three- and four-year-old children (manuscript under review).<sup>33</sup> The RCT was designed to evaluate the impact of the intervention on child literacy and parent-child interaction using randomization blocked on child age and language. Parents in the intervention group received three unique texts weekly focused on a particular literacy skill (total of 84 unique texts) and parents in the control group had no intervention. Every week, parents in the intervention group received a *Fact* text designed to educate the parent about the importance of that week's skill, a *Tip* text describing a child-centered activity to build that skill, and a *Growth* text providing reinforcement and an additional activity. Text messages were uni-directional and provided in either English or Spanish (Figure 1). Messages were customized to come from the family pediatrician with the phrase, "Doc Says" or "El Doctor Dice." Parents were excluded from participation if 1) they did not speak English or Spanish, 2) their child had received services for developmental delay in the past 12 months, or 3) their child was enrolled in preschool at the time of recruitment.

The *TbT* intervention was implemented in two Northern California pediatric clinics affiliated with a federally qualified health center primarily serving a low-income, publicly-insured population.

**Qualitative data collection.** Participants who received the texting intervention for at least three months were invited to participate via phone calls and text messages. Invited participants included a purposeful sample of both English and Spanish-speaking participants. Semi-structured focus groups conducted from May to July 2018 explored expectations for the intervention, parenting practices, and connection with their pediatrician (Box 1). Focus groups were held at the pediatric clinic where *TbT* recruitment took place. Focus groups were facilitated in English and Spanish, using a flexible structure to encourage dialogue (Appendix 1). The research team involved in

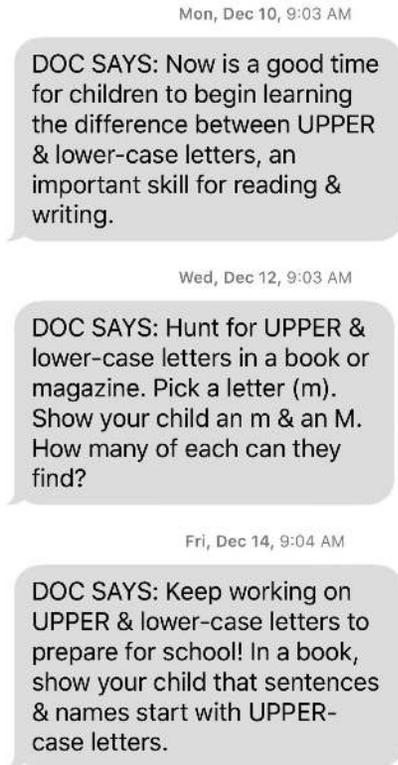


Figure 1. Example text messages.

recruitment and study enrollment were not present during focus groups to diminish social desirability bias and withholding of negative feedback about the program. Each focus group lasted approximately 20–40 minutes and was securely audio-recorded.<sup>34</sup>

Parents were asked to complete a demographic survey at the time of the focus group to supplement data collected during enrollment in the *TbT* intervention. Written consent was obtained during initial enrollment in *TbT*, with secondary spoken consent given prior to the start of the focus group. Parents were compensated with \$50 gift cards. All study protocols were approved by the institutional review boards at Stanford University and the participating clinic. Data saturation, defined by our study as the point at which focus groups revealed no new codes or themes, was reached after nine focus groups, at which point data collection ended.<sup>35</sup>

**Data analysis.** Focus group audio files were transcribed verbatim and, if necessary, translated into English. A preliminary codebook was developed inductively by three analysis team members and underwent multiple rounds of adjudication with other members of the research team prior to codebook stabilization.<sup>36</sup> Dedoose® qualitative software was used to organize and code transcripts and to conduct inter-rater reliability testing.<sup>37</sup> Interrater reliability testing was completed among all three coders to ensure standardization with a minimum Cohen's Kappa of 0.7 (Pooled Kappa = 0.77–0.83).<sup>38</sup> Emerging themes were identified from the coded data through an iterative process until the final themes were agreed upon by the analysis team.<sup>38</sup> Multiple researcher perspec-

**Box 1.****SEMI-STRUCTURED INTERVIEW GUIDE WITH SAMPLE QUESTIONS**

Domain	Example Question
Expectations for Intervention	Can you tell us what you think about the text messages now that you have received them for several months?
Parenting	Could you describe some ways that the text messages support you as a parent?
Connectivity with Provider	Please tell us how receiving texts has changed your relationship with your child's pediatrician?

tives were collected throughout the critical review process to check the potential bias of study authors and strengthen the credibility of the findings.<sup>39</sup>

**Results**

**Parent characteristics.** Of the 72 eligible parents, 64 were reached by the research team by phone or text. Of those, 45 were scheduled to attend focus groups. Ultimately, thirty-two parents (16 Spanish-speaking and 16 English-speaking) participated in one of nine focus groups (four in Spanish and five in English). Focus groups had an average of 3.5 participants (range 1–6). Thirty-one parents were mothers, and one was a father; the average age was 32 years. At the time of enrollment, 93% identified as non-White and 59% of parents had a high-school degree or less education. Seventy-five percent of parents reported a monthly household income of less than \$4,000 (less than \$48,000 per year), making them eligible for Medi-Cal for Kids in California (\$69,692; 266% of federal poverty level for family of 4)<sup>40</sup> (Table 1).

**Qualitative findings.** The opinions and experiences shared by the focus group participants were organized into four domains with one to three related themes in each. The domains encompass how the *TbT* program influenced the role of parents as teachers, child learning, the larger family and community, and the family-medical provider relationship (Box 2).

*Domain 1: Parent as teacher. Teaching children new skills using new strategies.* Parents reported that *TbT* introduced them to important early childhood learning concepts such as letter sounds, rhyming, and reading mechanics. Parents considered these skills new but were quick to integrate them into the teaching already occurring in the household such as singing or reading books.

Parents deeply valued the specific strategies *TbT* provided for engaging with their children. A first-time mother referred to texts as a “guide-book” broken up into accessible pieces that taught her how to engage with and proactively teach her child. Other parents said that they learned strategies to engage their child when they were

**Table 1.**  
**FOCUS GROUP PARENT CHARACTERISTICS**

Focus Group Parent Characteristics (n=32)	n (%)
Caregiver Race/Ethnicity <sup>†</sup>	
Hispanic/Latinx	21 (66%)
Non-Hispanic White	4 (13%)
Non-Hispanic Black/African American	3 (9%)
Asian	2 (6%)
American Indian/Alaska Native	1 (3%)
Other/Missing	3 (9%)
Monthly Household Income	
<\$2,000 (\$24k) <sup>a</sup>	16 (50%)
\$2,001-\$4,000 (\$24k-\$48k)	8 (25%)
>\$4,001 (>\$48k)	5 (16%)
Declined to respond	3 (9%)
Caregiver Education Level	
HA high school degree or less	19 (59%)
Some College	7 (22%)
BA/BS Degree	5 (16%)
Missing	1 (3%)
Parent Age (years)	
20-30	12 (38%)
31-40	15 (47%)
41+	1 (3%)
Declined to respond	4 (12%)
Preferred language for text messages	
English	17 (53%)
Spanish	15 (47%)
Relationship to child	
Mother	31 (97%)
Father	1 (3%)
How long have text messages been received (months)	
3-4	15 (47%)
5-6	4 (13%)
7-8	10 (31%)
9	3 (9%)
Child Gender	
Male	14 (44%)
Female	15 (47%)
Declined to respond	3 (9%)
Child Age (years)	
3	20 (63%)
4	11 (34%)
5	1 (3%)

(continued on p. 49)

**Table 1. (continued)**

Focus Group Parent Characteristics (n=32)	n (%)
Child currently enrolled in daycare	
Yes	6 (19%)
No	26 (81%)
Child currently enrolled in Preschool or Head start	
Yes	5 (15.6%)
No	27 (84.4%)
Child currently enrolled in Kindergarten	
Yes	2 (6.3%)
No	30 (93.8%)

*Note:*  
<sup>a</sup>Caregivers could select multiple choices.  
<sup>b</sup>Federal poverty level is \$26,200/year for a family of 4 (January 2020).

distracted or uninterested in learning activities. Specific examples included snuggling up in blankets for reading time and giving their child more choices in activities. A few parents mentioned they were able to use *TbT* to redirect their children away from technology (e.g., video games or TV) and engage them in literacy activities. Additionally, parents reported *TbT* prompted them to reinforce the alphabet, syllables, name writing, and vocabulary.

Changing parent and child reading behaviors. Most parents said they regularly read to their children before participation in the texting program but described reading as a passive activity with minimal parent-child interaction. Parents described how *TbT* taught them to engage with their child during reading with new strategies such as using book illustrations and asking their child questions while they read. One English-speaking parent described the changes in how she read to her daughter:

Before she [daughter] just knows we open the book and start reading. Now she knows because I follow with my finger when I read and before I used to have her lay down and I would read to her. Now I face her and show her the book.

A Spanish-speaking parent highlighted that *TbT* helped her teach important literacy concepts through books saying, “I always taught him [younger child] like I teach older kids . . . I never stopped to think that he didn’t know the different parts of a book, that was so important, and to start over and explain ‘This is the title.’” This broadened conceptualization of reading mechanics was shared by many other parents.

Increasing time spent teaching within a busy day. Parents did encounter barriers to participation in *TbT*. One parent noted that the number of text messages was overwhelming because she deeply wanted to accomplish all of the activities, while another was discouraged because she felt the activities were too challenging for her three-year-old child. One parent felt that the literacy activities were above her own level. However, most parents were excited to recount their newly acquired teaching

## Box 2.

### THEMES & REPRESENTATIVE QUOTATIONS

Domains:

Parent as Teacher

**Teaching children new skills using new strategies.**

*“I was teaching only the alphabet not the sound. So everywhere I put alphabets [letters] on the wall. When he [son] sees the alphabet [he says] ‘Mommy, A is a you know.’”* (English Speaking Parent)

**Changing parent and child reading behaviors.**

*“I would read him [son] books before, but I feel that I was reading them for me. I was reading them, but I didn’t make it so that he [son] could participate: ‘What do you see?’ ‘What are they doing?’ That is something new that I learned and that we did.”* (English Speaking Parent)

*“I always taught him [son] like I teach older kids, just to read the books and read the books, and I never stopped to think that he [son] didn’t know the different parts of a book, that was so important, and to start over and explain ‘this is the title.’”* (English Speaking Parent)

**Increasing time spent teaching within a busy day.**

*“I’m working and don’t have time to look at them [the text messages], but I find a way to read them later. Maybe if there isn’t time at that moment to do the activity, I look for a time later.”* (Spanish Speaking Parent)

Child Learning

**Increasing children’s confidence, skills, and engagement in early learning.**

*“She [daughter] feels more confident. There’s more communication, and now she’s not afraid to ask, ‘What does this say?’ ‘What does that say?’ The truth is that it [TbT] has helped us a lot, a lot.”* (Spanish Speaking Parent)

*“He’s [son] more confident with . . . reading, even though he doesn’t know how, he tells me what he sees there. It’s like he imagines, he describes what he sees in the book, that’s how he reads. If the character’s sitting or standing, that’s what he says about the book, even if he doesn’t understand it, ‘Look mommy.’ That’s what he is more confident in, in reading, because he likes to read.”* (Spanish Speaking Parent)

(continued on p. 51)

## Box 2. (continued)

Family &

Community

Impact

### **Fostering family interactions and closer bonds.**

“He [son] now wants to read and learn more. And it’s helped me become closer to him. It’s helped me plant a little seed to want to learn. I liked it [TbT] a lot.” (Spanish-Speaking Parent)

“Every time I would get the messages at work, I thought, ‘How am I going to ask him [son] this question?’ or ‘How am I going to do this?’ We started talking more, dialoguing more, between the two of us. He started talking to me about things that happened at school that were related. We are dialoguing more.” (Spanish Speaking Parents)

### **Creating an educational ripple effect.**

“Oh, I think they’re [text messages] very handy. I actually started forwarding some of them [text messages] to my friend just as little tips especially with the reading [and] writing because most of our kids are all in the same age too and they’re [kids] all in that stage.” (English Speaking Parent)

Parent—Provider

Relationship

### **Strengthening communication with the pediatrician.**

“I feel more comfortable making more direct and specific questions about things that she [daughter] might not be able to do. For example, if she was unable to distinguish between colors, I would notice...” (Spanish Speaking Parent)

### **Leveraging the authority of the pediatrician’s voice.**

“It has also helped me because I can say, ‘The doctor wants you to draw,’ and so he [son] starts to draw. It has helped me a lot because I only have to say, ‘The doctor says to...’ for him [son] to do something, because sometimes he [son] doesn’t want to.” (Spanish Speaking Parent)

strategies and how they used the texts to incorporate learning into existing activities at home. One mother began using daily walks around the neighborhood to work on color identification, while many others mentioned practicing colors, letter recognition, and letter-sound correspondence during grocery shopping.

The most common barrier to using *TbT* was having a busy schedule. Parents stressed the number of commitments they have, including housework, employment, and caring for multiple household members. However, the ability to save messages and read them later allowed texts to act as a reminder that could be returned to at a convenient time. One parent summarized the sentiment of many: “I’m working and don’t have time to look at them [text messages], but I find a way to read them later. Maybe if there isn’t time at that moment to do the activity, I look for a time later.” Several parents also specifically stated that they preferred texts to phone calls or emails because they were “more direct and easier” and because compared with phone calls “one learns, but when one has time.” Parents shared that *TbT* supported their current activities by providing an important reminder and motivation to set aside time for learning during a busy day.

*Domain 2: Child learning. Increasing children’s confidence, skills, and engagement in early learning.* Parents observed personal and educational development among their children. Parents reported their children became more confident after engaging in *TbT* activities, describing a transformation from reserved and timid to expressive and self-assured. They reported that their children became more courageous in communicating with others (e.g., family members, friends at school, health professionals) as a result of the program. Parents noted the newfound confidence made their children more likely to ask questions, initiate learning opportunities, and explore the world around them.

Many parents reported witnessing improvements in their child’s engagement, motivation, and enjoyment of academic activities. After participation in *TbT*, children self-initiated learning opportunities more frequently, spent more time engaging in early learning activities, and demonstrated greater focus. Children grew more enthusiastic and curious in their learning and sought to learn more.

Many parents described diverse and profound child learning. Through engagement in *TbT* activities, parents noted their children developed skills in alphabet knowledge, early phonics, phonological awareness, color identification, and expressive language. Parents also described growth in following directions, paying attention, and understanding rules and consequences. One Spanish-speaking parent noted her child’s growth in attention and academic skills saying, “It [her son’s behavior] was worrying me because I would read to him every day but he [son] had no interest in letters and numbers and the sounds that they made but now he is, and it [TbT] has helped a lot.”

*Domain 3: Family and community impact. Fostering family interactions and closer bonds.* Parents observed that *TbT* fostered closer bonds between themselves and their children. All parents shared that texts prompted an increase in communication with their child. Parents began asking their children more questions throughout the day such as, “Would you like ketchup on your eggs?” at breakfast, or “Tell me what you did at daycare today” on the car ride home. Parents felt this increased communication helped them better understand their child and become more comfortable initiating reciprocal dialogue.

Additionally, *TbT* activities increased family cohesion. Several parents reported that

older siblings often facilitated the activities for their younger siblings, increasing quality-time and communication. They noted that their children loved having one-on-one time with multiple family members. One English-speaking mother noted, “So, it’s not just me doing it [the texts], they [older siblings] are involved with me . . . I think she [younger child] likes it because she feels like she’s getting a lot more attention because we’re asking her [ideas].”

Creating an educational ripple effect. The impact of the *TbT* messages spread beyond the immediate family. Many parents shared messages with extended family members (e.g., grandparents, spouses, aunts, uncles) who engaged in *TbT* activities with the child. It was reported that *TbT* activities also benefited both older and younger siblings who participated in the suggested activities as teachers and participants. Similarly, some parents reported that *TbT* activities inspired their child to begin teaching others around them, repeating what they had learned and practiced. One parent described being surprised when her previously rambunctious son began quietly teaching his cousin about animals. Another parent shared that her daughter had begun playing teacher for her brother. Finally, many noted sharing the messages with friends who have young children because they valued the messages and wanted to share this resource.

Domain 4: Parent-provider relationship. Strengthening communication with the pediatrician. Most parents reported positive relationships with their child’s pediatrician. Some also described an enhanced relationship resulting from participation in *TbT*, reporting increased confidence in discussing their child’s development. Specifically, parents noted that they were better able to ask and answer questions about their child’s developmental milestones. Other parents believed that the program improved their child’s interaction with their pediatrician, as they witnessed their child’s increased ability to respond independently to the pediatrician’s questions during visits.

Leveraging the authority of the pediatrician’s voice. Recognition of the importance of the doctor’s voice—each *TbT* message began with “Doc Says” or “El Doctor Dice”—was mentioned by a number of parents. TipsbyText messages prompted them to engage in activities with their children because they were coming from their pediatrician. Some parents described that they would point directly to *TbT* messages on their phone and tell their child, “The doctor wants us to do an activity.” Parents appreciated the level of authority that came with *TbT*, as they believed their children were more engaged and responsive when they knew the recommendation was coming from the pediatrician. Some parents even began to use “El Doctor dice” to encourage other positive behaviors such as listening to parents’ instructions or putting away iPads and other technology.

Parents viewed pediatricians as knowledgeable experts who would gather information, process it, and then pass it along to them. Therefore, *TbT* contained important educational information being passed from pediatrician to parent, and from parent to child. In the words of one Spanish-speaking parent, “The doctor is our teacher, and we are the teachers of our children. They say education lies within the household.”

## Discussion

**Leveraging physician trust to promote behavior change.** TipsbyText extended SR guidance that pediatricians provide beyond the clinic walls and between well-child

visits through the customized “Doc Says” format. The pre-established trust between provider and family strengthened *TbT* because parents felt confident in the messages they were receiving and the recommended early learning activities. While the importance of trust among pediatricians has been established previously, for instance in regard to childhood immunization preferences,<sup>41,42</sup> this research highlights how parents utilize these trusted relationships to encourage behavior change in their children (e.g., reading more or participating in educational activities). Our findings suggest the power of physician trust to promote behavior changes between a parent and child, further encouraging parents to be their child’s first teacher.

Parents reported that *TbT* prompted specific changes in reading behaviors and an increase in time spent reading to their children. These findings are consistent with the physician-engaged *Reach Out and Read (ROR)* program.<sup>31</sup> For over 20 years pediatricians across the country have provided low-income children with a free book and parents with brief (30 seconds to two minutes) literacy guidance at well-child visits.<sup>30</sup> At our study clinic, children three to four years old received a book during well-child visits, and almost all parents in our study reported reading to their children prior to intervention. However, prior to *TbT* very few parents noted using books to teach specific literacy skills such as reading direction, letter recognition, and identifying parts of a book—skills reinforced in the *TbT* program. Some parents also changed how they read to their children, now clearly displaying the book pages rather than facing the book away from the child. *TbT* has the potential to work synergistically with ROR by further reinforcing early literacy messaging and promoting behavior change between regular well-child visits. Instead of hearing literacy messaging only once on a yearly basis, *TbT* lengthens the period of engagement with trusted pediatric providers through frequent contact and concrete advice.

**School readiness support in pediatrics clinics.** Our study highlights parental desire for pediatricians to play an active role in SR.<sup>28,31,43</sup> Parents in our study did not believe clinic-based SR programs would detract from their child’s health care, but rather that it would strengthen the guidance that pediatricians already provide regarding their child’s early development.<sup>28</sup> Pediatrician involvement in promoting SR is also consistent with the American Academy of Pediatrics (AAP) statement that pediatric care should encompass social determinants of health, specifically early literacy engagement in the clinic.<sup>44</sup> Pediatricians have regular access to low-income pediatrics populations, many of whom are often the most disconnected from other early literacy resources.<sup>29</sup> The program was well-liked and widely used by parents, suggesting the opportunity to leverage AAP recommendations and the pediatrician’s relationships with low-resource children to promote clinic-based SR through a creative mHealth texting intervention.

**Breaking down traditional barriers to school readiness.** Many barriers prevent low-income families from accessing early childhood education programs and resources.<sup>12,13</sup> In our study, the most cited barrier to parental engagement in early learning was time. Consistent with the literature, our study found that busy schedules and multiple demands on parents made carving out time for literacy development challenging.<sup>5,17,28</sup> Many programs (e.g., parenting classes and workshops) aimed at increasing SR place substantial demands on parents’ time and overwhelm them with content, often resulting in lack of engagement.<sup>17</sup> *TisphyText* was instead designed to break down large concepts into

small bits of information to reduce parents' cognitive load.<sup>32,45</sup> One parent described this as getting a parenting book, "one page at a time." This strategy gives parents the ability to choose how and when to engage with their children.<sup>32</sup> Parents appreciated that this approach was easy to implement and integrate into their daily routine while also helping them to become more confident teachers. Rather than feeling overwhelmed, the flexibility of *TbT* gave parents the control to support their child's early literacy in a manner that best worked for their family and schedule.

Low access to high-quality early education is another particularly problematic barrier to SR.<sup>46</sup> Though this population is eager to engage in their child's early learning,<sup>28</sup> it faces challenges in participating in the early learning sector, including lack of available spots and prohibitive costs of preschool, difficulty navigating systems due to linguistic barriers, and disengagement with systems due to worries around immigration status.<sup>5,46,47</sup> This intervention, *TbT*, helped parents to become their child's first teacher, a role essential for early educational development.<sup>7,48</sup> The perceived impact of this program is particularly relevant given the intervention was implemented at a public clinic serving a primarily Spanish-speaking population with Medicaid insurance. Opportunities to break down barriers for this population are important for promoting educational equity for all children.

This mHealth intervention provided parents with the scaffolding needed to create language-rich interactions outside traditional preschool environments. Interventions such as *TbT* are critical (a) in their ability to stimulate a child's cognitive abilities without requiring expensive materials or resources and (b) in their ability to be accessed without interfacing with state or federal agencies that may be unsafe or threatening to families with mixed immigration status. Furthermore, *TbT* brought trusted early literacy advice directly to parents in their preferred language, reducing the linguistic barrier faced by non-English language speakers.<sup>46</sup> While this intervention only targeted English- and Spanish-speaking families, *TbT* has already expanded their texting program into multiple other languages, including Chinese, Vietnamese, and Danish. Therefore, this clinic-based early literacy model has the potential to expand and reach the most under-resourced and disconnected families, thereby mitigating disparities in developmental outcomes among children living in low-income households.<sup>49</sup>

**Use of mobile technology to promote SR.** Consistent with similar evaluations of text vaccine reminders, our participants preferred text prompts to emails or calls.<sup>24</sup> Specifically they appreciated that tri-weekly messages served as reminders that could then be accomplished at a time that best fit their schedule. The ease of saving messages for later was frequently described by our focus group participants, and the technological ease of sharing text message content between family members and friends expanded the intervention's reach.

**Expanding a child's educational network.** Finally, our focus groups unexpectedly revealed that *TbT* increased children's access to literacy-rich interactions beyond parents alone, promoting engagement with additional caregivers, family members, and friends. While the intervention was designed to support interactions with the primary caregiver who received the weekly texts, the extent to which the tips were shared reinforces the broad reach already attributed to *TbT*.<sup>50</sup> The sharing of texts expanded children's network of individuals with whom they could engage in early learning activities. It

also increased the number of children reached by *TbT*, as siblings and others were also included. This finding is important given that we know a child's success in school depends not only on their household but also on the ability of the larger community to support SR, particularly among English language learners.<sup>7,49,51</sup> The texting program indirectly expanded the child's family and community network, which is critical for promoting broad change.<sup>52</sup>

**Limitations.** Our study had several limitations. First, our sample size was small and predominantly Latinx; like those of many qualitative studies, our findings cannot be generalized to other populations and clinics. However, our study population demographically reflects the diversity of the clinic overall and provides valuable insights into the perspectives of a largely Latinx parent population. Another limitation was possible selection bias as parents responded to the opportunity to participate in a focus group. Parents who had positive experiences with *TbT* may have been more likely to participate. Additionally, social desirability bias may have deterred parents from sharing negative feedback given that the program was administered through the clinic, particularly because the focus groups were held in the same office building as the pediatric clinic where our participants' children received care. To minimize this bias, focus group facilitators specifically probed for negative opinions, and every focus group introduction included specific language about confidentiality and the fact that answers would not affect care.

Finally, while children in preschool at time of enrollment were not eligible to participate, many began preschool and kindergarten while receiving the *TbT* intervention. This additional education, in conjunction with normal child development, could confound the changes in literacy attainment and attention reported by parents during this study. We recognize our findings do not demonstrate the program's objective impact on child literacy and parent engagement, outcomes assessed in the RCT.<sup>33</sup> This study was undertaken to understand parents' perspective on the program and provides important insight into how a clinic-based text messaging intervention changes parent-child interactivity in the daily lives of families. These findings can inform how and what future studies might examine when looking for ways to support early learning among children living in low-income households.

**Next steps.** While findings from the RCT are forthcoming, we recognize the need to further examine the application of *TbT* across other clinical settings with potentially different clinic priorities, provider time and resources, and technology systems. Therefore, two of the study authors are currently involved in a feasibility study in two distinct clinics, unrelated to the clinics from this study.

**Conclusion.** Children from low-income families face inequities in school readiness.<sup>5</sup> Unfortunately, the children who are most in need of resources are often the most difficult to reach, especially in their preschool years. Our findings represent early feedback that among a subset of parents, a texting intervention deployed from the clinical setting can elicit positive behavioral change in families otherwise possibly disengaged and is easily adopted and well-liked. Additionally, this study emphasizes the important relationship between the pediatrician and parents and the success of leveraging the power of pediatrician trust. These findings paint an encouraging picture for light-touch technology-based interventions in decreasing disparities in SR and addressing the needs of the most disconnected children and families.

## Appendix 1.

### FOCUS GROUP QUESTION GUIDE

#### Focus Group Questions

Introduction & Ice Breaker	Here are some examples of the text messages you have received with our program. Could you please introduce yourself, first name only, and share with us the activity you did (or would do) with your child when you received this message?
Expectations for Intervention	Can you please describe some activities you did with your child before the program? Can you tell us what you think about the text messages now that you have received them for several months?_
Parenting: Self-Efficacy, Social Support, Stress	Could you describe some ways that the text messages support you as a parent and could help promote your child's development? Could you describe any changes in your child's confidence since starting the texting program? Can you describe a time you received the Tips by Text messages but weren't able to complete the activity or prompt with your child, if any?
Connectivity with Provider	Please tell us how receiving texts has changed your relationship with your child's pediatrician?
Feasibility	Can you please tell us your overall experience receiving the text messages, specifically how and when you received the messages? Is there anything you would change about the Tips by Text Program?

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