

# Sparkling Connections: Evaluations of Mobile Messaging on Responsive Caregiving

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# Introduction

**Children’s early experiences with their parents have a profound effect on their lifelong academic achievement and physical and mental health** (see, for example, Duncan et al., 1998; Fox et al., 2010). *Responsive caregiving* is a key approach that parents and caregivers<sup>1</sup> can adopt during this sensitive developmental period to improve children’s long-term outcomes (Cristofaro & Tamis-LeMonda, 2012; Landry et al., 2001; Mol et al., 2008). Responsive caregiving includes parenting behaviors like serve and return interactions, rich and varied language inputs, and positive affect (Landry et al., 2001). There is strong evidence that interventions can help parents improve these skills (De Graaf et al., 2008; Moore et al., 2014); yet such services are expensive, and not all are effective. One meta-analysis of parent support programs in early childhood education settings found that only those that provided parents with clear and explicit guidance on how to implement parenting practices led to positive impacts for children (Grindal et al., 2016).

Mobile messaging programs are a **low-cost, scalable approach** to building parents’ knowledge and capacity to support their children’s development. These programs



**Serve and return interactions** are reciprocal and supportive back-and-forth interactions between parents and children that support early brain development (Fisher et al., 2016).

directly deliver simple and straightforward information, tips, and activities that parents can incorporate into daily routines. Mobile messaging programs thus can overcome barriers to take-up and scalability of typical parenting interventions (Gennetian et al., 2019; York & Loeb, 2014). However, there is a need to better understand **how mobile messaging affects parents’ engagement in responsive caregiving and other positive parenting behaviors, particularly with infants and toddlers.**

To meet this need, SRI Education partnered with Bright by Text (BBT) and Univision (whose program was developed with Too Small to Fail) to evaluate the impacts of mobile messaging on key parenting outcomes. Because these programs,

<sup>1</sup> “Caregivers” includes persons other than biological parents who are responsible for the care of young children. The mobile messaging programs are targeted to this range of caregivers, and caregivers other than parents are included in both study samples. For brevity, we use “parents” to refer to both parents and caregivers in this report.

contexts, and target populations are distinct, the SRI team conducted separate studies of each: a randomized controlled trial study of BBT and a quasi-experimental design study of Consejos de Univision (Consejos). We also conducted surveys and interviews with treatment group participants from both studies to understand parents' experiences with the messaging content. Together, these studies examined how receiving messages from BBT and Consejos affects responsive caregiving and the attitudes, knowledge, and confidence of parents with children aged 18 to 36 months.

For BBT, we found that parents randomly assigned to the treatment group did not demonstrate statistically significantly higher scores on the parent-reported outcomes relative to parents assigned to the control

group. The treatment effects were not statistically significant, and effect sizes ranged from less than .01 to .15. For Consejos, we found that, relative to the comparison group, parents in the treatment group reported they read for significantly more minutes on a typical day, engaged more frequently in shared reading activities, and had higher self-efficacy. Effect sizes ranged from .01 to .56.

In this report, we first present our systematic review of the literature on mobile messaging, after which we describe our study design, analyses, and findings for the BBT and Consejos programs. We conclude that mobile messaging programs like BBT and Consejos can be an effective strategy to **spark connections** between parents and their children as they learn.



# Systematic Literature Review

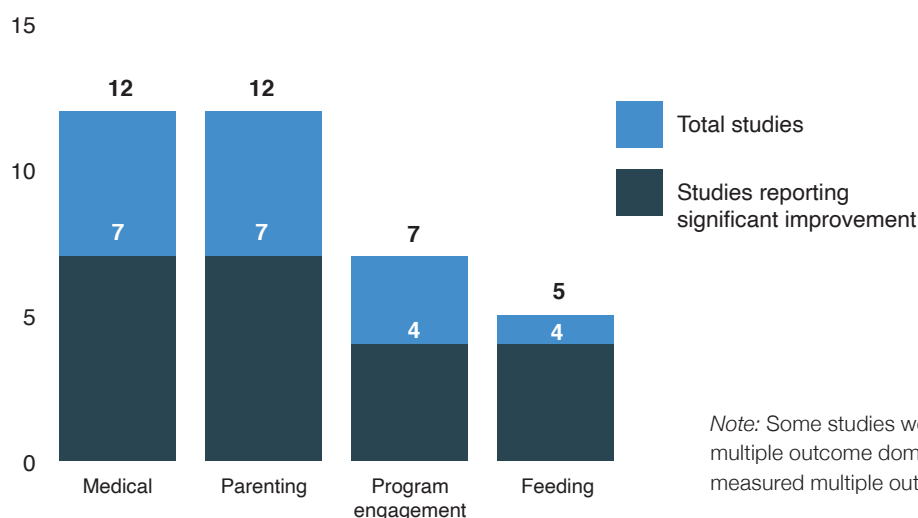
To situate the BBT and Consejos studies in the landscape of mobile messaging research, highlight their unique contributions, and contextualize the findings, we began with a systematic literature review. Research on the specific impact of mobile messaging on responsive caregiving is an emerging field, but there is a robust broader literature on the impact of mobile messaging on a range of parent and child outcomes in medicine, education, and parenting. See Appendix A for more details about the literature review.

The SRI team screened 97 studies for inclusion in the systematic literature review. We screened out 65 studies and included 32 in the final

review. Figure 1 displays the number of studies that met eligibility criteria<sup>2</sup> within four broad outcome domains: medical, parenting, program engagement, and feeding. Most of the rigorous research on mobile messaging for parenting had been conducted in the medical and parenting fields. Within each outcome domain, more than half of the studies reported at least one statistically significant improvement.

Our review shows that mobile messaging is an outreach strategy that can promote parenting outcomes. Many rigorous studies explored the impact of mobile messaging on parenting in early childhood across diverse areas of focus. The research base suggests that mobile

**Figure 1. A majority of mobile messaging studies in each outcome domain reported significant improvement**



<sup>2</sup> The review included studies in English published in or after 2005 that focused on parenting outcomes and included a messaging component. Studies must also have included a placebo or no-SMS control and implemented a quantitative comparison of treatment and control. See Appendix A for full eligibility criteria.



messaging is more effective for certain types of parenting outcomes, such as those based on concrete parenting behaviors like vaccination, learning activities at home, use of specific intervention strategies, or feeding practices (e.g., having family meals). Mobile messaging may also be an effective strategy for promoting parent well-being—such as reducing stress, anxiety, anger, depression, and inter-parental conflict—and self-efficacy. On the other hand, mobile messaging may have a less consistent impact on more complex or time-consuming parent behaviors, like patterns of parent–child interaction or breastfeeding. These behaviors may require more intensive supports. The extent of the evidence for each outcome domain is summarized in Table 1.

More research is needed to explore potential mediators or process variables, which may

explain the link between mobile messaging and observable outcomes. For example, mobile messaging may support well child visits and vaccination via parent health care engagement, or use of intervention strategies via intervention skill practice.

A small body of evidence suggests that mobile messaging may have promise for supporting responsive caregiving. Of the five studies in this review that focused on parent–child interactions, two measured the impact on responsive caregiving. Lefever et al. (2017) reported a significant, positive impact on responsive caregiving, and Carta et al. (2013) found no significant between-group difference on this outcome. More research is needed to clarify the potential of mobile messaging to support responsive caregiving.

**Table 1. Summary of the extent of mobile messaging evidence by outcome domain**

Extent of evidence	Medical	Parenting	Program engagement	Feeding
At least 50% of studies reported a statistically significant impact of mobile messaging on these outcomes <sup>a</sup>	<ul style="list-style-type: none"> <li>• Vaccination</li> </ul>	<ul style="list-style-type: none"> <li>• Opportunities for learning</li> <li>• Parent psychosocial outcomes</li> <li>• Parenting self-efficacy</li> </ul>	<ul style="list-style-type: none"> <li>• Use of intervention strategies</li> </ul>	<ul style="list-style-type: none"> <li>• Feeding practices</li> </ul>
Less than 50% of studies reported a statistically significant impact of mobile messaging on these outcomes <sup>a</sup>	<ul style="list-style-type: none"> <li>• Well child visits</li> </ul>	<ul style="list-style-type: none"> <li>• Parent–child interaction</li> </ul>	<ul style="list-style-type: none"> <li>• Program attendance</li> <li>• Program engagement</li> </ul>	<ul style="list-style-type: none"> <li>• Breastfeeding</li> </ul>
There is too little evidence to draw conclusions about the impact of mobile messaging on these outcomes <sup>b</sup>	<ul style="list-style-type: none"> <li>• Emergency department visits</li> <li>• Parent health care engagement</li> <li>• Oral health</li> </ul>	<ul style="list-style-type: none"> <li>• Dysfunctional parenting</li> </ul>	<ul style="list-style-type: none"> <li>• Program retention</li> <li>• Intervention skill practice</li> </ul>	<ul style="list-style-type: none"> <li>• Contact with a peer breastfeeding counselor</li> </ul>

<sup>a</sup> Among outcomes supported by a medium to large evidence base, which we defined as including at least two studies and at least 350 total participants. These criteria are loosely based on What Works Clearinghouse (WWC 2020) guidelines.

<sup>b</sup> Outcomes supported by only a small evidence base, which we defined as included only one study with a combined sample size of fewer than 350 participants. These criteria are loosely based on WWC (2020) guidelines.

# Evaluations of Bright by Text and Consejos de Univision

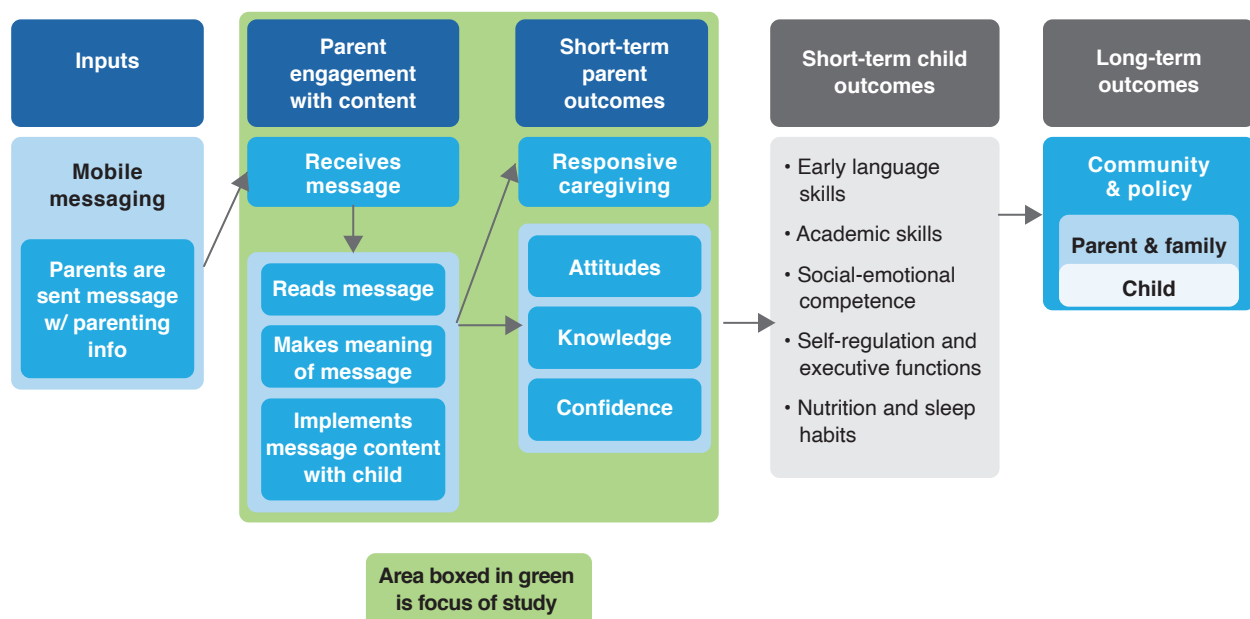
## Description of Messaging Programs

BBT and Consejos aim to provide effective tools to foster parents' support of children's early learning. Both programs reach parents through text messaging (SMS) and provide brief and actionable information, tips, and activities focused on child development and parenting. The tips and activities help parents integrate opportunities for early learning into everyday life.

The theory of change for BBT and Consejos posits that parents read, make meaning of, and implement text messaging content with their children (Figure 2). Parents' engagement

with the messaging content in turn may translate to responsive interactions with children, more positive attitudes toward parenting, knowledge about supporting children's learning and development, and greater self-efficacy and confidence in supporting children's learning. Although not the focus of the current study, these parenting behaviors are believed to support children's positive development, including early academic skills, interest in and excitement about learning, and self-regulation. While many other factors influence parent behaviors and child development over time, this theory of change suggests that BBT and Consejos can lead to improved child outcomes in a cyclical way, as gains in children's skills

Figure 2. Theory of change for Bright by Text and Consejos de Univision





reinforce parenting behaviors, leading to positive long-term impacts at the child, family, and community levels.

Although BBT and Consejos share a common framework and theory of change, the programs and parent outreach strategies have key differences. Therefore, we conducted a separate study of each program.

**BBT** messages focus on child milestones, early learning, social-emotional skills, and health and wellness. Messages also address parents' well-being and provide information about local child-friendly events and resources. Each message includes information, an activity, or a resource as well as a link to the BBT web page with more details. The messages are tailored to children's age, from prenatal through 8 years. Messages are sent 3–5 times a week. BBT reaches potential parent subscribers through social media advertisements and outreach from partner organizations such as PBS.

**Consejos** messages focus on conversational prompts and suggested activities to increase parents' responsive and language-rich interactions with children. The program enrolls Spanish-speaking parents, and all messages are delivered in Spanish. Messages are targeted toward parents of infants, toddlers, and young children but are not tailored to children's age. Messages are sent 3 times a week. Consejos reaches prospective parent subscribers primarily through cross-promotion on Univision programs and advertisements on Facebook. Previous enrollment campaigns have been delivered through interstitials on television programs such as *Pequeños Gigantes* and *Despierta América*.

### Example BBT message:

Nursery rhymes promote learning about rhythm and language. Share the rhymes that you know with your child!  
<https://bit.ly/3JKiHC5>

### Example Consejos message:



¡Convierte la hora de bañarse en un momento de aprendizaje jugando a “¿Se hundirá o flotará?” Dile a tus niños que las cosas menos densas que el agua flotarán, mientras que las más densas se hundirán. Mientras tus niños estén en la bañera, dales algunos juguetes diferentes y pídeles que adivinen cuáles se hundirán y cuáles flotarán. Luego, haz que tus niños coloquen cada objeto en el agua para comprobar sus suposiciones.

*Translation: Turn bath time into a learning moment by playing “Will it float or sink?” Tell your kids that things that are less dense than water float, while things that are denser sink. While your kids are in the bathtub, give them a few different toys and ask them to guess which ones will sink and which ones will float. Then ask your kids to place each object in the water to test their guesses.*

# Methods

## Research Questions

The study team sought to answer three confirmatory research questions for each mobile messaging program:

1. How does each focal mobile messaging program affect responsive caregiving (i.e., serve and return interactions, rich language environments, and positive affect)?
2. How does each focal mobile messaging program affect parent attitudes, knowledge, and confidence?
3. How do the effects of mobile messaging on responsive caregiving and parent attitudes, knowledge, and confidence differ across subgroups of parents?

We also examined the following exploratory questions:

4. How do parents engage with the information, tips, and activities from each focal program?
5. What do parents perceive as the strengths and areas for improvement of each focal program?

## Study Design

To address these research questions, we conducted a **randomized controlled trial** (RCT) study of BBT and a **quasi-experimental design** (QED) study of Consejos.<sup>3</sup> These designs are described in more detail in the study design sections

for each program and in Appendix B. Participants for both studies were recruited using the means that BBT and Univision typically use to enroll parents in the programs. Recruitment lasted from May through August 2021 for BBT and from June through August 2021 for Consejos.

Eligible participants were parents who were responsible for 18- to 36-month-old children and who were new enrollees to BBT or Consejos. There were additional eligibility requirements for the BBT study, described in the Study Design section for that program. New enrollees to BBT or Consejos received a text with a study link upon enrollment. After opening the link and consenting to participate, parents received an online survey with questions about their responsive caregiving; their parenting attitudes, knowledge, and confidence; and their demographic characteristics. All participating BBT parents completed the survey immediately before random assignment. Participants in the Consejos treatment group completed this survey immediately after enrolling in the program.

Participants in each treatment group received 12 weeks of intervention messages, whereas participants in the BBT control group received placebo messages and participants in the Consejos comparison group received no messages. Study participants received the same messages that nonstudy enrollees received. During the intervention period, the study team texted parents in each treatment group a link to a brief implementation survey with questions about their engagement with the messaging content. After 12 weeks, we texted parents

<sup>3</sup> Both research designs were preregistered with the Registry of Efficacy and Effectiveness Studies (Registry ID 7680.1v1 for BBT; Registry ID 7680.2v1 for Consejos).

in both treatment and control or comparison groups a link to the parent post survey using texting software. We asked parents to complete the survey within 1 week of receiving them, but we accepted responses through the end of the post survey period. Respondents in each study were compensated with a \$25 Amazon electronic gift card for completing the baseline and post surveys, for a total of \$50.

After parents completed the post survey, we invited five additional participants in each treatment group to participate in parent interviews for an additional \$25 incentive. Interviews were conducted in English or Spanish and lasted approximately 15 minutes.

## Measures

### Parent Baseline and Post Surveys

Participating parents completed online surveys at baseline and post with questions regarding their use of responsive caregiving: serve and return interactions, rich language environments, and positive affect. Additional questions were about attitude toward parenting, confidence in parenting, and knowledge about parenting and early development (see Table B1 in Appendix B for additional details).<sup>4</sup> The study team collected demographic and parent survey data for all eligible participating parents. We also surveyed parents at baseline about their experiences during the COVID-19 pandemic. We surveyed parents about each of the constructs at baseline and post, except for

questions about serve and return interactions, which we administered only at post to avoid prompting the behaviors targeted by the intervention. We designed the surveys to be brief, user-friendly, authentically translated, and readable at a sixth-grade or lower level.

We conducted preliminary factor analysis on the survey items to reduce the outcome variables included in the analysis, ease interpretation, and avoid numerous comparisons. One scale, positive affect, did not show sufficiently high reliability and was dropped from analysis. We examined the following outcomes in our impact analysis:



Serve and return interactions



Days read with child in the last week



Minutes read with child on a typical day



Shared reading



Frequency of labeling



Attitude toward parenting



Parent self-efficacy



Parent confidence



Parenting knowledge

<sup>4</sup> We asked a subset of BBT participants to complete an additional survey regarding on their children's vocabulary skills. This is described in the BBT Study Design section.



## Implementation Surveys

During the 12-week implementation of each messaging program, we surveyed parents in the treatment group about their engagement with the messaging content. To minimize the burden for participants, we administered the survey to half the parents at 4 weeks and to the other half at 8 weeks. Parents answered questions about whether they read and implemented messaging content with their children, whether they shared the messages with friends or family, and what might make the messages more helpful for parents.

## Parent Interviews

We sampled five parents from each program (10 parents total) to participate in a brief (15–20 minutes) phone interview in the 2 weeks after they completed the post survey. We designed interview questions to elicit the parents' perspectives on the program components they believed were most meaningful, the components they believed had the greatest impact on responsive caregiving, concrete examples of activities or interactions they engaged in with their children related to the messaging content, and the program components they thought could be improved.

We sorted parents within each messaging program into one of five groups based on their relationship to a child, gender, household income, and experiences during the COVID-19 pandemic:

- Female parent with household income less than \$50,000
- Female parent with household income higher than \$50,000

- Any non-parent caregiver
- Any male parent
- Any respondent who reported they strongly agreed that the COVID-19 pandemic negatively impacted their own or their child's wellbeing

We randomly selected one parent from each group. Interviews were in either English or Spanish, depending on parents' language preferences.

## Analytic Strategy

For both BBT and Consejos analyses, the study team began by examining response rates overall and in the treatment and control or comparison groups, calculating the extent to which the treatment and control or comparison groups were equivalent at baseline, and conducting descriptive analyses.

Descriptive analyses included correlations among parent survey variables and demographic characteristics. We used correlation results to determine the demographic characteristics to include as covariates in the analysis of mobile messaging impacts on parent outcomes. We calculated baseline equivalence between the treatment and control or comparison groups with a *t*-test (for continuous variables) or chi-square test (for categorical variables) to assess statistical significance and with a Cohen's *d* effect size to assess the magnitude of the differences.

## Impact Analysis

We examined BBT and Consejos program impacts using an intent-to-treat framework. This means we analyzed participants in the group they were assigned to at baseline, regardless of whether they participated in the study as assigned. The results of these analyses can be interpreted as supporting causal inferences about the effect of BBT and Consejos on parent outcomes.

We conducted linear (ordinary least squares) regression models for all continuous outcome scale scores and logistic regression for dichotomized outcomes to answer Research Questions 1–2. For each outcome for each program, we adjusted for baseline differences in parent attitudes, knowledge, and confidence, as well as differences in participant backgrounds. All Consejos models also included propensity score weights. We calculated the statistical significance of treatment effects, as well as effect sizes, or the mean standardized difference between the treatment and control or comparison groups, adjusted for all covariates.

## Moderation and Subgroup Analysis

We conducted analyses on differences in the impact of BBT and Consejos for relevant subgroups of children and parents (Research Question 3). We first examined whether messaging differentially impacted specific groups of parents. To do this, we added treatment by parent characteristic interaction terms to the regression model

used to answer Research Questions 1–2. We examined whether the programs had a differential impact on parent outcomes by child gender, child age in months, household income, and parent education.

We next conducted exploratory analyses of the impacts of each program among subgroups of parents with relatively lower and higher household incomes (lower than and higher than \$50,000 a year) and younger and older children (18 to 27 months and 28 to 36 months). We chose these characteristics based on theory that messaging may impact parents with more constrained resources as well as parents with younger children who consequently have relatively less parenting experience.

## Parent Interview Analysis

We translated and transcribed all parent interviews before analyses. We coded the interviews to identify common themes, using four broad categories: experiences with messages, use of messages, benefits of messages, and suggestions for changes or improvements. Subthemes emerged from each of these categories during coding. We then selected key quotes to illustrate parents' experiences.

# Bright by Text

## Study Design

The RCT study of BBT was launched in May 2021. BBT recruited participants through its typical means of enrolling parents to receive its messaging services. These means included advertisements on Instagram, Facebook, and radio; posts shared by parenting “micro-influencers” on Instagram; outreach to parents from partner organizations; and promotion of BBT by PBS partners via on-air interstitials. None of the recruitment means mentioned the study. Parents who subscribed to BBT with a child whose birth date fell between June 2018 and January 2020 received a follow-up text from BBT inviting them to participate in the study and receive an electronic gift card.<sup>5</sup> The text included a link to the baseline survey. Parents who opened the link were prompted to consent to participate, after which they received baseline survey questions.

In addition, the study team administered a survey about child vocabulary to a subset of BBT participants. The first 65 parents with a child between 18 and 30 months who took the baseline survey in English also had the option to complete the MacArthur-Bates Communicative Development Inventories (CDIs) to receive an additional electronic gift



card.<sup>6</sup> The CDIs questions were embedded in the baseline survey and completed prior to randomization.

At the conclusion of the baseline survey, parents were randomly assigned to a treatment group that received 12 weeks of BBT services or to a control group that received six placebo messages about childhood nutrition over 12 weeks. After completing the post survey or the end of the study period, control group participants began to receive typical BBT messages. This approach meant that participants were not told whether they had been assigned to the treatment or control group.

In addition to meeting the eligibility criteria for the study (see the Methods section), BBT participants must have provided the same phone number on the baseline survey that they used to sign up for messaging and must have completed the baseline survey within 48 hours of signing up for BBT.

<sup>5</sup> A child's birth date is required to sign up for BBT as part of its typical practices.

<sup>6</sup> The age range was limited to 18–30 months because the CDIs are recommended for children only up to 30 months old due to ceiling effects for children older than 30 months. Also, the CDIs were offered only to parents completing the survey in English as the study team had concerns about the comparability of responses between the English and Spanish versions because they were normed on different samples.



## Sample

Five hundred and thirty (530) participants completed the baseline survey. After removing ineligible participants, we attained a baseline sample of 499 parents (252 in the treatment group and 247 in the control group). Of these 499 eligible participants randomized at baseline, 409 completed the post survey and composed the analytic sample for the study. The overall response rate was 82% (80% in the treatment group and 84% in the control group). According to What Works Clearinghouse (WWC, 2020) guidelines, there is a low risk of

bias due to attrition from the sample. Of the 65 parents who completed the CDI at baseline, 46 completed the post survey. See Figure 3 for sample characteristics.

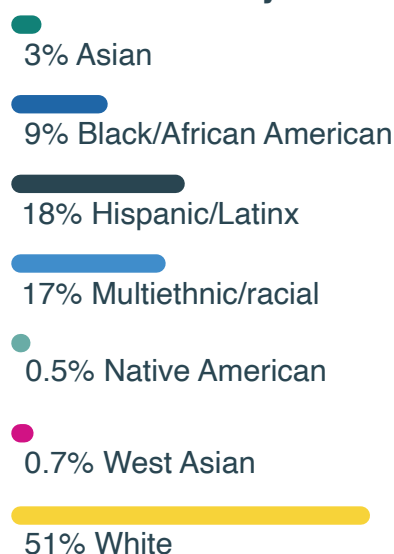
Children were 26 months old on average. Most BBT respondents were from Texas, Kansas, and Colorado (Figure 4). Baseline equivalence analyses (described in Appendix B) demonstrated that the participant characteristics and survey outcomes at baseline were equivalent between the treatment and control groups. All sample characteristics by treatment and control groups are in Table B2 in Appendix B.

Figure 3. Sample characteristics of Bright by Text participants

### Respondent gender

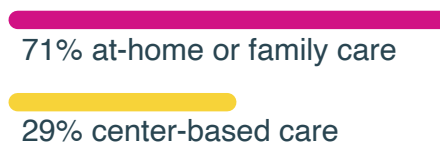


### Child race/ethnicity

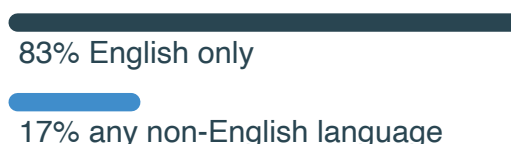


Note: Due to rounding, percentages may not add to 100.

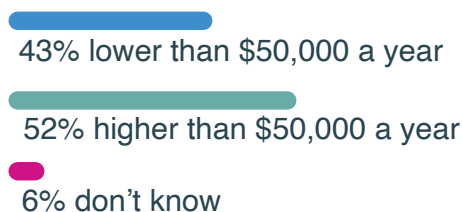
### Childcare arrangement



### Home language



### Household income



### Parent Education

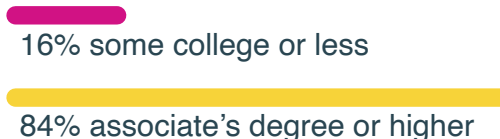
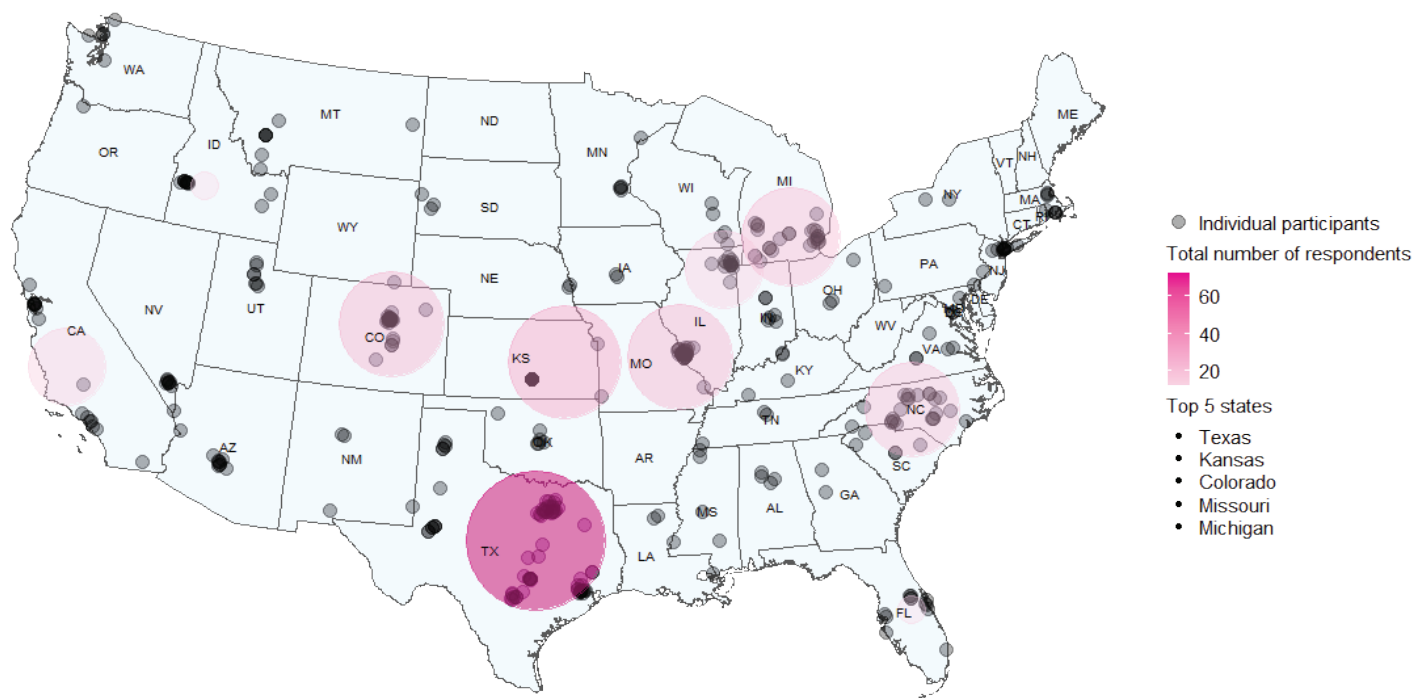


Figure 4. BBT participants were geographically diverse



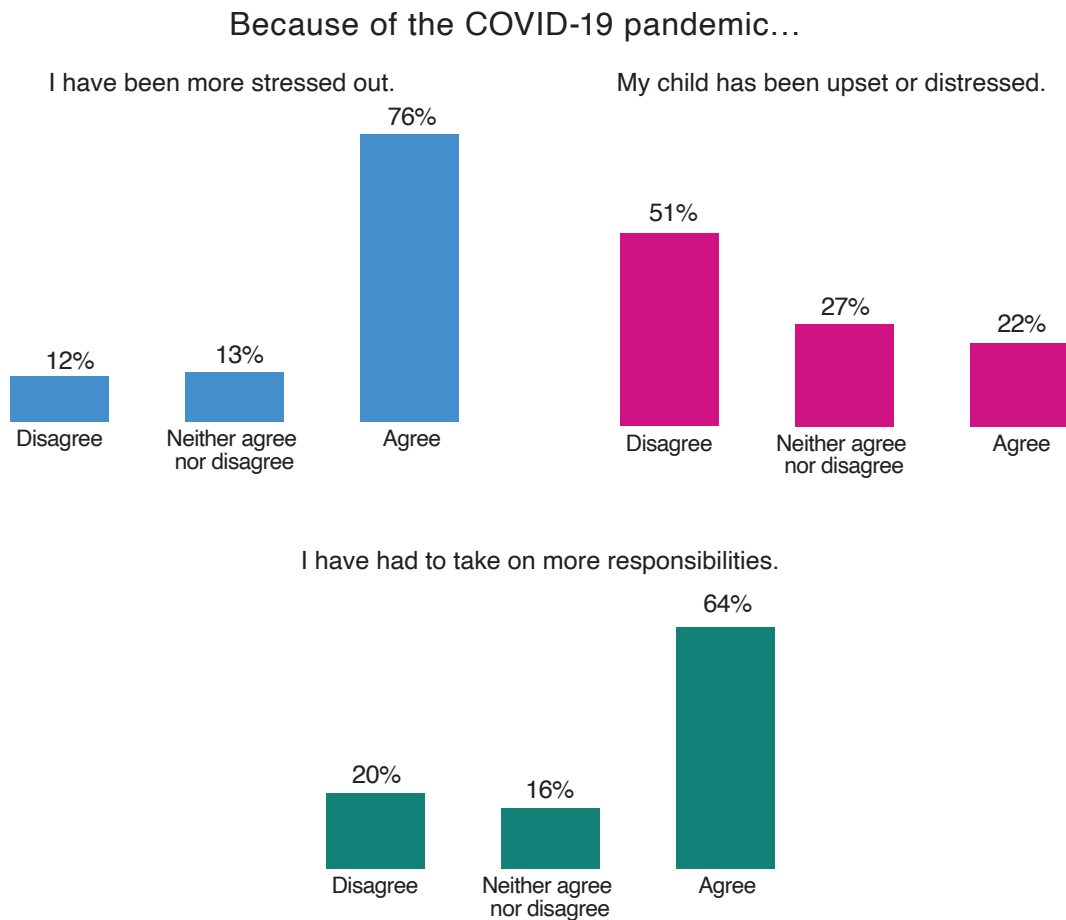
## Experiences During the COVID-19 Pandemic

Given the significant impact of the COVID-19 pandemic at the time of the study, we asked parents about their experiences during the pandemic and its impact on their lives and their children's lives (Figure 5). A majority of parents reported increased stress levels (76%) and having to take on more responsibilities (64%) due to the COVID-19 pandemic. Some parents (22%) reported that their child had been upset or distressed because of the pandemic.

## Dosage

Nineteen treatment group participants (5%) unsubscribed from BBT during the 12-week study period. Because all study participants had already enrolled in BBT, it was not possible for control group participants to receive treatment BBT messages during the study period. Participants who remained subscribed to BBT messages were enrolled in the intervention during the study period for 88 days on average, ranging from 76 to 131 days. Participants who unsubscribed from messages were enrolled in the intervention for 59 days on average, ranging from 4 to 146 days.

Figure 5. BBT parent experiences during COVID-19



## Data Analysis

The study team used linear ordinary least squares to examine continuous outcome data and logistic regression to analyze dichotomous outcome data. The main predictor was assignment to the BBT treatment condition, and we included baseline parent report and all available respondent characteristics. For additional analytic details, see Appendix B.

We coded parent interviews for parents' experiences with messages, use of messages, benefits of messages, and suggestions for changes or improvements. The study team

additionally noted other subthemes that emerged during coding, summarized across codes, and selected key quotes to illustrate parents' experiences.

## Results

### Impacts of Bright by Text

We found that, relative to the control group, participating in BBT did not significantly impact parent outcomes. There were no statistically significant differences between the treatment and control group ( $p > .10$ ). Effect sizes were small, ranging from less than 0.01 to -0.15 (Figure 6). Effect sizes represent the standard



mean difference between the treatment and control group, adjusted for all covariates.

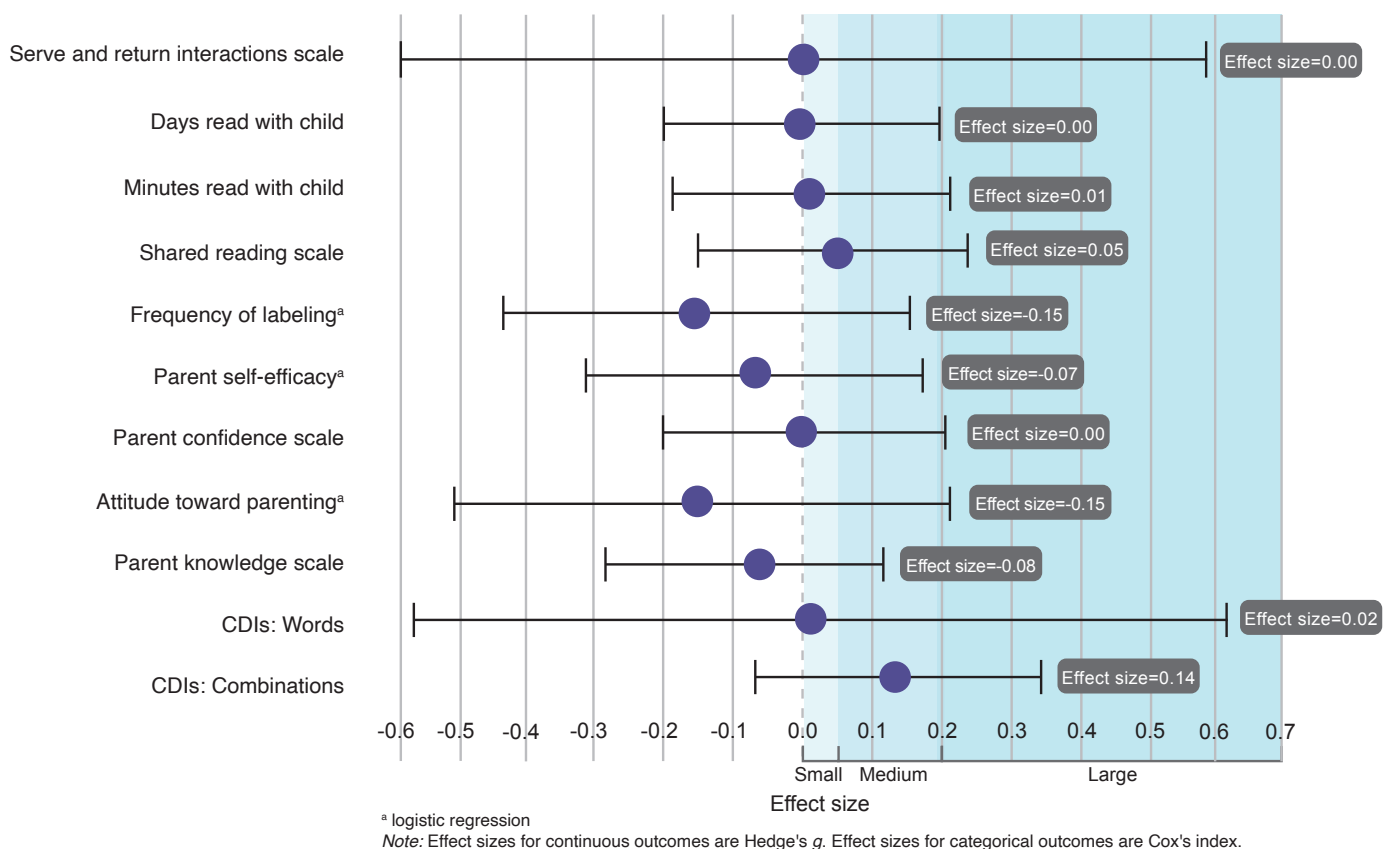
## Moderation and Subgroup Impacts of Bright by Text

We examined the extent to which BBT differentially impacted parents by their baseline characteristics. To do so, we conducted separate regression models with interaction terms between treatment and (1) child gender, (2) child age, (3) household income, and (4) parent education. Significant interaction terms can be interpreted as the intervention having a larger impact for that

group, relative to their peers in the reference category in the control group.

Findings suggest that BBT may have a larger impact for some parents. Because these groups were small, they did not reach conventional levels of statistical significance but are nevertheless suggestive of possible impacts.<sup>7</sup> We found that BBT impacted days in a typical week spent reading for parents who reported an annual household income above \$50,000, compared to parents who reported an income below \$50,000. Our findings suggest the same impact for parents who had at least an associate's degree, compared to

**Figure 6. BBT impacts on parent responsive caregiving outcomes**



<sup>7</sup> All  $p < .10$ .

parents with some college or less. In contrast, we found that BBT impacted minutes spent reading on a typical day for parents who reported an annual household income below \$50,000, compared to parents who reported an income above \$50,000. Finally, the findings suggest BBT impacted engagement in shared reading activities for parents of boys compared to parents of girls and impacted attitude toward parenting for parents who reported an annual household income lower than \$50,000, compared to parents who reported an income higher than \$50,000.

We also conducted exploratory analyses of the impact of BBT, dividing the sample by household income (lower than and higher than \$50,000 a year) and child age (18–27 months old and 27–36 months old). We did not find impacts of BBT within these subgroups of participants.

## Parent Interviews

The study team interviewed BBT participants about their experiences receiving the messages, their use of the messages, and their perceptions of the overall benefits of the messages.

Interviewees reported the primary benefit of the messages was that they could access the content on their own time. One parent described the messages as “short, sweet, and to the point.” Parents used words and phrases like “reminder,” “jog my memory,” and “refresh” to describe their reactions to the messages. Two parents said that even though their experience with older children made the content more familiar to them, they appreciated how the messages nudged

them. For example, one parent said the texts reminded them not to fixate on the end goal but rather break down the process with their child: “You don’t have to read the whole book ... take time to describe the pages ... break down the book instead of reading the story.”

Interviewees referred to click-throughs to describe their interaction with the content. Parents clicked the links in BBT text messages to get information about a suggested app or read a resource related to a developmental milestone. Although one parent was pleasantly surprised by the number of resources on the linked page, another shared they sometimes chose to look at social media instead of reading the resources in the text message.

“The biggest struggle is that I work all day, so I don’t always have time to plan activities for [my child]. I use BBT when I’m getting ready to leave for work or I just came home. If there’s a text that has come in that’s interested me, like ‘Oh there’s one about nature’ and we have time to go outside today ... [I click] on it and get some ideas for activities I can use to engage her that are age appropriate.”

Interviewees felt that the messages primarily helped them as parents as opposed to helping their children learn. The messages reminded parents to engage with their children even if they did not use the specific activities suggested in the messages. As

one parent put it, the messages “give me the tools to do it, you know ... [they] kind of just remind me to do little things.” Another parent suggested the text messages allowed her to cognitively offload some of the burden of planning activities on the text. And another parent stated the reminders to engage in learning activities provided an opportunity to bond with their child.

“I think [my child has] gained more one-on-one time with me, you know, doing some more stuff with just me and her. It’s kind of nice, her and I get to try some of these things out together.”

## Implementation of Bright by Text

Response rates to the implementation surveys were low because the study team did not offer an additional incentive for completion. Forty-eight treatment group parents (38%) completed the week 4 survey, and 33 treatment group parents (29%) completed the week 8 survey. Most parents (60%) reported they saved the messaging content for later, whereas a third (33%) reported trying it right away. Nearly all parents (96%) said they read every message or most of the messages. Only about half of parents (45%) reported sharing messages with friends and families, but the same number (45%) said they would like to do so. Most parents (90%) reported rereading the messages often or sometimes. Although these sample sizes are small and parents who were more engaged in the program were more likely to respond to the survey, these findings indicate that parents read and implemented the information, tips, and activities BBT sent to them.





# Consejos de Univision

## Study Design

For the Consejos QED study, parents were not randomly assigned to condition. Univision recruited separate treatment and matched comparison groups. To recruit treatment group participants, Univision generally used its typical method for enrolling participants in the Consejos program: two on-air spots promoting the messaging service during the *Despierta América* morning show and a post on its Facebook page. In addition, Univision sent an invitation to all subscribers to its COVID-19 informational text service, which was not a typical Consejos enrollment strategy. The team added this method because *Pequeños Gigantes* did not air during the COVID-19 pandemic, and we sought an alternative recruitment method.

When parents enrolled in the Consejos program during the recruitment window, they received a text message inviting them to participate in the study if their child was between 18 and 36 months old. The message also included a link to the baseline survey. Parents with age-eligible children who completed the baseline survey received standard Consejos messages for the 12-week study period. Parents whose children were outside the age range also received Consejos messages but were not enrolled in the study.

Univision recruited participants for a comparison group through advertisements



posted on its Facebook page for a study for parents of young children. The advertisements included a link to the baseline survey. The baseline survey screened for age eligibility; parents whose children were outside the age range of 18–36 months to were not enrolled in the study. The Consejos program was intentionally not mentioned in the study advertisement or baseline survey, to limit potential participants' ability to guess the intervention or discover there were eligibility restrictions based on their responses.

## Sample

The study team recruited an initial sample of 234 parents in the treatment group and 300 parents in the comparison group. After removing ineligible participants, we attained a baseline sample of 495 participants (210 in the treatment group and 285 in the comparison group). Of these 495 eligible participants at

Figure 7. Sample characteristics of Consejos participants

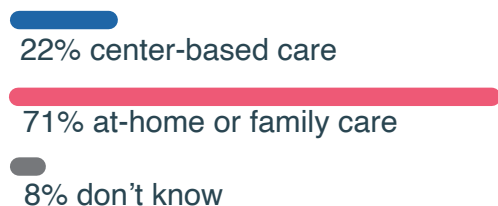
### Respondent gender



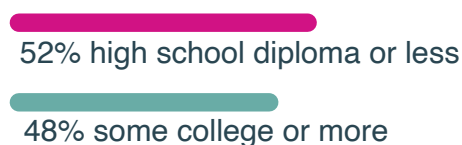
### Child race/ethnicity



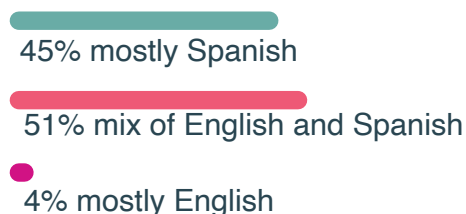
### Childcare arrangement



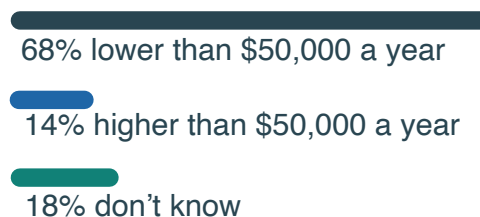
### Parent education



### Home language



### Household income



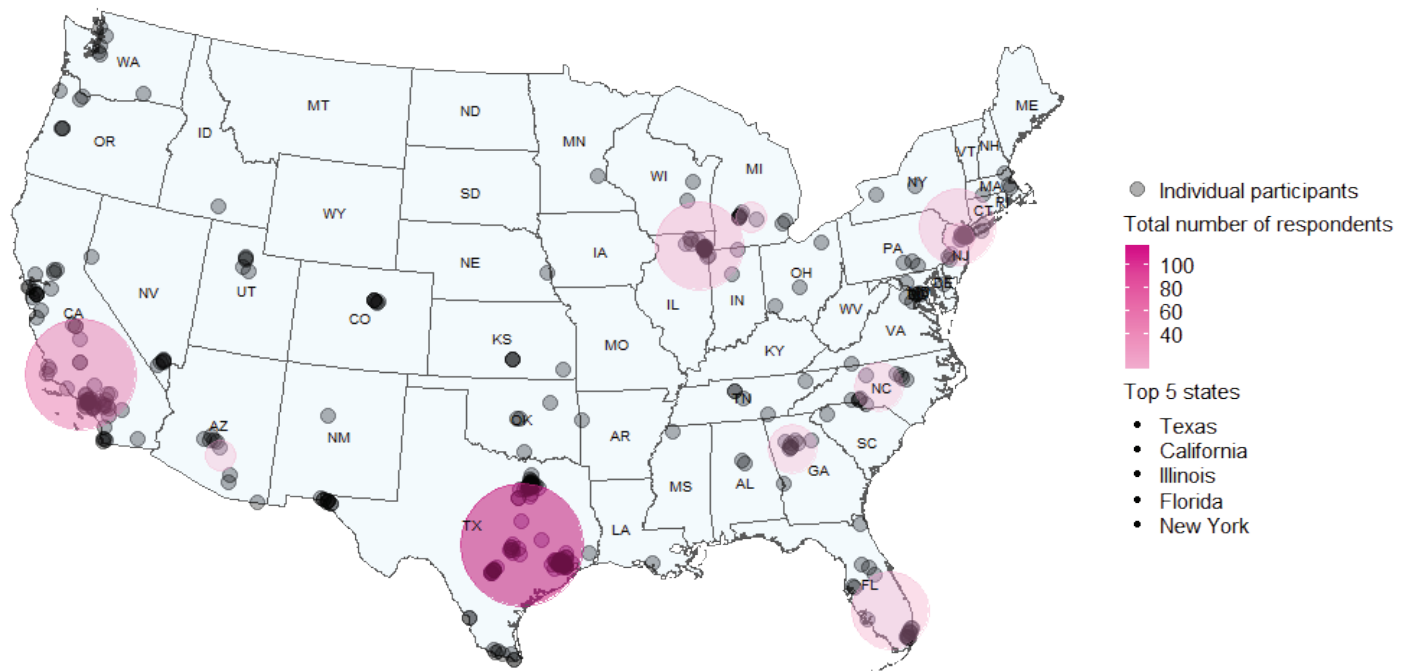
Note: Due to rounding, percentages may not add to 100.

baseline, 372 completed the post surveys, and comprised the analytic sample for the study. The overall response rate was 75%, and the response rates for the treatment and comparison groups were 77% and 74%, respectively. According to WWC (2020) guidelines, there is a low risk of bias due to attrition from the sample. See Figure 7 for sample characteristics.

Children were 26 months old on average. Most Consejos respondents were from Texas, California, and Illinois (Figure 8). Baseline equivalence analyses (described in Appendix B) demonstrated that the survey outcomes

at baseline were equivalent between the treatment and comparison groups. However, participant characteristics were not equivalent at baseline. Relative to the comparison group, treatment group participants were more likely to be parents than grandparents or other caregivers, have a household income less than \$50,000 per year, have fewer children and more adults living at home, and report watching Univision for more days in the last week. All sample characteristics by treatment and control groups are in Appendix B, Table B4. We implemented propensity weighting to address these differences between the groups.

Figure 8. Consejos participants were geographically diverse



## Experiences During the COVID-19 Pandemic

We asked Consejos parents about their experiences during the COVID-19 pandemic and its impact on their lives and children's lives (Figure 9). Two thirds of parents reported increased stress levels (65%) and having to take on more responsibilities (66%) due to the COVID-19 pandemic. A third of parents (37%) reported that their child had been upset or distressed because of the pandemic.

## Dosage

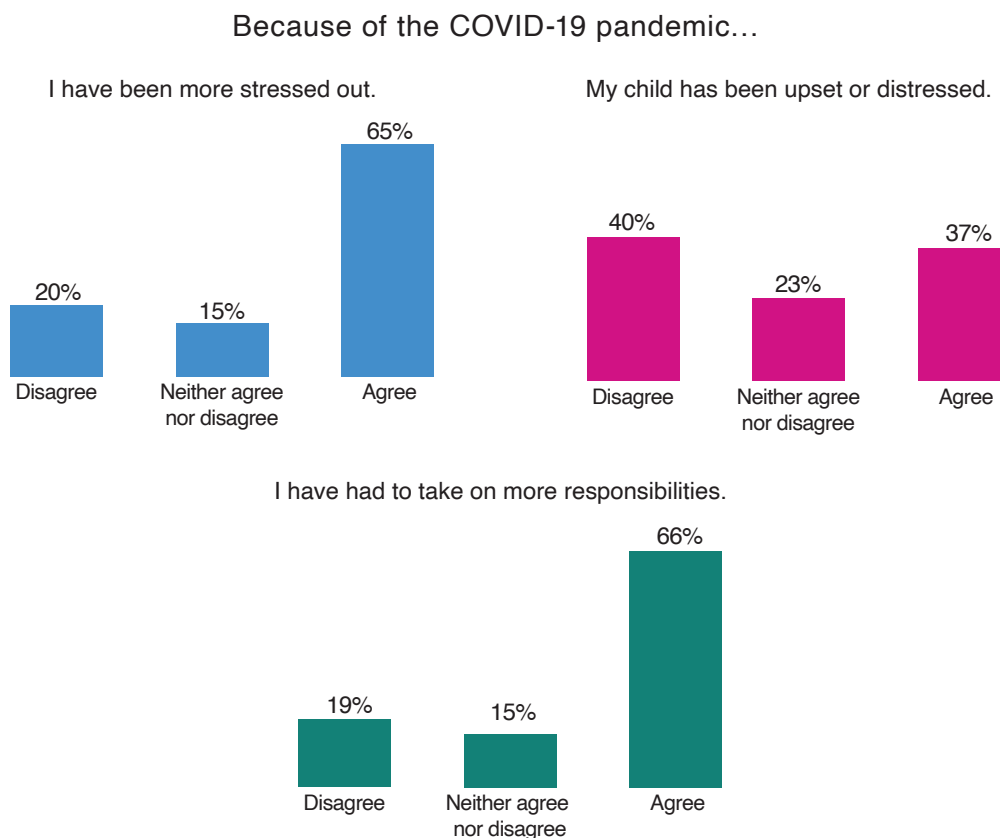
During the 12-week study period, 28 treatment group participants (8%) unsubscribed from Consejos, and nine

comparison group participants (2%) subscribed to Consejos. In addition, Consejos records indicated that four treatment group participants never subscribed to messages and that four comparison group participants had enrolled in Consejos before the start of the study.<sup>8</sup>

The study team assessed the number of days treatment group participants were exposed to messages during the study period. We also examined the number of days that treatment group participants who unsubscribed and comparison group participants who subscribed to Consejos were exposed to the messages. Participants who remained subscribed to Consejos messages were enrolled for 91 days on average, ranging

<sup>8</sup> The baseline survey for the treatment group was sent to only new subscribers to Consejos. Therefore, we hypothesize that these eight participants received the survey link from one or more other participants who had newly subscribed and received the survey. We included these eight participants in the intent-to-treat analyses.

Figure 9. Consejos parent experiences during COVID-19



from 84 to 147 days. The 28 treatment group participants who unsubscribed were enrolled for 88 days on average, ranging from 8 to 185 days. The nine comparison group participants who subscribed were enrolled for 2 days on average, ranging from 1 to 96 days.

## Data Analysis

The study team used propensity modeling with inverse probability weights to analyze outcome data for Consejos. This technique uses observed participant characteristics to statistically weight each group to be equivalent on observable qualities. Because it is not possible to account for unobserved participant

characteristics, there remains the possibility that differences in outcomes between those persons who did and did not sign up for Consejos were driven by some factor other than program participation. However, when randomization is not possible, propensity models can provide plausible causal estimates of program impacts. This analytic strategy is described in further detail in Appendix B.

We included all background characteristics in the propensity model, but we included no baseline survey variables because they were equivalent at baseline. We then estimated the probability (i.e., propensity) that a participant was in the treatment group, as a function of



those characteristics, and computed inverse probability weights.

We next conducted impact models, as described in the Analytic Strategy section. The main predictor in these models was treatment status, and we included corresponding baseline parent report and all participant characteristics as covariates, in addition to the propensity weights.

## Results

### Effects of Consejos de Univision

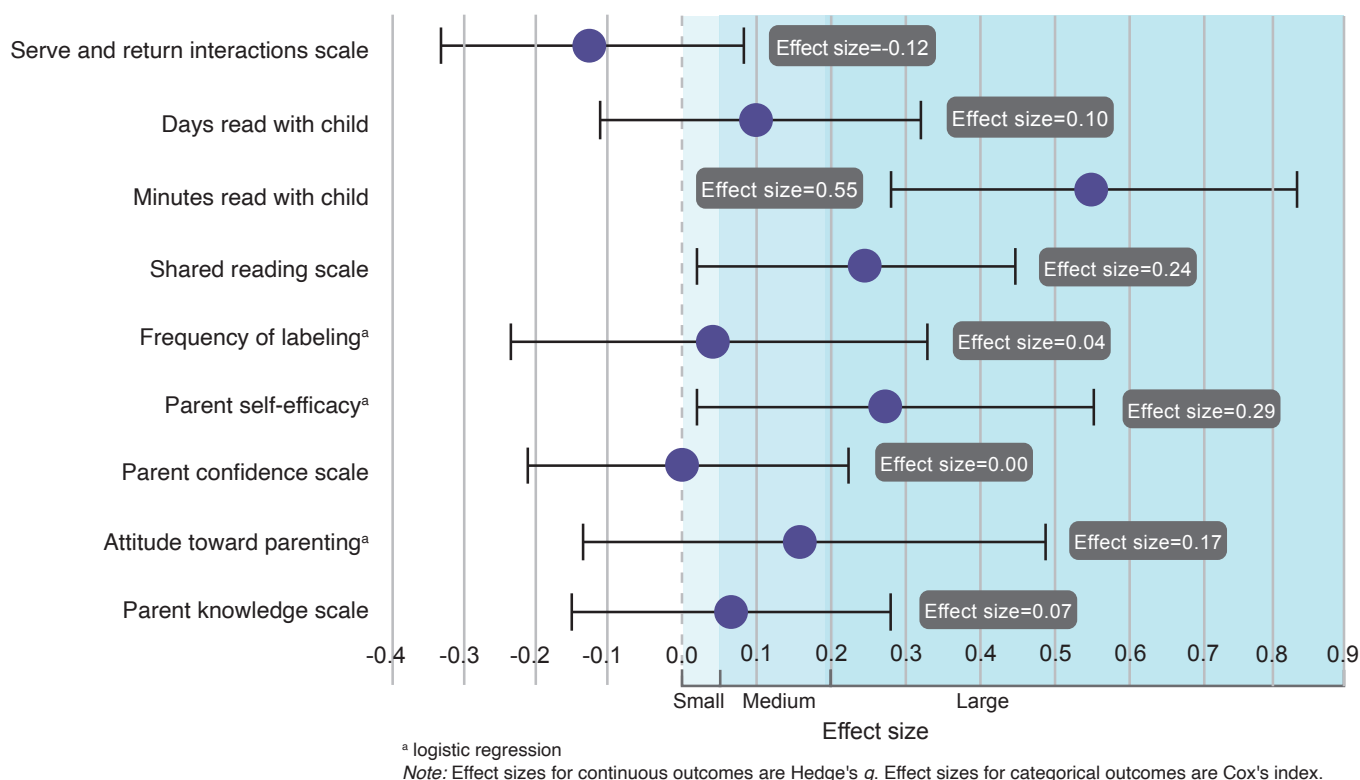
Effect sizes are summarized in Figure 10. We found that, relative to parents in the comparison group, parents in the treatment group reported reading with their children for significantly more minutes on a typical day ( $p < .001$ ). Parents in the treatment

group also reported engaging in significantly more shared reading activities with their children than parents in the comparison group did ( $p < .01$ ). Further, parents in the treatment group reported higher self-efficacy than parents in the comparison group did, but this effect was only marginally significant ( $p < .10$ ). Participating in the Consejos program was not significantly associated with the remaining parent outcomes.

### Moderation and Subgroup Effects of Consejos de Univision

We examined the extent to which Consejos differentially affected relevant subgroups of parents. To do so, we conducted separate regression models with interaction terms between treatment and (1) child gender, (2) child age, (3) household income, and (4)

**Figure 10. Consejos effects on parent responsive caregiving outcomes**



parent education. Significant interaction terms can be interpreted as the intervention having a larger effect for that group, relative to their peers in the reference category in the comparison group.

Moderation findings pointed to a differential effect of Consejos for some subgroups of parents. First, we found that Consejos had a stronger effect on minutes spent reading in a typical day ( $p < .05$ ) and the frequency of labeling ( $p < .10$ ) for parents with at least some college, relative to parents with a high school diploma or less. Second, we found that Consejos had a stronger effect on the self-efficacy of parents of girls ( $p < .05$ ) as compared to parents of boys, and it had a stronger effect on confidence in parenting to a greater degree among parents of boys as compared to parents of girls ( $p < .05$ ). Finally, Consejos had a greater effect on knowledge about parenting among parents of younger children as compared to parents of older children ( $p < .01$ ).

We also conducted exploratory analyses of the effects of Consejos, dividing the sample by household income (lower than and higher than \$50,000 a year) and child age (18–27 months old and 27–36 months old; Table 2). Among parents with household incomes lower than \$50,000, Consejos affected the number of minutes spent reading with their children ( $p < .001$ ) and engagement in shared reading activities ( $p < .001$ ). Among parents with children younger than 27 months old, Consejos affected the number of days parents reported reading with their children ( $p < .05$ ), the number of minutes parents reported reading with their children ( $p < .001$ ), parents' engagement in shared reading activities ( $p < .05$ ), their self-efficacy ( $p < .05$ ), and their knowledge about parenting ( $p < .01$ ). Among parents with household incomes higher than \$50,000, Consejos affected their confidence about supporting early learning ( $p < .01$ ) and knowledge about parenting ( $p < .05$ ).

**Table 2. Consejos effects varied by demographic subgroups**

Outcome	Household income		Child age	
	Less than \$50K	More than \$50K	18–27 months	28–36 months
Serve and return interactions	-	-	-	-
Days read	-	-	0.20*	-
Minutes read	0.72***	-	0.63***	-
Shared reading	0.35***	-	0.24*	-
Frequency of labeling	-	-	-	-
Self-efficacy	-	-	0.57*	-
Parent confidence	-	0.66**	-	-
Attitudes toward parenting	-	-	-	-
Knowledge about parenting	-	0.52*	0.37**	-

Note: Table cells present Hedge's  $g$  effect size. Blank cells were not statistically significant.

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

## Parent Interviews

The study team interviewed parents (including grandparents and aunts) about the Consejos messaging program. Participants shared their experiences receiving messages, their use of the messages, and their perceptions of the overall benefits of the messages.

Interviewees reported positive experiences with the messages. They appreciated that they could read the messages on their own time when they had a few moments to themselves. One primary benefit of the messages was that they sparked ideas about how participants could interact with their children and motivated them to spend more time with their children.

Parents did not feel pressure to use the activities and suggestions exactly as described. Instead, the messages provided a framework for putting their own spin on the activities. One parent kept notes about the messages so that she could use the prompts in the future, while another planned an

“Aprendí a tener más tiempo con la niña, como un poquito de más actividades, porque a veces no tenía muchas ideas para compartir con la niña. Y si te da ideas porque aunque no las hagas al 100% como dice el texto, te motiva y te da ideas hacer cosas con ellos a tus posibilidades.”

*“I learned to have more time with my daughter, like more activities, because sometimes I don’t have many ideas to share with her. The ideas you get, even if you don’t do them 100% like the text says, they motivate you and give you ideas of things to do within your means.”*

activity related to the message the following day. The value of the messaging content, therefore, was in providing ideas.

Several parents reported that receiving and using the messages led to more frequent interactions and greater bonding with their children. One parent also reported the messages gave her more self-efficacy to prepare their child for experiences outside the home environment: “I am much, much, better as far as doing things at home to prepare MY child to go out there. Not only prepare the kid with things for learning but also life things—about feelings and things like that, things in the kitchen.” Several parents reported focusing their interactions on language development by encouraging verbal responses from their children or reading to them.

“Pues, como estamos no más las dos aquí solas, pues para para que no se me aburriera ... quería ver televisión y ya. Agarrando sus mensajes de ustedes, empecé a interactuar más con ella y ayudarle más que nada por lo de su habla. Y como ya ves, que ahorita más es el inglés que el español, pues hablamos más español. En vez de que me apuntara a las cosas le decía que me repitiera.”

*“Since it is the two of us here, alone, I didn’t want her to get bored ... she just wanted to watch TV and that’s it. Using the messages from you, I started to interact with her more and help her, especially with her speech. You see, right now it’s more English than Spanish so we speak more Spanish. Instead of having her point to things, I told her to repeat after me.”*

## Implementation of Consejos de Univision

Response rates to the Consejos implementation surveys were low because the study team did not offer an additional incentive for completion. Thirty-nine treatment group parents completed the week 4 survey, and 21 treatment group parents (27%) completed the week 8 survey. Most parents (78%) reported they immediately incorporated a tip or activity into an interaction with their children, rather than saving it for later. Nearly all parents (96%) said they read every message or most of the messages. More than half of parents (59%) reported sharing messages with friends and families, and less than half (39%) said they would like to do so. Parents were split on

what would make the messages more helpful. Thirty-eight percent said making them easier to try with their children would be helpful, 19% said sending the messages earlier in the day would be better, and 24% wanted more frequent messages. Only 14% reported that fewer messages would be helpful. About half of parents (52%) reported using all or most of the tips and activities, and only one parent reported never using them. Although these sample sizes are small and parents who were more engaged in the program were more likely to respond to the survey, these findings indicate that parents read and implemented the information, tips, and activities that Consejos sent to them.





# Discussion

The study results indicate mobile messaging can be an effective strategy for *sparking connections* between parents and children. Consejos messages supported parents' engagement in language-rich activities, and parents in both BBT and Consejos reported they valued and benefited from messages.

We found that parents in the Consejos treatment group reported reading for more minutes in a day and engaging more frequently in shared reading activities than parents in the comparison group did. We also found evidence that parents in the Consejos treatment group may have higher self-efficacy than parents in the comparison group. Exploratory analyses indicated that effects were more pervasive among parents with lower household incomes and younger children.

These findings suggest that Consejos messages prompted parents to engage more frequently in literacy-related activities. Because the messages included guidance on questions and conversations for children, parents may have been able to translate the content more easily to literacy interactions, perhaps building upon information learned in recent widespread parenting campaigns like Talk, Read, Sing, which have raised parents' awareness of the importance of reading with children and asking them questions. In addition, parents reported the Consejos



messages sparked ideas and prompted them to interact with their children, even if they did not do the specific activity in a message. Consejos messages may therefore have both reminded parents to read with their children and provided a framework for making these interactions high quality.

We did not find significant impacts of participating in BBT on parent outcomes. This may be because BBT might impact parent outcomes in domains other than those we measured in the current study and it is possible that a longer time period than 12 weeks is needed for the program to impact parenting. Also, most information was on the linked web pages and not in the messages themselves. If parents did not click the links, they did not receive details about the information or activities. Finally, parents reported high stress because of the COVID-19 pandemic, which may have limited their capacity to engage in high-quality interactions with their children and the extent to which they could effectively implement the information and activities in the messages.

For BBT, conflicting moderation results suggest that household income and educational attainment may influence how parents benefit from the program. In addition, BBT may differentially benefit parents' engagement in shared reading with boys. In our systematic review, few studies examined for whom messaging is most effective. Together, these findings point to the need to better understand whether messages should be tailored for parents based on factors like their income and education.

We also found effects of Consejos messages among subgroups of parents with lower household incomes and younger children. This suggests Consejos is effective for parents with constrained household resources who may have less time and access to other forms of parenting support. In addition, messages may be particularly useful for parents of younger children and relatively less experience with parenting. It may be that these parents of younger children were more open to receiving parenting advice; messaging programs may therefore affect their parenting practices. Because Consejos does not target messages to children's age, it is also possible that the messages were more useful for parents of younger children.

Taken together, the evidence for these two programs is notable given the light touch of the messaging (2–3 times a week) and the short study period (12 weeks). Even extensive parenting programs often show a mix of positive and null findings (Avellar & Supplee, 2013; National Academies of Sciences, Engineering, and Medicine, 2016).

The parents interviewed in both programs indicated that the easy access to and integration of activities into their lives made the messages successful.

We did not observe impacts of either messaging program on serve and return interactions. These types of parenting behaviors can be difficult to implement with children and may require more time to learn to implement effectively than a single text message allows. Messaging programs that aim to support engagement in serve and return interactions may instead spread these parenting behaviors across several messages and embed them in multiple examples to help parents learn more easily.

This study has several notable strengths, including the attention to minimizing bias. Attrition was minimal, balanced across groups, and met WWC (2020) standards. Parents in the control or comparison groups were not informed they were in those groups, and there was little crossover in condition group assignment. Although we were unable to randomly assign Consejos participants to receive messages or not, we implemented a quasi-experimental design to address observed differences between the samples. We therefore feel confident making causal inferences.

## Limitations

These studies implemented rigorous experimental and quasi-experimental designs. However, there are several limitations readers should consider.

**Unobserved differences in the quasi-experimental design study.** We applied propensity weighting in the Consejos study to statistically adjust for observed differences between the treatment and comparison groups. However, we were not able to account for unobserved differences, and it is possible that these drove the impacts we observed. Therefore, we encourage caution in drawing conclusions from this study.

**External generalizability.** We collected data for these studies during the COVID-19 pandemic, and parents in both studies reported high levels of stress and disruption because of the pandemic. The findings described here may not generalize to a non-pandemic era.

**Study measures.** Our measures were based entirely on parent report, and our digital data collection meant we could not meet with parents to verify information such as their children's ages. In addition, parents receiving messages may have been more motivated to report behaviors that reflected the content of the messages. Finally, to avoid burdening parents and keep the parent survey short, we excerpted existing parent surveys and created some survey items for this study. We observed ceiling effects on some of the parent outcomes at baseline, and we

therefore do not have information on the validity or reliability of these parent surveys.

## Implications

This study has three key implications:

### **Receiving Consejos messages induced more language-rich interactions among parents.**

Receiving messages with conversation prompts and questions can influence parents' reading interactions with their children, pointing to the value of nudge interventions delivered via text messaging.

### **BBT messages may differentially impact some groups of parents.**

Some effects were for parents who were socioeconomically advantaged because of higher household incomes and educational attainment; others suggested that parents with lower incomes may benefit more from BBT. Due to the small sample sizes of these subgroups, more research is warranted to better understand these patterns of findings.

### **Parents do not necessarily implement the specific tips and activities in the messages; instead, they are a *spark* to engage with their children.**

Providing parents with guidance on how to engage in high-quality interactions with their children rather than suggesting specific activities may be a more necessary and effective support. To impact serve and return interactions, parents may need more targeted messages with explicit guidance and prompts that are applicable to a range of activities.

## Conclusions

This study aligns with and contributes to the literature on mobile messaging as a support for parents—a growing area of study across the early childhood, education, and medical fields. The study adds new knowledge about the effect of messaging on parenting behaviors—particularly responsive caregiving, which as our systematic review showed, has been less examined in the literature. Our findings are particularly notable given that messaging delivery is low-cost and easily scalable and modifiable for children's ages, parents' language backgrounds, or geographic locations.

As the ecosystem of informal early learning continues to evolve, particularly because of the COVID-19 pandemic, funders, researchers, and program developers might explore the role of parent nudges through other modes such as social media; YouTube; podcasts; or venues like public transit, childcare centers, playgrounds, libraries, and community centers. Parent interviews revealed the value of reaching parents where they are. Extending this approach to other places where parents spend time may be a fruitful area for future development and research.

In addition, our systematic review of the literature indicated that the field has shifted toward examining not only *whether* messaging is an effective strategy, but *how and what kind* of messages are most impactful. For example, a number of recent studies have compared parent outcomes

among different SMS-based interventions such as manipulating message frequency (Cortes et al., 2021), personalized versus general messages (Doss et al., 2017, 2019), program engagement reminders with and without additional content (Yi & Dixon, 2021), and general school readiness messages with and without additional math-related messages (Kuchirko et al., 2021). In addition, a recently released study examined 22 different approaches to texting vaccination reminders to adults and found evidence of differential efficacy depending on how messages were phrased, pointing to the need to carefully craft and target messaging content (Milkman et al., 2022).

Finally, few studies have examined *for whom* messages are most effective and what it would take to best reach parents and caregivers in marginalized and under-resourced contexts. Our findings point to some initial evidence of subgroup impacts of both BBT and Consejos. We suggest that researchers, funders, and program developers consider deeply engaging in this kind of inquiry, particularly when it comes to key parenting behaviors like serve and return interactions. Such work would benefit from centering the voices of parents and caregivers in the conversation about the resources and information they would like and the best methods to receive them.



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