# The Conceptual Replication of *Crianza Positiva* E-messaging Program during the COVID-19 Pandemic: Too Much or Too Little Information?

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## Summary

This article evaluates the conceptual replication of a text and audio Behavioral Change Communication Program (Crianza Positiva) on parenting practices and well-being in households with children aged 0-2 years during the COVID-19 pandemic. The intervention uses behavioral economics tools to reorient parents' attention towards positive parenting practices. Using an experimental design involving 39 early childhood centers (687 families), we find no effects of the intervention on the outcomes of interest. This finding contrasts with those found in a previous edition of the program in 2018, which showed improvements in parental involvement and in the quality of parent-child interaction. We consider various hypotheses behind the lack of results, which in turn point to key issues to consider when designing similar programs. First, these messaging programs may work as a complement to more intensive interventions, but may have limited impact when implemented in isolation. Unlike the 2018 messages, which were sent after an 8-session face-to-face workshop, the new edition was implemented without a previous workshop. Second, the problems introduced by the pandemic increased families' stress, time and space constraints, potentially reducing family's receptivity to the messages. Indeed, we find suggestive evidence that the messages increased parental stress or depressive symptoms in adults facing household overcrowding or difficulties in balancing work and childcare. In addition, early childhood centers actively used WhatsApp messages to stay in touch with families during the pandemic, competing for the attention of the families. Finally, the 2020 sample had a higher prevalence of more educated mothers, who may be less responsive to these types of interventions.

**Keywords:** parenting; early childhood; messages; e-health; behavioral change communication; behavioral economics; pandemic; COVID-19; replication; impact evaluation; RCT; Latin America.

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All the subjects have provided appropriate informed consent: the research team administered it at the start of the baseline survey

**Data availability**

The data that support the findings of this study will be available on request from the corresponding author.

**Disclosure Statement**

Nothing to disclose

# 1. Introduction

The importance of a nurturing environment on child development has been widely documented in the economics, psychology and neuroscience literature. The first 1000 days of life are strong predictors of long-term outcomes such as employment, health, education, and wages. To enhance the childrearing environment during this critical stage, governments have been increasingly strengthening early childhood education, home visiting programs, and parental leave policies. The need to scale up parenting programs has also encouraged the surge of Behavior Change Communication (BCC) interventions that work with families through the application of Information and Communication Technologies (ICTs). In developed countries, programs such as Ready for K (York et al., 2019; Doss et al., 2019), PACT (Mayer et al., 2019), HeadStart e-messages (Hurwitz et al 2015), Text2Learn (Meuwissen 2017), and others (Fricke et al., 2018; Cortés et al., 2021; Fletcher et al., 2017) have shown positive effects on parental engagement and self-efficacy, parental attachment, and children's literacy skills. There is also evidence of positive impacts of BCC programs in developing countries. Barrera et al., (2020) shows that a messaging program in Nicaragua improved nutrition and hygiene practices. Lenel et al., (2020) find that parenting messages targeting cash transfer recipients in Indonesia improved parental knowledge and health behaviors. For Nigeria, Carneiro et al., (2021) show that combining informative messages with cash transfers improved children's anthropometric and health outcomes and increased women's employability. In Costa-Rica, providing parents of preschool children with text messages suggesting stimulating activities increased children's cognitive skills (Hernandez-Agramonte et al., 2021). In the case of Uruguay, Bloomfield et al., (2022) and Balsa et al., 2021(a) find that "Crianza Positiva", an e-messaging program targeting parents with children below the age of 3, increased the frequency of parental involvement, the quality of parent-child interaction, and the quality of language exchanges.

In a recent paper, Al-Ubaydli et al. (2021) highlight the importance of generating "credible and scalable results that policymakers can trust when implementing programs." They consider three challenges associated with the successful scalability of an intervention. First, the original analysis could suffer from inappropriate statistical inference. Second, the original population may not be sufficiently representative. Third, the situational features in the original implementation may differ from those in the scaled-up program. To avoid wasting resources in the scaling up of programs that will not deliver the size effects promised by the original research, the authors underscore the importance of replicating studies, publishing research with null effects, and leveraging multi-site trials to learn about the variation of program impacts across both population and situational dimensions.

In this paper, we provide evidence on the effects of a conceptual replication of the "Crianza Positiva" messaging program. The first edition of the program took place between January and June 2018 with parents of children below the age of three enrolled in Early Childhood and Family Centers (CAIF) in

Uruguay (Balsa et al., 2021; Bloomfield et al., 2022). The intervention consisted of 72 messages sent to parents during 24 weeks via WhatsApp and SMS, and covered topics such as parental sensitivity and response, expressions of affection and good treatment, home safety, routines, language, free play, and caring for the caregiver, among others. The second edition took place between June and December 2020, during the COVID-19 pandemic, also with parents of similarly aged children enrolled in CAIF centers in Uruguay. Both were evaluated using Randomized Control Trials (RCT). We refer to each intervention as Crianza Positiva 2018 (CP2018) and Crianza Positiva 2020 (CP2020), respectively.

The content and frequency of the messages was very similar across both implementations, but the setting changed in non-trivial ways. First, both treatment and control families in 2018 attended an eight-week parenting workshop prior to the e-messaging intervention. This was not possible in 2020 due to pandemic-related CAIF center closures. Furthermore, the pandemic introduced new contextual variables that affected families' socioeconomic status and well-being, as well as the way childhood centers got in touch with them. Given that the exact circumstances of the original research could not be reproduced in 2020, the second implementation is not an exact replication of CP2018. However, it does reproduce the theoretical and conceptual process that was invoked in the original study (Hüffmeier et al., 2016), and sheds light on how changes in context interact with the program. We refer to CP2020 as a conceptual replication of CP2018.

Using a Randomized Control Trial (RCT), we find no statistically significant effects of CP2020 on any of the parental or child outcomes. These findings are strikingly different to those found in Bloomfield et al. (2022) and Balsa et al. (2021) for CP2018, who show that the intervention increased the frequency of parental involvement with the child, the quality of the parent-child interactions, and adult-child language patterns. Because both pilots were implemented at a small scale and administered directly by the research team, we disregard scaling up problems, such as the fidelity of the implementation or the upward sloping supply curves of quality management, as the culprits of the differences in the results. We use Al-Ubadli et al.'s (2021) framework to explore the extent to which the differences respond to variations in the context in which each study took place, to the representativeness of the populations under study, or to potential inference problems.

We explore several hypotheses for the null effects. First, as mentioned above, families participating in the CP2020 study did not attend a parenting workshop prior to the launch of the messages, unlike those in CP2018. This suggests that e-messaging programs may work as a complement to more intensive interventions, but may have limited impact when implemented in isolation. Second, the CP2020 program took place during the pandemic, when families were exposed to many stressors and overloaded by virtual stimuli. We find some suggestive evidence that families in overcrowded households and those who had to take care of their children while working at home were more likely to report stress or depression symptoms in response to the messages. In addition, interviews with the treatment and control

centers suggest that the centers assumed an active policy of communication with the families through mobile phones at the same time that the Crianza Positiva intervention was taking place. This policy likely diverted attention away from the treated families and offered a parallel treatment to control families. Finally, families willing to participate in the CP2020 study were more educated, more likely to work and less likely to receive government assistance, and could have been less responsive either because they have more information or had less time to focus on the messages.

Our study contributes to several strands of the literature, including early childhood and parenting programs, behavioral change interventions, and the implementation and scaling up of policies and programs. First, our analysis highlights the importance of conducting replications (either exact or conceptual) to increase the credibility and utility of previous results (internal validity), as well as to understand how context may hinder program effectiveness and its potential for scalability (external validity). While there have been some conceptual replications of a texting program in the US trying to engage parents with their pre-kindergarten children's learning (York et al., 2019, Doss et al., 2019, Cortes et al., 2021, Frick et al., 2018, Cabell et al. 2019), we are not aware of any replication of text-messaging interventions targeting the quality of the parent-child interaction. Our research is also unique in studying a parenting texting program and its conceptual replication in the developing world.

Second, our results contribute to enhance learnings from texting interventions delivered to parents of young children. Prior studies, based on internally valid RCTs, have shown that text messages work better when they are differentiated and personalized according to the child's developmental level (Doss et al., 2019), when they do not burden parents with an excessive weekly frequency or complexity (Cortes et al., 2021; Fricke et al., 2018), or when, in addition to proposing an activity, they explain its purpose and provide rewarding reinforcements (Fricke et al., 2018). Findings reveal also that children with lower skills may benefit more from programs that address socioemotional skills, health and wellbeing, rather than exclusively cognitive stimulation (Cabell et al., 2019), that messages work better for families with less interaction with the school (Hernandez-Agramonte et al., 2022) and that e-messaging programs may have unintended effects, such as crowding out the intervention of local leaders (Barrera et al., 2020) or adding to parental stress for caregivers burdened by poverty (Amaral et al., 2021). We add to this literature by identifying contextual variables that should be taken into consideration when designing and implementing text-messaging behavioral change interventions. Our results suggest that text messages may be more effective when complementing other face-to-face more intensive interventions. Also, like Amaral et al. (2021), we find suggestive evidence that text-messages may not only be ineffective, but could be detrimental to households facing high levels of cognitive load. Both interventions were implemented in the context of the pandemic, with many households confronting negative economic shocks and high levels of uncertainty. Households during this period were also more likely to receive many other digital stimuli likely to divert their attention and increase communication noise.

## 2. The Crianza Positiva Messaging Intervention

*2.1 Core features of the "Crianza Positiva" Messaging Program*

The "Crianza Positiva" Messaging program was designed to help families build up parenting competencies, strengthen family bonds, and sustain positive parenting habits over time. The program consists of 72 messages that are sent 3 times a week for 24 weeks. Messages are organized around modules of two weeks, each of which focuses on relational, formative, protective and reflective parental competencies (Gómez and Muñoz 2014). The program seeks to empower parents to be competent agents of change and capable of positively influencing the lives of their children, by recognizing family strengths and by circumventing potential behavioral biases associated with low parental investment. Table 1 describes the themes covered in each pair of weeks and the parenting competencies addressed.

**Table 1.** Message topics and parental competencies according to sending week

| Week | Thematic | Parental competency |
|---|---|---|
| 0 | Welcome message | |
| 1-2 | Sensitive observation | Relational |
| 3-4 | Expressions of affection and good treatment | Relational |
| 5-6 | Home Safety | Protective |
| 7-8 | The importance of routines | Protective |
| 9-10 | Care of the caregiver | Reflective/self-care |
| 11-12 | Language: talking to the child | Formative |
| 13-14 | Language: reading to the child | Formative |
| 15-16 | Free play | Formative |
| 17-18 | Care of the caregiver | Reflective/self-care |
| 19-20 | Care of the caregiver | Reflective/self-care |
| 21-22 | Parental Involvement | All competencies |
| 23-24 | Parental Reflection | Reflective/self-care |
| 25 | Closing message | |

The structure of the messages explicitly addresses behavioral biases that play against optimal parental investment (Gennetian et al, 2016; Mayer et al, 2019; Ajzenman and Lopez Boo, 2019). A typical weekly sequence includes three messages (see Table 2 for an example). The first message seeks to make the returns to positive parenting practices and behaviors more salient through information and reminders. These messages address present bias and the relative low weight that parents assign to future intangible benefits in relation to present costs (Thaler, 2015). The second message offers suggestions of actions and tips as a way of encouraging positive parenting by simplifying complex tasks into simple and easy to implement activities. [2] These messages aim at circumventing status quo bias, as well as the barriers imposed by limited attention and cognitive fatigue, which are especially present in households

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[2] As part of the "actionable" messages, families received a username and password to access "Radio Butiá", a Uruguayan website that features Latin American songs and stories online.

with multiple poverty-related problems (Schilbach et al., 2016). The third message addresses negative identities by helping parents reflect on their strengths and resources and encouraging self-care.

**Table 2**. Examples of proposed messages to overcome behavioral barriers

| Behavioral barrier | Nudges that address barrier | *Sample Message* |
|---|---|---|
| Present bias and time inconsistency | ● Messages that highlight the benefits of certain positive parenting practices.<br>● Reminders about the importance of certain parenting habits.<br>● Personal commitment reminders about parenting habits. | *Children's brains are like sponges, they absorb everything: sounds, tones of voice, the language they hear. The more words they hear at this stage, the more they develop their language. Talking to your baby is very important: it will determine their language acquisition and their ability to learn in the future.* |
| Parental role complexity, lack of attention and diversion of the cognitive resources needed to carry out parental tasks. | ● Messages that facilitate the execution of tasks with concrete suggestions to do at home.<br>● Messages that work on the importance of self-care as a way to release worries and balance stress. Breathing and relaxation techniques. | *After doing something you like, we invite you to play with your baby thinking that this moment is unique and full of enjoyment. You could, for example, take a ball and throw it gently to your baby. You will see that when you are happy with yourself, you will enjoy activities with your baby more.* |
| Negative identities | ● Messages that reinforce self-esteem and parental empowerment. | *No one wants what is best for your baby more than you do. Think of one or two moments in the last few days when you felt like you did a lot of good for your baby. Trust yourself and keep looking for more of those moments throughout the week!* |
| Status quo bias | ● Messages that remind parents of the importance of positive parenting and promote good parenting habits. | *The more you talk to [child's name], the more her language will develop and the better she will learn. Today and in the days ahead, remember and repeat this thought to yourself: "I take advantage of all the moments together to talk to my baby".* |

*2.2 The 2018 Implementation of the Crianza Positiva Messaging Intervention*

The Crianza Positiva messaging program was first implemented in 2018 in 12 CAIF centers. The intervention targeted families that had attended during 2017 weekly parental encounters at Early Childhood and Family Centers (CAIF)[3] in Uruguay, namely the *Timely Experiences* Program, and had participated in at least some sessions of a *Crianza Positiva* Parenting Workshop between September

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[3] CAIF centers are not-for-profit privately managed, but publicly funded centers that offer early childhood education for children aged 1 to 3, as well as weekly group-based encounters for caregivers and their children aged 0 to 24 months.

and November 2017. The *Timely Experiences* Program consists of weekly group-based, semi-structured encounters that take place in CAIF centers each year between February and November, and that target children between birth and the age of 24 months, and their parents or caregivers. They aim to integrate families into the childhood center, strengthen their social networks, and promote respectful parenting practices. The *Crianza Positiva* Parenting Workshop, on the other hand, is a highly protocoled, intensive and experiential parenting workshop delivered during eight of the *Timely Experiences* sessions at CAIF centers in the second semester of 2017. The content of the Crianza Positiva messages is closely aligned to that of the Crianza Positiva workshop, covering similar parental competencies and contents. Messages were sent to families three times a week for 24 weeks. All messages were personalized with the gender of the adult and the gender of the child. Families could get messages through SMS and/or through WhatsApp. They had to add the Crianza Positiva phone number to their contact list in order to be able to get the messages through a distribution list.

The 2018 intervention was evaluated using an RCT design. Bloomfield et al. (2022) find that the messages generate positive effects on the frequency of parental involvement and on the quality of parenting, with effect sizes of around 0.24 standard deviations. The effects are larger for families who experienced previous negative shocks (more prone to cognitive fatigue) and who have a lower parental identity (lower sense of parental competence) at baseline. In a subsequent evaluation using a 10-minute video-recording of a free-play activity between the child and the caregiver, Balsa et al. (2021a) assess the effect of the messages on the quality of language interaction. They find that mothers who participated in the messages speak to their infants with a greater range of intonation and increase the duration of their vocalizations than those who did not receive messages.

*2.3 The 2020 edition of the Crianza Positiva Messaging Intervention*

The need to reach families through virtual means became imperative in 2020 with the advent of the COVID-19 pandemic. In response to this demand, a new edition of the *Crianza Positiva* Messaging Intervention (CP2020) took place between July and December 2020. Because centers remained closed due to the pandemic between February and June 2020, families had had very little face-to-face contact with center staff by the time the new messaging program began, and unlike families from CP2018, they had not attended the *Timely Experiences* Program, nor the *Crianza Positiva* Parenting workshop prior to receiving the messages.

The number of messages (3 per week for 24 weeks), the topics covered, and their sequence remained the same as in 2020. However, there were a couple of differences with respect to 2018. First, messages were longer in 2020 than in 2018: the average message had around 690 characters in 2020 relative to 330 in 2018. This increase in the number of characters aimed at compensating for the fact that parents had not attended the Crianza Positiva workshop and were being exposed to many parenting concepts for the first time.

Second, a few messages underwent deeper adaptations to work on aspects linked to the confinement and uncertainty associated with the pandemic. These new messages emphasized the importance of affection and the negative consequences of violence and abuse. They encouraged parents to reinforce safety measures at home to avoid accidents, and to organize explicitly the allocation of household space and the division of care tasks. Caregivers were also invited to be attentive to changes in the child and were reminded that they could contact the CAIF in case of need. The following messages illustrate the above adaptations:

Example 1

*"These days you have been "tuning up" your home to try to make it "accident-proof". Think back to those times when you sought to make {BABY}'s environment safer and more secure. These measures become especially important nowadays when we are more at home, and it becomes more difficult to manage the space we must share while we work, study, or play. It is important to talk with those who live with you, and make agreements to use the shared space in a way that accommodates each one's needs. Think together about the changes needed to make living together easier."*

Example 2

*"This week we have seen the importance of routines in the lives of babies. We are living in a period in which many of our routines have changed drastically, such as work, study, or childcare, and this can cause insecurity, and sometimes even a sense of chaos. The situation impacts {BABY} as well, and may be reflected in more anger, tantrums, fears, or new behaviors. Although it is a challenge today to organize routines in the midst of so much change, it is still important. Try to convey security and confidence to {BABY}, making it clear that you are there for her. It's key to take turns between adults in childcare, and to organize as best we can (with schedules if necessary) with time and space."*

Unlike the first edition, the CP2020 messages were only sent via WhatsApp. This was a deliberate change that responded to the fact that SMS messages are hardly used as a communication vehicle in Uruguay, and that most people use WhatsApp as the prevailing communication channel.

During the implementation of the CP2020 Messaging Intervention, the pandemic was relatively under control and the country gradually returned to higher levels of mobility. Schools and early childhood centers reopened their doors, although attendance was irregular due to the appearance of COVID-19 positive cases across children and educators. Some families were also reluctant to resume contact with the centers due to contagion concerns. Furthermore, as the *Timely Experiences* workshop took place once a week and did not solve childcare problems, the families were not in a hurry to return. To compensate for the unstable levels of participation, many centers turned to WhatsApp communication to stay in touch with the families. We come back to this point in Section 5.

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## 3. Impact Evaluation of the 2020 Crianza Positiva Intervention: Data and methodology

### 3.1 Recruitment and randomization

In February 2020, the research team introduced the messaging program to a set of CAIF centers authorized to participate by the Institute of the Child and Adolescent (INAU by its acronym in Spanish)[4]. Fifty CAIF centers across the country expressed interest in participating: half were randomized to receive messages and the other half was assigned to a control group. The randomization was stratified by CAIF size (large CAIF of more than 64 children vs. small CAIF). Families had no active role in enrollment decisions. They were automatically assigned to the program as long as they were enrolled in the *Timely Experiences* workshops in those centers. Due to the pandemic, four treated centers and seven control centers dropped out after randomization, leaving 21 treated centers and 18 control. The final sample consisted of 687 families, 348 in the treatment arm and 339 in the control arm. Of the 348 treated families, 482 adults signed up to receive messages: 71% were mothers, 20% were fathers, and 9% were other family members. The final sample includes centers from 14 departments of the country. [5]

### 3.2 Data collection and attrition

a) Baseline. After the randomization took place, centers were asked to contact families who had enrolled in the Timely Experiences' program as of March 2020. The arrival of the COVID-19 pandemic in the country the same March, and the school closure policies that followed, complicated the start of the intervention and data collection. The intervention was postponed until July 2020 and the baseline survey (socio-demographics) was carried out in June 2020 through a virtual questionnaire. All families who answered the questionnaire signed an informed consent to participate in the study. One problem that arose at that time was that several of the centers that had been randomized to the control group provided less contact information for the families than the centers assigned to the treatment. Specifically, of the 513 families that could be contacted in that instance, 348 belonged to treated centers and 165 belonged to control centers.

b) Collection of contact information from control families not previously surveyed. In November 2020, control centers that had not submitted complete information were asked for contact information of all families that had signed up for the Timely Experiences' program in March 2020. This effort expanded the number of families in the sample, reaching 174 additional

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[4] The project was supported by INAU: a communication was sent to the CAIF from the institutional mail of Early Childhood, and technicians of the institution were involved in the final design of the program.
[5] Artigas, Canelones, Cerro Largo, Colonia, Durazno, Flores, Maldonado, Montevideo, Paysandú, Rivera, Río Negro, Salto, Soriano and Tacuarembó.

control families. After including these families, the total sample of families reached 687 (348 treated and 339 controls).

c) 1st follow-up. Between December 2020 and January 2021, we sent families a new virtual survey (web questionnaire), which allowed us to collect information on the child's socioemotional development and on a selection of socio-demographic indicators for the 174 additional families in the control group. We surveyed a total of 557 families (response rate of 81% of the complete sample).

d) 2nd follow-up. Finally, between March and April 2021, we conducted a telephone survey which collected information on different variables linked to the effects of the pandemic, the child-rearing environment, and the well-being of the child and the referring adult. It also included some questions on sociodemographic characteristics. In this last instance, we collected data on 602 families (response rate of 88%, even between treated and controls). 97% of the questionnaires were answered by the children's mothers. Table 3 summarizes the response rates by wave and by treatment condition.

**Table 3.** Response Rate by Wave of Survey by Treatment Condition

|  | Treatment | Control batch 1 | Control batch 2 | Total control | Total sample |
|---|---|---|---|---|---|
| **Baseline: June 2020. Online survey** |  |  |  |  |  |
| N. of consenting families | 348 | 165 | NA | 165 | 513 |
| N. of families responding | 320 | 141 | NA | 141 | 461 |
| Response rate | 92% | 85% | NA | 85% | 90% |
|  |  |  |  |  |  |
| **1st follow-up: Dec 2020-Jan 2021. Online survey** |  |  |  |  |  |
| N. of target families | 348 | 165 | 174 | 339 | 687 |
| N. of families responding | 258 | 125 | 174 | 299 | 557 |
| Response rate (%) | 74% | 76% | 100% | 88% | 81% |
|  |  |  |  |  |  |
| **2nd follow-up: March-April 2020. Telephone survey** |  |  |  |  |  |
| N. of target families | 348 | 165 | 174 | 339 | 687 |
| N. of families responding | 306 | 150 | 146 | 296 | 602 |
| Response rate (%) | 88% | 91% | 84% | 87% | 88% |
|  |  |  |  |  |  |
| **Families with 1st and 2nd follow-up** | **239** | **121** | **146** | **267** | **506** |
| Response rate | 69% | 73% | 84% | 79% | 74% |

Columns (1) and (2) of Table 4 confirm that there are no statistically significant differences in attrition rates between treated and control families at waves 2 and 3 respectively.

**Table 4.** Sample Attrition by Treatment Condition

|  | (1) Probability of not answering the questionnaire in wave 2 | (2) Probability of not answering the questionnaire in wave 3 |
|---|---|---|
| ITT | 0.016 | -0.006 |
|  | (0.041) | (0.025) |
| Attrition rate control arm | 0.242*** | 0.127*** |
|  | (0.034) | (0.018) |
| N | 513 | 687 |

Note: *** p<0.01, ** p<0.05, * p<0.1 Table reports coefficients and standard errors in parentheses. Column 1 estimates the difference between treated and controls in the probability of not answering the ASQ:SE questionnaire. Column 2 estimates the difference in the probability of not answering the third wave questionnaire.

*3.3 Evaluation instruments, outcomes and sociodemographic characteristics*

Waves 2 and 3 collected information on the household environment, parenting practices, and the child's and main caregiver's well-being. We measured the frequency of parental involvement in physical play, didactic activities and socialization with the child, by using a version of the scale proposed by Cabrera et al. (2004) for the evaluation of the Early Head Start program. These variables take values between 1 and 6, where 1 is never and 6 is almost always or always.

To quantify the quality of the caregivers' investment, we administered the Positive Parenting Scale (E2P) of Gómez-Muzzio et al. (2022), focusing on the first 15 items of the instrument, which allow us to measure the bonding competencies of the referent adult. We used items of the Parent-Child Conflict Tactics Scale for Parents and Children by Straus (1998) (PCCTS) to assess levels of aggression towards the child and child maltreatment. We also assessed caregivers' beliefs and perceptions about child rearing by including 10 true or false items referring to a set of child behaviors. With regard to co-parenting, we asked about the sharing of childrearing tasks, in particular the degree of cooperation from the partner received by the mother.

Based on the above instruments, we defined the following outcomes: (i) whether the quality of parenting was in a risk zone (based on the E2P Positive Parenting Scale and assuming a value 1 if the scale's score fell within the "Low Frequency" zone and 0 otherwise); (ii) physical aggression towards the child, a dichotomous variable with a value of 1 if the referring adult hit the child with an object, pinched the child or spanked the child sometime in the last 6 months and 0 otherwise; (iii) psychological aggression towards the child, a dichotomous variable with a value of 1 if the referring adult shouted loudly at the child, said bad words to the child or threatened the child sometime in the last 6 months and 0 otherwise; (iv) intensity of physical and/or psychological aggression towards the child, constructed as the sum of

the frequencies in which the adult physically and/or psychologically assaulted the child in the last 6 months (the frequencies vary between 1, which is never, and 4, which is always); (v) parental knowledge, constructed from the number of correct answers in a total of 10 statements related to childrearing and children's behaviors; (vi) equitable parental cooperation, a dichotomous variable that takes the value of 1 if the mother reports that both mother and father in six childrearing tasks: boundary setting, childcare, education, health, expenses, and recreation.

We captured the well-being of the caregiver with two instruments: (i) the *dysfunctional parent-child interaction* subscale of the Parental Stress Index proposed by Abidin (1995) (PSI), which assesses whether the child meets parental expectations and the degree of satisfaction parents have with the child; and (ii) the Center for Epidemiological Studies Depression Scale (CES-D) in its reduced version (Andresen, 1994). Based on the PSI and the CES-D we define the following outcomes: (i) symptoms of parental stress, captured by the PSI scale score; (ii) high or clinical stress, which takes the value of 1 if the person is located in a PSI percentile ≥81 and 0 otherwise; (iii) symptoms of depression, captured by the CES-D score; and (iv) risk of depression, a dichotomous variable that takes the value of 1 if the person has a CES-D score ≥10 and 0 otherwise;

To assess the child's well-being, we asked families to complete an online assessment of the Ages & Stages Questionnaires (version 2), Social-Emotional Scale (ASQ-SE) (Squires et al., 2015). We also inquired whether the child had suffered any accident at home. The outcomes considered included: (i) whether the child was in a socioemotional risk zone according to the ASQ-SE-2 scale (Squires et al., 2015) and (ii) whether the child suffered an accident in the past 6 months. In all cases, the variables take the value of 1 if the answer is yes and 0 otherwise.

Finally, the surveys also collected data on sociodemographic characteristics, including the age and sex of the child, age and education of the mother, number of household members, and variables indicating State aid, employment status of the referring adult, cohabitation of the father and mother in the household, conditions of habitability of the household, and region of residence of the household. We also collected information on the occurrence of negative shocks in the past 12 months (such as decreases in income, unemployment, increases in debt, food insecurity, death of family members or of a close friends, divorce, judicial problems, accident or serious illness, and problems with substance use), and on aspects of the daily life potentially affected by the pandemic (such as the organization of the household, compatibility of work and care, free time, and physical space).

### 3.4 Descriptive statistics and balance

Table 5 summarizes the descriptive statistics of the household, child and mother by treatment condition. All variables considered are dichotomous except for the age of the child and mother and the number of

household members. The negative economic shock variable has a value of 1 if any of the following occurred in the household in the past 12 months (and 0 otherwise): a decrease in income, unemployment, increases in debt, food insecurity, death of a family member or of a close friend, divorce, problems with the law, accident or serious illness, and problems with substance use. The economic shock variable is constructed in a similar way, but focuses only on debt, drop in income, unemployment and food insecurity. This last variable takes the value of 1 if there were days in the past 12 months when there was nothing to eat in the household, and 0 otherwise. Regarding the habitability conditions of the household, we consider that a household is overcrowded if there are more than two people per room, not counting the bathroom and kitchen (INE, 2011).

Children are on average 24 months old and approximately half of them are the first child of the respondent. The average age of the mother is 30 years old and around 53% did not complete high school. In addition, more than 60% of the adult referents are active in the labor market. Approximately 55% of households receive some type of cash allowance from the government, while 10% are beneficiaries of the cash transfer program "Tarjeta Uruguay Social" (TUS), a benefit targeting households in the worst socio-economic situation according to the Critical Deprivation Index (ICC by its acronym in Spanish) from the Ministry of Social Development (MIDES by its acronym in Spanish)[6]. 81% of the children live with their mother and father, while approximately seven out of ten children live in households that have suffered some kind of negative shock in the last 12 months. If we consider only negative economic shocks (drops in income, debt, food insecurity, or unemployment), 57% of households were exposed to some contingency of this type. Approximately 20% of households are overcrowded.

The last column of Table 5 shows that the vast majority of these characteristics are balanced between treated and control families. Out of a total of 17 variables considered, only the department of residence of the child was statistically different at 1%. There is also a difference in the likelihood that the child lives with both parents, but the difference is statistically significant only at 10%. For the rest of the variables, no statistically significant differences are observed between the two groups at the usual levels of significance. [7]

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[6] The ICC approaches the determination of households with lower incomes through other dimensions of well-being, which is why it differs from the most usual methodology for defining poverty, which is monetary poverty. It is the targeting instrument used to select the beneficiary population of some state aid programs and its construction involves the development of a statistical model to estimate the probability that a household belongs to the target population, which are households in vulnerable situations (Colombo et al., 2013).

[7] Table A2 in the appendix shows the results of the balance between treated and controls who answered the ASQ:SE questionnaire. The test results confirm that this is also a largely balanced sample, with only significant differences in geographical distribution (1%).

**Table 5.** Descriptive statistics and balance

| | ------Controls------ | | -----Treated----- | | -----Balance----- |
| | N | Mean (Std. Dev.) | N | Mean (Std. Dev.) | Diff. (Std. Dev.) |
|---|---|---|---|---|---|
| Child is male | 296 | 0.514 | 306 | 0.536 | 0.022 (0.041) |
| Child's age (months) | 294 | 24.600 (6.439) | 306 | 23.863 (5.849) | -0.736 (0.502) |
| Child is first child | 277 | 0.498 | 285 | 0.547 | 0.049 (0.042) |
| Mother did not finish middle school | 296 | 0.172 | 306 | 0.180 | 0.007 (0.031) |
| Mother completed middle school but not high school | 296 | 0.341 | 306 | 0.353 | 0.012 (0.039) |
| Mother completed high school | 296 | 0.486 | 306 | 0.467 | -0.019 (0.041) |
| Mother's age | 259 | 30.562 (6.035) | 281 | 30.965 (6.353) | 0.403 (0.534) |
| Adult referent works | 296 | 0.652 | 303 | 0.630 | -0.022 (0.039) |
| Survey respondent: mother | 296 | 0.956 | 306 | 0.977 | 0.021 (0.015) |
| Beneficiary of Family Allowances (AFAM) | 286 | 0.538 | 293 | 0.560 | 0.021 (0.041) |
| Beneficiary of TUS | 286 | 0.094 | 292 | 0.103 | 0.008 (0.025) |
| Child lives with mother and father | 291 | 0.845 | 303 | 0.789 | -0.057* (0.032) |
| Household suffered any negative shock (past 12 months) | 296 | 0.699 | 305 | 0.672 | -0.027 (0.038) |
| Household suffered negative economic shock | 295 | 0.576 | 304 | 0.566 | -0.010 (0.041) |
| Number of household members | 296 | 3.939 (1.091) | 305 | 4.046 (1.416) | 0.107 (0.103) |
| Household in overcrowded conditions | 296 | 0.203 | 305 | 0.200 | -0.003 (0.033) |
| Region: Montevideo | 296 | 0.061 | 306 | 0.127 | 0.067*** (0.024) |

Note: *** p<0.01, ** p<0.05, * p<0.1 All variables are dichotomous except for the age of the child and mother and the number of household members.

*3.5 Data Analysis*

We first estimate a reduced form model that regresses the outcome of interest, $Y_i$ on the intention to treat (ITT) indicator, a dichotomous variable that takes the value of 1 if the family was randomly assigned to receive messages, and 0 otherwise. We then add as covariates the randomization stratum and a set of control variables, $X_i$, that includes the age of the child and the mother, the child's gender, mother's education, household's members and living conditions, and region of residence, all variables with the potential to improve the precision of the model.

$$Y_i = \beta_0 + \beta_1 ITT_i + \beta_2 X_i' + \beta_3 Stratum_i + \varepsilon_i \qquad (1)$$

Not all families initially assigned to treatment actually received Crianza Positiva messages. 62 of the 306 treated families who responded to the 2$^{nd}$ follow-up questionnaire were not receiving messages by November 2020. Because of this imperfect compliance, the coefficient of interest, $\beta_1$ captures the average intention-to-treat effect rather than a treatment effect.

To calculate the average treatment effect (ATE), we estimate a Two-Stages Least Squares (2SLS) model that regresses the outcome variable on an indicator of whether the family was receiving messages in November 2020, instrumenting the latter with the ITT, and controlling for the covariates considered in (1).

$$Y_i = \gamma_0 + \gamma_1 \widehat{ReceivesM}_i + \gamma_2 X_i' + \gamma_3 Stratum_i + \zeta_i \qquad (2)$$

where $\widehat{ReceivesM}_i$ is the prediction arising from regressing the dichotomous variable that takes the value 1 if the household was receiving messages in November 2020 on the ITT indicator, on the covariates $X$ and the stratum variables. The coefficient $\gamma_1$ captures the average treatment effect (ATE).

## 4. Results

4.1 *Main results*

Table 6 presents the coefficients and standard errors of the treatment variable across three different specifications. Column 1 shows the OLS estimates that arise from a simple model that regresses the outcome of interest on the Intention-to-treat (ITT) variable and the stratum used in randomization. Column 2 enriches the above specification by incorporating a set of covariates. In both cases, standard errors are clustered by center. Finally, column 3 yields the results of the 2SLS estimations and therefore shows the ATE.

We find no statistically significant effects of the message intervention on most of the dimensions assessed. There is only a positive and significant impact (at 1%) on the likelihood of equal cooperation in child-rearing tasks within the household (a 35% increase compared to the mean for controls), and a drop (albeit weak) on the average frequency of parental involvement in socialization activities. In a pandemic setting, this effect is not necessarily an adverse result: it may indicate that the intervention contributed to internalize the risks of exposure to the virus in children. In any case, none of these results are robust to multiple hypotheses testing.

**Table 6.** ITT and ATE Effects of the Crianza Positiva 2020 Message Program

| | ITT | ITT | ATE | Mean (Std. dev) | Power |
|---|---|---|---|---|---|
| | Coef (Std. error) | Coef (Std. error) | Coef (Std. error) | ITT=0 | |
| | (1) | (2) | (3) | (4) | (5) |
| *A. Frequency of involvement* | | | | | |
| in physical games | 0.014 | 0.012 | 0.014 | 4.391 | 0.948 |
| | (0.058) | (0.058) | (0.070) | (0.787) | |
| in didactic activities | 0.070 | 0.062 | 0.076 | 4.542 | 0.782 |
| | (0.108) | (0.095) | (0.114) | (1.030) | |
| in socialization activities | -0.248* | -0.205* | -0.254* | 3.361 | 0.776 |
| | (0.137) | (0.124) | (0.149) | (1.210) | |
| *B. Quality of the environment and parenting practices* | | | | | |
| Risk zone E2P | 0.018 | 0.028 | 0.034 | 0.119 | 0.105 |
| | (0.031) | (0.032) | (0.038) | (0.324) | |
| Physical aggression | 0.010 | 0.003 | 0.004 | 0.285 | 0.307 |
| | (0.030) | (0.031) | (0.037) | (0.452) | |
| Psychological aggression | -0.041 | -0.033 | -0.041 | 0.386 | 0.401 |
| | (0.043) | (0.040) | (0.048) | (0.488) | |
| Aggressiveness towards the child | -0.068 | -0.065 | -0.080 | 4.953 | 0.953 |
| | (0.097) | (0.091) | (0.108) | (1.250) | |
| Parenting knowledge (no. of correct answers) | -0.005 | 0.038 | 0.048 | 7.659 | 0.571 |
| | (0.210) | (0.149) | (0.181) | (1.736) | |
| Equal parental cooperation | 0.052* | 0.079*** | 0.098*** | 0.226 | 0.213 |
| | (0.031) | (0.028) | (0.034) | (0.419) | |
| *C. Adult Well-Being* | | | | | |
| Parental Stress Symptoms (PSI Score) | -0.075 | 0.022 | 0.028 | 17.572 | 0.780 |
| | (0.429) | (0.394) | (0.474) | (4.907) | |
| High or clinical stress | 0.020 | 0.023 | 0.029 | 0.203 | 0.175 |
| | (0.030) | (0.029) | (0.034) | (0.403) | |
| Depressive symptoms (CES-D score) | 0.064 | 0.122 | 0.151 | 6.071 | 0.849 |
| | (0.286) | (0.258) | (0.312) | (3.982) | |
| Depression risk (CES-D score≥10) | 0.010 | 0.012 | 0.014 | 0.186 | 0.176 |
| | (0.033) | (0.030) | (0.037) | (0.390) | |
| *D. Child Well-being* | | | | | |
| Risk zone ASQ:SE | 0.007 | 0.010 | 0.012 | 0.167 | 0.146 |
| | (0.034) | (0.029) | (0.034) | (0.374) | |
| Child had an accident | 0.001 | 0.005 | 0.007 | 0.390 | 0.420 |
| | (0.037) | (0.037) | (0.044) | (0.489) | |

Notes: *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Column 1 shows the OLS estimates that arise from a simple model regressing the outcome of interest by the Intention to Treat (ITT) variable, the stratum used in randomization, and adjusting for errors by cluster of centers to the extent that there may be unobservables that affect groups of families coming from the same CAIF. Column 2 enriches the previous specification by incorporating covariates. Column 3 gives the results of the 2SLS estimations and therefore shows the ATE. Column (4) shows the mean and standard deviation of the outcome of interest in the subsample of controls, while column 5 reports the power to obtain an increase of 0.3 standard deviations (continuous variables) and 20% (dichotomous variables). The calculations take into account the intra-cluster correlation (intra-CAIF) of the outcome.

*4.2 Heterogeneity analysis*

Regarding differential effects of the intervention according to different family traits, Table 7 shows that in general there are no major differences in the impact of the intervention between treated and control families within different subsamples. There are, however, some specific heterogeneous effects. For example, when the child is male, the intervention reduces the intensity of aggression towards the child, while it increases parental knowledge in overcrowded households.

On the other hand, the intervention reduces the risk of depression in households without completed high school education, but increases this risk in households with completed high school. The latter are households that reported more difficulties regarding the organization of care during the pandemic[8] (Balsa et. al. 2021b) and therefore may have felt more overload in relation to the content of the messages in a context where COVID-19 stressors were operating. Likewise, the intervention contributes to an increase in parental stress (significant effect at 10%) in overcrowded households.

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[8] In these households, women were more likely to be working, so the pandemic led to more difficulties in balancing work and care.

# Table 7. Heterogeneity analysis

| | Child's Gender | | Mother's education | | Overcrowding | | State Aid (TUS) | | Negative shocks | |
|---|---|---|---|---|---|---|---|---|---|---|
| | ITT | Boy*ITT | ITT | ITT*mother's education | ITT | Over-crowding ITT | ITT | TUS*ITT | ITT | Shock*ITT |
| | (1) | (2) | (3) | (7) | (8) | (1) | (7) | (8) | (9) | (10) |
| **Frequency of involvement** | | | | | | | | | | |
| In physical games | -0.041 | 0.098 | -0.038 | 0.101 | 0.044 | -0.167 | -0.015 | 0.161 | 0.029 | -0.032 |
| | (0.077) | (0.113) | (0.076) | (0.135) | (0.074) | (0.170) | (0.060) | (0.161) | (0.087) | (0.102) |
| In didactic activities | 0.008 | 0.101 | 0.053 | 0.018 | 0.039 | 0.114 | 0.020 | 0.347 | 0.136 | -0.131 |
| | (0.122) | (0.150) | (0.123) | (0.205) | (0.112) | (0.198) | (0.093) | (0.259) | (0.139) | (0.183) |
| In social activities | -0.227 | 0.039 | -0.195 | -0.022 | -0.263* | 0.292 | -0.232* | -0.060 | -0.191 | -0.026 |
| | (0.156) | (0.195) | (0.138) | (0.167) | (0.142) | (0.238) | (0.133) | (0.307) | (0.158) | (0.185) |
| **Childrearing environment** | | | | | | | | | | |
| Risk zone E2P | -0.000 | 0.052 | 0.026 | 0.003 | 0.046 | -0.096 | 0.034 | -0.097 | 0.052 | -0.044 |
| | (0.057) | (0.071) | (0.036) | (0.060) | (0.037) | (0.062) | (0.035) | (0.081) | (0.045) | (0.066) |
| Aggressiveness | 0.112 | -0.332** | -0.087 | 0.046 | -0.056 | -0.045 | -0.018 | -0.252 | -0.132 | 0.120 |
| | (0.148) | (0.154) | (0.134) | (0.172) | (0.117) | (0.241) | (0.091) | (0.356) | (0.138) | (0.226) |
| Parental knowledge (# correct answers) | 0.082 | -0.084 | -0.067 | 0.216 | -0.137 | 0.843** | 0.100 | -0.549 | -0.154 | 0.334 |
| | (0.257) | (0.355) | (0.282) | (0.380) | (0.168) | (0.358) | (0.166) | (0.599) | (0.272) | (0.362) |
| Equal parental cooperation | 0.094** | -0.028 | 0.074** | 0.011 | 0.083** | -0.021 | 0.078** | -0.053 | 0.141*** | -0.110 |
| | (0.047) | (0.066) | (0.037) | (0.055) | (0.033) | (0.081) | (0.032) | (0.101) | (0.051) | (0.068) |
| **Well-being** | | | | | | | | | | |
| PSI Score | 0.321 | -0.559 | -0.379 | 0.814 | -0.061 | 0.417 | -0.028 | 0.264 | -0.003 | 0.045 |
| | (0.693) | (0.871) | (0.670) | (0.834) | (0.434) | (1.044) | (0.430) | (1.790) | (0.574) | (0.680) |
| High or clinical stress | -0.031 | 0.101 | -0.025 | 0.097 | -0.001 | 0.124* | 0.025 | -0.055 | 0.038 | -0.026 |
| | (0.056) | (0.071) | (0.047) | (0.062) | (0.030) | (0.072) | (0.031) | (0.140) | (0.054) | (0.064) |
| Depressive symptoms | 0.401 | -0.524 | -0.328 | 0.913 | 0.084 | 0.194 | 0.222 | -0.643 | -0.319 | 0.785 |
| | (0.459) | (0.692) | (0.436) | (0.739) | (0.304) | (0.926) | (0.271) | (1.334) | (0.331) | (0.625) |
| Risk of depression | 0.043 | -0.060 | -0.067* | 0.159** | 0.019 | -0.038 | 0.023 | -0.102 | -0.003 | 0.026 |
| | (0.040) | (0.061) | (0.039) | (0.068) | (0.038) | (0.085) | (0.034) | (0.133) | (0.032) | (0.054) |
| Child had an accident | 0.018 | -0.023 | -0.007 | 0.025 | -0.006 | 0.060 | 0.002 | -0.018 | -0.029 | 0.061 |
| | (0.049) | (0.076) | (0.050) | (0.069) | (0.046) | (0.088) | (0.039) | (0.141) | (0.048) | (0.067) |

## 5. Discussion: Inference, population and situational considerations behind the failure to replicate the original results

As raised in Al-Ubaydli et al. (2017, 2021), in this section we consider inference, population, and situational features that may explain the difference in results between CP2020 and CP2018. The identification of idiosyncrasies related to the statistical procedures applied to the data, the representativeness of the population, and the representativeness of the situation or implementation context may help understand the internal and external validity of the results, and shed light on the design of stronger programs. As mentioned already, both interventions were implemented at similar scales (slightly larger for the CP2020 edition) directly by the research team, and did not rely strongly on human resources, so we dismiss problems of fidelity of implementation, quality of human resources, or general equilibrium effects behind the difference in results.

*5.1 Inference*

Bloomfield et al. (2022) provide details of the experimental evaluation of the first Crianza Positiva Messaging Intervention. It included 529 families from 24 CAIF centers that were randomized to treatment in two steps to assess spillovers. The final number of families assigned to receive messages was 237. 72% of these families responded to the follow-up questionnaire, whereas the response rate was of 78% among control families. The difference in attrition rates was not statistically significant at usual levels. In terms of compliance, 11% of families assigned to treatment did not receive SMS nor WhatsApp messages.

The evaluation of CP2020 included more centers than the original study (39 vs. 24), and a larger number of families (687 families relative to 529 in CP2018). The response rate in the 2nd follow-up was also larger (88% versus 75% in CP2018). All these features suggest that the CP2020 study was better powered to identify effects. The last column in Table 6 shows the power of the CP2020 data to detect a minimum effect size of 0.3 standard deviations in the case of continuous variables or a 30% increase in the case of dichotomous outcomes. We observe that the outcomes measuring frequency of parental involvement, aggressiveness towards the child, parental stress and depression symptoms have reasonable power levels. In both evaluations, standard errors were clustered at the center level. Table 8 below compares power levels for an outcome that was identically measured in both interventions: the frequency of parental involvement with the child. We see that the power to detect an effect size of 0.3 standard deviations is larger in CP2020.

Table 8. Power to detect an effect of 0.3 standard deviations

|  | CP 2018 | CP 2020 |
|---|---|---|
|  | (1) | (2) |
| *Frequency of parental involvement* |  |  |
| Physical games | 0.526 | 0.948 |
| Didactic Activities | 0.606 | 0.782 |
| Social Activities | 0.666 | 0.776 |

*5.2 Population*

Regarding the representativeness of the population, both interventions recruited families that were enrolled in the *Timely Experiences* program at CAIF early childhood centers and covered different regions of the country. CAIF centers provide free early childhood education and are the first option chosen by families of low and middle socioeconomic status. Therefore, the platform is quite representative of families with young children who a priori would be thought to benefit from BCC interventions. There are, however, some differences between the populations recruited for CP2018 and CP2020.

As with the first edition of CP, in 2020 CAIF centers were in charge of informing families about the messaging program and of asking them to sign the informed consent. However, while in 2018 these informational sessions took place face-to-face in the center with families that had been participating throughout the year, in 2020 the recruitment took place through WhatsApp, with very little prior acquaintance between the families and centers' staff. In 2020, families had to sign their informed consent through an online link, possibly constraining the type of families that signed up for the program. Table 9 shows that the populations recruited for the two studies are similar in terms of demographics (mother's age, the gender of the child and the child's age) but differ in their socioeconomic status. Families in the CP2020 sample are more likely to have both the mother and father living together, are less likely to be beneficiaries of cash transfers and are more likely to be high school graduates. This comparison suggests that the CP2018 population has higher levels of vulnerability than the CP2020 one. Families in the CP2018 sample are more similar to families at the national level with children below 36 months old enrolled in CAIF centers, while families in the CP2020 sample are more similar to families at the national level with children below 36 months old.

**Table 9**. Comparison of the CP2020 sample with that of CP2018 and with the National Nutrition, Child Development and Health survey 2018 (ENDIS)

| Variable | CP 2018 Mean (Std. dev) | CP 2020 Mean (Std. dev) | ------- ENDIS 2018 ------ Mean (<=36 months +CAIF) | Mean (<=36 months) |
|---|---|---|---|---|
| Male child | 0.518 | 0.524 | 0.479 | 0.525 |
| Child's age | 23.958 | 23.905 | 21.779 | 17.940 |
| | (6.207) | (6.466) | (8.883) | (10.687) |
| Mother's age | 29.273 | 30.710 | 28.551 | 30.177 |
| | (6.744) | (6.214) | (6.608) | (6.826) |
| Mother and father live together | 0.771 | 0.812 | 0.700 | 0.810 |
| Mother did not complete middle school | 0.376 | 0.179 | 0.388 | 0.296 |
| Mother completed middle school, not HS | 0.336 | 0.352 | 0.359 | 0.275 |
| Mother completed high school | 0.288 | 0.469 | 0.254 | 0.429 |
| Household beneficiary of Family Allowances (AFAM-PE or contributory) | 0.659 | 0.552 | 0.706 | 0.522 |
| Household beneficiary of Uruguay Social Card | 0.196 | 0.105 | 0.295 | 0.182 |
| Number of household members | 4.288 | 3.992 | 4.268 | 4.194 |
| | (1.426) | (1.264) | (1.566) | (1.358) |
| Region: Montevideo | 0.210 | 0.094 | 0.296 | 0.471 |
| Negative shocks past 12m (at least two in CP2018, at least one in CP2020) | 0.320 | 0.683 | n/a | n/a |
| Sample Size | 586 | 615 | 313 | 1656 |

Goldfarb and Prince (2008) show that income and education are positively correlated with internet adoption, but, at the same time, it is the more educated and higher-income individuals who tend to use the internet less intensively than low-income or less educated individuals. For the authors, the most likely explanation for this finding is that low-income individuals spend more time online due to their lower opportunity cost of leisure time. Boik et al. (2016) find that income plays an important role in the allocation of time spent online and find the existence of inferiority in attention: higher income households spend less time online per week. A possible explanation is that the effects of CP2020 were somehow diluted due to the higher socioeconomic status of families. On the other hand, we find no differential effect of the program by mother's level of education, although this could also be due to power issues.

*5.3 Implementation context / situation*

Understanding the peculiarities of the implementation environment in each study is critical when thinking about scalability. List (2007) suggests that the representativeness of the situation is even more important than the representativeness of the population. We underscore below a few differences in the implementation context of the CP2018 and the CP2020 messaging programs that may help understand why the two editions delivered distinct results.

*Complementarity between the Crianza Positiva workshop and the messages.* Families recruited for the CP2018 messages (both treated and control families) attended at least some sessions of a Crianza Positiva parenting workshop, while those recruited for the CP2020 messages were not offered this workshop. The messages reminded families about parenting concepts that had already been raised during the intense Crianza Positiva sessions and invited them to put them into practice during a 6-month-long period. In this sense, it is reasonable to expect a complementarity between the effects of the messages and those of the workshop. If this were the main explanation for the lack of results, it suggests that messages contribute to enhance and sustain over time the effects of a more intensive intervention, but do not have an impact when implemented in isolation.

*Length of the messages*. Partly to compensate for the fact that caregivers had not been exposed to the Crianza Positiva Workshop, the messages in 2020 were longer than those in 2018. While more characters may have helped them better understand the underlying proposals, parents may have also been more reluctant to read them. Still, we find that a higher fraction of families opened the messages in 2020 than in 2018.

*The identity of the sender.* The CP2018 messaging program was launched during the summer holidays (in January 2018) after families had been in contact with the center for a full year attending the Timely Experiences workshops. The latter program, CP2020, was launched in the second semester of the year of enrollment in Timely Experiences (July 2020), with very little prior contact between the families and center educators due to school shutdowns in response to the pandemic during the first semester. Prior research has shown that the receiver's perception of who the sender is has a large impact on communication effectiveness, that people can attribute automated messaging to a human sender and that the sender (or message writer) should be identified for increased credibility (Muench and Baumel 2017). While CP2018 messages were likely to be associated by families with the CAIF staff involved in the Crianza Positiva workshop (despite the fact that they were not the actual senders), the messages in CP2020 were less likely to be linked to known senders.

*Limited attention due to a stressful environment*. During COVID-19, families were exposed to economic shocks and changes in household organization that could also explain lower levels of attention to messages. Twenty percent of families lived in an overcrowded household, 57% experienced

some negative economic shock potentially associated with COVID-19, and 67% reported having to spend more time caring for children. These realities may have influenced how people attended to and interpreted the content of the messages in a context of strong stressors. The nature of these shocks is different from those analyzed in the 2017 program, as they have a persistent nature in the period under study, and occurred simultaneously with the course of the messages. In fact, we observe some negative effects of the intervention in more educated households, subject to more work and childcare compatibility problems, and in overcrowded households, strongly affected by the mobility restrictions imposed by the pandemic.

*Parallel messaging interventions: treatment of control families and competing attention for treated families.* A final explanation has to do with the parallel implementation of other interventions at CAIF centers in response to the pandemic. Between March and June 2020, the government mandated that CAIF centers remain closed. Although in the second half of the year (a period that coincided with the intervention of messages), the institutional guidelines were to reopen the centers, there was heterogeneity in the number of families who returned to the centers face-to-face, both due to outbreaks of contagion and to different perceptions of the families about their risks of infection.

To understand the approach that CAIF centers used with the families in this period, we consulted treated and control CAIF staff through a brief telephone questionnaire. A first element that emerges from these surveys is that families in treated centers were more likely to return face-to-face to the *Timely Experiences* encounters than the control centers. Table 10 shows that, while 58% of control families had a frequent participation in face-to-face activities at CAIF activities during the 2nd semester, among treated families this figure increased to 69%.[9] On the other hand, and probably because of this lower attendance, the control centers made more use of WhatsApp messages: 88% of families in the control group were associated with CAIF centers that reported sending group messages on a weekly basis and 74% were in CAIF centers that reported sending individual messages to families on a weekly basis. These numbers drop to 79% and 49%, respectively, for families in treated centers. Furthermore, more than half of the families in the control group belonged to centers where the referents indicated that exchanges through WhatsApp occurred much more frequently than in previous years, while the figure is five times lower in the case of treated centers.

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[9] It is not clear whether this increase in face-to-face attendance by treated families responds in any way to the Crianza Positiva messages. Crianza Positiva's intervention was launched a few weeks before the centers reopened their doors, so it is possible that they increased family's awareness about the CAIF and their motivation to attend face-to-face, in particular among families in centers with low intensity of direct message from CAIF educators.

**Table 10.** CAIF's approaches to families in the second half of 2020 (N=571)

| | Control | | Treated | | Difference |
| --- | --- | --- | --- | --- | --- |
| | N | Mean | N | Mean | |
| % of families in centers with > 75% face-to-face participation at CAIF | 296 | 0.575 | 275 | 0.691 | 0.117*** |
| % of families in centers sending individual messages on a weekly basis | 296 | 0.740 | 275 | 0.491 | -0.249*** |
| % of families in centers sending group messages on a weekly basis | 296 | 0.878 | 275 | 0.793 | -0.086*** |
| % of families with message content similar to that in CP2020 | 296 | 0.929 | 275 | 0.782 | -0.147*** |
| % of families in centers reporting more frequent Whatsapp exchanges with families than in previous years. | 296 | 0.611 | 275 | 0.120 | -0.491*** |

*** Statistically significant at 1% (p<0.01).

Ninety-three percent of the control families and 78% of the treated families were in centers in which the messages included contents and activities similar to those proposed in the Crianza Positiva messages. Whatsapp communication was also used as a platform to share material, photos, and feelings derived from the situation of confinement, and to discuss child-rearing practices and behaviors, child care, and vaccination.

The data above suggest two additional hypotheses that could shed light on the null results in our study. The first one is that the control group was exposed to a treatment potentially comparable to that of Crianza Positiva, contaminating the identification strategy. To assess this conjecture, we constructed an index that measured the frequency and coverage of group and individual messages sent by the CAIF centers to enrolled families. This message "intensity" index takes the highest value when the center sends messages to more than 75% of families with a frequency of at least twice a week and the lowest when the center sends messages sporadically and the coverage is less than 50%. We split this index according to its median and used propensity score techniques to evaluate the effect of receiving "high intensity" messages from the center on the outcomes in Table 6. We find no beneficial effects of these messages on any of the outcomes, and for some outcomes, we find even detrimental effects. For the sake of space, we do not show these results here (they are available upon request), but they seem to suggest a small role for the hypotheses that competing messages invalidated our identification strategy.

The second hypothesis is that the higher traffic of messages received by treated families competed with the Crianza Positiva messages for families' attention, especially in a context where online communication encompassed an increasing array of aspects of daily life. In other words, the opportunity cost of paying attention to *additional* messages increased substantially during the COVID-19 pandemic. Our heterogeneity findings reveal some suggestive evidence pointing in this same direction. For example, we find that messages reduce the probability of depression risk in less educated mothers, but increase it in the case of more educated and working women, who were subject, during the pandemic, to a high demand for attention due to the need to combine work and childcare. We also observe that the

messages increase parental stress in overcrowded households, exposed to significant pressures due to the "stay at home" public exhortations.

## 6. Conclusions

This paper shows the results of replicating the Crianza Positiva messaging program, a behavior change intervention aimed at strengthening parenting skills of families with children aged 0 to 2 through mobile communication and behavioral economic insights. The intervention took place between July and December 2020, in the context of the COVID-19 pandemic, and involved sending messages to families three times a week for 24 weeks. Unlike the first edition of the program in 2018, families in 2020 were not asked to participate in a prior 8-session face-to-face parenting workshop. Beyond finding alternative ways of communicating with families during the pandemic, the study aimed at shedding light on cost-effective and scalable ways of strengthening parental competencies and childrearing environments. Successful parenting interventions rely heavily on qualified personnel, a feature that makes them hard to scale up. Mobile behavioral change interventions hold the promise of reaching large fractions of the population at low cost.

This paper evaluates the Crianza Positiva 2020 messaging intervention using a randomized experimental design and compares it with the findings of the Crianza Positiva 2018 messaging intervention, which was implemented in a similar but not identical setting. We provide one of a few conceptual replications of an e-messaging program targeting families with children below the age of 3, and focusing on the quality of the parent-child interaction. Aside from Doss et al. (2019), Cortés et al. (2021), Fricke et al. (2018), and Cabell et al. (2019), who explore variations of the initial READY4K study (York et al., 2019) in the US, we are not aware of any replication of other text messaging programs targeting parents of young children.

Our results show that the 2020 messaging intervention had essentially no impacts on parenting behaviors, childrearing environments, or family well-being. These findings contrast with those reported by Bloomfield et al. (2022) in the evaluation of the first edition of the 2018 CP messaging program, which finds positive impacts on the frequency of parental involvement and parenting quality of around 0.24 standard deviations. We discuss several hypotheses behind the failure to replicate the prior results. First, the absence of a complementary workshop to the messages may have reduced the meaning of the messages and the openness of families to the program. The null results could suggest that a standing alone e-messaging program would not be enough to encourage and maintain parenting practices over time, and that the effectiveness of e-messages relies heavily on the complementarity with more intense face-to-face program. Second, participants in the CP2020 intervention were less vulnerable (more likely to be high school graduates, and less likely to be beneficiaries of cash transfers), and perhaps less sensitive to this type of intervention. Third, messages were slightly longer in 2020 to compensate for the fact that parents were not exposed to a previous workshop. Fourth, parents got the messages in a

period in which they were facing high cognitive loads due to the stressors imposed by the pandemic: negative economic shocks, high levels of uncertainty, fear, and the need make childcare compatible with work. Added to this, both treatment and control centers also made frequent use of WhatsApp messages to communicate with families during that period. The pandemic context, together with the coexistence of other messages, reflects the importance of "attention management" already underscored by Simon (1971): "In a world rich in information, the wealth of information means a dearth of something else: a scarcity of whatever it is that information consumes[...]. [A] wealth of information creates a poverty of attention and a need to allocate that attention efficiently among the overabundance of information sources that might consume it". Our results show some suggestive evidence about this competition for attention: messages increased symptoms of depression or parental stress in families that were time or space constrained, i.e. working mothers that had an increased burden of childcare or families in overcrowded households. Our findings suggest that messages may not be welfare enhancing when they compete strongly with stimuli that add responsibilities and time demands to already constrained recipients. Understanding the stimuli that compete for the attention and the cognitive load of the receiver can be important when implementing an intervention; not only because of their mitigating effect, but also because they could even be harmful when the subject is either too constrained or the target of too much information.

Based on small scale studies, interventions using text messages to target parents of young children look promising. But in order for policy makers to adopt them and scale them up, more replications are needed. Future interventions should take into consideration in their design the potential complementary between face-to-face and mobile interventions, the population target, parents' cognitive load, and the stimuli that compete for the attention of the receiver.

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**Appendix**

Table A1. Main instruments used to measure the outcomes of interest

| Result of interest | Instrument | Description |
|---|---|---|
| Social-emotional development of the child | ASQ:SE v2 by Squires, J., Bricker, D., and Twombly, E. (2015). | Questionnaire completed by parents to identify which children are in the social-emotional development risk zone. Six versions are used depending on the age of the children: 6, 12, 18, 30 and 36 months. The risk threshold varies depending on the age.<br>Allows you to monitor seven areas of behavior:<br>- Self-regulation: the child's ability to calm or adapt to physiological or environmental conditions or stimulation.<br>- Obedience: a child's ability or willingness to conform to others and follow rules.<br>- Adaptive functioning: the child's success or ability to cope with psychological needs.<br>- Autonomy: the child's ability or willingness to initiate or respond without guidance.<br>- Affection: a child's ability to show his or her own feelings and empathy for others.<br>- Social communication: a child's ability to interact with others by initiating verbal or nonverbal cues.<br>- Interaction with people: the child's ability to respond or initiate social responses to parents, other adults, or peers. The test items are not organized into categories, but the questionnaire manual suggests which items are intended to measure performance in a certain area according to the child's age.<br>A dummy is defined as 1 if the child is in the risk zone of the test in general. |
| Parental Stress | Abidin's (1995) Parental Stress Index (PSI) dysfunctional parent-child interaction subscale. | The PSI consists of 36 statements to which parents must respond on a Likert scale (1 to 5). The scale is divided into three subscales of 12 items each. In this report we use the dysfunctional parent-child interaction subscale that focuses on assessing whether children meet the expectations parents had of them and the degree of satisfaction their children provide.<br>The sum of the scores obtained in each subscale determines the total stress of the individual. A higher score indicates greater parental stress. |
| Depression | CES-D short version (10 items) | The range of scores for the 20-item scale varies from 0 to 60, and a score of 16 or more indicates the presence of significant depressive symptoms. According to Andresen (1994), the possible range for the 10-item scale is from 0 to 30, and a cut-off score of ten or more indicates the presence of significant depressive symptoms. |

| Positive Parenting | Positive Parenting Scale (E2P) v2, bonding competencies dimension by Gómez Muzzio et al. (2022) | It is a questionnaire addressed to any adult responsible for the breeding of a child. Its objective is to identify those parental competencies that these adults use when relating to the child in their care, grouping them into four areas: bonding, training, protection and reflection. In this report, only the area of bonding competencies is used. The questionnaire is age-sensitive, so the questionnaires for 4 to 10 months, 11 to 18 months, 19 to 36 months and 3 to 5 years were used. It consists of 15 items that describe daily parenting behaviors that would reflect the display of parental competence and the respondent must report on the frequency with which the described situation occurs. Each item has a score according to the frequency reported by the respondent and if it falls below a certain threshold it is considered to have "Low frequency" in that parental competence. In the case of bonding competencies, if it falls in "Low frequency" it is considered that the parental competencies are in the risk zone and it is recommended to indicate a specialized intervention. |
|---|---|---|
| Parental Involvement | Adapted from the parental involvement scale of Cabrera et al. (2004). | Seven items related to physical games, five to didactic games, and seven linked to socialization activities were used. Respondents had to report their frequency of participation in each activity on a scale of one to six. The higher the value, the greater the frequency of involvement in the activity in question. An average score was calculated for the three types of activities. Frequencies ranged from 1=Never to 6=Almost or every day of the week. |
| Conflict in the parent-child relationship | Adaptation of the *Parent-Child Conflict Tactics Scale* that seeks to identify child maltreatment. Straus, Murray A.; Hamby, Sherry L.; Finkelhor, Daniv; Moore, David; Runyan, Desmond (1998) | Some items from the physical and psychological aggression subscales of the original scale are used. Respondents had to detail the frequency (from one to four, being four always) of certain actions.<br>- Physical aggression: hit with object/palm on the tail, pinching<br>- Psychological aggression: yells loudly/cursing, threatens to hit but does not do so<br>Physical and psychological aggression dummies are constructed and take the value of 1 if the caregiver responds that he or she has ever assaulted his or her child.<br>A measure of the intensity of the aggressions is also constructed, which arises from adding the frequencies (which vary from 1=Never to 4=Always) of physical aggression (slap on the tail or hit with an object/pinch) and psychological aggression (shouting loudly or saying bad words/threatening with a blow). The higher the value obtained, the greater the aggression towards the child. |

| Beliefs and perceptions about parenting | Parental Knowledge Index | Ten statements related to parental knowledge were made where the interviewees had to answer whether they agreed or disagreed with the statement. The continuous variable that collects the number of correct answers is considered. |
| --- | --- | --- |
| Co-parenting | | The questions in this section were asked only of respondents who reported being the parent of the child in question. The questions referred to aspects related to the couple and parenting and to the division of tasks related to the child's breeding. Dummies are created that take the value of 1 if in the task in question (limits, care, education, health, expenses, recreation) a balanced distribution is observed (between mother and father, or between mother/father and their partner). Then a variable is obtained that counts the number of tasks in which there is a balanced sharing (cooperation). Taking into account this last variable, *equal parental cooperation* is defined as total cooperation, that is to say, in the six aspects mentioned above. |

**Table A2**. Balance in the sample that answers the 1ˢᵗ follow-up questionnaire

| | ----Controls----- | | ----Treated---- | | ---Balance---- |
|---|---|---|---|---|---|
| | N | Mean | N | Mean | Diff. (Std.error) |
| Child's gender: male | 299 | 0.515 | 258 | 0.547 | 0.031 (0.042) |
| Child's age (months) | 299 | 21.792 (6.545) | 258 | 21.916 (5.888) | 0.124 (0.531) |
| First child | 291 | 0.474 | 249 | 0.526 | 0.052 (0.043) |
| Mother did not finish middle school | 291 | 0.210 | 249 | 0.173 | -0.037 (0.034) |
| Mother completed middle school but not high school | 291 | 0.289 | 249 | 0.301 | 0.013 (0.039) |
| Mother completed high school | 291 | 0.502 | 249 | 0.526 | 0.024 (0.043) |
| Mother's age | 270 | 30.507 (6.049) | 243 | 31.286 (6.358) | 0.779 (0.548) |
| Mother respondent | 299 | 0.967 | 258 | 0.977 | 0.010 (0.014) |
| Family Allowances (AFAM-PE) | 288 | 0.483 | 246 | 0.467 | -0.015 (0.043) |
| TUS allowances | 288 | 0.101 | 247 | 0.134 | 0.033 (0.028) |
| Region: Montevideo | 299 | 0.060 | 258 | 0.124 | 0.064*** (0.024) |