Leveraging Mobile Phone Expansion in LMICs to Improve Parental Practices

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Abstract

We implemented a large-scale RCT in rural Côte d'Ivoire to measure the impact of an easily scalable intervention to promote simple parental practices fostering early childhood stimulation (ECS). The intervention consists of mobile phone videos that were disseminated via memory cards with the help of volunteer local actors. After five months, the videos had reached a third of the target population and video exposure had improved caregivers' ECS-related knowledge and practices, including those of male caregivers. In particular, the intervention reduced the prevalence of violent discipline. Our results highlight the public policy potential of mobile phone expansion in LMICs.

Keywords: Mobile Phone Expansion, Early Childhood Stimulation, Violent Discipline, Videos

JEL Codes: J13, O1, O33

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I. Introduction

Over the past two decades, mobile phones have become widespread in Low- and Middle-Income Countries (LMICs), including in rural areas. Illustrating this trend, mobile phone subscriptions (per 100 people) increased from 2 to 83 in Sub-Saharan Africa between 2000 and 2020 (ITU, 2020) (Appendix 1). From an economic point of view, this evolution offers new opportunities to consumers and producers, as well as prospects for economic development (Aker and Mbiti, 2010). More generally, it also provides policymakers with a unique tool for delivering standardized informational content to individuals with the goal of changing behaviors and norms at scale and at a low-cost.

In this study, we investigate how mobile phone expansion can be leveraged to improve parenting practices and, in particular, to foster Early Childhood Stimulation (ECS) practices. Doing so is important for at least two reasons. First, addressing parenting practices matters in its own right. For instance, throughout the world, 250 million children aged two to four are physically punished in their homes (UNICEF, 2017).[1] Second, parenting practices are also a key determinant of Early Childhood Development (ECD) (Shonkoff et al., 2011; Milteer et al., 2012; Black al., 2016; Britto et al., 2017). In fact, parenting programs designed to foster ECS have been shown to be particularly effective at improving ECD (Baker-Henningham and López Bóo, 2010; Gertler et al., 2014; Rao et al., 2014; Aboud and Yousafzai, 2015; Britto et al., 2015; Britto et al., 2017).[2] Fostering ECS is especially important in LMICs, where 250 million (43%) children under five years of age are at risk of not reaching their developmental potential (Lu et al., 2016) – inadequate cognitive stimulation and exposure to violence being among the most important risk factors, along with nutritional deficiencies and chronic infections (Walker et al., 2007; Walker et al., 2011).[3] The consequences for affected children can be severe, as they are likely to do poorly in school and, subsequently, to have low incomes, high fertility, and to fail to take adequate care of their own children, thus contributing to the intergenerational transmission of poverty (Grantham-McGregor et al., 2007; Richter et al., 2017).

[1] Representing about six out of ten children in this age group (UNICEF, 2017).
[2] More generally, there is now strong evidence that effective investments in a child's development in their first years can set them on a trajectory towards a better equilibrium (Grantham-McGregor et al., 2007; Walker et al., 2007; Black et al., Engle et al., 2011; Walker et al., 2011; Lu et al., 2016; Black et al, 2017; Richter et al., 2017).
[3] The global consensus on the importance of child development is reflected in Sustainable Development Goal 4.2.

The intervention we study consists of a series of nine short educating and entertaining videos promoting parental knowledge and practices fostering ECS to caregivers of young children (aged one to three at intervention start). The intervention was specifically designed to foster ECS in a LMIC setting and the content of the videos was informed by a qualitative study conducted in the study area at the beginning of the project. The intervention leverages the expansion of mobile phones in LMICs in two ways. First, the videos were specifically designed to be watched on simple but video-enabled handsets, which are becoming increasingly common in LMICs (available from USD 5 to 10 in our study area). Second, the intervention also exploits the fact that the expansion of mobile phones has resulted in mobile phone memory cards now being commonly used to exchange music and videos in West Africa. We leverage this medium to distribute the videos within communities.[4,5]

To measure the impact of this intervention, we implemented a cluster randomized trial in a random sample of 200 villages located in the western part of Côte d'Ivoire. In each village, a representative subset of 2,901 households with a child under 24 months of age was constituted and immediately divided into two groups: *specifically targeted* and *non-specifically targeted* households – on average 10 and 5 per village respectively. Half of the villages were then randomly assigned to a treatment group and the other to a control group. In treatment villages, mobile phone memory cards containing the videos were given to volunteer village leaders and local health workers, who then took on the task of disseminating the videos in the villages. In parallel, the memory cards containing the videos were distributed directly to *specifically targeted* households. The control group did not receive any form of intervention. This experimental design ensures that we can measure both the impact of the video content on those exposed to it (focusing on *specifically targeted* households) and the strength of the medium through which it is shared with the target population (focusing on *non-specifically targeted* households). It is especially relevant to settings in which such content sharing is done in real-world conditions and the proportion of the target population naturally exposed to the intervention may be small, which reduces the chances of

[4] This project follows a pilot study conducted in Burkina Faso, which suggested that the dissemination of videos via mobile phones can be an effective tool for health promotion (Swigart et al., 2019).
[5] An account of how mobile phone memory cards are being used in West Africa to transfer music or videos can be found here: https://www.theguardian.com/music/musicblog/2010/nov/01/music-from-saharan-cellphones-mali (accessed in May 2023).

being able to measure the impact of the content on individuals naturally exposed to it. Follow-up data was collected five months after the start of the intervention.

We reach several conclusions regarding the impact of the intervention on preregistered outcomes. First, we show that the low-cost and scalable dissemination strategy was effective at reaching an important share of the target population. In treatment villages, 31% of *non-specifically targeted* households had been exposed to the videos. This is significant given that village leaders and local health workers involved in the dissemination received no incentive other than being informed that the videos addressed the importance of ECS for ECD. Importantly, note that potential spillovers between household types cannot explain this high exposure rate, as 81% of exposed *non-specifically targeted* households reported having received the videos directly from either a village leader or a local health worker.

Second, exposure to the mobile videos increased caregivers' knowledge. Among *specifically targeted* viewers, the videos increased female and male caregivers' knowledge by 0.23 and 0.20 standard deviations respectively (statistically significant at the 1% level). In particular, we also show that exposure to the videos led male caregivers to become more aware of their role in the education and development of their children. The index reflecting their perception of the importance of their role in their child's development increased by 0.14 standard deviations.

Third, these effects resulted in an evolution of parenting practices towards greater child stimulation. In particular, we observe an increase in the number of different ECS activities carried out by caregivers exposed to the videos with their children. This number increased by 11% for female caregivers and 19% for male caregivers (statistically significant at the 5% level). Moreover, we find that video exposure also led to a stark reduction in the prevalence of violent discipline (psychological aggression or physical punishment). In particular, the proportion of children subjected to physical punishment decreased by 8 percentage points among exposed households, and by 7 percentage points for severe physical punishment (*i.e.*, hitting or slapping a child on the face, head or ears), representing a 13% and 21% decrease from the control means respectively (statistically significant at the 5% level).[6] We find similar results on parenting practices *observed* by data collectors over the course of their interactions with sampled households at

[6] Physical punishment is defined more broadly as shaking, hitting or slapping a child on the hand/arm/leg, hitting on the bottom or elsewhere on the body with a hard object, spanking or hitting on the bottom with a bare hand, and hitting or slapping on the face, head or ears.

follow-up (lasting over an hour). The number of observed stimulating practices increased by 16% of a standard deviation (statistically significant at the 5% level). This rules out the possibility that these effects are merely driven by social desirability bias.

This study contributes to different strands of literature. First, it adds to the literature on ECS and ECD in two ways. While research has shown that parenting programs designed to foster ECS (typically taking the form of home visits, health-center based programs, or group sessions) can be effective at improving ECD in LMICs (Baker-Henningham and López Bóo, 2010; Gertler et al., 2014; Rao et al., 2014; Aboud and Yousafzai, 2015; Britto et al., 2015; Britto et al., 2017), recent evidence suggests that the impact of these parenting programs diminishes significantly when they are scaled up (Andrew et al., 2018; Araujo et al., 2021). The reason appears to be that such programs rely on local health workers to teach parenting skills and that their overall quality is therefore highly dependent on the proficiency of the staff recruited and their supervision, both of which are difficult to maintain when the number of individuals they serve increases dramatically (often over a short period of time). We provide evidence of the effectiveness of a low-cost, technology-based intervention to promote parental knowledge and practices fostering ECS. In LMICs, where financial and human capital constraints may be an issue for implementing large-scale labor-intensive interventions, this alternative type of intervention holds particular promise in providing standardized information content to a potentially large number of caregivers at low cost. It is also interesting to note that despite the low-intensity nature of the intervention under study, it had considerable effects on parental knowledge and practices (including in dimensions as crucial as fathers' investment in their children's education and development, and the use of violent discipline). This indicates that they may be more malleable than previously thought – as suggested by the intensive nature of the parenting interventions studied to date (Appendix 2).[7]

Second, our study adds to the literature on the media. We contribute to the experimental literature on the topic by proposing an innovative design that allows us both to measure the impact of media content on individuals exposed to it and to assess the percentage of the target population that is exposed to it when

[7] In Appendix 2, we have reproduced information on 17 studies discussed in the J-PAL policy brief on the importance of encouraging early childhood stimulation by parents and caregivers to improve child development (see Table 1) (J-PAL, 2020). We replicated the information about the nature of the intervention under study and added some information about the group targeted by the intervention and the measured impact of the intervention. Appendix 2 shows that, to date, the typical parenting program studied was intensive and consisted of weekly individual or group meetings over a period of 6 to 12 months.

it is shared in real-world conditions – both parameters being equally essential for measuring the potential for scale-up of any intervention. This design is particularly relevant to the growing experimental literature on the impact of media programs, which has tended to elude the second question to focus on the first, inviting treatment individuals to screenings (Paluck and Green, 2009; Bernard et al., 2014; Ravallion et al., 2015; Banerjee et al., 2019; Bjorvatn et al., 2020) or offering financial incentives to encourage them to gain exposure to the program (Berg and Zia, 2017).[8] As a result, while this literature has made it possible to establish that a variety of media programs *can* have an impact on exposed individuals, there is a lack of evidence on the effect they could have if shared under real-world conditions (*e.g.*, if broadcast without strong incentives through any available channel such as the television or the radio).[9]

Finally, our study adds to the growing literature on the expansion of mobile phones in LMICs. There is now a well-established body of evidence showing the profound consequences of mobile phone expansion in various dimensions, such as market functioning (Aker, 2010; Aker and Fafchamps, 2015; Aker and Ksoll, 2019), access to financial services (Suri, 2017), savings (Jack and Suri, 2016), consumption (Jack and Suri, 2014), and poverty levels (Jack and Suri, 2014). Our study is part of a smaller set of studies (Banerjee et al., 2020) that, in taking stock of the widespread use of mobile phones, provide policymakers with an example of an intervention that can be implemented to change behavior at scale. Our study provides evidence that mobile phones can now be used by policymakers to foster ECS and, more generally, to change norms at scale (in our case parenting practices). It is also the first study to highlight the promising – and so far unnoticed – role that mobile phone memory cards can play in disseminating information, especially in the many countries where mobile broadband connection and access to traditional media remain scarce (Appendix 3).

The remainder of the article is organized as follows: in section II, we describe the context and intervention; in section III, we describe our research design; in section IV, we present our study results; in section V, we conclude.

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[8] A notable exception is Barsoum et al. (2022), who aimed to measure the impact of an edutainment program broadcast on the Egyptian television with the objective of promoting entrepreneurship among young adult viewers. To do so, they implemented a randomized controlled trial following a non-symmetric encouragement design, in which treatment individuals received text messages encouraging them to watch the program on television.

[9] As further discussed below, note that the definition of the dissemination strategy can be accommodated to account for possible spillovers between household types.

II. Context and intervention

A. Context

Our study is set in Côte d'Ivoire, a country of 29.4 million inhabitants (INS, 2021) with a per capita income of USD 2,579 (World Bank, 2022). The country is linguistically fragmented, with 78 indigenous languages from five different branches of the Congo-Niger language family being spoken. French is the sole official language and is used as a *lingua franca*[10] – in particular by the media.

The last two decades have been marked by important changes in the Ivorian society, with a spectacular rise in mobile telephone penetration, favored in recent years by the development of mobile money.[11] Illustrating this trend, mobile cellular subscriptions in the country increased from 3 per 100 people in 2000 to 152 in 2020 (ITU, 2020). In contrast, only 49% of households own a television set and 52% own a radio (INS, 2017). Most users are now using simple but video-enabled handsets (available from USD 5 to 10), similar to those shown in Appendix 4. In the process, these phones have become an important means of playing multimedia content (videos and music), and mobile phone memory cards are frequently used to exchange content from one phone to another.[12,13]

Child developmental delay is an important issue in the country. In 2015, it was estimated that 51% of children under five were at risk of experiencing a developmental delay (Richter et al., 2018).[14] As in many other countries, there appears to be significant room for improvement in parenting practices. In particular, the cognitive stimulation of children appears to be insufficient, possibly due to limited knowledge of the importance of ECS for children's development (INS, 2017).[15] Violent discipline is also pervasive, with 87% of children aged one to 14 experiencing violent discipline (psychological aggression

[10] It should be noted that other languages (*e.g.*, Dyula) are also commonly used to communicate among members of different language groups. However these languages have a limited importance in the media.
[11] See Suri (2017) for an overview of the importance of mobile money in LMICs.
[12] To exchange content from one phone to another using a memory card, one just needs to insert the memory card into the phone, save the files from the first phone to the memory card, insert the memory card into the second phone and save the files there.
[13] It can be noted that mobile broadband and, more generally, overall Internet access remain limited in Côte d'Ivoire. Overall, only 36% of Ivoirians used the Internet in 2019 (ITU, 2019).
[14] For comparison purposes, in Sub-Saharan Africa, 66% of children under five are at risk of experiencing a developmental delay (Richter et al., 2018).
[15] In 2016, the Multiple Indicator Cluster Survey 6 collected information on the involvement of adult members of the household with children in early stimulation and responsive care activities: reading books or looking at picture books, telling stories, singing songs, taking children outside the home, compound or yard, playing with children, and spending time with them naming, counting, or drawing things. Only 28.7% of children aged 36-59 months had been engaged in four or more ECS activities by adult household members (INS, 2017) – which is used by MICS as the threshold beyond which a child receives adequate stimulation.

or physical punishment) and 65% experiencing physical punishment (INS, 2017).[16] Finally, it should be noted that child development is also hampered by traditional gender norms in parenting practices, with fathers often being little involved in the upbringing and development of their children, which they see as the responsibility of mothers.[17]

B. Intervention and implementation

We partnered with Development Media International[18] to produce nine short videos (two to three minutes each) encouraging simple parenting practices fostering ECS and child development.

The videos constituted a mini-series telling the story of a father who, following the advice of his brother, begins to play and interact with his children in a stimulating way and marvels at the progress they make. The messages conveyed by the videos encouraged parents to praise and support their children, speak to them, and play with them from an early age to foster their development.[19] It is worth noting that the videos addressed contextual barriers and facilitators to parental investment in stimulating activities that had been identified during qualitative formative research conducted in the intervention areas. For instance, the videos addressed the beliefs that mothers are solely responsible for raising children, that praising children will make them vain and disrespectful, or that stimulating children is only important if they can talk. Finally, the videos encouraged the use of non-violent discipline methods (see Appendix 5 for a description of the message conveyed by each video).

Several measures were taken to facilitate the dissemination of the videos, engage viewers, and increase buy-in to the messages conveyed. First, the videos were produced for very small screens so that they could be watched on low-cost phones that are video enabled. Second, videos were set in a village similar to those in the intervention areas, so that viewers could identify with the protagonists in the story. Third, videos were dubbed and made available in French and in the seven most spoken local languages in the areas where the intervention was implemented (Baoulé, Bété, Guéré, Malinké, Moré, Wobé, and

[16] The survey asked about violence experienced in the month prior to the interview.
[17] Only 4.9% of children aged 36-59 months had been engaged in four or more of the ECS practices listed above by their biological father (INS, 2017).
[18] Development Media International is a non-governmental organization whose stated goal is to "*conduct evidence-based media campaigns to change behavior and improve lives in low-income countries.*"
[19] The videos aimed to have an impact on male caregivers as well as the other adults in the home (a mother and, to a lesser extent, two grandparents are other central characters in the storyline).

Yacouba). Finally, the fact that the main characters in the videos were played by actors appearing on relatively popular local television shows probably also facilitated the buy-in of those exposed to these television programs.

The videos were disseminated using mobile phone memory cards. Memory cards containing the videos were distributed to village leaders (village chief and president of the "youth" association[20]) and local health workers ("agents de santé communautaires"[21]), who were instructed to share them with households with young children living in their village. The videos were shared either by physically copying them from one phone to another or via Bluetooth. Because mobile phones often do not have access to the Internet in our study setting, Whatsapp, Facebook, and other social media were rarely used to share the videos.[22,23] Local health workers and village leaders received no incentive other than being informed that the videos addressed the importance of ECS for ECD.

III. Research design

A. Sampling

The study area was restricted to villages located in the regions of Nawa (Bas-Sassandra district), Goh (Goh-Djiboua district), and Guémon (Montagnes district), as well as in the *départements* of Issia and Sinfra (Sassandra Marahoué district), and the district of Yamoussoukro[24,25] (Figure 1). The area has a population of 4.2 million and extends from the center of the country to its western borders – representing

[20] The typical youth association includes all the villagers, except for the elderly.
[21] An "agent de santé communautaire" is a "*volunteer man or woman, selected within and by his or her community according to specific criteria, who has received basic training to provide an integrated package of promotional, preventive, basic curative and support services under the supervision of health personnel. He/she is responsible for raising community awareness on health issues and for providing certain services at the community level.*" On average, an agent de santé communautaire looks after 250 to 500 individuals (Ministère de la Santé et de l'Hygiène Publique, 2017).
[22] As an illustration, at follow-up, only eight respondents reported having used these platforms to share the videos disseminated as part of the intervention (out of 317 responses).
[23] In 2019, only 36% of individuals used the Internet (via a computer, mobile phone, personal digital assistant, games machine, digital TV etc. and from any location) (ITU, 2019). This figure is likely to be considerably lower in rural villages like those included in our sample. For example, in 2016, 26.4% of women aged 15-24 reported using the Internet in the previous 12 months in urban areas, compared to 1.4% in rural areas. These figures were 58.5% and 11.7%, respectively, for men in the same age range (INS, 2017).
[24] The largest administrative unit is the district, then the region, then the department.
[25] Grand Challenge Canada, TRECC, and the Saul Foundation provided financial support for this study under the condition that the randomized controlled trial would be implemented in the cocoa-producing region of Côte d'Ivoire (other than that, the donors had no role in the study design, data collection, data analysis, data interpretation, or writing of this manuscript). We restricted our focus to a subset of this area so as not to increase the dispersion of the sampled villages unnecessarily and to limit transportation costs during data collection.

14.3% of the country's population and 10.4% of its total area. The poverty rate in this area is comparable to that of the country as a whole (48.1% and 46.3% respectively) (INS, 2015).

In these five regions, we identified medium-sized villages (500 to 2,000 inhabitants) located in the cocoa-growing districts of Côte d'Ivoire using 2014 census data (Ba, 2014) and randomly selected 200 villages to participate in the experiment. These villages have an average population of 1,324 – as per 2014 census data.

In each village, a representative sample of households was recruited.[26] For households to be eligible, at least one of the household members had to own a mobile phone on which they could watch videos[27] and at least one child under 24 months of age had to live in the household. When more than one child aged under two lived in the household at the time of the baseline survey, one of them was randomly selected for the study, along with their main female and male caregivers. Random selection was performed by a built-in function of the software used for tablet data collection. Up to 15 households per village were sampled. In total, 2,901 households and children were selected.

Sampled households were split into two groups at baseline: *specifically targeted* households (referred to as "*type T*" households hereafter) and *non-specifically targeted* households (referred to as "*type N*" households hereafter). The first group was composed of the first ten households surveyed, and the second group of the next five households.[28] In total, 1,953 households (around ten per village) were asked to complete a full baseline questionnaire (*type T*) and 948 households (around five per village) were asked to complete only a short questionnaire gathering basic information about each household member (gender, age, highest level of education, etc.) (*type N*).[29] Baseline data was collected from male caregivers.

[26] Households were selected using a standard random walk sampling technique (similar in essence to that used by the Afrobarometer), as part of which data collectors investigated household eligibility following randomly selected directions from randomly selected starting points.
[27] Note that in 2016, 87.2% of rural households already owned a mobile phone (INS, 2017).
[28] This method of sorting is the result of a miscommunication between the investigators and field staff for which we take full responsibility. We had originally planned for both specifically and non-specifically targeted households to be recruited in a randomly defined order in each village.
[29] Given the high rate of illiteracy and in accordance with standard practice in the study area, caregivers gave their oral consent to take part in the study and answer our questionnaires.

Upon completion of the baseline survey, we randomly assigned half of the 200 selected villages to the treatment group and the other half to the control group (Figure 2). The draw was stratified by district.

In treatment villages, memory cards containing the videos were distributed to local health workers and village leaders (one memory card per person), who were instructed to share them with households with young children living in their village. In parallel, memory cards containing the videos were distributed to *specifically targeted* households by a network of midwives (who were paid for this work). Note that midwives were instructed to give the memory cards in the presence of both female and male caregivers. They were also asked to encourage caregivers to watch the videos but were specifically told not to provide any information about ECS or ECD.[30] To avoid any spillover effect on *type N* respondents, *type T* households were also instructed to keep their memory card and its contents private.

Villages selected for the control group did not receive any intervention as part of this study. This allows our estimates to capture two important aspects that are integral to the intervention: the effect of receiving a memory card containing the videos on ECS and the effect of watching the videos on individuals' time allocation.[31]

This design allows us to estimate two equally important parameters that are essential for measuring the potential of a media intervention. First, it makes it possible to measure the share of the target population that is exposed to the videos when disseminated in a low-cost and scalable way (*i.e.*, via volunteer local health workers and village leaders). This is achieved by measuring the exposure rate among *type N* respondents. Second, it ensures that the impact of video exposure can be measured concomitantly and with sufficient statistical power by artificially increasing the video exposure of a random subset of the sample. This is achieved by measuring changes among *type T* respondents.

The main concern with this design is that *type T* households may share videos with *type N* households, which would lead us to overestimate the effectiveness of the dissemination strategy measured on *type N*

[30] They were asked to merely provide technical assistance to enable specifically targeted households to play the videos on their phones.
[31] Indeed, it is generally believed that the impact of media programs can materialize through potentially concomitant channels: 1) providing information to exposed individuals; 2) changing their preferences; and 3) changing their allocation of time (*i.e.*, increasing the time dedicated to consuming media content and reducing the time allocated to other activities) (La Ferrara, 2016). Most experimental studies conducted on this topic to date have opted for symmetric designs in which the control group is exposed to placebo content. Although these designs have advantages, one disadvantage is that the resulting estimates do not account for the impact that the intervention would have on time allocation if it was to be generalized.

households. We show below that these spillovers can, at best, only explain a small share of *type N* households being exposed to the intervention. More generally, it should also be noted that the definition of the interventions measured on *type N* and *type T* households respectively can be modified to account for possible interactions between the two types of treatment households without affecting the scope of the results. Specifically, in this experiment, the exposure rate of *type N* households can be interpreted more broadly as the natural take-up rate in a setting where videos are disseminated by village leaders and local health workers, and up to ten households receive the videos directly. Similarly, the impact of the videos on *type T* households can be interpreted as capturing the effects of the videos in a context where they are being disseminated by village leaders and local health workers.

B. Outcomes

Follow-up data was collected from female and male caregivers by data collectors who were masked as to the treatment status of the village.[32]

First, we collected information on household exposure to the intervention (primary outcome). To do so, both *type N* and *type T* male caregivers were asked whether they or anyone else in the household had watched at least one of the videos contained in the memory card. To limit social desirability bias, these questions were placed at the very end of the follow-up questionnaire.

Second, we collected information on the parental knowledge and practices of *type T* caregivers (primary outcomes). Parental knowledge was measured using the Parent Knowledge Scale (Powell et al., 2004; Chang et al., 2015; Hamadani et al., 2019), which asks caregivers the extent to which they agree with a series of general statements on a scale of one to five (*e.g.*, "*too much love and attention will spoil a child*," "*there is no need to give toys to children below one year old*", etc.). This information was collected from both female and male caregivers to capture potentially differential effects. Given the purpose of the intervention, we added two statements to the scale investigating knowledge about what "busy fathers" should or should not do. To do this, we simply adapted two existing statements from the scale that asked what "busy mothers" should or should not do.[33] We combined these two additional statements into an

[32] The data collectors were also not involved in the dissemination of the videos, nor were they ever in contact with those responsible for implementing it.

[33] These statements are "*it is important that a busy father/ busy mother spend plenty of time talking with his/her infant"* and "*it is important that a busy father/busy mother spend plenty of time playing with his/her young child*."

index reflecting male caregivers' knowledge of the importance of fathers' involvement in the education and development of their children. Indexes were calculated as the standardized sum of caregivers' responses.

Parenting practices were measured using questions from the UNICEF's Multiple Indicator Cluster Survey (round 6).[34] The extent to which household members engaged in childhood stimulation is calculated as the number of *different* basic activities performed by any adult household member (over 15 years old) with the sampled child in the previous three days among the following five: telling stories; singing songs (including lullabies); taking the child out of the house; playing; and naming, counting, and/or drawing. For each of these activities, we asked, if applicable, whether it was performed by the mother, father, or any other adult household member. Other questions from the same questionnaire were used to measure the number of toys available to the child, the number of days during which they were left unattended in the previous week, as well as the prevalence of different types of violent discipline (psychological aggression, physical punishment, and severe physical punishment[35]). This information was collected from female caregivers only.

To address concerns about social desirability bias, data collectors were asked to *observe* the nature of the interactions between selected children and their caregivers during the survey (lasting over an hour). Specifically, data collectors were asked to record whether or not they could observe 12 different ECS practices from the individuals who looked after the sampled child throughout the visit (*e.g.*, "*the caregiver tells the child the name of some person or object during the visit*," "*the caregiver does not shout at the child*," "*the caregiver provides toys or activities during the visit*", etc.). The behaviors studied were drawn from a modified version of the Home Observation for Measurement of the Environment (HOME) inventory (Jones et al., 2017) and selected based on their relevance to the content of the intervention before the start of the follow-up data collection. The index was calculated as the standardized

[34] Information on the Multiple Indicator Cluster Survey can be found here: https://mics.unicef.org/tools#survey-design (accessed in May 2023).

[35] Psychological aggression is defined as shouting, yelling or screaming at a child, as well as calling a child offensive names such as "dumb" or "lazy." Physical punishment is defined as shaking, hitting or slapping a child on the hand/arm/leg, hitting on the bottom or elsewhere on the body with a hard object, spanking or hitting on the bottom with a bare hand, and hitting or slapping on the face, head or ears. Severe physical punishment is defined as hitting or slapping a child on the face, head or ears, and hitting or beating a child hard and repeatedly. Note that, for ethical reasons, we were not allowed to ask the MICS question that investigates whether a caregiver hits or beats a child hard and repeatedly (which is considered severe physical punishment).

number of ECS practices observed and provides a second measure for the quality of the interactions between children and their caregivers.

Although only a secondary outcome, we also collected data on child development using the long form of the Caregiver Reported Early Childhood Development Instrument (CREDI),[36] which asks caregivers whether a child can or cannot do a series of tasks (McCoy et al., 2017). CREDI data was collected from both female and male caregivers to investigate potentially differential effects. We reported the impact on the overall child development score, as well as on the different sub-scores for motor skills, cognitive skills, language skills, and socio-emotional skills. Scores were standardized with respect to the control group. Note that child development was not retained as a primary outcome because we considered that statistically detectable improvements in child development would likely take longer to materialize than the project duration. For comparison, note that the median time difference between the start of the intervention and the follow-up data collection for the studies measuring the impact of an ECS intervention on child development reported in Appendix 2 is 11 months. It is larger if one excludes studies focusing on children with clinical conditions and/or on particularly disadvantaged households.

It should be noted that a pre-result article was written before the start of the follow-up survey and only minor changes were made to the analysis plan between the finalization of the pre-result article and the start of the follow-up survey (see Appendix 6). In particular, the categorization of the outcomes into primary and secondary outcomes remained unchanged.

For both types of respondents, attrition is low for male and female caregivers (about 10%) and is balanced between groups (Table 1).

C. Timeline

In Figure 3, we present a timeline of the project. The baseline survey was conducted in January 2020. Due to the COVID-19 pandemic, the start of the intervention was delayed to December 2020. Sampled

[36] Information on the Caregiver Reported Early Childhood Development Instrument can be found here: https://sites.sph.harvard.edu/credi/ (accessed in May 2023).

children were between one and three years old at the time. The follow-up survey was conducted between April 23 and June 24, 2021 (on average five months after the start of the intervention).[37]

D. Summary statistics and validity

In Table 2, we show the baseline characteristics of sampled male caregivers and children. In *type T* control households, children were on average 11 months old at baseline and half of them are boys (50%). Most children lived in the same household as their biological mother (97%) and father (87%). Male caregivers were on average 38 years old at baseline, had limited education (27% of them had no education at all and 37% had only been through primary education), and most lived with a partner in a formal monogamous marriage (47%) or cohabitation (38%) – which is a very common form of union in some parts of the country. Moreover, 51% reported listening to the radio and 47% reported watching TV.[38] They rarely reported reading newspapers or using Internet. *Type T* control households owned an average of 2.2 mobile phones. Finally, ECS was relatively low as household members reported performing 2.3 types of basic stimulating activities with children (out of the five investigated).

At baseline, *type N* and *type T* households had similar characteristics, with some small differences. For instance, *non-specifically targeted* households were slightly less likely than *specifically targeted* households to have reached middle school (30.7% *vs.* 38.4%), to have an income-generating activity (91.4% *vs.* 93.1%), and to be in a monogamous marriage (44.7% *vs.* 47.8%). While these differences are generally small, some are statistically significant (Appendix 7) and seem to indicate that *non-specifically targeted* households may be slightly more disadvantaged than *specifically targeted* ones. This suggests that the way the two sets of households (*type N* and *type T*) were formed did not result in two perfectly balanced groups. While this is unfortunate, the consequences for our results are limited. First, our results are based on comparisons within (and not between) household types and, as such, their internal validity is not called into question by these differences (more on this below). Second, with respect to their external validity, we show that correcting for these small differences does not affect the estimated reach of the dissemination strategy based on village leaders and local health workers.

[37] The date of the follow-up survey could not be delayed any further due to our contract with our donors.
[38] Ownership of these goods is lower, as 41.4% of *type T* households report having a radio and 34.1% report having a television.

In Table 2, we also show that, for both types of households, the baseline observable characteristics of villages, households, and children are balanced across treatment and control groups. We show the coefficients obtained by successively regressing each of the baseline characteristics displayed in the left column of the table on a dummy variable indicating whether or not a respondent *i* lives in a treatment village and a vector of region fixed effects. Standard errors are clustered at the village level to account for possible correlations within villages. We do this separately for *type N* and *type T* respondents. The point estimates associated with the treatment variable are always small and never statistically significant at the 10% level.

E. Empirical strategy

We measure the reach of the intervention among *type N* households using an Intention-To-Treat (ITT) analysis. To do so, we estimate the following equation:

$$y_i = \beta T_i + \mu_i + X_i\gamma + \varepsilon_i \qquad \textbf{Eq.1}$$

Where y_i is the outcome measured at follow-up, T_i is a dummy variable indicating whether respondent *i* belongs to a village which was randomly selected to benefit from the intervention, μ_i is a vector of region fixed effects (used for stratification) (Bruhn and McKenzie, 2009), and X_i is a vector containing baseline covariates. To avoid any suspicion of p-hacking, covariates included in the estimation are selected using a double-lasso procedure (Belloni et al., 2014). The full set of covariates included in the double-lasso procedure and the list of variables selected in the production of the main results are reported in Appendix 12. In this equation, the coefficient of interest is β, which captures the Intention-To-Treat (ITT) effect of the intervention. We report the same estimates for *type T* households.

We estimate the impact of being exposed to the videos among *type T* households using an instrumental variable (IV) approach. IV estimates are obtained by instrumenting a dummy variable indicating whether a household member declared having watched at least one of the videos by their treatment status using a Two-Stage-Least-Squares (2SLS) estimation strategy. A vector of region fixed effects and a vector of baseline covariates selected using a double-lasso procedure are added to all estimated equations.

To better understand the impact of the intervention, we also investigate this impact on subgroups of respondents (*e.g.*, boys and girls, or highly and non-highly educated respondents). For each of these subgroups, we measure the impact of the intervention estimating the following equation:

$$y_i = \beta_1 \left(Group_{1,i} * T_i\right) + \beta_2 \left(Group_{2,i} * T_i\right) + \gamma Group_{1,i} + \mu_i + \varepsilon_i \qquad \textbf{Eq.2}$$

In this equation, $Group_{1,i}$ and $Group_{2,i}$ are dummy variables indicating whether respondent *i* belongs to group 1 or group 2 (*e.g.*, boys or girls). These subgroup analyses were not pre-registered, and therefore these results should only be interpreted as suggestive.

Standard errors were clustered at the village level to account for possible correlations in outcomes within villages.

IV. Results

A. Reach of the intervention

In Table 3, we provide ITT estimates describing the degree of exposure to the videos among *type N* households (Panel A) and *type T* households (Panel B). In Tables 4a (*type N*) and 4b (*type T*), we provide the same estimates for different subsamples. In Table 5, we provide descriptive information on the role played by the various stakeholders involved in the dissemination of the videos among *type N* households.

Among *type N* households, we find that, in the treatment group, 31% of households had been exposed to the videos, *i.e.* at least one household member was reported to have watched at least one of the videos (Table 3, Panel B). More specifically, 29% of *type N* male caregivers had watched at least one video (12% had watched them all), and 20% reported that at least one other household member had done so. The magnitude of the effect is large considering that, again, no incentives other than the promotion of early childhood development were given to the local health workers and village leaders involved in disseminating the videos. This suggests that information campaigns could reach a significant share of their target population at a very low cost through this means of dissemination (and that an even larger share could be reached by adding carefully crafted incentives). In this regard, it is also important to note that we find no difference in the exposure rate of households depending on whether they have access to traditional media (television or radio). This suggests that the delivery of media content via memory cards

can be an effective way to reach people who do not have access to traditional media, which, in our case, represents 41% of the population targeted by the intervention. We also find no difference in the differential exposure rate based on the household head's level of formal education and the gender of sampled children (Table 4a).

Several interesting results emerge from the analysis of the role played by village leaders and local health workers in the dissemination of the videos among *type N* households (Table 5). First, 83% of *type N* respondents received the memory cards we gave to village leaders and local health workers. While we had imagined that village leaders and health workers would keep their memory card to be able to share the videos with as many people as possible, the data suggests that this was not the case and reinforces the sense that there is significant room for improvement in the way the dissemination strategy was implemented. Second, consistent with the limited overall mobile broadband connectivity, we find that the Internet was rarely used to share the videos with *type N* respondents (only 3% received them through the Internet). This probably helps explain the low contamination rate in the control group. Third, quite strikingly, village chiefs did not share the videos with any *type N* households. Conversely, 71% of *type N* households who received the videos got them from a local health worker. This finding is consistent with field observations that village leaders may be too caught up in their routine tasks to contribute meaningfully to this type of project, and urges caution regarding the types of tasks that development programs should assign to village leaders.[39] Finally, 81% of *type N* households received the videos from either a village leader or a local health worker, indicating that potential spillovers between household types cannot explain the high exposure rate of *non-specifically targeted* households.

Among *type T* households, who, again, were directly given a memory card containing the videos, differential exposure rates are higher, as expected (Table 3, Panel B). In the treatment group, 91% of *type T* households had been exposed to the videos. More specifically, 89% of *type T* male caregivers had watched at least one video (71% had watched them all), and 88% reported that at least one other household member had watched the videos. These high numbers reflect the effectiveness of a more

[39] To some extent, these findings lead us to wonder whether the mixed results obtained by programs based on village chiefs may be due, at least in part, to a lack of involvement on their part. This is particularly true of studies that examine the effectiveness of targeting methods based on local leaders (Alatas et al., 2012; Anderson et al., 2015; Kilic et al., 2015; Alatas et al., 2019; Basurto et al., 2020; Beaman et al., 2021). In any case, our finding suggests that it is better not to rely blindly on village chiefs for program implementation and that it may be more efficient to involve other prominent community actors such as local health workers in settings like ours.

expensive (and therefore less scalable) method of disseminating the videos. Again, differential exposure rates are similar across all investigated subgroups, with one notable exception: the less affluent half of households appears to have been slightly more exposed to the videos than the more affluent half (91% vs 85%, p-value=0.02).

Overall, contamination was limited in the control group as less than 5% of *type N* and *type T* households were exposed to the videos. However, note that this result probably underestimates the true dissemination potential of the intervention given that local health workers and village leaders involved in the dissemination of the videos were specifically instructed not to share them outside their village – precisely to limit contamination problems.

Finally, two results deserve to be particularly emphasized. First, 35% of *type N* and 39% of *type T* control male caregivers reported having shared a video via mobile phone memory card in the previous 3 months, which illustrates how widespread this method of video sharing is in the region. Second, respondents report being particularly enthusiastic about the videos. For instance, *type N* male caregivers reported that they had watched each video 4.5 times on average, and 80% of them declared that they "loved" the content of the videos (none "disliked" or "hated" them). These figures are 6.5 and 91% respectively for *type T* respondents (Appendix 8). This dimension is important to keep in mind when interpreting the effects of the intervention.

In Appendix 9, we show that controlling for differences in characteristics between *type N* and *type T* households does not change the magnitude of the effects. Point estimates are essentially the same when we control for these differences and when we do not.

B. Impact of the videos on viewers

In Table 6, we focus on *type T* households and report ITT and IV estimates. The first set of estimates can be interpreted as capturing the impact of a more expensive dissemination strategy in which an organization would be paid to deliver memory cards containing the videos directly to the targeted population. The second set of estimates captures the effect of being exposed to the videos. In what follows, we focus on the second group of estimates.

First, we find that the videos improved parental knowledge for both female and male caregivers. Indeed, the parental knowledge index of female and male caregivers exposed to the videos increased by 0.22

standard deviations and 0.20 standard deviations, respectively (statistically significant at the 1% level). In Appendix 10, we report ITT and IV coefficients for each individual item (going from one to five) used in the construction of the index. For instance, we find that watching the videos increased the likelihood of caregivers agreeing that singing and chatting help infants learn and that it is important that parents look at picture books with children under two. Caregivers also became more likely to disagree with the fact that parents need to spank or beat their young children when they are rude or they will grow up to be bad, and that there is no need to give toys to children under one. Interestingly, videos also made male caregivers more aware of the role they can play in fostering their child's development, as the knowledge index reflecting the perceived importance of fathers' involvement in ECD also increased by 0.15 standard deviations among male caregivers exposed to the videos (statistically significant at the 5% level).[40]

Second, being exposed to the videos also had a positive impact on parenting practices. While no statistically significant impact was found on the overall number of different support-for-learning activities that were performed with the child by adult household members (main female and male caregivers, and other household members), the number of different activities carried out individually by the main female and male caregivers (the main targets of the intervention) both increased. Among those exposed to the videos, this number rose by 0.22 among main female caregivers and by 0.21 among main male caregivers (statistically significant at the 5% level) – whereas in the control group the mean is 1.8 and 1.0 among main female and male caregivers, respectively. These effects represent 12% and 21% increases, respectively. We find no effect on other adult household members. Additionally, among those exposed to the videos, the average number of toys available for children increased by 0.13 from a basis of 2.03 in the control group (statistically significant at the 5% level). ITT and IV coefficients are reported for each type of activity carried out by the different groups of individuals in Appendix 11.

Generally speaking, it is particularly interesting to observe that knowledge and parenting practices improved not only among female caregivers but also among male caregivers. For males, the increase in parenting practices fostering ECS is likely to have been facilitated by the fact caregivers became more aware of the role they can play in their child's development after watching the videos. This is an

[40] This effect is particularly consistent with the nature of the messages conveyed by the videos, since their primary target was male caregivers. Indeed, the two central figures in the mini-series are fathers, and one of the videos (episode five) heavily emphasized the fact that taking care of children's education and development is also the responsibility of fathers, not just mothers.

important finding given that it is customary for men in Côte d'Ivoire and many other countries to rely heavily on women for child-rearing (Richter and Morrell, 2008; Rabie et al., 2020), and that fathers' involvement has been shown to be important to foster child development (Sarkadi et al., 2008; McWayne et al., 2013; Jeong et al., 2017).

Importantly, we also find that exposure to the videos significantly reduced the prevalence of violent discipline (psychological aggression and physical punishment), which is particularly high in our setting. In particular, the prevalence of physical punishment decreased by eight percentage points in exposed households, representing a 13% decrease from the control mean (63%). Furthermore, the share of children subjected to severe physical punishment also decreased by seven percentage points in exposed households (statistically significant at the 5% level), representing a 21% decrease from the control mean (33%).[41] This finding is particularly encouraging for Côte d'Ivoire, where at least 65% of children aged one to 14 are subject to physical punishment (INS, 2017). It is also promising on a more global scale given that, worldwide, 250 million children aged two to four are physically punished in their home (around six out of ten children in the age group) (UNICEF, 2017). From a policymaker's perspective, this finding is all the more important as there is little solid evidence demonstrating the effectiveness of an intervention in reducing the prevalence of violent discipline in LMICs (Knerr et al., 2013). Lastly, it is also important in the current context of the COVID-19 pandemic, which has seen a surge in violence against children (Egger et al., 2021).

Note that similar results are found using observational data on parenting practices, suggesting that the above results are not merely driven by social desirability bias. First, interactions between sampled children and their caregivers could be observed in 90% of the times (this proportion is similar in both groups). Second, we find that observed parenting practices improved in the treatment group. Out of 12 possible positive ECS practices, 5.02 were observed on average in the control group. This number increased by 0.16 standard deviations in treatment households exposed to the videos (statistically significant at the 5% level), representing an additional 0.53 types of positive ECS practices observed. In Table 7, we perform the same analysis when restricting the sample to the first interview conducted by

[41] Again, these results are consistent with both the impact on knowledge and the content of the videos. In particular, one of the videos (episode 8) focused on the importance of using positive discipline rather than negative discipline.

each data collector in each village, and obtain the same results. This suggests that these results are not driven by the fact that data collectors' learning of the treatment status of a village may influence the nature of their observations. We report ITT and IV coefficients for each individual item used in the construction of the index in Appendix 10.

Table 8 shows that we do not find statistically significant effects of the videos on child development (neither on the overall score, nor on any of the sub-scores). This result is not particularly surprising given that child development is a relatively slow process and follow-up data was only collected five months after the start of the intervention. In fact, child development was only registered as a secondary outcome precisely because we believed that statistically detectable improvements in child development may take longer to materialize than the project duration. The fact that all the coefficients are positive supports this idea and suggests that the intervention could already have had a small effect on this variable that we do not yet have the statistical power to detect. It's also possible that one of the consequences of the intervention was to make parents more aware of their children's difficulties, making it harder for us to find statistically significant effects on this outcome.

Finally, it is worth noting that the videos seem to have had similar effects on the different subgroups investigated, as differential treatment effects are rarely statistically significant (Table 9). Nonetheless, two exceptions can be noted. The most striking one is that the reduction in the prevalence of violent discipline appears to be entirely driven by poorer households exhibiting higher prevalence rates (82% vs 76% in the control group). In particular, the prevalence of physical punishment decreased by 12 percentage points among exposed households, representing an 18% decrease from the control mean (65%). In contrast, the point estimate is zero for wealthier households. Although less statistically significant, results also seem to suggest that increased knowledge was more pronounced among female and male caregivers of boys than of girls. In this case as well, the largest impact is found on the group with the lowest sample mean – indicating that knowledge was more limited among caregivers of boys than of girls.

V. Conclusion

We measure the impact of an innovative, low-cost, scalable intervention to promote knowledge and parenting practices fostering early childhood stimulation. We show that the intervention was effective at improving not only female but also male caregivers' parental knowledge and practices, and find that it decreased the prevalence of physical punishment, including severe physical punishment. These results are particularly important given that the quality of children's interactions with their caregivers in the early years of life is a key determinant of their cognitive, physical, social and emotional development (Shonkoff et al., 2011; Milteer et al., 2012; Black al., 2016; Britto et al., 2017). The fact that a low-intensity intervention such as the one evaluated in this study (consisting only of 9 mobile videos of 2-3 minutes each) was sufficient to produce lasting changes in caregivers' knowledge and practices also suggests that they are perhaps more malleable than previously thought.

The dissemination strategy used as part of this study provides policymakers who are interested in fostering ECS with a tool to do so on a large scale and at low cost. First, the intervention is easy to scale up with high fidelity and should therefore address concerns about the scalability of ECD interventions (Andrew et al., 2018; Araujo et al., 2021). Again, scale-up issues are likely to be less important for this intervention because it relies on health workers only to distribute the videos, and not to induce the desired behavior changes themselves (as is the case in most existing approaches). Thus, the issue of their recruitment, training, and supervision is less central to the success of this intervention.

Second, the cost of the intervention is limited, and the cost per exposed individual would be particularly low if scaled up, as the fixed costs associated with video production (which amount to approximately US$150,000) are spread over an increasing number of beneficiaries.[42] In addition, while results suggest that the current version of the dissemination strategy fails to reach a large portion of the target population if disseminated via village leaders and local health workers, the high exposure rate among *specifically targeted* households and their enthusiasm for the videos suggest that there is considerable room for improvement. To increase exposure, a complementary measure may be to provide better incentives to

[42] For comparison, parenting programs such as those presented in Appendix 2 tend to cost several hundred dollars per child. For example, the program studied in Attanasio et al. (2014) costs about $750 USD per child, the program studied by Andrew et al. (2020) costs $251 USD, and the one studied in Attanasio et al. (2022) costs $322 USD.

individuals involved in the dissemination of the videos and to require health workers to distribute the videos as part of routinely conducted activities (*e.g.*, during check-ups at health facilities or during local health workers' routine village visits).

In this context, a possibly cost-effective strategy for LMICs may be to use interventions such as the one studied in this article to raise general awareness on the benefits of early childhood stimulation for child development and foster good parenting and child development in households with a high propensity to change. And to complement these interventions with more intensive, more targeted programs such as those described in Appendix 2, focusing on households with a low propensity to change as well as those with children with clinical conditions.

More generally, our findings also highlight the potential of media-based interventions leveraging the generalization of mobile phones in LMICs as a new and promising way to deliver information campaigns to change behaviors and norms at scale. Indeed, a particular strength of the intervention lies in its wide potential reach and flexibility – especially compared to television, the radio, the Internet, and newspapers, on which the media literature has focused to date. While traditional media channels have been shown to offer promising avenues for conveying important information and changing behaviors among a large audience at a low cost (see DellaVigna and La Ferrara (2015) for a review), access to them remains limited in many LMICs, as shown in Appendix 2. This suggests that the typical exposure rate to a particular program broadcast by one of these media channels is likely to be much lower. This further highlights the good performance of the dissemination strategy in reaching an important share of the target population (including those without a television and/or radio). Finally, note that the intervention may be particularly useful in linguistically fragmented contexts such as Côte d'Ivoire (which has 78 indigenous languages), where media programs are mostly broadcast in the *lingua franca, i.e.* French, which may not be fully understood by a significant proportion of the population. In contrast, the language of the videos disseminated via mobile phone memory cards can be adapted to match the demographics of each village.

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Figures

Figure 1: Study area

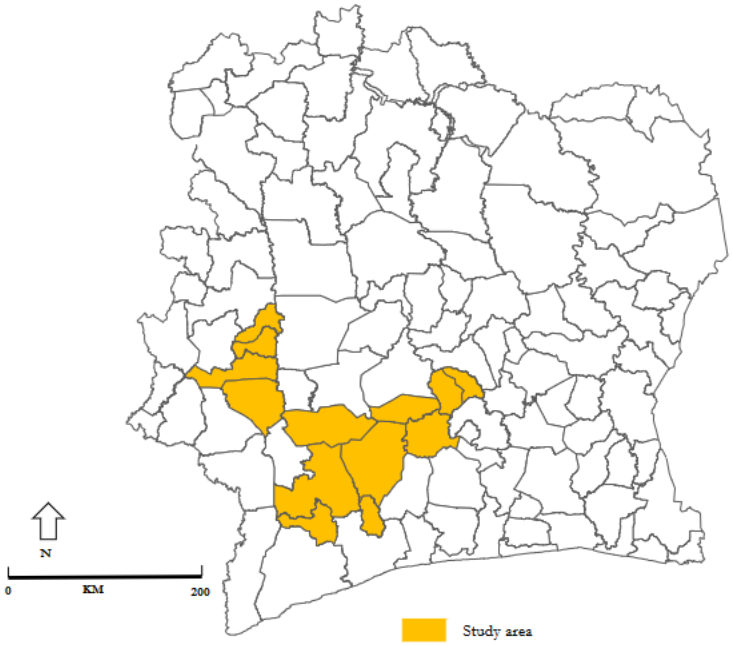

Figure 1: Our study is taking place in the southwestern part of Cote d'Ivoire, in the cocoa-growing region. In all, 200 villages (located in 13 of the 109 departments of the country) were randomly selected to take part in the experiment.

Figure 2: Study design

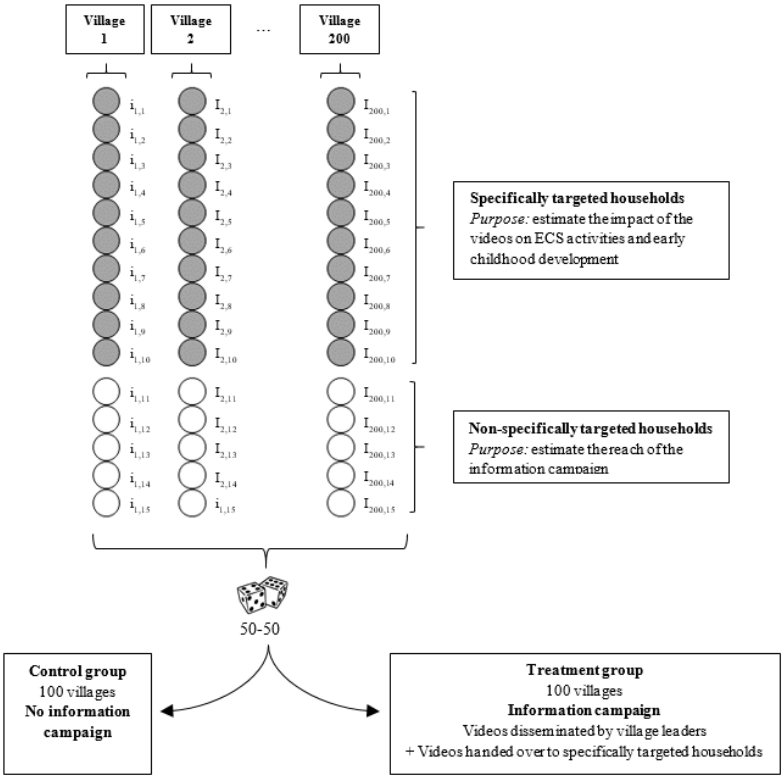

Figure 2: Study design

Figure 3: Timeline

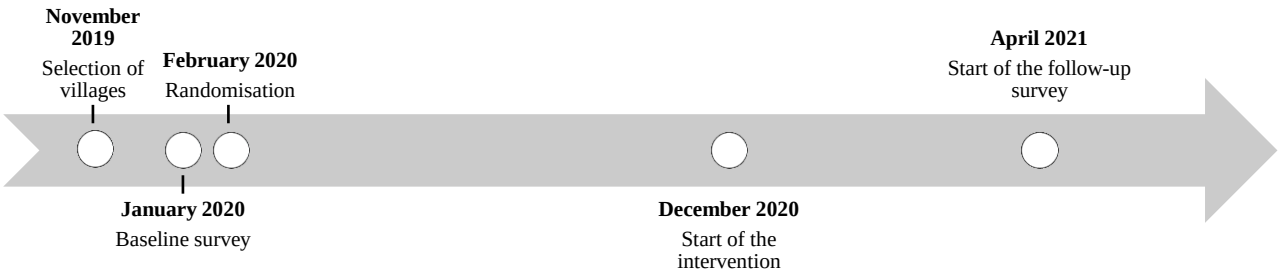

Figure 3: Study timeline

Tables

Table 1: Attrition

Variables	N	Control group Mean	Control group S.d.	Balancing tests (T-C) Coeff.	Balancing tests (T-C) S.e.	Balancing tests (T-C) Sig.
Panel A: Type T respondents						
Attrition, Men	1,953	0.097	0.296	0.002	0.016	
Attrition, Women	1,953	0.098	0.297	-0.012	0.014	
Panel B: Type N respondents						
Attrition, Men	948	0.085	0.279	0.023	0.019	
Attrition, Women	948	0.083	0.275	0.029	0.019	

Notes: In the table, we provide the rate of attrition for *type N* and *type T* control respondents and test for differences across treatment and control groups. In order to do so, equation (1) is estimated for each variable displayed in the left column. Standard errors are clustered at the village level. *, **, *** denote significance at the 10, 5 and 1 percent levels respectively.

Table 2: Baseline characteristics

	TYPE T RESPONDENTS						TYPE N RESPONDENTS					
		Control group charact.		Balancing tests (T-C)				Control group charact.		Balancing tests (T-C)		
Variables	**N**	**Mean**	**S.d.**	**Coeff.**	**S.e.**	**Sig.**	**N**	**Mean**	**S.d.**	**Coeff.**	**S.e.**	**Sig.**
Panel A: Village-level information												
Number of respondents	200	9.765	0.885	-0.109	0.125		194	4.887	0.506	0.019	0.073	
Panel B: Caregiver-level information												
Male	1,953	0.963	0.190	0.025	0.015		948	0.919	0.273	0.020	0.025	
Age	1,953	38.580	11.065	-0.057	0.540		948	38.204	11.276	-0.521	0.803	
Household size	1,953	6.400	2.595	0.059	0.149		948	6.309	2.550	-0.010	0.188	
Level of education												
None	1,953	0.247	0.432	-0.029	0.026		948	0.323	0.468	-0.024	0.037	
Primary	1,953	0.369	0.483	-0.006	0.024		948	0.369	0.483	0.050	0.032	
Higher	1,953	0.384	0.486	0.035	0.026		948	0.307	0.461	-0.028	0.033	
Has an income-generating activity	1,953	0.931	0.253	0.006	0.014		948	0.914	0.281	0.021	0.020	
Marital status												
Monogamous marriage	1,953	0.478	0.500	0.016	0.041		948	0.447	0.497	0.049	0.042	
Polygamous marriage	1,953	0.073	0.260	-0.002	0.014		948	0.108	0.310	-0.014	0.022	
Cohabitation	1,953	0.384	0.486	-0.024	0.040		948	0.371	0.483	-0.039	0.043	
Single	1,953	0.040	0.196	-0.001	0.010		948	0.042	0.201	-0.005	0.014	
Other	1,953	0.026	0.158	0.011	0.010		948	0.032	0.175	0.008	0.012	
Assets												
#Mobile phones	1,953	2.269	1.329	0.070	0.074							
#Radios	1,953	0.414	0.535	-0.015	0.026							
#TVs	1,953	0.341	0.511	0.011	0.029							
#Bicycles	1,953	0.500	0.665	0.035	0.044							
#Motos	1,953	0.250	0.477	-0.038	0.027							
#Acres of arable land	1,925	3.898	4.973	0.100	0.281							
Electricity at home	1,953	0.699	0.459	-0.010	0.035							
Bank account	1,953	0.101	0.301	0.002	0.016							
Mobile money account	1,953	0.726	0.446	0.001	0.025							
Media exposure												
Newspapers	1,953	0.173	0.378	0.023	0.023							
Radio	1,953	0.531	0.499	0.053	0.033							
TV	1,953	0.481	0.500	0.029	0.032							
Internet	1,953	0.175	0.380	0.033	0.022							
Early childhood stimulation												
Support for learning (0 to 5)	1,932	2.375	1.157	0.053	0.086							
Availability of toys	1,945	0.544	0.514	-0.005	0.028							
Inadequate care	1,953	0.171	0.377	-0.003	0.022							
Panel C: Child-level information												
Male	1,953	0.506	0.500	0.004	0.022		948	0.484	0.500	-0.004	0.032	
Age (in months)	1,953	10.928	6.657	-0.398	0.328		947	11.245	6.658	-0.665	0.430	
Bio. father lives in the household	1,953	0.879	0.326	0.027	0.017		948	0.869	0.337	0.030	0.023	
Bio. mother lives in the household	1,953	0.971	0.167	0.004	0.008		948	0.978	0.147	-0.002	0.009	

Notes: In the table, we provide the average characteristics of *type T* and *type N* control villages, male caregivers, and children and test for differences across treatment and control groups. In order to do so, equation (1) is estimated for each variable displayed in the left column. Standard errors are clustered at the village level. *, **, *** denote significance at the 10, 5 and 1 percent levels respectively.

Table 3: Exposure to the intervention

Variables	N	Control group charact. Mean	Control group charact. S.d.	ITT (standardized effects) Coeff.	ITT (standardized effects) S.e.	Sig.
Panel A: Type T male caregivers						
Has exchanged videos using a SD card in past 3 months	1,762	0.389	0.488	0.278	0.025	***
Got SD card containing the videos	1,762	0.006	0.075	0.883	0.012	***
Watched at least some of the videos	1,762	0.026	0.159	0.861	0.014	***
All of the videos	1,762	0.011	0.106	0.696	0.018	***
Some of the videos	1,762	0.008	0.089	0.149	0.015	***
Only one video	1,762	0.007	0.082	0.014	0.006	**
None of the videos	1,762	0.974	0.159	-0.861	0.014	***
Does not remember	1,762	0.000	0.000	0.001	0.001	
#times each video was viewed	1,747	0.105	0.895	6.254	0.216	***
Someone else in the hh watched the videos	1,746	0.016	0.125	0.868	0.013	***
Household exposed to the videos	1,749	0.029	0.167	0.882	0.013	***
Panel B: Type N male caregivers						
Has exchanged videos using a SD card in past 3 months	857	0.353	0.479	0.036	0.035	
Got SD card containing the videos	856	0.007	0.083	0.106	0.016	***
Watched at least some of the videos	855	0.035	0.183	0.254	0.028	***
All of the videos	855	0.002	0.048	0.120	0.017	***
Some of the videos	855	0.014	0.117	0.113	0.019	***
Only one video	855	0.019	0.135	0.022	0.012	*
None of the videos	855	0.965	0.183	-0.254	0.028	***
Does not remember	855	0.000	0.000	0.000	0.000	
#times each video was viewed	854	0.072	0.498	1.203	0.153	***
Someone else in the hh watched the videos	841	0.009	0.096	0.192	0.023	***
Household exposed to the videos	846	0.037	0.190	0.276	0.029	***

Notes: In this table, we describe the effect of the intervention on *type T* and *type N* male caregivers' and households' exposure to the intervention at follow-up. Households are considered to have been exposed to the intervention if at least one household member was reported to have watched at least one of the videos. In order to do so, we report the Intention-To-Treat (ITT) estimates obtained by estimating equation (1) for each variable displayed in the left column. Covariates were selected using a double-lasso procedure. Standard errors are clustered at the village level. *, **, *** denote significance at the 10, 5 and 1 percent levels respectively.

Table 4.a: Exposure to the intervention, heterogeneity (*type N* households)

	Child's gender	Household head education	Access to traditional media
G1: Females	0.263***		
	(0.039)		
G2: Males	0.291***		
	(0.039)		
G1: No education		0.275***	
		(0.044)	
G2: Primary education		0.274***	
		(0.043)	
G3: Higher education		0.297***	
		(0.049)	
G1: Owns a TV or a radio			0.288***
			(0.038)
G2: Owns neither			0.279***
			(0.045)
Strata FE	YES	YES	YES
Add. Con.	LASSO	LASSO	LASSO
Testing equality of coefficients:			
F-Stat	0.296	0.0864	0.0261
P-value	0.587	0.917	0.872
Observations	846	846	795
Control mean (G1)	0.0357	0.0347	0.0234
Control mean (G2)	0.0390	0.0204	0.0654
Control mean (G3)		0.0580	

Notes: In this table, we describe the exposure of different subgroups. Households are considered to have been exposed to the intervention if at least one household member was reported to have watched at least one of the videos. In order to do so, we estimate equation (2) for each set of subgroups using as a dependent variable a dummy variable taking the value 1 if a household was exposed to the intervention. Standard errors are clustered at the village level. *, **, *** denote significance at the 10, 5 and 1 percent levels respectively.

Table 4.b: Exposure to the intervention, heterogeneity (*type T* households)

	Child's gender	Household head education	Asset ownership	Support for learning	Access to traditional media
G1: Females	0.897***				
	(0.016)				
G2: Males	0.868***				
	(0.018)				
G1: No education		0.855***			
		(0.028)			
G2: Primary education		0.905***			
		(0.017)			
G3: Higher education		0.875***			
		(0.019)			
G1: Top 50 %			0.854***		
			(0.018)		
G2: Bottom 50%			0.909***		
			(0.017)		
G1: Top 50 %				0.880***	
				(0.017)	
G2: Bottom 50%				0.885***	
				(0.017)	
G1: Owns a TV or a radio					0.893***
					(0.015)
G2: Owns neither					0.872***
					(0.022)
Strata FE	YES	YES	YES	YES	YES
Add. Con.	LASSO	LASSO	LASSO	LASSO	LASSO
Testing equality of coefficients:					
Chi2-Stat	1.714	1.816	5.149	0.0387	0.768
P-value	0.192	0.165	0.0243	0.844	0.382
Observations	1,749	1,749	1,749	1,730	1,669
Control mean (G1)	0.0258	0.0304	0.0313	0.0297	0.0181
Control mean (G2)	0.0310	0.0153	0.0260	0.0277	0.0448
Control mean (G3)		0.0406			

Notes: In this table, we describe the exposure of different subgroups. Households are considered to have been exposed to the intervention if at least one household member was reported to have watched at least one of the videos. In order to do so, we estimate equation (2) for each set of subgroups using as a dependent variable a dummy variable taking the value 1 if a household was exposed to the intervention. Standard errors are clustered at the village level. *, **, *** denote significance at the 10, 5 and 1 percent levels respectively.

Table 5: Insights into the implementation of the scalable dissemination strategy

	Type N *who received the videos AND remembered who gave them the videos*		
Variables	**N**	**Mean**	**S.d.**
Received an SD card containing the videos	63	0.828	0.381
Other way(s) through which respondents received the videos			
SD card	63	0.241	0.432
Bluetooth	63	0.276	0.451
Internet (Facebook, WhatsApp, etc.)	63	0.034	0.184
Other	63	0.034	0.184
Identity of the individual(s) through whom the respondents obtained the videos			
a) Health workers	63	0.707	0.459
b) Presidents of the youth association	63	0.103	0.307
c) Village chiefs	63	0.000	0.000
d) Parents	63	0.172	0.381
e) Neighbors	63	0.052	0.223
f) Others	63	0.000	0.000
Share of individuals who received the videos from village leaders and local health workers: a) + b) + c)	63	0.810	0.395

Notes: In this table, we analyze how the scalable dissemination strategy involving village leaders and community health workers was implemented. To do this, we restrict the sample to those who received the videos (regardless of whether they watched them), and remembered *who* gave them the videos. We investigate the means(s) though which they received the videos and the identity of the person(s) who shared the videos with them.

Table 6: Impact on primary outcomes, parental knowledge and practices (*type T* households)

		Control group charact.		ITT (standardized effects)			IV (standardized effects)		
Variables	**N**	**Mean**	**S.d.**	**Coeff.**	**S.e.**	**Sig.**	**Coeff.**	**S.e.**	**Sig.**
Panel A: Knowledge				*Standardized effects*					
Female caregiver knowledge index	1,688	36.644	4.546	0.188	0.063	***	0.221	0.071	***
Male caregiver knowledge index	1,719	37.710	4.664	0.181	0.065	***	0.209	0.074	***
Male caregiver knowledge index, Implication of the father	1,760	6.802	1.549	0.129	0.060	**	0.150	0.069	**
Panel B: Parenting practices (reported by female caregivers)									
a. Early childhood stimulating activities				*Non-standardized effects*					
Support for learning (#act.)	1,687	2.234	1.263	0.086	0.088		0.137	0.098	
Male caregiver	1,687	1.033	1.163	0.164	0.070	**	0.202	0.082	**
Female caregiver	1,687	1.818	1.352	0.163	0.083	**	0.209	0.097	**
Other	1,687	2.234	1.263	0.086	0.088		0.137	0.098	
Learning material (#toys)	1,687	2.031	0.880	0.102	0.055	*	0.125	0.062	**
Inadequate care	1,683	0.303	0.460	-0.039	0.025		-0.037	0.028	
b. Violent discipline									
Violent discipline	1,687	0.789	0.408	-0.058	0.023	**	-0.062	0.026	**
Psychological violence	1,687	0.726	0.446	-0.057	0.025	**	-0.061	0.029	**
Physical violence	1,687	0.632	0.483	-0.065	0.027	**	-0.073	0.031	**
Severe physical violence	1,687	0.328	0.470	-0.059	0.026	**	-0.068	0.030	**
Violent discipline (#disc.)	1,687	2.229	1.687	-0.340	0.096	***	-0.380	0.110	***
Panel C: Parenting practices (observed by data collectors)				*Standardized effects*					
Child present during interviews	1,666	0.896	0.305	-0.023	0.016		-0.025	0.018	
Parenting practices index	1,472	5.023	3.820	0.137	0.065	**	0.157	0.073	**

Notes: In this table, we describe the effect of the intervention on *type T* caregivers. For each outcome displayed in the left column of the table, we report the intention-to-treat (ITT) estimates and the Instrumental Variable (IV) estimates obtained by instrumenting the dummy variable indicating whether or not household *i* was exposed to the intervention by a dummy variable indicating whether or not household *i* resides in a treatment village. Covariates were selected using a double-lasso procedure. Standard errors were clustered at the village level. *, **, *** denote significance at the 10, 5 and 1 percent levels respectively.

Table 7: Robustness checks, impact on the first respondents surveyed and on subsequent ones (*type T* households)

		Control mean		ITT: T-C						Coef.1 =
				First surveyed			Next ones			
Variables	**N**	**First**	**Others**	**Coef.1**	**S.e.**	**Sig.**	**Coef.2**	**S.e.**	**Sig.**	**Coef. 2**
Child present during interviews	1,666	0.943	0.879	-0.066	0.026	**	-0.008	0.020		0.084 *
Parenting practices index	1,472	5.061	5.008	0.151	0.104		0.132	0.076	*	0.876
Caregiver spontaneously vocalizes to the child during the visit	1,472	0.598	0.596	0.089	0.050	*	0.017	0.033		0.219
Caregiver verbally responds to child's vocalizations	1,472	0.449	0.485	0.063	0.052		0.060	0.038		0.959
Caregiver tells the child the name of some person or object during the visit	1,472	0.425	0.442	0.072	0.051		0.073	0.038	*	0.987
Caregiver spontaneously praises child twice during visit	1,472	0.360	0.353	0.071	0.050		0.070	0.039	*	0.982
Caregiver does something affectionate with the child (hugs, pats, etc.) during the visit	1,472	0.556	0.549	0.042	0.052		0.081	0.033	**	0.524
Caregiver smiles at or laughs with the child	1,472	0.537	0.519	0.056	0.050		0.049	0.032		0.904
Caregiver does not shout at the child	1,472	0.397	0.411	0.057	0.050		0.025	0.038		0.549
Caregiver does not overtly display annoyance or hostility toward the child	1,472	0.369	0.355	0.061	0.052		0.019	0.039		0.450
Caregiver does not scold/criticize the child during the visit	1,472	0.393	0.394	0.043	0.051		0.024	0.037		0.731
Caregiver keeps the child within visual range and looks at the child frequently	1,472	0.533	0.487	0.012	0.052		0.060	0.038		0.459
There are appropriate play materials (e.g., toys, balls, dolls, slates) in the house	1,472	0.276	0.251	0.005	0.043		0.021	0.032		0.755
The caregiver provides toys or activities during the visit	1,472	0.168	0.166	0.006	0.036		0.005	0.032		0.988

Notes: In this table, we describe the effect of the intervention for two subgroups of respondents: the first household interviewed by each surveyor in each village and the others. For each outcome displayed in the left column of the table, we present the Intention-To-Treat (ITT) estimates obtained by estimating equation (2). Standard errors are clustered at the village level. *, **, *** denote significance at the 10, 5 and 1 percent levels respectively.

Table 8: Impact on secondary outcomes, child development (*type T* households)

		Control group charact.		ITT (standardized effects)			IV (standardized effects)		
Variables	**N**	**Mean**	**S.d.**	**Coeff.**	**S.e.**	**Sig.**	**Coeff.**	**S.e.**	**Sig.**
Panel A: Female caregivers				*Standardized effects*					
Overall score	1,508	50.469	1.895	0.039	0.064		0.037	0.076	
Motor	1,508	50.430	1.409	0.064	0.064		0.065	0.074	
Cognitive	1,508	50.017	1.084	0.065	0.065		0.063	0.077	
Language	1,508	50.542	1.322	0.016	0.064		0.015	0.075	
Socio-emotional	1,508	50.565	1.289	0.053	0.065		0.059	0.078	
Panel B: Male caregivers									
Overall score	1,474	50.588	1.864	0.074	0.068		0.087	0.078	
Motor	1,474	50.710	1.454	0.096	0.067		0.112	0.077	
Cognitive	1,474	50.119	1.091	0.080	0.067		0.094	0.077	
Language	1,474	50.544	1.335	0.051	0.067		0.061	0.077	
Socio-emotional	1,474	50.646	1.297	0.072	0.068		0.087	0.078	

Notes: In this table, we describe the effect of the intervention on *type T* children's developmental level at follow-up. For each outcome displayed in the left column of the table, we present the Intention-To-Treat (ITT) estimates obtained by estimating equation (1) and the Instrumental Variable (IV) estimates obtained by instrumenting the dummy variable indicating whether or not household i was exposed to the intervention by a dummy variable indicating whether or not household i resides in a treatment village. Covariates were selected using a double-lasso procedure. Standard errors are clustered at the village level. *, **, *** denote significance at the 10, 5 and 1 percent levels respectively.

Table 9: Heterogeneity (*type T* households)

		Child's gender										Household wealth								
		Control mean			ITT: T-C						Coef.1 =		Control mean		ITT: T-C					Coef.1 =
					Boys			Girls							Bottom 50%			Top 50%		
Variables	N	Boys	Girls		Coef.1	S.e.	Sig.	Coef.2	S.e.	Sig.	Coef. 2	N	Bot. 50%	Top 50%	Coef.1	S.e.	Sig.	Coef.2	S.e.	Sig.	Coef. 2
Panel A: Knowledge																				
Female caregiver knowledge index	1,688	36.539	36.752	4.597	0.266	0.079	***	0.111	0.078		0.104	1,688	36.740	36.542	0.176	0.077	**	0.201	0.086	**	0.810
Male caregiver knowledge index	1,719	37.495	37.938	4.592	0.253	0.079	***	0.102	0.081		0.090 *	1,719	37.837	37.569	0.184	0.080	**	0.174	0.082	**	0.911
Male caregiver knowledge index, Implication of the father	1,760	6.832	6.772	1.639	0.159	0.071	**	0.100	0.081		0.516	1,760	6.862	6.736	0.115	0.068	*	0.146	0.084	*	0.743
Panel B: Parenting practices (reported by female caregivers)																				
a. Early childhood stimulating activities																				
Support for learning (#act.)	1,687	2.257	2.210	1.279	0.059	0.103		0.114	0.113		0.660	1,687	2.284	2.179	0.109	0.108		0.062	0.107		0.712
Male caregiver	1,687	1.071	0.995	1.174	0.111	0.089		0.192	0.094	**	0.470	1,687	1.073	0.990	0.220	0.093	**	0.078	0.092		0.233
Female caregiver	1,687	1.767	1.869	1.345	0.167	0.103		0.132	0.116		0.789	1,687	1.908	1.720	0.170	0.109		0.128	0.108		0.752
Other	1,687	2.257	2.210	1.279	0.059	0.103		0.114	0.113		0.660	1,687	2.284	2.179	0.109	0.108		0.062	0.107		0.712
Learning material (#toys)	1,687	2.026	2.036	0.897	0.114	0.066	*	0.096	0.071		0.827	1,687	1.991	2.074	0.121	0.069	*	0.088	0.073		0.716
Inadequate care	1,683	0.324	0.282	0.451	-0.041	0.033		-0.037	0.032		0.929	1,683	0.291	0.316	-0.016	0.033		-0.063	0.032	*	0.272
b. Violent discipline																				
Violent discipline	1,687	0.798	0.780	0.414	-0.068	0.029	**	-0.048	0.031		0.610	1,687	0.817	0.759	-0.112	0.029	***	-0.001	0.033		0.009 ***
Psychological violence	1,687	0.748	0.704	0.457	-0.080	0.033	**	-0.033	0.035		0.294	1,687	0.743	0.707	-0.101	0.031	***	-0.009	0.036		0.043 **
Physical violence	1,687	0.667	0.597	0.491	-0.088	0.034	***	-0.044	0.037		0.344	1,687	0.645	0.618	-0.115	0.036	***	-0.014	0.038		0.045 **
Severe physical violence	1,687	0.383	0.272	0.446	-0.092	0.033	***	-0.025	0.033		0.111	1,687	0.333	0.323	-0.073	0.034	**	-0.043	0.037		0.531
Violent discipline (#disc.)	1,687	2.395	2.062	1.625	-0.433	0.128	***	-0.256	0.120	**	0.266	1,687	2.273	2.181	-0.484	0.124	***	-0.193	0.134		0.091 *
Panel C: Parenting practices (observed by data collectors)																				
Child present during interviews	1,666	0.887	0.907	0.291	-0.012	0.024		-0.036	0.023		0.465	1,666	0.920	0.870	-0.036	0.021	*	-0.010	0.024		0.398
Parenting practices index	1,472	4.829	5.220	3.935	0.106	0.085		0.167	0.082	**	0.557	1,472	4.955	5.102	0.137	0.080	*	0.136	0.084		0.998
Panel D: Child development																				
Overall score	1,572	0.001	-0.001	1.000	0.083	0.079		0.030	0.078		0.550	1,572	-0.042	0.047	0.091	0.087		0.017	0.082		0.489

Notes: In this table, we describe the effect of the intervention for different subgroups of respondents. For each outcome displayed in the left column of the table, we present the Intention-To-Treat (ITT) estimates obtained by estimating equation (2). Standard errors are clustered at the village level. *, **, *** denote significance at the 10, 5 and 1 percent levels respectively.

Appendix

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Appendix 1: The generalization of mobile phones in different parts of the world

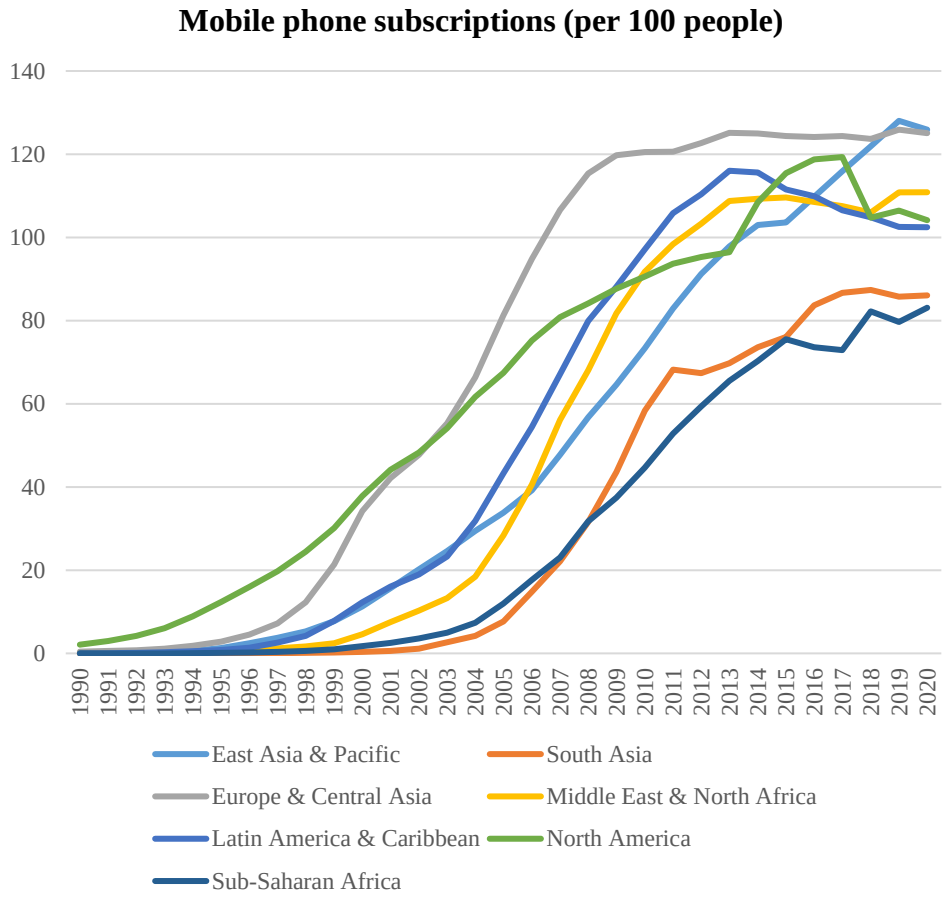

Figure A.1: Evolution of mobile phone subscriptions in various regions of the world over the past 30 years. The figure uses International Telecommunication Union data on "Mobile cellular subscriptions (per 100 people)" retrieved from World Development Indicators (ITU, 2020).

Appendix 2: Implementation details of other early childhood stimulation programs

The following table provides information on the nature of the interventions identified in the J-PAL 2020 policy brief on early childhood stimulation programs, as well as their impact (J-PAL, 2020).

Available here: https://www.povertyactionlab.org/policy-insight/encouraging-early-childhood-stimulation-parents-and-caregivers-improve-child?lang=fr?lang=en

#	Country	Program duration	Delivery method	Meeting frequency	Program facilitators	Child age at program start	Effect sizes (ITTs)	Cited articles
1	Antigua and Barbuda; Jamaica; St. Lucia	15 months	Group	Every 3 months for 12 months, then one final meeting 6 months later	Community health workers	3 months (N=501)	**10 to 12 months after intervention start:** Parenting knowledge: +0.4 SD Cognitive development: +0.3 SD No effect on language and hand-eye coordination	Chang et al. 2015; Walker et al. 2015
2	Bangladesh	12 months	Individual and group	*Group meetings:* weekly for 10 months, then every 2 weeks for 2 months *Individual meetings:* Twice weekly for 8 months, then weekly for 4 months	Local literate women from the community	Undernourished children aged 6-24 months (N=214)	**12 months after intervention start:** Cognitive development: +1.3 SD Language skills: +1.1 SD Motor index: +1.2 SD Behavior index: +0.7 SD No effect on growth	Hamadani et al. 2006
3	Bangladesh	6 months	Individual	Every 2 weeks for the 6 months (half with food supplementation and half without)	Female health workers at community clinics	Severely underweight hospitalized children aged 6–24 months (n=507)	**6 months after intervention start:** mental development index: +0.37 SD Weight-for-age Z-score: +0.26 SD	Nahar et al. 2012
4	Bangladesh	2 months	Group	Weekly	Local young women with at least grade 9 education	Children aged 6-18 months from the poor and very poor wealth categories (N=302)	**3 months after intervention start:** Improved home environment Improved responsive talk Language skills not measured **8 months after intervention start:** Improved home environment Improved responsive talk Improved language skills	Aboud and Akhter 2011
5	Bangladesh	10 months	Individual or group	*Group meetings*: every 2 weeks for 4 months, then monthly for 6 months (Model 1)	*Model 1*: Young women recommended by	7-17 months (N=463)	**11 months after intervention start:** Dietary diversity: +0.40 SD HOME stimulation: +0.55 SD Knowledge about developmental	Aboud et al. 2013

				Individual meetings: 10-minute counselling session integrated into home visits from health workers; average of 2 home visits over 10 months delivered by trained village mothers (Model 2)	community leaders, unpaid *Model 2*: Government-paid family welfare assistants and health workers		Milestones: +0.49 SD Cognitive development: +1.60 SD Receptive Language: +0.89 SD Expressive Language: 1.13 SD	
6	Bangladesh	9 months	Individual	Weekly	Local women with 9-12 years of education	6-24 months, with iron deficiency anemia (N= 225) and without anemia or iron deficiency (N=209)	**9 months after intervention start:** Improved psychomotor development index an mental development index, especially for the group without anemia or iron deficiency (no effect size provided)	Tofail et al. 2013
7	Bangladesh	12 months	Group	Every 2 weeks	Government health clinic workers	Underweight children aged 5 to 24 months (N=1,737)	**1 year after intervention start:** Children's cognition: +1.3 SD Language skills: +1.1 SD Motor skills: +1.2 SD Behavior index: 0.7 SD Growth: no effect	Hamadani et al. 2019
8	China	6 months	Individual	Weekly	Local officials previously responsible for enforcing the One Child Policy	18-36 months (N=592)	**6 months after intervention start:** Cognitive development: +0.28-0.29 SD. Parenting skills index: +0.32 SD Parental investment index: +0.83 SD	Sylvia et al. 2021
9	Colombia	18 months	Individual	Weekly	Female community leaders liasing between local program officials from the Familias en Acción cash transfer and beneficiary families	12-24 months (N=1,419)	**18 months after intervention start:** cognitive development:+0.26 SD Receptive language: +0.22 SD. **3.5 years after intervention start:** No effect on cognitive development, behavioral index or home stimulation	Attanasio et al. 2014 Andrew et al. 2018
10	Colombia	10 months	Both	*Group meetings*: weekly *Individual meetings*: monthly	Local women with a high school degree	0-12 months (N=1,460)	**Over 20 months after intervention start:** cognitive development: +0.16 SD	Attanasio et al. 2022
11	Ethiopia	6 months	Home-based	Weekly	Nurses	"Children in a foster care program in an extremely poor community" aged 3-59 months (N=78)	**3 months after intervention start:** Language skills: +0.34 SD Social-emotional skills: +0.60 SD **6 months after intervention start:** Language skills: +0.55 SD Social-emotional skills: +1.28 SD Personal-social skills: +0.56 SD	Worku et al. 2018
12	India	18 months	Home-based	Weekly	Local women	Children aged 10-20 months	**18 to 19 months after intervention start:**	Andrew et al. 2020

						living in urban slums (N=421)	Maternal knowledge of child development: no effect Quality of the home environment: +0.32 SD Child development index: +0.30 SD	
13	Jamaica	24 months	Home-based	Weekly	Community health workers	Stunted children aged 9-24 months (N=129)	**Two years after intervention start:** Positive effect on child development.	Grantham-McGregor et al. 1991; Grantham-McGregor et al. 1997;
14	Jamaica	12 months	Home-based	Weekly	Community health workers	Undernourished children aged 9-30 months (N=139)	**About 1 year after intervention start:** not reported	Baker-Henningham et al. 2005
15	Mexico	27 months	Group	Weekly (combined with a conditional cash transfer)	Local literate women	0-18 months (N=1,113)	**About 4 years after intervention start:** General Cognitive Index, Verbal Score, and Memory score: + 0.26-0.29 SD.	Fernald et al. 2017
16	South Africa	9 months	Individual	2 times antenatally, weekly for first 8 weeks after birth, followed by every 2 weeks for 2 months, then monthly for 2 months (16 sessions from late pregnancy to 6 months)	Local women selected with help from the local council	Last trimester of pregnancy (N= 449)	**6 to 9 months after intervention start:** Quality of mother-infant interactions improved: sensitivity: +0.24 SD; Intrusiveness: -0.26 SD. **12 to 15 months after intervention start:** Quality of mother-infant interactions improved: sensitivity: +0.26 SD; Intrusiveness: -0.24 SD. **18 to 21 months after intervention start:** increased secure infant attachments (no effect size provided):	Cooper et al. 2009
17	Uganda	6 months	Both	*Group meetings*: every 2 weeks *Individual meetings*: 1-2 visits over 6 months	Community volunteers with six or more years of education	12-36 months (N=319)	**9 months after intervention start:** Cognitive score: +0.36 SD; Receptive language score: +0.27SD	Singla et al. 2015

Appendix 3: MICS data on access to traditional media in sub-Saharan Africa (2012-2022)

We restrict ourselves to data collected over the past 10 years on a nationally representative sample as part of a Multiple Indicator Cluster Survey. For comparison purposes, we limit comparisons to owned assets, not exposure to those assets (exposure to a mobile phone not being collected as part of the MICS). Hence, readers should keep in mind that exposure rates are somewhat higher than the ownership rates reported below.

The reports from which the statistics were extracted are available on the following webpage: https://mics.unicef.org/surveys

National statistics

Country	Data source	% households owning a TV	% households owning a radio	% households owning a mobile phone
Benin	MICS5 (2014)	32.6%	58.6%	81.4%
Cameroon	MICS5 (2014)	48.0%	46.8%	81.0%
Central African Republic	MICS6 (2018-2019)	5.7%	26.5%	35.6%
Chad	MICS6 (2019)	5.3%	31.8%	70.8%
Congo	MICS (2015)	60.1%	55.9%	88.9%
Congo, Democratic Republic of the	MICS6 (2017-2018)	19.4%	37.6%	51.8%
Côte d'Ivoire	MICS5 (2016)	51.6%	48.6%	91.8%
Eswatini	MICS5 (2014)	54.9%	67.7%	95.9%
Gambia	MICS6 (2018)	69.3%	52.6%	98.4%
Ghana	MICS6 (2017-2018)	60.4%	57.2%	92.5%
Guinea	MICS5 (2016)	31.5%	47.9%	83.7%
Guinea-Bissau	MICS6 (2018-2019)	60.2%	22.0%	94.1%
Lesotho	MICS6 (2018)	32.0%	51.5%	91.7%
Madagascar	MICS6 (2018)	49.3%	19.8%	52.4%
Malawi	MICS5 (2013-2014)	11.1%	47.8%	48.6%
Mali	MICS5 (2015)	39.5%	72.4%	89.7%
Mauritania	MICS5 (2015)	39.7%	43.5%	90.2%
Nigeria	MICS6 (2021)	43.2%	47.8%	87.6%
Sao Tome e Principe	MICS6 (2019)	69.5%	56.3%	87.1%
Sierra Leone	MICS6 (2017)	18.2%	54.7%	71.4%
Togo	MICS6 (2017)	39.1%	41.6%	84.6%
Zimbabwe	MICS6 (2019)	35.7%	40.2%	89.4%

Notes: Statistics are available from tables HH.7 (wave 5) and SR.9.2 (wave 6).

Statistics for rural areas

Country	Data source	% rural households owning a TV	% rural households owning a radio	% rural households owning a mobile phone
Benin	MICS5 (2014)	15.8%	54.0%	74.0%
Cameroon	MICS5 (2014)	18.3%	37.2%	65.7%
Central African Republic	MICS6 (2018-2019)	5.7%	26.5%	35.6%
Chad	MICS6 (2019)	0.3%	26.5%	66.5%
Congo	MICS (2015)	21.5%	45.4%	75.0%
Congo, Democratic Republic of the	MICS6 (2017-2018)	19.4%	26.8%	51.8%
Côte d'Ivoire	MICS5 (2016)	26.4%	44.7%	87.2%
Eswatini	MICS5 (2014)	46.3%	65.5%	94.4%
Gambia	MICS6 (2018)	12.8%	73.7%	96.5%
Ghana	MICS6 (2017-2018)	45.6%	55.2%	88.3%
Guinea	MICS5 (2016)	8.0%	44.7%	79.1%
Guinea-Bissau	MICS6 (2018-2019)	8.1%	57.4%	92.0%
Lesotho	MICS6 (2018)	15.7%	45.4%	87.7%
Madagascar	MICS6 (2018)	10.2%	45.2%	45.0%
Malawi	MICS5 (2013-2014)	5.6%	44.3%	42.5%
Mali	MICS5 (2015)	27.5%	71.1%	87.3%
Mauritania	MICS5 (2015)	6.9%	43.5%	84.7%
Nigeria	MICS6 (2021)	Not available	40.0%	81.0%
Sao Tome e Principe	MICS6 (2019)	64.1%	53.0%	83.1%
Sierra Leone	MICS6 (2017)	1.5%	44.8%	53.4%
Togo	MICS6 (2017)	15.0%	47.2%	75.0%
Zimbabwe	MICS6 (2019)	40.5%	15.1%	85.0%

Notes: Statistics are available from tables HH.7 (wave 5) and SR.9.2 (wave 6).

Appendix 4: Mobile phones in the context of the experiment

The pictures below show the type of video-enabled mobile phones commonly used by sampled households.

Appendix 5: Key messages conveyed by the videos

Episode	Key message(s)
1	Talk to your children, it awakens their consciousness and develops their intelligence.
2	When your children are unable to do something, encourage them, do not get angry at them.
3	Your children learn by playing. You can encourage play activities by making toys for them from scratch or by using what you find at home, as long as it is safe for them.
4	Stimulate your children from an early age, even before they can speak. Babies can understand long before they can talk.
5	Playing with your children promotes their development. It is not just the responsibility of mothers to do so, but also of fathers.
6	Praising your children will not make them vain and disrespectful but promotes their development.
7	If you are too busy with daily chores to play with your children, you can get them involved in some of your activities (to the extent of their abilities). It allows you to accomplish your tasks while promoting your children's learning.
8	Use positive discipline rather than negative discipline.
9	Encouraging children, talking to them, playing with them, fosters their development. This is everyone's responsibility.

Appendix 6: Outcomes and deviations from the pre-result study

#	Outcome	Type	Indicators (source, if any)	Deviation(s) from pre-result study and justification
H1	Exposure to the videos	Intermediate	Whether or not respondents watched at least one video; Number of videos watched	**None**
H2	Parental knowledge	Primary	Parent Knowledge Scale (Powell et al., 2004)	**None**
H3a	Parenting practices, early childhood stimulation activities carried out	Primary	1. Parenting practices as per survey data: - Number of support-for-learning activities - Number of toys available to the child - Number of days the child was left without adequate supervision 2. Parenting practices observed by surveyors	**1.** We had registered that we would use the MICS's *Support for Learning index*, which captures *whether* adult household members engaged in four or more activities (out of five) that promote learning and school readiness in the previous three days. However, the threshold used to create the index ("four or more activities") was developed for children aged 2 to 4, and we expected that a significant share of selected children would be below 2 at follow-up (in fact, 37% of *type T* respondents reached at follow-up were below 2). Consequently, we decided to use the *number* of such activities that adult household members engaged in during the previous three days. **2.** We had registered that we would use the MICS's *Learning materials index*, which captures *whether* children have access to adequate learning materials (including books and toys). However, baseline data indicated that only 4% of children included in our sample had access to a book in their home. Therefore, we decided not to collect information on the number of books available at follow-up, but to measure the impact of the intervention on the learning materials available to children in their homes only based on the number of toys available. We focused on the *number* of toys available and not on *whether* the number of toys is sufficient for child development purposes (in a context where books are very rare) because of the difficulty in establishing the right threshold. **3.** We had registered that we would use the MICS's *Inadequate supervision index*, which captures *whether* children were left alone or in the care of another child younger than 10 years of age for more than one hour at least once in the previous week. In the article, we focused on the *number* of days children were left without adequate supervision for the sake of consistency, as we focused on the impact of the intervention on the *intensive* (and not extensive) margin of other parenting dimensions. However, it should be noted that we find similar results on whether children were left without adequate supervision. **4.** Measures of parenting practices by interviewers were not recorded but were added to the analysis plan at a later stage to test the robustness of the results based on the survey data.
H3b	Parenting practices, use of violent discipline	Primary	Violent discipline (MICS) - prevalence of psychological aggression	**None**

			- prevalence of physical punishment - prevalence of severe physical punishment	
H4	Early childhood development	Secondary	CREDI score	**None**

Appendix 7: Comparison of *type T* and *type N* households

		Type T charact.		Balancing test Type N-Type T		
Variables	**N**	**Mean**	**S.d.**	**Coeff.**	**S.e.**	**Sig.**
Panel A: Village-level information						
Number of respondents	200	9.765	0.885	0.000	0.000	
Panel B: Caregiver-level information						
Male	2,901	0.963	0.190	-0.044	0.012	***
Age	2,901	38.580	11.065	-0.379	0.481	
Household size	2,901	6.400	2.595	-0.093	0.098	
Level of education						
None	2,901	0.247	0.432	0.077	0.019	***
Primary	2,901	0.369	0.483	0.000	0.020	
Higher	2,901	0.384	0.486	-0.077	0.019	***
Has an income-generating activity	2,901	0.931	0.253	-0.018	0.010	*
Marital status						
Monogamous marriage	2,901	0.478	0.500	-0.031	0.018	*
Polygamous marriage	2,901	0.073	0.260	0.035	0.011	***
Cohabitation	2,901	0.384	0.486	-0.013	0.017	
Single	2,901	0.040	0.196	0.002	0.008	
Other	2,901	0.026	0.158	0.006	0.006	
Panel C: Child-level information						
Male	2,901	0.506	0.500	-0.022	0.019	
Age (in months)	2,900	10.928	6.657	0.319	0.260	
Bio. father lives in the household	2,901	0.879	0.326	-0.010	0.013	
Bio. mother lives in the household	2,901	0.971	0.167	0.007	0.006	

Notes: In the table, we provide the average characteristics of *type T* villages, male caregivers, and children and compare them with those of *type N* villages, male caregivers, and children. To do this, we regress each variable displayed in the left column on a dummy variable taking the value 1 for *type N* male caregivers, and children, and strata fixed effects. Standard errors are clustered at the village level. *, **, *** denote significance at the 10, 5 and 1 percent levels respectively.

Appendix 8: Insights into viewers' opinions of the videos

	Households exposed to the videos					
	Type T			Type N		
Variables	**N**	**Mean**	**S.d.**	**N**	**Mean**	**S.d.**
Extent to which they understood the content of the videos						
Very well	798	0.609	0.499	137	0.667	0.488
Well	798	0.348	0.487	137	0.200	0.414
Not well	798	0.043	0.209	137	0.133	0.352
Not at all	798	0.000	0.000	137	0.000	0.000
Do not remember	798	0.000	0.000	137	0.000	0.000
Extent to which they liked the videos						
Loved them	798	0.913	0.288	137	0.800	0.414
Liked them	798	0.087	0.288	137	0.200	0.414
Disliked them	798	0.000	0.000	137	0.000	0.000
Hated them	798	0.000	0.000	137	0.000	0.000
Do not remember	798	0.000	0.000	137	0.000	0.000
What they liked about the videos						
Nothing	798	0.000	0.000	137	0.000	0.000
Found them entertaining	798	0.696	0.470	137	0.200	0.414
Found them educational	798	0.783	0.422	137	1.000	0.000
Understood them well	798	0.304	0.470	137	0.000	0.000
Could identify with main characters	798	0.087	0.288	137	0.133	0.352
Other	798	0.000	0.000	137	0.000	0.000
Understood that the videos aimed to promote ECS	798	0.956	0.209	137	0.867	0.352

Notes: In this table, we describe how the videos were perceived by viewers (*type T* and *type N* respondents).

Appendix 9: Exposure to the intervention among *type N* and *type T* households, controlling for differences in characteristics

		Control mean		ITT: T-C					
				Type T			Type N		
Variables	**N**	**Type T**	**Type N**	**Coef.1**	**S.e.**	**Sig.**	**Coef.2**	**S.e.**	**Sig.**
Has exchanged videos using a SD card in past 3 months	2,619	0.389	0.353	0.277	0.026	***	0.052	0.037	
Got SD card containing the videos	2,618	0.006	0.007	0.883	0.012	***	0.106	0.016	***
Watched at least some of the videos	2,617	0.026	0.035	0.860	0.014	***	0.254	0.028	***
All of the videos	2,617	0.011	0.002	0.696	0.018	***	0.121	0.017	***
Some of the videos	2,617	0.008	0.014	0.150	0.015	***	0.110	0.020	***
Only one video	2,617	0.007	0.019	0.014	0.006	**	0.022	0.012	*
None of the videos	2,617	0.974	0.965	-0.861	0.014	***	-0.254	0.028	***
Do not remember	2,617	0.000	0.000	0.001	0.001		0.000	0.000	
#times each video was viewed	2,601	0.105	0.072	6.253	0.216	***	1.211	0.155	***
Someone else in the hh watched the videos	2,587	0.016	0.009	0.868	0.013	***	0.191	0.024	***
Household exposed to the videos	2,595	0.029	0.037	0.882	0.013	***	0.276	0.030	***

Notes: In this table, we describe the effect of the intervention for different subgroups of respondents. For each outcome displayed in the left column of the table, we present the Intention-To-Treat (ITT) estimates obtained by estimating equation (2). Standard errors are clustered at the village level. *, **, *** denote significance at the 10, 5 and 1 percent levels respectively.

Appendix 10: Effects on parental knowledge (individual items)

	Female caregivers								Male caregivers							
		Control group charact.		ITT (unstandardized effects)			IV (unstandardized effects)			Control group charact.		ITT (unstandardized effects)			IV (unstandardized effects)	
Variables	**N**	**Mean**	**S.d.**	**Coeff.**	**S.e.**	**Sig.**	**Coeff.**	**S.e.**	**Sig.**	**N**	**Mean**	**S.d.**	**Coeff.**	**S.e.**	**Sig.**	**Coeff.**	**S.e.**	**Sig.**
Panel A: Core questions																		
Too much love and attention will spoil a child	1,770	2.675	1.214	-0.132	0.072	*	-0.153	0.082	*	1,760	2.488	1.267	-0.063	0.068		-0.067	0.078	
A parent needs to spank or beat young children when they are rude or they will grow up to be bad	1,774	2.767	1.169	-0.057	0.067		-0.071	0.078		1,761	2.475	1.239	-0.131	0.074	*	-0.154	0.083	*
It is important that a busy mother spend plenty of time talking with her infant	1,773	3.389	0.814	0.116	0.054	**	0.121	0.061	**	1,762	3.419	0.796	0.027	0.050		0.034	0.057	
It is important that parents look at picture books with children who are <2 years old	1,731	3.223	0.867	0.137	0.050	***	0.137	0.057	**	1,747	3.224	0.925	0.132	0.047	***	0.152	0.053	***
The best way to get a child to behave is to praise them when they are good	1,773	3.624	0.552	0.029	0.036		0.032	0.041		1,762	3.692	0.513	-0.010	0.033		-0.015	0.037	
It is important that a busy mother spend plenty of time playing with her young child	1,772	3.455	0.767	0.068	0.051		0.082	0.058		1,761	3.425	0.806	0.082	0.048	*	0.091	0.055	*
There is no need to give toys to children <1 year old	1,767	2.017	1.151	-0.146	0.062	**	-0.173	0.070	**	1,758	1.947	1.151	-0.130	0.070	*	-0.156	0.080	*
A time for play is important for young children	1,774	3.575	0.567	0.037	0.032		0.045	0.036		1,762	3.625	0.590	0.025	0.032		0.027	0.036	
Singing and chatting with your infant will help them learn	1,771	3.555	0.617	0.083	0.036	**	0.096	0.042	**	1,762	3.569	0.665	0.095	0.036	***	0.109	0.041	***
Children should not be given crayons until they are ready to learn to write	1,744	2.576	1.195	-0.026	0.067		-0.031	0.078		1,741	2.370	1.214	-0.001	0.067		0.004	0.077	
Young children should not be held when they cry because this will make them want to be held all the time	1,772	2.373	1.221	-0.002	0.074		-0.027	0.084		1,759	2.240	1.210	-0.098	0.072		-0.121	0.082	
How a parent behaves with their child when they are young affects how well they will learn in school	1,759	3.249	0.886	0.038	0.046		0.046	0.052		1,757	3.255	0.959	0.067	0.047		0.081	0.054	
Panel B: Added questions																		
It is important that a busy father spend plenty of time talking with his infant										1,760	3.418	0.811	0.088	0.048	*	0.103	0.055	*
It is important that a busy father spend plenty of time playing with his young child										1,762	3.382	0.840	0.116	0.049	**	0.132	0.056	**

Notes: In this table, we describe the effect of the intervention on *type T* respondents' knowledge at follow-up. For each outcome displayed in the left column of the table, we present the Intention-To-Treat (ITT) estimates obtained by estimating equation (1) and the Instrumental Variable (IV) estimates obtained by instrumenting the dummy variable indicating whether or not household *i* was exposed to the intervention by a dummy variable indicating whether or not household *i* resides in a treatment village. Covariates were selected using a double-lasso procedure. Standard errors are clustered at the village level. *, **, *** denote significance at the 10, 5 and 1 percent levels respectively.

Appendix 11: Effects on observed parenting practices (individual items)

		Control group charact.		ITT (unstandardized effects)			IV (unstandardized effects)		
Variables	**N**	**Mean**	**S.d.**	**Coeff.**	**S.e.**	**Sig.**	**Coeff.**	**S.e.**	**Sig.**
Panel A: Support for learning									
Main female caregivers									
Told stories	1,953	0.072	0.259	0.031	0.015	**	0.037	0.019	*
Sang songs	1,953	0.315	0.465	0.062	0.026	**	0.083	0.030	***
Took them out of the house	1,953	0.488	0.500	0.029	0.028		0.038	0.032	
Played	1,953	0.571	0.495	0.044	0.027	*	0.059	0.030	*
Named, counted, and/or drew	1,953	0.107	0.309	0.013	0.018		0.021	0.022	
Main male caregivers									
Told stories	1,953	0.043	0.202	0.015	0.010		0.020	0.013	
Sang songs	1,953	0.103	0.304	0.036	0.017	**	0.044	0.021	**
Took them out of the house	1,953	0.256	0.436	0.062	0.025	**	0.080	0.030	***
Played	1,953	0.405	0.491	0.045	0.028		0.058	0.033	*
Named, counted, and/or drew	1,953	0.076	0.266	0.007	0.013		0.013	0.016	
Other adult caregivers									
Told stories	1,953	0.097	0.296	0.024	0.017		0.032	0.021	
Sang songs	1,953	0.385	0.487	0.061	0.028	**	0.080	0.033	**
Took them out of the house	1,953	0.594	0.491	0.024	0.028		0.035	0.032	
Played	1,953	0.683	0.465	0.018	0.026		0.030	0.029	
Named, counted, and/or drew	1,953	0.150	0.357	0.007	0.021		0.014	0.025	
Panel B: Observations									
Caregiver spontaneously vocalizes to the child during the visit	1,472	0.597	0.491	0.037	0.028		0.043	0.032	
Caregiver verbally responds to child's vocalizations	1,472	0.475	0.500	0.061	0.032	*	0.066	0.037	*
Caregiver tells the child the name of some person or object during the visit	1,472	0.437	0.496	0.073	0.032	**	0.081	0.036	**
Caregiver spontaneously praises child twice during visit	1,472	0.355	0.479	0.070	0.034	**	0.077	0.039	**
Caregiver does something affectionate with the child (hugs, pats, etc.) during the visit	1,472	0.551	0.498	0.071	0.028	**	0.081	0.032	**
Caregiver smiles at or laughs with the child	1,472	0.524	0.500	0.050	0.027	*	0.057	0.031	*
Caregiver does not shout at the child	1,472	0.407	0.492	0.034	0.034		0.040	0.038	
Caregiver does not overtly display annoyance or hostility toward the child	1,472	0.359	0.480	0.031	0.035		0.038	0.040	
Caregiver does not scold/criticize the child during the visit	1,472	0.394	0.489	0.029	0.034		0.037	0.038	
Caregiver keeps the child within visual range and looks at the child frequently	1,472	0.500	0.500	0.046	0.030		0.054	0.035	
There are appropriate play materials (e.g., toys, balls, dolls, slates) in the house	1,472	0.258	0.438	0.016	0.028		0.021	0.032	
The caregiver provides toys or activities during the visit	1,472	0.167	0.373	0.008	0.028		0.006	0.031	

Notes: In this table, we describe the effect of the intervention on *type T* respondents' knowledge at follow-up. For each outcome displayed in the left column of the table, we present the Intention-To-Treat (ITT) estimates obtained by estimating equation (1) and the Instrumental Variable (IV) estimates obtained by instrumenting the dummy variable indicating whether or not household *i* was exposed to the intervention by a dummy variable indicating whether or not household *i* resides in a treatment village. Covariates were selected using a double-lasso procedure. Standard errors are clustered at the village level. *, **, *** denote significance at the 10, 5 and 1 percent levels respectively.

Appendix 12: Double-lasso procedure

The set of baseline covariates considered as part of this procedure includes the following variables:

Information on the children:

- Age of the child (in months)
- Gender of the child
- A dummy variable indicating whether the biological father lives in the household
- A dummy variable indicating whether the biological mother lives in the household

Information on the female caregiver:

- Age: dummy variables for 1st quartile, 2nd quartile, 3rd quartile, 4th quartile
- Relationship to the head of the household: dummy variables for "Head of household," "Wife or husband," "Son or daughter," "Son-in-law or daughter-in-law," "Grandson or granddaughter," "Father or mother," "Parents in-law," "Brother or sister," "Other relative," "Adopted, custody, children of the wife or husband," "No family tie," "Does not know"
- Formal instruction: dummy variables for no education, preschool, primary school, secondary education and higher, does not remember
- Quranic instruction: dummy variable indicating whether they have been enrolled in a quranic school
- Technical school education: dummy variable indicating whether they have been enrolled in a technical school
- Dummy variable indicating whether they have an income-generating activity
- Dummy variable indicating whether they have a personal mobile phone
- Dummy variable indicating whether they have a personal mobile phone that allows them to play videos

Information on the male caregiver:

- Age: dummy variables for 1st quartile, 2nd quartile, 3rd quartile, 4th quartile
- Relationship to the head of the household: dummy variables for "Head of household," "Wife or husband," "Son or daughter," "Son-in-law or daughter-in-law," "Grandson or granddaughter,"

"Father or mother," "Parents in-law," "Brother or sister," "Other relative," "Adopted, custody, children of the wife or husband," "No family tie," "Does not know"

- Formal instruction: dummy variables for no education, preschool, primary school, secondary education and higher, does not remember
- Quranic instruction: dummy variable indicating whether they have been enrolled in a quranic school
- Technical school education: dummy variable indicating whether they have been enrolled in a technical school
- Dummy variable indicating whether they have an income-generating activity
- Dummy variable indicating whether they have a personal mobile phone
- Dummy variable indicating whether they have a personal mobile phone that allows them to play videos

Information on the village: number of sampled households in the village.

Other information:

- For *specifically targeted* households (long baseline survey):
  - Household size
  - Gender of the baseline respondent
  - Marital status of the household: dummy variables for monogamous marriage, polygamous marriage, cohabitation, single, other
  - Dwelling's main floor material: dummy variables for natural floor, rudimentary floor, finished floor
  - Dwelling's main wall material: dummy variables for natural wall, rudimentary wall, finished wall
  - Dwelling's main roof material: dummy variables for natural roofing, rudimentary roofing, finished roofing
  - Number of rooms household members usually use to sleep
  - Main source of drinking water used by members of the household: dummy variables for faucet, dug well, spring, conditioned water

- Type of toilet household members usually use: dummy variables for water hunting, pit latrine, composting toilet, other
- Dummy variable indicating whether the household has electricity
- Size of land owned by household members: dummy variables for 1st quartile, 2nd quartile, 3rd quartile, 4th quartile
- Dummy variable indicating whether the household has a bank account
- Dummy variable indicating whether the household has a mobile money account
- Standardized wealth index
- Reading skills: dummy variables indicating if the baseline respondent could read a whole sentence, could read part of it, could not read at all, refused to try to read the sentence
- Time spent reading newspapers in the past week (in minutes)
- Time spent listening to the radio in the past week (in minutes)
- Time spent watching television in the past week (in minutes)
- Time spent on the Internet in the past week (in minutes)
- Time spent using mobile phones in the past week (in minutes)
- Religion: dummy variables for Muslim, Catholic, Protestant, Evangelist, other Christian, Animist, other religion, without religion
- Scale reflecting the importance of religion in the respondent's life (1/10)
- Scale reflecting the importance of traditions in the respondent's life (1/10)
- Parental knowledge index: dummy variables for 1st quartile, 2nd quartile, 3rd quartile, 4th quartile
- Number of different stimulating activities carried out with the child: dummy variables for 0 activity, 1 activity, 2 activities, 3 activities, 4 activities, 5 activities
- Number of toys available
- Dummy variable indicating if the child was left in inadequate care
- Dummy variable indicating if the child experienced any type of violent discipline
- Dummy variable indicating if the child experienced psychological violence
- Dummy variable indicating if the child experienced physical violence
- Dummy variable indicating if the child experienced severe physical violence

- Proxy for child development (ranging from 0 to 5): dummy variables for each possible value taken by the proxy

- For *non-specifically targeted* households (short baseline survey):
  - Household size
  - Gender of the baseline respondent
  - Marital status of the household: dummy variables for monogamous marriage, polygamous marriage, cohabitation, single, other

Note that when implementing the double-lasso procedure, we require that strata fixed effects (which, by definition, are orthogonal to T_i) be systematically included in the estimated equation.

The following table summarizes the variables selected as part of the first and second steps of the double-lasso procedure, through which we obtained the results shown in *Table 3 (Panel A Type T households)*:

Variables	**Step 1: predicting y_i**	**Step 2: predicting T_i**
Has exchanged videos using a SD card in past 3 months	Dummy indicating that the main female caregiver has no formal instruction Dummy indicating that the main male caregiver is in the fourth age quartile	None
Got SD card containing the videos	None	None
Watched at least some of the videos	None	None
All of the videos	None	None
Some of the videos	Dummy indicating that the main male caregiver is the household head Dummy indicating that the household is composed of a single parent Dummy indicating that the marital status of the household falls into the "other" category	None
Only one video	Dummy indicating that the main female caregiver is the daughter of the household head	None
None of the videos	None	None
Does not remember	None	None
#times each video was viewed	None	None
Someone else in the hh watched the videos	None	None
Household exposed to the videos	None	None

The following table summarizes the variables selected as part of the first and second steps of the double-lasso procedure, through which we obtained the results shown in *Table 6*:

Variables	**Step 1: predicting y_i**	**Step 2: predicting T_i**
Panel A: Knowledge		
Female caregiver knowledge index	None	None
Male caregiver knowledge index	Dummy indicating that the main male caregiver has no formal instruction Dummy indicating that the main male caregiver is in the fourth age quartile	None
Male caregiver knowledge index, Implication of the father	None	None
Panel B: Parenting practices (as reported by female caregivers)		
a. Early childhood stimulating activities		
Support for learning (#act.)	None	None
Male caregiver	Dummy indicating that the main female caregiver is the wife of the household head Dummy indicating that the main female caregiver is the mother of the household head Dummy indicating that the information on the main male caregiver's level of formal instruction is missing Dummy indicating whether the main male caregiver ever attended Quranic school Dummy indicating whether the main male caregiver ever attended a technical school Dummy indicating whether the main male caregiver has an income-generating activity Dummy indicating whether the main male caregiver has a personal mobile phone Household size	None
Female caregiver	Dummy indicating that the main female caregiver is the wife of the household head Household size	None
Other	None	None
Learning material (#toys)	None	None
Inadequate care	Dummy indicating that the main male caregiver is the son of the household head	None
b. Violent discipline		
Violent discipline	None	None
Psychological violence	None	None
Physical violence	None	None
Severe physical violence	None	None
Violent discipline (#disc.)	Dummy variable indicating children who suffered from psychological violence, dummy variable indicating children who suffered from physical violence	None
Panel C: Parenting practices (observed by data collectors)		
Child present during interviews	Dummy indicating that the main male caregiver is the household head	None
Parenting practices index	None	None

As a reminder, the *first* step of the double-lasso procedure involves fitting a lasso regression predicting y_i and keeping variables with non-zero estimated coefficients. The *second* step of the double-lasso

procedure involves fitting a lasso regression predicting T_i, and keeping variables with non-zero estimated coefficients.

The results of the procedure indicate that no variable is ever selected in the second step (which aims to select covariates predicting T_i). This provides further evidence that the treatment and control groups are comparable.

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