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What drives parental investments in early childhood?

Experimental evidence from a video intervention in Rwanda

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Abstract: This paper investigates the causal impact of a randomized video intervention designed to study the determinants of parental time investments in early childhood among low-income parents. We designed and screened a video that provided information and conveyed persuasive messages about the importance of parental investments in early childhood. In a second video, we added a positive feedback message to parents about their accomplishments during their participation in an earlier parenting program. We find that this second treatment (information plus feedback) improves maternal time investment by 0.2 SD. The provision of information without positive feedback was not enough to shift parental behavior on average but generated important heterogeneous effects. Notably, the poorest, most disadvantaged households benefited the most from both treatment arms. We explore the potential sources of these changes and document a weak impact of the treatments on parental self-efficacy and knowledge beliefs, but a strong positive effect of the treatments on social support within the community. This result suggests a potentially important role for social networks in parenting interventions in low-income settings.

Key words: early childhood development, parental investments, beliefs, technology, human capital, Rwanda

JEL classification: D83, D91, I25, J13, O55

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1 Introduction

Experiences during early childhood have consequences for later life human capital, health status and labour market outcomes (Currie and Almond 2011; Almond et al. 2018). Parents have a prominent role in shaping the first years of a child's life and, as a result, their long-term human capital accumulation (Attanasio, Cattan, et al. 2020). There is strong evidence across many contexts showing that early child development interventions that aim to enhance parental skills and knowledge are highly effective in improving child development outcomes. Parental investments play a particularly key role in these processes (Britto et al. 2017; Attanasio, Cattan, et al. 2020; Justino et al. 2022). However, despite accumulated evidence from early childhood parenting programmes implemented across the world on the importance of parental investments, we have to date limited evidence about what mechanisms drive changes in parental investments in their children, and what specific interventions could further incentivize stronger parental investments. This paper addresses these questions.

The literature so far has focused largely on the role of household resources and parental traits as determinants of parental investments (Attanasio, Meghir, and Nix 2020). Recent developments in social psychology and the economics of parenting point to at least three other sets of factors having a potentially strong—yet largely unknown—role in shaping parental investments. A first set of factors includes the provision of knowledge and information about optimal parental practices and about the importance of the role of parents for early child development (Leung et al. 2020; Attanasio et al. 2019). The second set of factors refers to parental beliefs about returns to investments in children (Cunha et al. 2013; Attanasio et al. 2019) and about their efficacy, competences, and effectiveness as parents (Bandura 1977, 1982; Carneiro et al. 2019). A third set of factors relates to the support parents get from their social networks and the communities where they live which may lead to the formation of shared norms of positive parenting practices (Carneiro et al. 2019).

These sets of factors are potentially important determinants of parental investments, especially in developing countries and among low-income and low-education populations, where parents lack information and knowledge about optimal parental practices that may support their children's development, lack adequate resources, and may hold incorrect beliefs about returns to investment in their children (Cunha et al. 2013; Boneva and Rauh 2018; Attanasio et al. 2019), about their own ability to influence and support their children's development (Wittkowski et al. 2016), and the role their own networks and communities may play in supporting them. Information constraints and incorrect beliefs seem to explain at least part of the observed differences in parental investments across families (Boneva and Rauh 2018), and gaps in children's human capital outcomes (Bhalotra et al. 2020). The role of social networks has been much less explored. The way parents interact and learn from each other, may be particularly relevant in developing country settings where it is common for children to be raised by whole communities, rather than within nuclear families. In these settings, social interactions may play a strong role in shaping individual or household behaviour. Hence, interventions that incentivize learning within a group may potentially lead to salient changes in parental investments in early childhood. The role of these factors as drivers of parental changes in their investments in early childhood remains to date under-researched.

To address these gaps, this paper investigates whether interventions that reduce information constraints and improve parental self-efficacy and knowledge beliefs among low-income parents, while allowing for group interactions, may increase parental investments. To this purpose, the paper evaluates the causal impact of a light-touch behavioural intervention in the form of two videos we designed and produced on parental practices and behaviours towards children. The intervention was designed with three objectives in mind. First, we investigate the impact of providing information and persuasive messages about the importance of early parental investments in children. Second, we study the effect of boosting such information mechanisms by offering generalized positive feedback to parents about their effectiveness as parents as a way of improving their self-efficacy beliefs (PSE beliefs, henceforth) through positive

messaging. Third, the screening of videos occurred in groups and was followed by group discussions which allowed for interactions among parents to exchange opinions and learn from each other.

The sample includes parents that were part of the evaluation of a parenting programme (called First Steps) implemented in 2015 in the Ngororero province in rural Rwanda. This programme was extremely effective in improving child development and parental investments outcomes in both short- and medium-term. In Justino et al. (2022), we show that a key channel driving these lasting effects was an increase in parental time investment.[1] However, it was unclear what could be the drivers of change in parental investments. We returned to Ngororero in 2018 and screened the two videos with the aim of identifying the relevance of the factors outlined above in affecting parental investments.

The content of both videos centered around conveying specific information about the importance of parenting, how parents can improve the development of their children, and ways in which parents can engage with their children, even when their time and resources are severely scarce. The second video includes, in addition, a component designed to improve the confidence of parents by providing them with a generalized positive feedback about how their actions benefited their children. Because the parents we worked with had participated in First Steps, we were able to use the evaluation results of the intervention to provide parents with concrete information about how their actions shaped their children's development. The intervention was implemented in 80 villages across the Ngororero province, one of the poorest and most remote areas of Rwanda.[2]

We collected baseline data in May 2018 and endline data in October 2018. The two videos were screened one week after the baseline data collection, between May and June 2018. The intervention was designed as a cluster-randomized controlled trial with three treatment arms at the village level. In the first arm, the information treatment group (T1), parents watched a video that contained information and persuasion messages about the importance of parents engaging with their children and playing an active role in supporting their development. In the second arm, the information and feedback treatment group (T2), parents watched a second video which, in addition to the contents of the first video, included also positive feedback messages based on the results of the evaluation of First Steps. The provision of generalized positive feedback and not individual feedback (irrespective of parents' and child actual performances) allows us to understand whether the provision of a signal about the average performance of children and parents within a group can boost beliefs and be effective at generating parents' behavioural change.[3] The two video screenings were followed by group discussions among parents ran by a facilitator in order to promote group exchanges and learning. In the third group, the control group, parents watched a placebo video on agricultural production techniques set in Rwanda.

We investigate the impact of the video interventions within the framework of a parental investment function (Attanasio et al. 2019; Attanasio, Cattan, et al. 2020). Within this framework, we first investigate whether the video interventions were effective in directly changing parental investments. We focus on two dimensions of parental investments: time investment (our main outcome of interest) and material investments (in our setting, these include investments in reading and playing materials). Second, we

[1] First Steps is a group-based early childhood development programme designed to strengthen parenting skills through 17 weekly group meetings. An evaluation of the short- and medium-term impact of the programme is provided in Justino et al. (2022).

[2] Rwanda is one of the poorest countries in the world, with GDP per capita below USD1000. The Ngororero district is one of the poorest in Rwanda. Around 48 per cent of its population is under the poverty line, and over 50 per cent of children under five years old (National Institute of Statistics of Rwanda 2015).

[3] We provide only positive feedback based on the average impact of First Steps, and not on information about individual performance. This choice is based on recent literature showing that subjects treat positive signals as more informative than negative ones (Möbius et al. 2022). Our intention is not to study whether the provision of correct information about individual performance has a role in updating beliefs about own ability (Bobba and Frisancho 2022), but rather how a positive signal about average performance can shape behaviour.

examine whether the intervention directly affected the set of potential drivers of parental investments we discuss above: (i) measures of parental self-efficacy beliefs and beliefs about their knowledge of optimal parental practices, and (ii) perceived support from the community. We then implement a linear mediation analysis to assess to what extent the intervention directly changed parental investments and to what extent the changes are indirectly explained by a change in these hypothesized parental investments inputs.

We document a number of important results.[4] First, we find a large and positive impact of the information and feedback treatment (T2) on maternal time investment (0.2 SD). The provision of information and persuasive messages only (T1) increases maternal time investment by 0.06 SD but the effect is overall not statistically significant. This result is consistent with social learning theory that highlights the importance of the provision of performance accomplishments for behavioural change, even if information and persuasive messages have been provided (Bandura 1982). Second, contrary to expectations, we show that the video intervention had a weak and statistically insignificant impact on parental self-efficacy beliefs and knowledge beliefs. Finally, we find a strong positive impact of both treatments on the indicator of perceived social support. We interpret this latter result as suggestive of an improvement in group relationships and learning when information and positive feedback are provided in group-based interventions.[5] This is a new result in the literature and important because it suggests that interactions between parents and the perceived support within the the community may have played a role in affecting parental investments decisions. This may open up new research on the role of the signals provided by the parents' network as determinants of parental investments in early child development, a potentially important dimension of intervention design and scaling up in developing settings. The relevance of this result is further strengthened by a simple linear mediation analysis that decomposes the effect of the interventions on maternal time investment into components attributable to changes in these measures. This decomposition shows that beliefs explain between 6 and 12 per cent of the overall effect of, respectively, T1 and T2 on maternal time investment. The measure of perceived social support explain about the 23 per cent of the effects of the two treatments on maternal time investment, both substantial results.

As a final result, we report significant heterogeneous impacts of the intervention across groups within our sample. Notably, both treatments have larger impacts on time investment for poorer households, and amongst families whose child development indicators and self-efficacy beliefs were below the median at baseline. Taken together, these results suggest that the provision of information and, especially, positive feedback has stronger impacts on the most vulnerable families. This is a significant result showing the importance of information and feedback among time- and resource-constrained households.

As an additional exercise, we investigate the impact of the video intervention among a sample of mothers who did not participate in the First Steps parenting programme in 2015. The evaluation of First Steps (Justino et al. 2022) was designed to include a control group that never received the parenting training programme. This group was supposed to have been part of First Steps after our evaluation, but for a variety of reasons this did not happen.[6] Therefore, when we designed and implemented this video and group discussion intervention, there was a sample of parents that was never engaged in the First Steps parenting training. We saw this as an opportunity to evaluate the importance of information and feed-

[4] All results are robust to a set of validity checks that account for few observed imbalances at baseline, differential attrition, to alternative estimation models (inverse probability weighting), and to alternative construction of average aggregate indexes.

[5] We note, however, that we are not able to disentangle the learning effect through the group from possible individual learning effects as both treatments were followed by group discussions. The strong effect on social support measures suggests, however, a potentially strong role for group learning effects, a finding we intend to pursue further in future research.

[6] The First Steps control group was supposed to receive the programme after the endline data were collected (October 2016). However, due to implementation challenges, the programme was either never implemented or only partially and poorly implemented in a few villages of the control group. See Justino et al. (2022) for more details. We were informed about this only after the design and implementation of the video interventions. More details are provided in Section 10.

back provision among parents never involved in formal parenting training interventions. In other words, are the information and feedback video interventions also useful in the absence of a more formal and extensive parenting training programme? The results show a larger impact of both video treatments (T1 and T2) on maternal time investment for mothers that did not participate in First Steps relative to those that participated, suggesting that the information and positive feedback mechanisms are not necessarily conditional on prior participation in a formal parenting training intervention and may change parental behaviour on their own. In addition, even though the information treatment (T1) was not significant among parents that participated in First Steps, it was effective among families that did not participate. This is not surprising as T1 provided new information to this group of parents. We interpret these findings with caution as this was not the intended design of this study and other mechanisms that we did not measure may have played a role (i.e. social conformity effect). However, the policy implications are interesting as results suggest that light-touch interventions that address information and confidence constraints and allow for group interactions could be effective in increasing parental investments and eventually improving early child outcomes in challenging contexts where more sophisticated programmes may be difficult to implement and scale-up.

Our paper offers important contributions to three strands of literature. The first is a growing literature that investigates the determinants of parental investments and their effects on child development outcomes, including the role of parental beliefs, perceptions, and other psychologically-grounded inputs. A few recent papers investigate the role of parental beliefs and expectations about the returns to investments as important determinants of parental investments (Cunha et al. 2013; Boneva and Rauh 2018; Attanasio et al. 2019; Bhalotra et al. 2020; List et al. 2021; Attanasio, Boneva, and Rauh 2020). Our focus is on the role of information and knowledge about optimal parenting practices, perceived beliefs about self-efficacy and competence in parenting, and the perceived role of social support. Parental self-efficacy beliefs have been studied in the social psychology literature mostly as an additional input determining parenting investments in early child development (Spoth et al. 1995; Miller-Heyl et al. 1998). This literature, which builds on the social learning and cognitive theory developed by Albert Bandura (Bandura 1982, 1977), focuses on the idea that individual behaviours can be driven by one's beliefs. If a person is not convinced that their actions will make a difference, the resources and opportunities which may be available will remain unexploited. We bring these insights to a growing body of economics literature on the determinants of parental investments by designing and evaluating a light-touch behavioural intervention designed to boost parental self-efficacy and knowledge beliefs, factors that so far have received limited attention in economics, especially in a low-income setting where such interventions may be most needed given the large resource, educational, and knowledge constraints faced by parents in such settings. The effect of the intervention on measures of perceived social support is particularly interesting given its implications for developing countries where more communal ways of child raising may offer opportunities to better leverage group learning interventions.

Second, we contribute to the social learning literature itself by testing explicitly the relative importance of the provision of information and persuasive messages and the boost effect generated by the additional provision of a generalized positive feedback to parents. This literature shows how behavioural change may be shaped by persuasion that the individual possesses the capabilities to master certain activities (verbal persuasion), the observation that people similar to ourselves succeed by their sustained effort (vicarious experience), or the direct experience of mastery or recognition of it (performance accomplishment) (Bandura 1977; Mouton and Roskam 2015). Our videos were designed to account for these mechanisms and test the importance of the latter component relative to the first two. To the best of our knowledge, we are the first to study these mechanisms in the context of the economics of parenting literature. The empirical relevance of T2 and the heterogeneous impacts of T1 and T2 across socio-economic status offer promising avenues for future research in economics on how each of the dimensions above may best impact on parental investments in different socio-economic contexts.

A related literature in economics has studied the link between motivation and self-confidence in other contexts outside parenting decisions. For instance, Benabou and Tirole (2002) highlight how higher self-confidence improves individual motivation to put more effort in the pursuit of own goals and that receiving positive feedback motivates beliefs and behavioural change. We add to these insights by showing that the provision of a positive feedback can also be applied to the context of parental decision-making processes: providing positive feedback to parents about their parenting skills and their children's development achievements changes parental behaviour, especially among the most vulnerable households who benefit the most from these interventions.

Finally, the paper is related to a growing literature in economics on the effectiveness of technological tools, in particular the media, to promote behavioural change. The use of media as an effective tool to promote social change and development is now widely recognized (La Ferrara 2016; Banerjee et al. 2019).[7] In this study, we deliver our messages directly to the parents through videos, a novelty in the literature. Another novelty of our intervention is that the videos include not only messages that expose viewers to role models with whom a viewer can identify and relate to as in Bernard et al. (2014), but they also include persuasion and positive feedback messages directed at parents and delivered by a professional in the field. Even though our targeted region is very poor and TV ownership is quite rare,[8] we show that this type of intervention has substantial effects in affecting behavioural change, especially among the most deprived households. Given its low cost and light touch, we believe the potential for scaling up of such video interventions is large, in particular in developing countries and either as part of existing parenting interventions or on their own.

2 Study and experimental design

The intervention was evaluated using a cluster-randomized controlled trial with a placebo group and two treatment arms randomly assigned at the village level. The intervention was designed and implemented by the Institute of Development Studies (IDS) in collaboration with Save the Children, in 80 villages in the (rural) Ngororero district in the Western province of Rwanda.

We designed and screened two videos. The first video (screened in 27 villages)—the information treatment (T1)—includes the following contents: (i) images of a family; (ii) information about optimal parental practices; and (iii) persuasion messages directed at parents. The video includes scenes of actors impersonating a family typical of the location (farmers) in a setting that resembles the Ngororero district. The scenes show a mother, father, and two young children going about their daily life. The parents work in the field, cooking, cleaning, and taking care of their children, playing with them, and reading books. Individuals watching the video are 'transported' into the story (M. C. Green and Brock 2000) and exposed to a salient experience to which they can emotionally connect to. In the second part of the video, an actor plays the role of an ECD (early child development) professional and addresses the parents directly. The actor explains the importance of believing that as parents they can really make a difference in their children's development (verbal persuasion component) through simple interactions with their child. The actor then proceeds to highlight the importance of playing, telling stories, reading books, caring, using positive discipline, and providing good nutrition and a balanced diet (information component), by providing practical examples to parents and encouraging them about their capabilities.

[7] Bernard et al. (2015) reviews this literature and highlights the importance of framing messages delivered through videos/TV in a way that individuals relate to them.

[8] In our sample only 1 per cent of the families own a TV, and according to the 2015 national survey (DHS 2015), on average only 10 per cent of the population in Rwanda owns a television.

The second video—information and feedback treatment group (T2)—includes, in addition to the content of the first video, a feedback component. Most families in this study participated in the First Steps parenting programme in 2015. First Steps led to an improvement in child development indicators (communication, gross motor, fine motor, problem solving, and personal social skills) and parenting practices (Justino et al. 2022).[9] In the video, the actor impersonating the ECD professional summarizes these achievements in a simple and direct way. The actor praises the parents and provides a generalized positive feedback to them with the aim of boosting their PSE beliefs. We provided a generalized positive feedback to all parents watching the videos no matter what their individual achievements may have been. The positive feedback was formulated to highlight their better parenting performance and child's positive development 'on average' and relative to other parents that did not participate in First Steps. This second video was screened in 28 villages.

In the remaining 27 villages we screened a third video (Placebo group) on agricultural production techniques in Rwanda. This was done to control for the fact that we screened a video in a setting where TV and video screenings are extremely rare (Bernard et al. 2015).

We assigned the treatment at the village level with strata at the cell level.[10] Participation in the intervention was voluntary.[11] Almost all families in the three groups who were offered participation in the study accepted the invitation (92 per cent). Compliance rates, calculated as the ratio between the number of participants at endline and the number of people assigned to the treatment at baseline, was 90 per cent for the T1 group and 89 percent for the T2 group. This sample size and evaluation methodology was designed to give us sufficient statistical power to detect causal effects. In a randomized trial with 27 clusters (villages) per treatment/control arm, and with 18 observations per cluster, the minimum detectable effect size was 0.25 standard deviations (with 80 per cent power and 0.05 intra-cluster correlation).[12]

3 Economic framework

The objective of our study is to investigate the *direct* role of the interventions (T1 and T2) as potential sources of change in parental investments and the *indirect* role (through the interventions) of parental beliefs and perceived support measures as potential determinants of parental investments. We study these effects within the framework of the following parental investment function:

$$P_t^j = f_t\left(\theta_0, T_t^i, S_t^\tau, R_t^\lambda, X_0, \eta_t\right) \tag{1}$$

Parental investments (P^j) can be modelled as a function of child development skills in the initial period (θ), of T which allows measuring the direct effects of the treatments (i.e. T1 and T2), of parental investments, of a set of parental beliefs (S^τ), and of perceptions of support (R^λ) from the community. Parental

[9] See Appendix A for a short description of the First Steps programme.

[10] A cell is a larger geographical unit than the village. Each cell includes a certain numbers of villages. See Appendix A2 for more details about the sampling and the randomization.

[11] During the baseline data collection in May 2018 we gave each parent an invitation to the video screening. Invited parents were expected to show up in a location within the village on a specific day and time to watch a video (see Appendix A1 for more details). At the end of the video screening, the facilitator started a group discussion with the parents to talk about the key messages of the video.

[12] Both compliance rates and power calculations are based on the original sample of parents and children that were part of the First Steps study. As we explain in Section 10, the main analysis of this paper is based on a reduced sample that does not include the First Steps control group. For the reduced sample, the compliance rates are 89 per cent for the T1 group and 84 per cent for the T2 group. In Appendix Section F1 we provide ex-post power calculations based on the reduced sample. We show that we have power to detect only large effects.

investments are also a function of a set of individual (parent and child) and household characteristics measured at baseline (X). η is the error term.

The interventions we designed generate an exogenous shock (through the provision of information, feedback and allowing for group discussions) and are therefore expected to generate exogenous variation in parental investments (P^j), parental beliefs (S^τ), and perceived support measures (R^λ). We take a reduced-form approach to document evidence of a change in these measures.[13]

4 Measurement

Investments (P^j). We measure parental *time investment* using data we collected on reported frequency of parent–child interaction on a set of activities. This is our key outcome of interest. We also collected additional measures that can be considered as proxies of parental investments aside from time investments. In particular, we measure parental *material investment* using information on the presence of children-related reading material and toys at home. We define these outcomes as *reading and play material in the home environment*.[14] As material investment is not possible for many poor parents, in the videos we highlight the importance of specific activities aimed at improving the quality of daily interactions between parents and their child based on activities that could be conducted alongside daily routines (for instance, parents would be informed and persuaded (T1) and additionally praised (T2) for talking more often to their children while cooking). This emphasis on child engagement alongside daily routines offers improved parenting skills without adding to the daily stresses of coping with low incomes in very remote areas.

Beliefs (S^τ). We measure parental *self-efficacy* beliefs using a very detailed tool, *Tool to Measure Parenting Self-Efficacy* (TOPSE) (Kendall and Bloomfield 2005). This is a task-specific measure that asks parents to rate how much they agree with each statement, within eight different domains, and how much they feel competent as parents for each task. We also asked parents about their *knowledge beliefs* around child development and child-related socio-emotional behaviours and practices. We investigate these measures separately but also build an aggregate index for the purpose of the mediation analysis.

Social support (R^λ). We asked parents specific questions to obtain a measure of *perceived social support from the community* (e.g. whether she receives support from someone within the community, and whether she joins the community to address a common problem). We build an average aggregate index of these questions. These measures will not capture the full social interactions dynamics within the groups and the community as we did not collect network data. They should therefore be interpreted as coarse proxies of social dynamics within the community.

Appendix Section A3 provides a detailed description of all tools and data collected and used in this study. To draw general conclusions about the experiment's results and to address the problem of testing multiple hypotheses, we constructed summary indices for each set of outcomes. We provide more details in Section 6 and in Appendix Section A3.

[13] We depart from the approach used in List et al. (2021) and do not exploit the randomly assigned treatments as instruments for our measures S^τ and R^λ, because we expect the treatments to directly affect parental investments. The mediation analysis we implement in Section 8 will shed more light on the indirect role of these measures.

[14] The context of the study is a poor rural area in Rwanda. Buying toys or books, for example, is in most cases outside the sphere of control of the parents in this setting. The focus on the time component of investment serves to make these results useful for future use in similar poor and rural areas.

5 Data

5.1 Data description

The baseline data (BL) were collected in May 2018, and endline data (EL) were collected in October 2018, four months after the intervention. Figure 1 reports a timeline of the study. At baseline, the study included an average of 500 parents for each intervention arm, with a total sample of 1,525 parents. The principal caregiver in 1,335 families was the mother. The father was identified as the main caregiver in 124 families. In October 2018, due to an average attrition rate of 3 per cent, the total sample included 1,479 parents, of which 1,257 were mothers.[15] The sample we use for the analysis is further reduced to include mothers that were interviewed both at baseline and endline and reported being the main caregiver of the child (1,180 mothers) and that participated in First Steps in 2015 (855 mothers).

We tested for differential attrition in group assignment and baseline characteristics. We do find some evidence of differential attrition (results in Appendix Section B).[16] Hence to account for potential differential attrition across treatment groups, we also estimated treatment effects using inverse probability weighting (IPW) that adjusts any potential attrition bias by weighting the observations with the inverse of the probabilities of not dropping out of the sample. All results are consistent with our main findings (discussion and results in Appendix Section B).

5.2 Baseline balancing

We examined whether observable baseline characteristics and outcomes of interest are balanced among treatment arms (Table 1). Column 1 reports averages of all variables in the control group at baseline.[17] Columns 2 (5) show the mean differences between variables in T1 (T2) and the control group. Columns 3 (6) show the corresponding unadjusted p-values. With the exception of some differences in self-efficacy measures in T1, all other dimensions are balanced across treatment and control groups. Normalized differences (Austin 2011) are smaller than one fourth of the combined sample variation, suggesting that linear regression methods are unlikely to be sensitive to specification changes (Imbens and Wooldridge 2009). In Appendix C we provide results from empirical checks that account for the observed imbalances. First, we add in the specification all control variables demeaned and interacted with the treatment indicators (Appendix Section C1). Second, we estimate inverse probability weighting and augmented inverse probability weighting to account for any existing unbalance at baseline (Appendix Section C2). We run these tests on all outcomes. All results are robust to these tests which reassures that the existing imbalances in self-efficacy measures are not likely to affect our results. We report also randomization inference p-values for each set of estimates and find that these are largely consistent with the main estimates.

5.3 Descriptives

Using information collected at baseline, we investigate the correlation between child development indicators, socioeconomic characteristics, and parental investments. As expected, child development skills are higher the higher the education level of parents (see Panel A Figure 2) and the higher the level of parental investments (see Panel B Figure 2). This is consistent with the existing empirical evidence that

[15] The sample of fathers is very small and therefore we exclude them from the analysis.

[16] We note that when we do the same analysis using the full sample that includes also fathers, we do not find any evidence of differential attrition. These results are available upon request.

[17] It should be noted that all variables that have been standardized against the control group have mean 0 and standard deviation equal to 1.

documents an observed gap in child development outcomes between low and high socioeconomic background families, and that at least part of this gap can be correlated with low parental investments (List et al. 2021).

We investigate the relationship between maternal investments and the inputs that enter the investment function as described in Equation 1 by regressing maternal time investment on these inputs (one at a time) and other mother's and household's characteristics. Figure 3 documents a strong and positive correlation between maternal time investment, other investment measures (i.e. play and read material), and potential determinants of maternal time investments (i.e. PSE beliefs and knowledge beliefs, perceived support from the community).

6 Empirical strategy

We estimate the following model:

$$y_{ijt} = \alpha + \beta_1 T_{1j} + \beta_2 T_{2j} + \lambda y_{ij0} + \gamma X_{ij0} + e_{ijt} \tag{2}$$

where y_{ijt} is the outcome for individual i, in village j surveyed at time t. t is equal to 0 at baseline and to 1 for endline observations.[18] The terms T_{1j} and T_{2j} are binary indicators for, respectively, the information treatment (T1) and the information and feedback treatment (T2). y_{ij0} is the baseline level of the outcome for individual i in village j, and X_{ij0} are baseline characteristics. In order to improve statistical power (McKenzie 2012), we include controls for child age and gender, the mother's age and education, her marriage status, the number of children in the household, an asset index, whether the child is enrolled in pre-primary school, and whether the caregiver participated in other parenting programmes. We support our main estimates using an alternative specification that includes control variables selected with the post-double selection LASSO procedure (Appendix Section E).

The parameter of interest is β, the average difference between treatment and control observations at endline. Under the assumption that the control observations constitute a valid counterfactual for the treatment sample, this identifies the causal effect of the intervention on parents that participated in the intervention. This is the intent to treat (ITT) estimate. Our specification includes strata fixed effects at the cell level to account for the randomization design. We clustered standard errors at the village level.

To account for multiple inference we follow two approaches. First, we construct summary indexes for each outcome of interest following Kling et al. (2007). Each index is defined to be the equally weighted average of its components with the sign of each measure oriented so that more beneficial outcomes have a higher score. The description of how we constructed each aggregate index is reported in Appendix Section A3. In Appendix Section D we present results using an alternative construction of the aggregate index (i.e. a weighted mean index) following Anderson (2008). Second, we further account for multiple hypothesis testing across the indices by calculating p-values using a step-down procedure with a nonparametric permutation test which controls the family-wise error rate (FWER), following Westfall et al. (1993) and Efron and Tibshirani (1994). The p-values used in this procedure are those generated by randomization inference (Young 2019).

[18] y_{ijt} in this model refers to both maternal investment measures (i.e. time and material investments) and their potential determinants (i.e. beliefs and support measures).

7 Findings

We present first our findings on parental investments: maternal time investment (our key outcome of interest) and investments in reading and play material in the home environment. We then show reduced-form results on the impact of the video interventions on the hypothesized determinants of parental investments (i.e. beliefs and support).

7.1 Effect of the interventions on parental investments outcomes

Time investment. Table 2 reports the estimated coefficients of the impact of the intervention on maternal time investment. The results show that only the provision of information and persuasive messages (T1) has a positive impact on maternal time investment but the coefficient is small and not significant. The provision of information and feedback (T2) increases the quality and frequency of interactions between the mother and the child by 0.2 SD. Looking at the components, learning activities are those mostly affected by the intervention. This is consistent with evaluations of ECD programmes highlighting how the most malleable, and thus improvable, dimensions of parental investment are the caregiver–child learning activities (Engle et al. 2011; Knauer et al. 2016; Justino et al. 2022). Learning activities such as singing, telling a story, playing with toys, reading, and counting are easily taught and are easily replicable once learnt. We look at the effects of the treatments on maternal single activities (Appendix Table G2). The results show that the information and feedback treatment affected mostly parental investments in learning activities and partly positive-discipline-related activities.

Reading and play material in the home environment. We investigate also whether the intervention affected the presence of reading and play materials in the home. The results in Table 3 show positive but not significant coefficients of the treatments on the average aggregate index of this measure, but the coefficients on some of the components are quite large and significant (i.e., coloring books, drawing material, colour and size games). The differences between T1 and T2 are however not statistically different, suggesting that both treatments were equally effective at shifting investments in some of these materials. This result is reasonable as we did not expect that the additional provision of a feedback in T2 would have changed differently the presence of reading and play material in the household.

7.2 Effect of the interventions on beliefs and support measures

Panel A of Table 4 shows results on the impact of the treatments on **PSE beliefs**. The coefficients on both treatments are either negative or close to zero and not significant. As discussed in Section 5, we estimate models using inverse probability weighting techniques (IPW and augmented IPW) to account for the imbalances observed at baseline on these measures. Appendix Table C3 shows results on PSE that are in general consistent with the main findings in Panel A of Table 4 (more details in Appendix Section C2). Overall, these results suggest that both treatments have a very small and mostly not significant impact on PSE beliefs. A first explanation for these results is that in low-income contexts, in our case Rwanda, parents might overstate their self-perception about parenting perhaps because they are not so aware or interested in the tasks being asked. We looked at the descriptives of PSE beliefs at baseline (Appendix Table G1) and noted that mothers reported high levels of PSE beliefs at baseline across most of the domains. Hence there might be little margin of increase of this measure following the intervention. This is an important finding that requires further research to inform how parental self-efficacy beliefs and other non-cognitive dimensions related to parenting are shaped in low-income contexts. Second, our measure of PSE is self-reported and task specific. With this type of measure it is difficult to disentangle preferences from beliefs (Manski 2004). Hence it is also possible that the lack of effect on this outcome

is caused by the way we measured PSE beliefs.[19] The effect of both treatments on maternal **knowledge beliefs** towards child behaviours and socio-emotional practices are in general positive but mostly not significant (Panel B of Table 4). Overall these results suggest that both T1 and T2 had small and mostly not significant impact on parental self-efficacy and knowledge beliefs. These findings are consistent with similar recent studies showing that light-touch and low-cost psychological interventions may not be effective, at least in the short term, in changing psychological outcomes such as beliefs (Baranov, Haushofer, and Jang 2020) but they can be effective in changing behaviours.

Finally, we investigated the effect of the interventions on indicators of **perceived social support**. The results in Panel B of Table 5 show that both treatments (T1 and T2) positively affected the social support aggregate index (by 0.14 and 0.15 SD, respectively). Mothers are more likely to report that they join together with other community members to address a common problem. These positive results on perceived social support might be due to the specific design of the intervention as parents met in groups to watch the video and the screening of video was followed by a group discussion. This result, while being only suggestive is, however, consistent with the idea that group-based programmes (often also less expensive than home visit programmes) can encourage peer-to-peer learning and support, and have the potential to modify group norms with respect to child raising and education (Aboud and Yousafzai 2015; Carneiro et al. 2019). Future research should focus on collecting full network data and study the learning process among parents in these settings.

8 Mediation analysis

We conduct a mediation analysis to investigate the *direct* role of the treatments (T) on providing direct information and persuasive messages to parents (in both T1 and T2) along with the additional feedback component (only T2). The interventions, through the interactions and discussions parents had between them and with the facilitators, may have directly influenced parental behaviours. We then investigate the potential mediating and *indirect* role of beliefs (S^{τ}) and social support measures (R^{λ}) in changing maternal investment behaviours.

We perform a mediation analysis following Heckman et al. (2013) in which we add the mediation measures of interest—the beliefs and support indexes[20]—to Equation 2 and estimate the following specification:

$$P_{ijt} = \alpha + \beta_1 T_{1j} + \beta_2 T_{2j} + \theta_0 + \omega S_t^{\tau} + \delta R_t^{\lambda} + \lambda P_{ij0} + \gamma X_{ij0} + e_{ijt} \tag{3}$$

where all variables are defined as in Equations 1 and 2.

Results in Column 4 of Table 6 show slightly lower coefficients on T1 and T2 after controlling for the mechanisms and for child development skills at baseline. This suggests for a large direct impact of the intervention on maternal time investment (roughly about 72 and 65 per cent for T1 and T2, respectively). The coefficients on the mechanisms are however large and statistically significant, suggesting for a mediating role of the hypothesized mechanisms. We decompose the overall intervention effect into exogenously induced changes in maternal beliefs and perceived support measures and other factors that can be attributed to the direct effect of the intervention. Columns 5 and 6 suggest that roughly the 6 and 12 per cent of the T1 and T2 effects, respectively, can be ascribed to the increase in maternal PSE beliefs and knowledge beliefs. Similarly, the 23 per cent of the T1 and T2 effects can be attributed to an increase

[19] Due to budget and time constraints, we did not elicit beliefs with hypothetical scenarios as in the most recent literature that studies parental beliefs (Attanasio et al. 2019; Boneva and Rauh 2018).

[20] We use two aggregate indexes to implement this analysis. We build an average aggregate index by taking the mean of the standardized PSE beliefs and knowledge beliefs indexes and re-standardize it. Then we take the social support average aggregate index as the second measure of interest.

in social support.[21] This analysis shows that the mediating contribution of the beliefs measure is almost two times larger for T2 relative to T1, whereas the contribution of the support measure is mostly similar between the two treatments.

Although we cannot assign a causal interpretation to this simple mediation analysis (D. P. Green et al. 2010), it provides suggestive evidence about the role of these parenting inputs as potential mechanisms explaining the overall effect of our intervention on maternal time investment. In order to partially attribute a causal interpretation to this mediation analysis, we implement unobservable selection and coefficient stability tests proposed in Oster (2019) to test if the coefficients on the mediators change based on the inclusion of observed controls. The idea of this test is that if the coefficient on the mediating factors does not change substantially with the inclusion of observable controls, it is unlikely that the coefficient estimates change with the inclusion of unobservables. The bottom of Table 6 shows that the bias-adjusted coefficients, for each mediating factor presented at the bottom of the tables, while slightly attenuated, are broadly in line with the estimates on our main results. These results suggest that the mediating impact of the mediating factors are relatively robust to unobserved heterogeneity.

9 Heterogeneous treatment effects

We analyze heterogeneous effects by testing whether the impact of the video intervention differs across the gender and age of the child, assets held by the family, the age and the level of education of the mother. We report results on heterogeneous effects on maternal time investment in Table 7. Each row reports estimates from an OLS regression. In Columns 1 and 2 we report the uninteracted effect of T1 and T2 treatments, respectively. Columns 3 (4) report the interaction between T1 (T2) treatments and the characteristics of interest. The results show that the effects of the intervention on maternal time investment are largely the same regardless of the gender and the age of the child, the age and the education level of the mother. We observe a much larger impact of both treatments on maternal time investment for poorer households.

We also looked at the heterogeneous impact of the treatments on maternal time investment by baseline levels of the child development indicator,[22] maternal time investment, and PSE beliefs. Although we did not experimentally test for these heterogeneous impacts, Figure 4 shows interesting patterns. Panel A shows that among mothers with child development index above the median, only the information and feedback treatment (T2) is effective in increasing maternal time investment. However, among mothers with child development index below the median, both treatments increase maternal time investment. Panel B shows similar results, although the effects of T1 and T2 are not statistically different from each other neither among mothers with the time investment index below nor among those above the median. Finally, Panel C of Figure 4 mirrors the results in Panel A. Both treatments increase maternal time investment among mothers with PSE beliefs below the median. Among mothers with PSE beliefs above the median, only the provision of information and feedback has a positive and significant effect on maternal time investment. These are interesting findings that suggest that not only the additional provision of a positive feedback but also the simple provision of information and persuasive messages (T1) is needed among parents with low self-efficacy beliefs and with children whose development indicators are below the median. In contrast, among parents with indicators above the median, the simple provision of information and persuasive messages is not enough to increase further their time investments in children. The additional provision of a feedback triggers a substantial increase in time investments.

[21] The mediation effects reported in Columns 5 (6) were calculated by multiplying each coefficient from Columns 1 (2) with the corresponding coefficient in Column 4 and by dividing this number by the coefficient on T1 (T2). The number is then normalized to 100 and presented in per cent.

[22] This indicator was collected only at baseline in October 2018.

10 Including the First Steps control group

We mentioned earlier that our initial sampling frame included all households that were part of the evaluation of First Steps. As explained in more detail in Appendix Section A2, First Steps was evaluated through an RCT with two treatment arms and one control group. The control group was supposed to receive the treatment after the endline data collection in September 2016. However, due to several implementation issues (see Justino et al. (2022) for more details), parents in the control group did not receive the parenting programme. Thus, weconcentrated our main analysis on the sample of parents that participated in the First Steps parenting training programme.

However, it is of interest to examine the effect of both treatments on a sample that includes also parents that never received First Steps. The effect of the information treatment (T1) may inform on whether the screening of a simple and short video containing information and persuasive messages, and followed by group discussions, can still be effective in changing parental behaviours and other parental inputs without the presence of a more intense parenting training programme. The interpretation of the effect of the information and feedback treatment (T2) is more challenging because T2 involves the provision of feedback to parents that were not part of the parenting programme. However, it is plausible that such feedback may still have an impact through a 'social conformity mechanism' when individuals see people that 'look like them' being praised. This exposure to positive feedback may thus trigger a behavioural change.

Figure 5 reports the effects of T1 and T2 on maternal time investment and the other outcomes on a sample that includes our main sample plus villages that were part of the First Steps control group. The estimates (compared to those that use a sample that includes only First Steps treatment villages) show a larger and significant impact of both T1 and T2 on maternal time investment (0.1 and 0.3 SD, respectively). The largest effect is still attributable to the learning component. The effects on the reading and play material indicators are in general comparable to the ones shown in Tables 3, although the coefficient of T1 on the average aggregate index of the reading and play material measure is now larger and significant. The two coefficients are however not statistically different from each other. The effects of both treatments on PSE beliefs are comparable with the results that exclude the First Steps control group, while the effect on the knowledge beliefs measure are statistically significant and larger than those reported in Table 4. The effects of both treatments on the perceived social support indicator are also comparable but the coefficients are now larger in magnitude.

To shed further light on how the screening of the two videos impacted parents differently depending on their participation in First Steps, we show results of the intervention for the sample of mothers that were part of First Steps control group villages. The results in Figure 6 show that the information and feedback treatment (T2) has a larger and statistically different impact relative to the information treatment (T1) among both groups (i.e. First steps treatment and control groups). However, it is interesting to note that T1 increases maternal time investment by 0.2 SD among the sample of mothers that did not participate in First Steps (i.e. the First Steps control group)—even though it did not affect the group of mothers that received the First Steps parenting training programme. Overall, these results suggest that the video interventions (and in particular the provision of both an information and feedback treatment) have a larger effect in a group that was never exposed to the parenting programme.

11 Conclusions

This paper investigated the effect of a light-touch intervention designed to understand how to change parental investments and the channels that may drive any observed change. We randomized the screen-

ing of two videos to parents in a rural, remote district of Rwanda. The first video was designed to provide information and persuasive messages related to parenting optimal practices and behaviours. The second video included also positive feedback messages to parents that participated in a parenting training programme a few years before. After the screening of each video, parents spent about one hour in a group discussion. Our results show that, among mothers that participated in the First Steps parenting programme, the provision of information and persuasive messages (T1) does not improve maternal time investments. However, the additional provision of positive feedback to parents improves time investments, increasing it by 0.2 SD. We also find that both treatments increase some measures of material investments. We show reduced-form estimates of both treatments on two sets of measures that may be important determinants of parental time investment (beliefs and support measures). We find no effect of the interventions on self-efficacy and knowledge beliefs, but find a positive effect of both treatments on perceived support from the community. These are important results that open new pathways for future research and policy design of learning processes and norms change in group interventions in developing countries as possible alternatives to more complex individualized parenting interventions.

We also find important heterogeneous impacts suggesting that the provision of both interventions (T1 and T2) increased maternal time investment among poorer mothers with levels of child development and PSE beliefs indicators below the median, and among mothers who were never exposed to First Steps.

Taken together, these results suggest that the provision of information and confidence-boosting messages may be important factors driving parental investments among deprived families even in the absence of larger, more complex parenting interventions, at least in the short term. We cannot rule out the importance of broader parental interventions to sustain meaningful improvements in child development indicators over the longer term. However, in challenging settings (for instance, remote areas or temporary contexts such as displacement camps or humanitarian settings), it is possible that simpler information and confidence-boosting interventions may yield positive effects among deprived families until more complex interventions are possible and feasible.

References

Aboud, F. E., and Yousafzai, A. K. (2015). 'Global Health and Development in Early Childhood'. *Annual Review of Psychology*, 66(1): 433–457. https://doi.org/10.1146/annurev-psych-010814-015128

Almond, D., Currie, J., and Duque, V. (2018). 'Childhood Circumstances and Adult Outcomes: Act II'. *Journal of Economic Literature*, 56(4): 1360–1446. https://doi.org/10.1257/jel.20171164

Anderson, M. L. (2008). 'Multiple inference and gender differences in the effects of early intervention: A reevaluation of the abecedarian, perry preschool, and early training projects'. *Journal of the American Statistical Association*, 103(484): 1481–1495. https://doi.org/10.1198/016214508000000841

Attanasio, O., Boneva, T., and Rauh, C. (2020). 'Parental Beliefs about Returns to Different Types of Investments in School Children'. *Journal of Human Resources*, Online before print(-): 0719-10299R1. https://doi.org/10.3368/jhr.58.2.0719-10299R1

Attanasio, O., Cattan, S., Fitzsimons, E., Meghir, C., and Rubio-Codina, M. (2020). 'Estimating the production function for human capital: results from a randomized controlled trial in Colombia'. *American Economic Review*, 110(1): 48–85. https://doi.org/10.1257/aer.20150183

Attanasio, O., Cunha, F., and Jervis, P. (2019). 'Subjective Parental Beliefs. Their Measurement and Role'. NBER Working Paper 26516. Cambridge, MA: National Bureau of Economic Research. https://doi.org/10.3386/w26516

Attanasio, O., Meghir, C., and Nix, E. (2020). 'Human Capital Development and Parental Investment in India'. *Review of Economic Studies*, 87(6): 2511—41. https://doi.org/10.1093/restud/rdaa026

Austin, P. (2011). 'An introduction to propensity score methods for reducing the effects of confounding in observational studies'. *Multivariate Behavioral Research*, 46(3): 399–424. https://doi.org/10.1080/00273171.2011.568786

Bandura, A. (1977). 'Self-efficacy: toward a unifying theory of behavioral change.' *Psychological review*, 84(2):

191. https://doi.org/10.1037/0033-295X.84.2.191
Bandura, A. (1982). 'Self-efficacy mechanism in human agency'. *American Psychologist*, 37(2): 122–47. https://psycnet.apa.org/doi/10.1037/0003-066X.37.2.122
Banerjee, A., La Ferrara, E., and Orozco-Olvera, V. H. (2019). 'The Entertaining Way to Behavioral Change: Fighting HIV with MTV'. NBER Working Paper 26096. National Bureau of Economic Research. https://doi.org/10.3386/w26096
Baranov, V., Bhalotra, S., Biroli, P., and Maselko, J. (2020). 'Maternal depression, women's empowerment, and parental investment: Evidence from a randomized control trial'. *American Economic Review*, 110(): 824–859. https://doi.org/10.1257/aer.20180511
Baranov, V., Haushofer, J., and Jang, C. (2020). 'Can positive psychology improve psychological well-being and economic decision making? experimental evidence from kenya'. *Economic Development and Cultural Change*, 68(4): 000–000. https://doi.org/10.1086/702860
Benabou, R., and Tirole, J. (2002). 'Self-Confidence and Personal Motivation'. *Quarterly Journal of Economics*, 117(3): 871-915. https://doi.org/10.1162/003355302760193913
Bernard, T., Dercon, S., Orkin, K., and Seyoum Taffesse, A. (2015). 'Will video kill the radio star? Assessing the potential of targeted exposure to role models through video'. *World Bank Economic Review*, 29(1): 226–237. https://doi.org/10.1093/wber/lhv014
Bernard, T., Dercon, S., Orkin, K., and Taffesse, A. (2014). 'The future in mind: Aspirations and forward-looking behaviour in rural ethiopia'. CEPR Discussion Paper. Centre for Economic Policy Research London. Available at: https://ideas.repec.org/p/csa/wpaper/2014-16.html
Bhalotra, S. R., Delavande, A., Gilabert, P., and Maselko, J. (2020). 'Maternal investments in children: The role of expected effort and returns'. IZA Discussion Paper No. 25513. Institute for the Study of Labor. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3562846#
Bobba, M., and Frisancho, V. (2022). 'Self-perceptions about academic achievement: Evidence from Mexico City'. *Journal of Econometrics*, 231(1): 58–73. https://doi.org/10.1016/j.jeconom.2020.06.009
Boneva, T., and Rauh, C. (2018). 'Parental beliefs about returns to educational investments-the later the better?' *Journal of the European Economic Association*, 16(6): 1669–1711. https://doi.org/10.1093/jeea/jvy006
Bradley, R. H., and Caldwell, B. M. (1977). 'Home Observation for Measurement of the Environment: a Validation Study of Screening Efficiency.' *American Journal of Mental Deficiency*, 81(5): 417-420.
Britto, P. R., Lye, S. J., Proulx, K., Yousafzai, A. K., Matthews, S. G., Vaivada, T., Perez-Escamilla, R., Rao, N., Ip, P., Fernald, L. C., et al. (2017). 'Nurturing Care: Promoting Early Childhood Development'. *Lancet*, 389(10064): 91–102. https://doi.org/10.1016/S0140-6736(16)31390-3
Carneiro, P. M., Galasso, E., Lopez Garcia, I. X., Bedregal, P., and Cordero, M. (2019). 'Parental Beliefs, Investments, and Child Development: Evidence from a Large-Scale Experiment'. IZA Discussion Paper No. 12506. Bonn: Institute of Labor Economics.
Cattaneo, M. (2010). 'Efficient semiparametric estimation of multi-valued treatment effectsunder ignorability'. *Journal of Econometrics*, 155(2): 138–154. https://doi.org/10.1016/j.jeconom.2009.09.023
Cunha, F., Elo, I., and Culhane, J. (2013). 'Eliciting maternal expectations about the technology of cognitive skill formation'. NBER Working Paper 19144. Cambridge, MA: National Bureau of Economic Research. https://doi.org/10.3386/w19144
Currie, J., and Almond, D. (2011). 'Human Capital Development Before Age Five'. In D. Card and O. Ashenfelter (eds), *Handbook of Labor Economics* (Vol. 4, pp. 1315–1486). Amsterdam: Elsevier. https://doi.org/10.1016/S0169-7218(11)02413-0
DHS. (2015). 'Rwanda Demographic and Health Survey 2014/15'. Tech. Rep.. Rockville, Maryland, USA: NISR, MOH, and ICF International: National Institute of Statistics of Rwanda (NISR) [Rwanda], Ministry of Health (MOH) [Rwanda], and ICF International 2015.
Doyle, O. (2020). 'The first 2,000 days and child skills'. *Journal of Political Economy*, 128(6): 2067–2122. https://doi.org/10.1086/705707
Efron, B., and Tibshirani, R. J. (1994). *An Introduction to the Bootstrap. Monographs on Statistics and Applied Probability* (Vol. 57). Boca Raton: CRC press. https://doi.org/10.1201/9780429246593
Emsley, R., Lunt, M., Pickles, A., and Dunn, G. (2008). 'Implementing double-robust estimators of causal effects'. *The Stata Journal*, 8(3): 334–353. https://doi.org/10.1177/1536867X0800800302
Engle, P. L., Fernald, L. C., Alderman, H., Behrman, J., O'Gara, C., Yousafzai, A., de Mello, M. C., Hidrobo, M., Ulkuer, N., Ertem, I., et al. (2011). 'Strategies for reducing inequalities and improving developmental outcomes for young children in low-income and middle-income countries'. *Lancet*, 378(9799): 1339–1353. https://doi.org/10.1016/S0140-6736(11)60889-1
Glennerster, R., and Takavarasha, K. (2013). *Running Randomized Evaluations: A Practical Guide*. Princeton University Press. https://doi.org/10.2307/j.ctt4cgd52

Green, D. P., Ha, S. E., and Bullock, J. G. (2010). 'Enough already about "black box" experiments: Studying mediation is more difficult than most scholars suppose'. *The Annals of the American Academy of Political and Social Science*, 628(1): 200–208. https://doi.org/10.1177/0002716209351526

Green, M. C., and Brock, T. C. (2000). 'The role of transportation in the persuasiveness of public narratives'. *Journal of Personality and Social Psychology*, 79(5): 701–721. https://doi.org/10.1037/0022-3514.79.5.701

Hastie, T., Tibshirani, R., and Wainwright, M. (2015). *Statistical Learning with Sparsity: The Lasso and Generalizations*. New York: Chapman and Hall/CRC. https://doi.org/10.1201/b18401

Haushofer, J., and Shapiro, J. (2016). 'The short-term impact of unconditional cash transfers to the poor: Experimental evidence from kenya'. *Quarterly Journal of Economics*, 131(4): 1973–2042. https://doi.org/10.1093/qje/qjw025

Heckman, J., Pinto, R., and Savelyev, P. (2013). 'Understanding the mechanisms through which an influential early childhood program boosted adult outcomes'. *American Economic Review*, 103(6): 2052–86. https://doi.org/10.1257/aer.103.6.2052

Imbens, G. W., and Wooldridge, J. M. (2009). 'Recent developments in the econometrics of program evaluation'. *Journal of Economic Literature*, 47(1): 5–86. https://doi.org/10.1257/jel.47.1.5

Justino, P., Leone, M., Rolla, P., Abimpaye, M., Dusabe, C., Uwamahoro, M. D., and Germond, R. (2022). 'Improving Parenting Practices for Early Child Development: Experimental Evidence from Rwanda'. *Journal of the European Economic Association*, December(-): jvac070. https://doi.org/10.1093/jeea/jvac070

Kendall, S., and Bloomfield, L. (2005). 'Developing and validating a tool to measure parenting self-efficacy'. *Journal of Advanced Nursing*, 54(2): 174–181. https://doi.org/10.1111/j.1365-2648.2005.03479.x

Kling, J. R., Liebman, J. B., and Katz, L. F. (2007). 'Experimental Analysis of Neighborhood Effects'. *Econometrica*, 75(1): 83-119. https://doi.org/10.1111/j.1468-0262.2007.00733.x

Knauer, H. A., Kagawa, R. M. C., García-Guerra, A., Schnaas, L., Neufeld, L. M., and Fernald, L. C. H. (2016). 'Pathways to improved development for children living in poverty: A randomized effectiveness trial in rural Mexico'. *International Journal of Behavioral Development*, 40(6): 492–499. https://doi.org/10.1177/0165025416652248

La Ferrara, E. (2016). 'Mass media and social change: Can we use television to fight poverty?' *Journal of the European Economic Association*, 14(4): 791–827. https://doi.org/10.1111/jeea.12181

Leung, C. Y. Y., Hernandez, M. W., and Suskind, D. L. (2020). 'Enriching home language environment among families from low-SES backgrounds: A randomized controlled trial of a home visiting curriculum'. *Early Childhood Research Quarterly*, 50(Part 1): 24–35. https://doi.org/10.1016/j.ecresq.2018.12.005

List, J. A., Pernaudet, J., and Suskind, D. L. (2021). 'Shifting parental beliefs about child development to foster parental investments and improve school readiness outcomes'. *Nature Communications*, 12(1): 1–10. https://doi.org/10.1038/s41467-021-25964-y

Manski, C. F. (2004). 'Measuring expectations'. *Econometrica*, 72(5): 1329–1376. https://doi.org/10.1111/j.1468-0262.2004.00537.x

McKenzie, D. (2012). 'Beyond baseline and follow-up: The case for more T in experiments'. *Journal of Development Economics*, 99(2): 210–221. https://doi.org/10.1016/j.jdeveco.2012.01.002

McKenzie, D., and Ozier, O. (2019). 'Why ex-post power using estimated effect sizes is bad, but an ex-post MDE is not'. World Bank Blogs - Development Impact. Washington, DC: World Bank. Available at: https://blogs.worldbank.org/impactevaluations/why-ex-post-power-using-estimated-effect-sizes-bad-ex-post-mde-not

Miller-Heyl, J., MacPhee, D., and Fritz, J. J. (1998). 'DARE to be you: A family-support, early prevention program'. *Journal of Primary Prevention*, 18(3): 257–285. https://doi.org/10.1023/A:1024602927381

Möbius, M. M., Niederle, M., Niehaus, P., and Rosenblat, T. S. (2022). 'Managing self-confidence: Theory and experimental evidence'. *Management Science*, 68(11): 7793–7817. https://doi.org/10.1287/mnsc.2021.4294

Mouton, B., and Roskam, I. (2015). 'Confident mothers, easier children: A quasi-experimental manipulation of mothers self-efficacy'. *Journal of Child and Family Studies*, 24(8): 2485–2495. https://doi.org/10.1007/s10826-014-0051-0

National Institute of Statistics of Rwanda (2015). *Demographic and Health Survey 2014/2015 - Western province Profile.* Kigali: NISR.

National Institute of Statistics of Rwanda (2018). *Population size and Population characteristics.* Kigali: NISR.

Oster, E. (2019). 'Unobservable selection and coefficient stability: Theory and evidence'. *Journal of Business & Economic Statistics*, 37(2): 187–204. https://doi.org/10.1080/07350015.2016.1227711

Robins, J. M., Rotnitzky, A., and Zhao, L. P. (1994). 'Estimation of regression coefficients when some regressors are not always observed'. *Journal of the American statistical Association*, 89(427): 846–866. https://doi.org/10.1080/01621459.1994.10476818

Spoth, R., Redmond, C., Haggerty, K., and Ward, T. (1995). 'A controlled parenting skills outcome study examining individual difference and attendance effects'. *Journal of Marriage and the Family*, 52(2): 449–464. https://doi.org/10.2307/353698

Tibshirani, R. (1996). 'Regression shrinkage and selection via the lasso'. *Journal of the Royal Statistical Society: Series B (Methodological)*, 58(1): 267–288. https://doi.org/10.1111/j.2517-6161.1996.tb02080.x

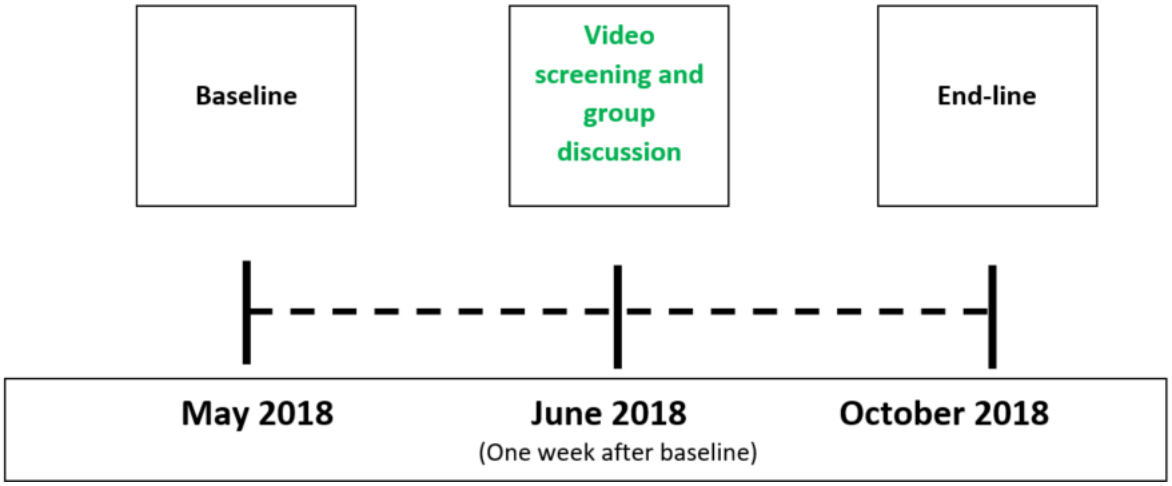
Westfall, P. H., Young, S. S., and Wright, S. P. (1993). 'On adjusting P-values for multiplicity'. *Biometrics*, 49(3): 941–945. https://doi.org/10.2307/2532216

Wittkowski, A., Dowling, H., and Smith, D. M. (2016). 'Does engaging in a group-based intervention increase parental self-efficacy in parents of preschool children? a systematic review of the current literature'. *Journal of Child and Family Studies*, 25(11): 3173–3191. https://doi.org/10.1007/s10826-016-0464-z

Young, A. (2019). 'Channeling fisher: Randomization tests and the statistical insignificance of seemingly significant experimental results'. *Quarterly Journal of Economics*, 134(2): 557–598. https://doi.org/10.1093/qje/qjy029

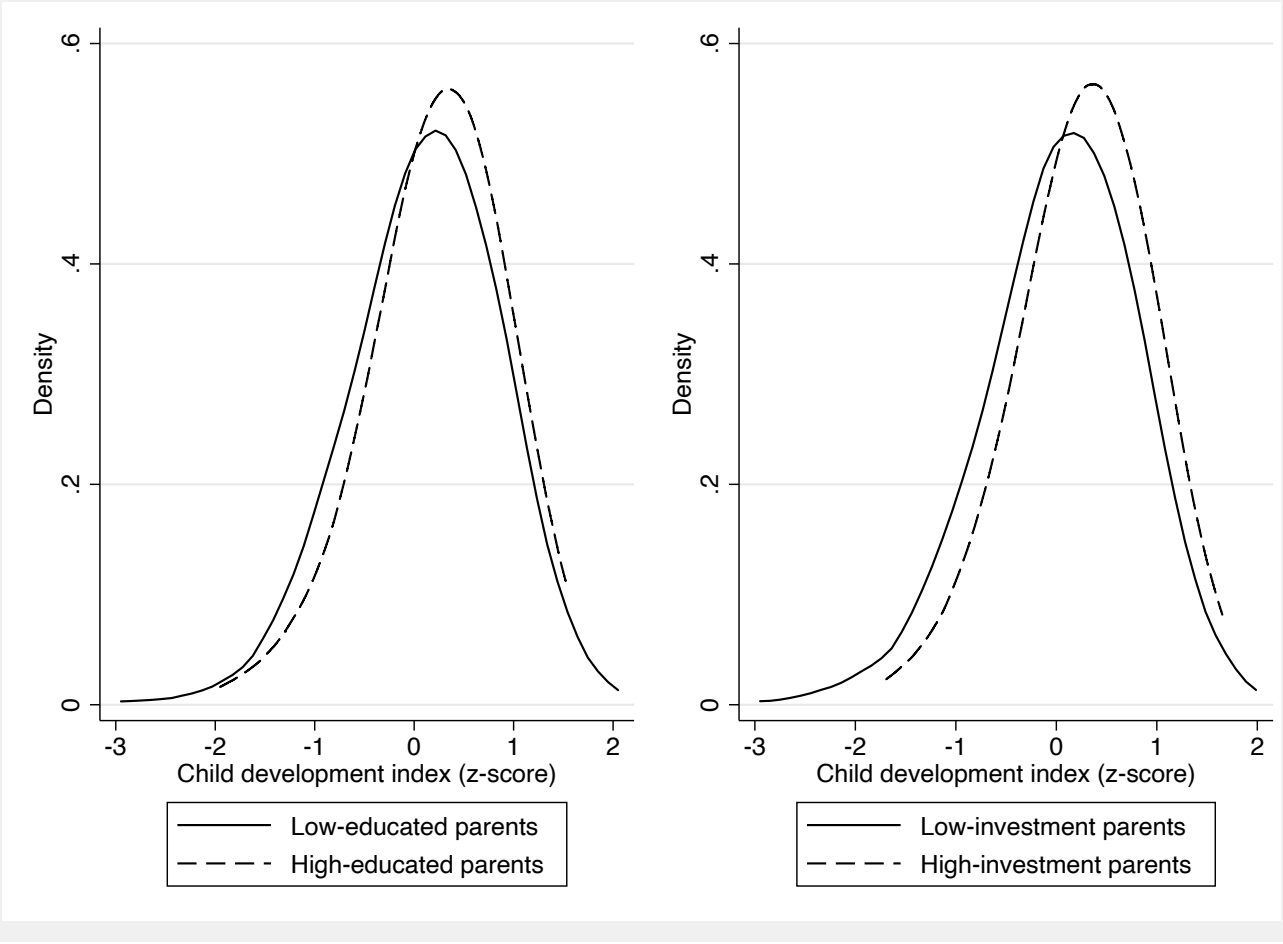
Figures

Figure 1: Timeline of the intervention



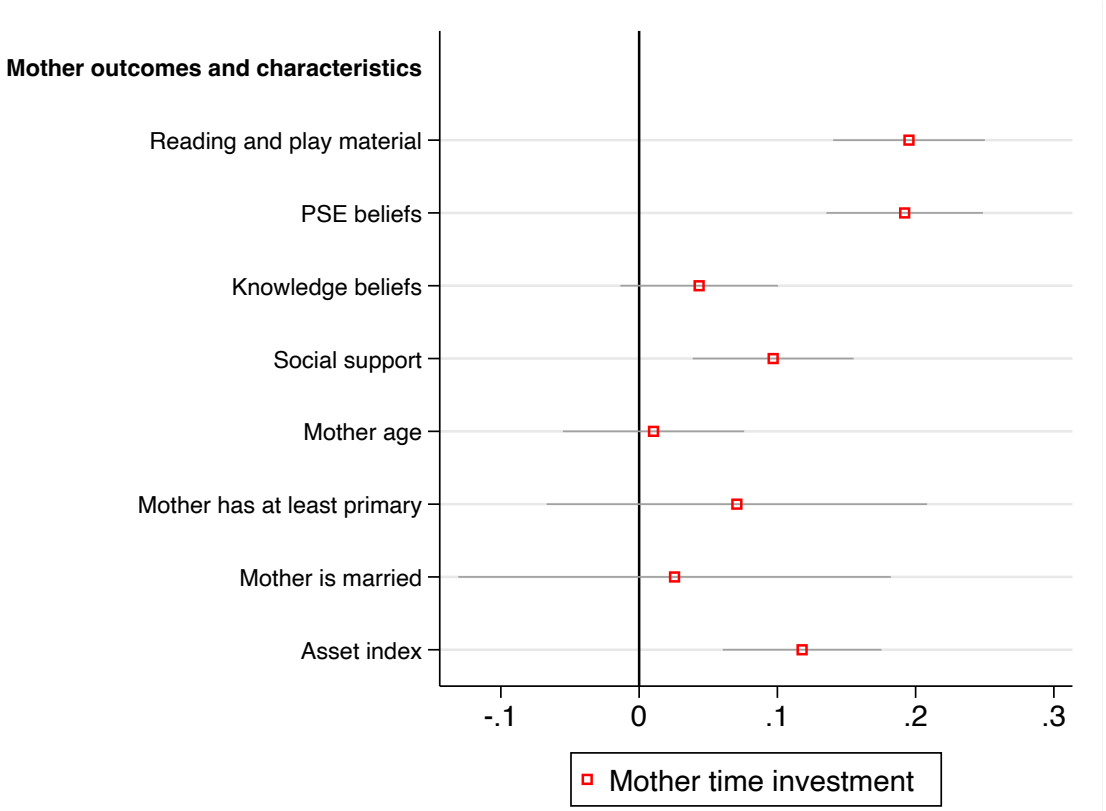
Note: the figure shows the timeline of the intervention. For more details on the intervention, see Section 2 and Appendix A1.

Figure 2: Density plot: child development and mothers' years of education (Panel A) and time investment (Panel B)



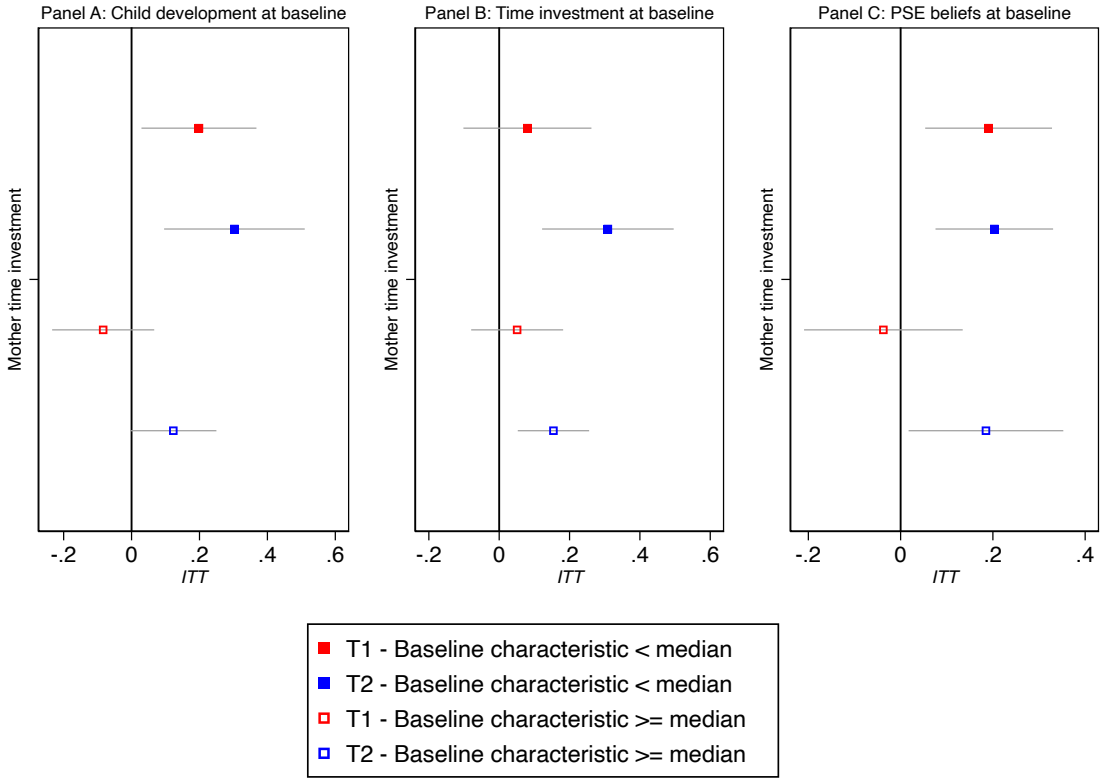
Note: the figure shows two density plots of disparities in child development at baseline. The sample includes mothers surveyed at the baseline survey (May 2018). The dependent variable is standardized to be mean 0 and SD 1 in the control group, with positive values associated with more favourable outcomes (see Appendix A3 for a detailed description of the variables). In Panel A, we plot the child development index for mothers with years of education above the median of the sample at baseline (high-educated mothers) or below the median (low-educated mothers). In Panel B, we plot the child development index for mothers with maternal time investment above the median of the sample at baseline (high-investment mothers) or below the median (low-investment mothers).

Figure 3: Relationships between maternal time investment and other characteristics



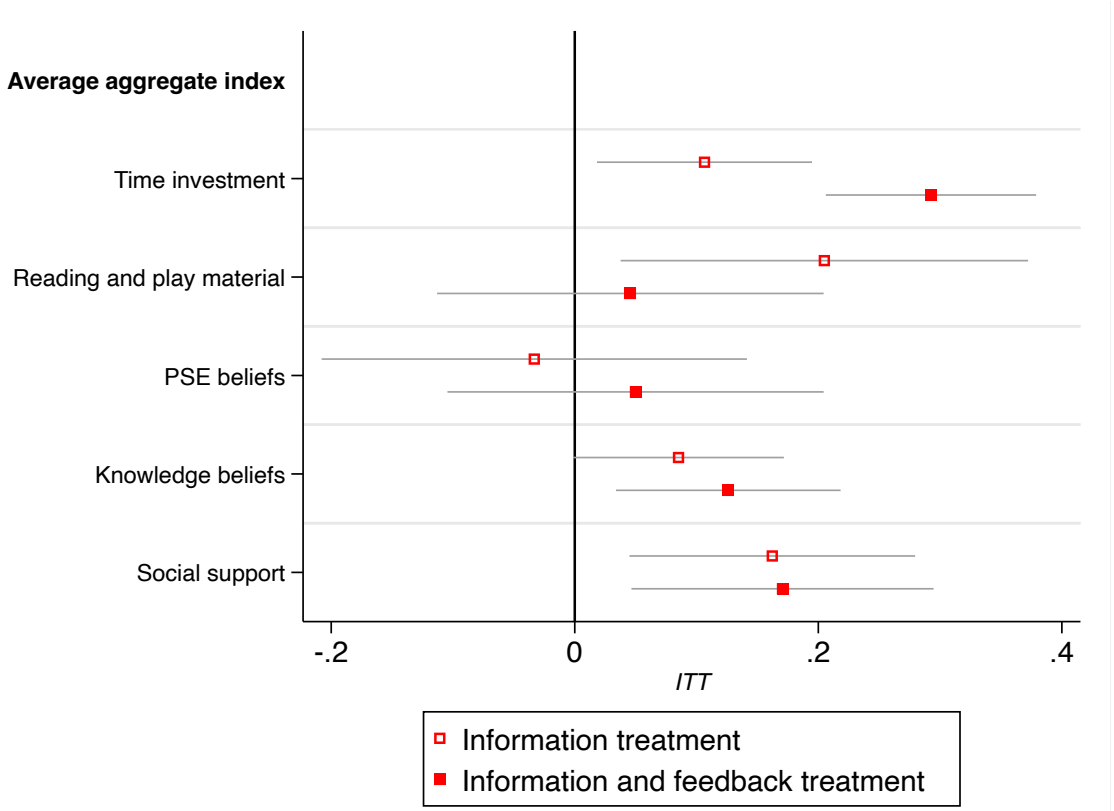
Note: the figure shows the correlation between maternal time investment and other maternal outcomes and characteristics at baseline. Each row is a separate OLS regression in which the dependent variable is maternal time investment at baseline and the independent variable is the variable presented on the y-axis. The sample includes mothers surveyed at the baseline survey (May 2018). The dependent variable is standardized to be mean 0 and SD 1 in the control group, with positive values associated with more favourable outcomes (see Appendix A3 for a detailed description of the variables). Mother's age and asset index are standardized, while mother's education and marriage status are not as these variables are constructed as dummies. Each regression also includes as covariates child age, child gender, number of children in the household, whether parents participated in other ECD programmes, and cell-level fixed effects. Confidence intervals are based on a 90% interval and on robust standard errors clustered at the village level.

Figure 4: Heterogeneity by child development, time investment, and PSE beliefs at baseline



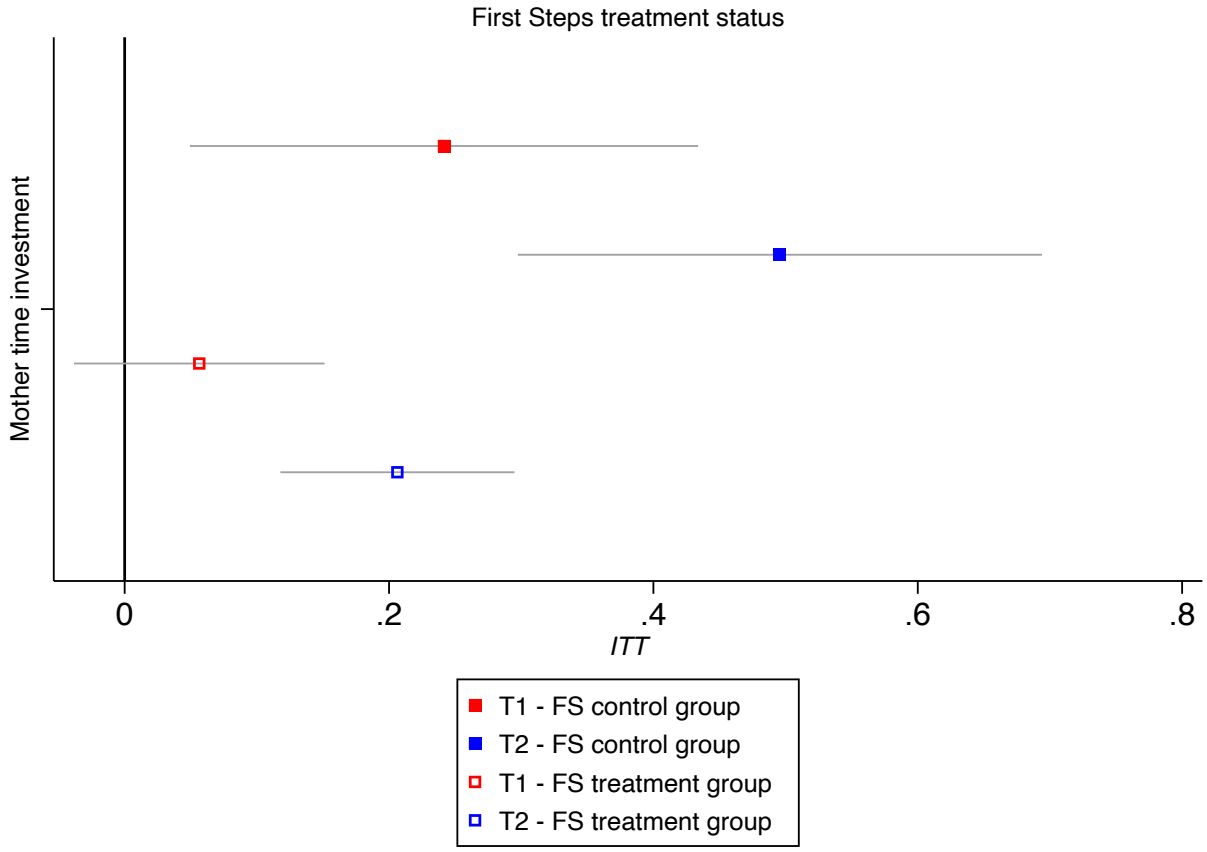
Note: the figure shows the heterogeneous impact of the treatments on maternal time investment by baseline levels of the child development indicator, maternal time investment, and PSE beliefs. The sample includes mothers surveyed at baseline and endline. The dependent variable is standardized to be mean 0 and SD 1 in the control group, with positive values associated with more favourable outcomes (see Appendix A3 for a detailed description of the variables). Each panel shows results from OLS regressions based on Equation 2 for the following subgroups: child development above/below the median at baseline (Panel A), maternal time investment above/below the median at baseline (Panel B), PSE beliefs above/below the median at baseline (Panel C). Each regression controls for the following characteristics measured at baseline: child age and gender, mother's age, a binary indicator for whether the mother completed at least primary education, whether the respondent is married, the number of children in the household, an asset index, and whether the caregiver participated in other ECD programmes. Each model includes baseline values of the outcome variables and cell-level fixed effects. More details are described in Section 6. T1 is a dummy variable equal to 1 if the respondent participated in the information treatment group. T2 is a dummy variable equal to 1 if the respondent participated in the information and feedback treatment group. Confidence intervals are based on a 90% interval and on robust standard errors clustered at the village level.

Figure 5: Coefficient plot including First Steps control group



Note: the figure shows the impact of the treatments on the outcomes using a sample that includes also villages that were part of the First Steps control group. The sample includes mothers surveyed at baseline and endline. The dependent variable is standardized to be mean 0 and SD 1 in the control group, with positive values associated with more favourable outcomes (see Appendix A3 for a detailed description of the variables). Each row shows results from an OLS regression based on Equation 2. Each regression controls for the following characteristics measured at baseline: child age and gender, mother's age, binary indicator for whether the mother completed at least primary education, whether the respondent is married, the number of children in the household, an asset index, and whether the caregiver participated in other ECD programmes. Each model includes baseline values of the outcome variables and cell-level fixed effects. More details are provided in Section 6. Information treatment is a dummy variable equal to 1 if the respondent participated in the information treatment group. Information and feedback treatment is a dummy variable equal to 1 if the respondent participated in the information and feedback treatment group. Confidence intervals are based on a 90% interval and on robust standard errors clustered at the village level.

Figure 6: Heterogeneity by First Steps status



Note: the figure shows the heterogeneous impact of the treatments on maternal time investment by First Steps treatment status. The sample includes mothers surveyed at baseline and endline. The dependent variable is standardized to be mean 0 and SD 1 in the control group, with positive values associated with more favourable outcomes (see Appendix A3 for a detailed description of the variables).The first (last) two rows show results from an OLS regression based on Equation 2 for a sample of families that were part of the FS control (treatment) group. Each regression includes controls as described in Table 2. Each model includes baseline values of the outcome variable and cell-level fixed effects. More details are provided in Section 6. T1 is a dummy variable equal to 1 if the respondent participated in the information treatment group. T2 is a dummy variable equal to 1 if the respondent participated in the information and feedback treatment group. Confidence intervals are based on a 90% interval and on robust standard errors clustered at the village level.

Tables

Table 1: Balance table

	Placebo group (C)	Information (T1)			Information and feedback (T2)			T1=T2	Obs
	Mean	Mean diff. T1 - C	Unadj. pvalue	Normal. diff.	Mean diff. T2 - C	Unadj. pvalue	Normal. diff.	Unadj. pvalue	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: Outcomes of interest									
Time investment index	-0.00	0.02	0.76	0.01	-0.04	0.58	-0.03	0.42	1335
Time investment: learning	0.00	0.02	0.84	-0.00	-0.05	0.50	-0.04	0.43	1335
Time investment: positive discipline	0.00	-0.04	0.53	-0.03	-0.01	0.87	-0.01	0.66	1335
Time investment: negative discipline	0.00	0.05	0.47	0.04	0.01	0.83	0.01	0.53	1335
Reading and play material index	-0.00	-0.10	0.34	-0.09	-0.10	0.30	-0.08	0.97	1335
PSE beliefs index	0.00	0.18	0.03	0.12	0.06	0.44	0.04	0.18	1335
PSE beliefs: emotions	0.00	0.17	0.03	0.10	0.04	0.60	0.02	0.11	1335
PSE beliefs: play	-0.00	0.14	0.10	0.08	0.02	0.81	0.00	0.16	1335
PSE beliefs: empathy	0.00	0.19	0.03	0.11	0.08	0.29	0.05	0.19	1335
PSE beliefs: control	-0.00	0.11	0.08	0.07	-0.05	0.45	-0.03	0.03	1335
PSE beliefs: discipline	-0.00	0.21	0.00	0.15	0.11	0.14	0.07	0.16	1335
PSE beliefs: pressure	-0.00	0.12	0.04	0.08	0.09	0.10	0.05	0.53	1335
PSE beliefs: self-acceptance	0.00	0.14	0.10	0.09	0.08	0.31	0.05	0.52	1335
PSE beliefs: learning	-0.00	-0.02	0.75	-0.02	0.02	0.81	0.00	0.58	1335
Knowledge beliefs index	-0.00	0.03	0.64	0.02	-0.04	0.55	-0.02	0.29	1335
Social support index	-0.00	0.01	0.94	0.00	-0.01	0.86	-0.02	0.80	1335
Panel B: Control variables									
Child age	47.01	0.25	0.52	0.02	-0.45	0.29	-0.04	0.10	1335
Child is a girl	0.55	-0.00	0.93	0.00	0.01	0.79	0.01	0.75	1335
Caregiver age	32.93	0.07	0.86	-0.00	0.28	0.45	0.03	0.60	1335
Caregiver has primary education	0.28	0.02	0.45	0.00	0.01	0.74	0.01	0.69	1335
Caregiver is married	0.87	0.04	0.09	0.09	0.01	0.54	0.02	0.24	1335
Number of children in the HH	3.36	0.03	0.80	0.01	0.05	0.67	0.01	0.88	1335
Asset index	-0.05	0.03	0.84	-0.02	0.11	0.43	0.04	0.51	1335
Participation in other ECD programmes	0.24	-0.04	0.19	-0.07	-0.05	0.15	-0.08	0.84	1335

Note: the sample in this table includes all mothers (including the First Steps control group) surveyed at baseline in May 2018. Column (1) reports the mean of observations in the placebo group at baseline from a regression that includes cell fixed effects and robust standard errors clustered at the village level. Column (2) reports the difference in means of the observations in the information treatment and the placebo group at baseline. Column (3) shows the unadjusted p-values for the null hypothesis of no difference between observations in the information treatment and the control group. Column (4) reports the normalized difference between the observations in the information treatment and the control group computed as the difference in means in treatment and control observations divided by the square root of the sum of the variances. Columns (5)–(7) report the corresponding statistics for the information and feedback treatment group. Column (8) reports p-values of a t-test for the null hypothesis of no difference between the information treatment and information and feedback treatment groups. Column (9) shows the number of observations at baseline. All variables are described in Section 6 and in Appendix A3.

Table 2: Maternal time investment

	(1) T1 β/SE	(2) Unadj p-value	(3) FWER&RI p-value	(4) T2 β/SE	(5) Unadj p-value	(6) FWER&RI p-value	(7) T1=T2 p-value	(8) Obs
Time investment								
Aggregate average index	0.057	0.332	0.327	0.209	0.000	0.001	0.009	855
	(0.058)			(0.055)				
Learning	0.001	0.984	0.981	0.197	0.003	0.002	0.003	855
	(0.063)			(0.062)				
Positive discipline	0.042	0.610	0.627	0.115	0.179	0.185	0.357	855
	(0.081)			(0.084)				
Negative discipline	0.112	0.167	0.168	0.034	0.591	0.606	0.305	855
	(0.080)			(0.063)				

Note: the table shows treatment effects on maternal time investment. Each row shows results from a regression. The dependent variables are indicated in rows. The sample includes mothers surveyed at baseline and endline. All estimates show results from OLS regressions based on Equation 2. The dependent variables are standardized to be mean 0 and SD 1 in the control group, with positive values associated with more favourable outcomes (see Appendix A3 for a detailed description of the variables). Each regression controls for the following characteristics measured at baseline: child age and gender, mother's age, binary indicator for whether the mother completed at least primary education, whether the respondent is married, the number of children in the household, an asset index which include a number of household assets, and whether the caregiver participated in other ECD programmes. Each model includes baseline values of the outcome variables and cell-level fixed effects. More details are provided in Section 6. Columns (1) and (4) present the ITT estimate of the information treatment group (T1) and of the information and feedback treatment group (T2), respectively. Standard errors (in parentheses) are clustered at the level of randomization (village). Inference is implemented using two tailed p-values which are presented in Columns (2) and (5) for each treatment arm. Columns (3) and (6) show randomization inference p-values adjusted to control for the FWER (Young 2019). Column (7) shows a t-test of equality of means of T1 and T2 coefficients. Column (8) reports the number of observations.

Table 3: Reading and play material

	(1) T1 β/SE	(2) Unadj p-value	(3) FWER&RI p-value	(4) T2 β/SE	(5) Unadj p-value	(6) FWER&RI p-value	(7) T1=T2 p-value	(8) Obs
Reading and play material								
Aggregate average index	0.153	0.221	0.219	0.075	0.529	0.552	0.539	855
	(0.123)			(0.118)				
Story or picture books	-0.055	0.484	0.462	-0.016	0.840	0.834	0.661	855
	(0.078)			(0.078)				
Coloring books	0.279	0.029	0.022	0.323	0.010	0.012	0.746	855
	(0.124)			(0.121)				
Homemade toys	0.059	0.476	0.461	0.004	0.960	0.966	0.496	855
	(0.082)			(0.087)				
Shop toys	0.057	0.509	0.498	-0.035	0.650	0.654	0.158	855
	(0.086)			(0.076)				
Objects in household	0.022	0.798	0.803	-0.083	0.399	0.429	0.267	855
	(0.086)			(0.098)				
Objects outside household	-0.010	0.910	0.895	-0.007	0.945	0.942	0.966	855
	(0.089)			(0.095)				
Drawing material	0.147	0.086	0.085	0.104	0.212	0.222	0.642	855
	(0.084)			(0.083)				
Puzzles	0.079	0.479	0.509	-0.009	0.929	0.921	0.409	855
	(0.110)			(0.102)				
Colour and size games	0.172	0.089	0.094	0.211	0.031	0.036	0.702	855
	(0.099)			(0.095)				
Counting games	0.107	0.432	0.440	0.096	0.454	0.455	0.937	855
	(0.135)			(0.127)				

Note: the table shows treatment effects on reading and play material in the home environment. Each row shows results from a regression. The dependent variables are indicated in rows. The sample includes mothers surveyed at baseline and endline. All estimates show results from OLS regressions based on Equation 2. The dependent variables are standardized to be mean 0 and SD 1 in the control group, with positive values associated with more favourable outcomes (see Appendix A3 for a detailed description of the variables). Each regression includes controls as described in Table 2. Columns (1) and (4) present the ITT estimate of the information treatment group (T1) and of the information and feedback treatment group (T2), respectively. Standard errors (in parentheses) are clustered at the level of randomization (village). Inference is implemented using two tailed p-values which are presented in Columns (2) and (5) for each treatment arm. Columns (3) and (6) show randomization inference p-values adjusted to control for the FWER (Young 2019). Column (7) shows a t-test of equality of means of T1 and T2 coefficients. Column (8) reports the number of observations.

Table 4: PSE beliefs and knowledge beliefs

	(1) T1 β/SE	(2) Unadj p-value	(3) FWER&RI p-value	(4) T2 β/SE	(5) Unadj p-value	(6) FWER&RI p-value	(7) T1=T2 p-value	(8) Obs
Panel A: PSE beliefs								
Aggregate average index	-0.069	0.591	0.577	-0.006	0.956	0.963	0.610	855
	(0.128)			(0.108)				
Emotions	-0.109	0.390	0.396	-0.078	0.466	0.499	0.796	855
	(0.126)			(0.107)				
Play	-0.030	0.786	0.801	-0.063	0.488	0.495	0.755	855
	(0.110)			(0.090)				
Empathy	-0.105	0.378	0.369	-0.065	0.523	0.551	0.713	855
	(0.118)			(0.101)				
Control	0.039	0.675	0.673	0.074	0.392	0.402	0.708	855
	(0.092)			(0.085)				
Discipline	-0.014	0.909	0.930	0.032	0.737	0.749	0.675	855
	(0.126)			(0.096)				
Pressure	-0.034	0.692	0.693	0.038	0.668	0.679	0.432	855
	(0.086)			(0.089)				
Self acceptance	-0.132	0.298	0.322	0.008	0.943	0.959	0.255	855
	(0.126)			(0.111)				
Learning	-0.003	0.981	0.989	0.090	0.451	0.494	0.483	855
	(0.136)			(0.119)				
Panel B: Knowledge beliefs								
Aggregate average index	0.099	0.128	0.119	0.078	0.254	0.236	0.757	855
	(0.064)			(0.068)				
Socio-emotional	0.138	0.052	0.057	0.055	0.449	0.444	0.269	855
	(0.070)			(0.073)				
Child development	-0.041	0.507	0.477	0.081	0.190	0.208	0.025	855
	(0.061)			(0.061)				

Note: the table shows treatment effects on maternal self-efficacy beliefs and knowledge beliefs. Each row shows results from a regression. The dependent variables are indicated in rows. The sample includes mothers surveyed at baseline and endline. All estimates show results from OLS regressions based on Equation 2. The dependent variables are standardized to be mean 0 and SD 1 in the control group, with positive values associated with more favourable outcomes (see Appendix A3 for a detailed description of the variables). Each regression includes controls as described in Table 2. Columns (1) and (4) present the ITT estimate of the information treatment group (T1) and of the information and feedback treatment group (T2), respectively. Standard errors (in parentheses) are clustered at the level of randomization (village). Inference is implemented using two tailed p-values which are presented in Columns (2) and (5) for each treatment arm. Columns (3) and (6) show randomization inference p-values adjusted to control for the FWER (Young 2019). Column (7) shows a t-test of equality of means of T1 and T2 coefficients. Column (8) reports the number of observations.

Table 5: Maternal social support

	(1) T1 β/SE	(2) Unadj p-value	(3) FWER&RI p-value	(4) T2 β/SE	(5) Unadj p-value	(6) FWER&RI p-value	(7) T1=T2 p-value	(8) Obs
Social support								
Aggregate average index	0.136	0.083	0.079	0.154	0.085	0.098	0.819	855
	(0.077)			(0.088)				
At least one person who can support	0.084	0.298	0.289	0.063	0.426	0.420	0.804	855
	(0.080)			(0.079)				
Join community to address a problem	0.107	0.091	0.102	0.139	0.047	0.059	0.664	855
	(0.062)			(0.068)				
Trust the majority of the community	0.092	0.147	0.169	0.048	0.449	0.438	0.487	855
	(0.062)			(0.063)				
Member of community groups (number)	0.019	0.833	0.832	0.090	0.266	0.271	0.398	855
	(0.088)			(0.080)				

Note: the table shows treatment effects on maternal social support measures. Each row shows results from a regression. The dependent variables are indicated in rows. The sample includes mothers surveyed in the endline survey (October 2018). All estimates show results from OLS regressions based on Equation 2. The dependent variables are standardized to be mean 0 and SD 1 in the control group, with positive values associated with more favourable outcomes (see Appendix A3 for a detailed description of the variables). Each regression includes controls as described in Table 2. Columns (1) and (4) present the ITT estimate of the information treatment group (T1) and of the information and feedback treatment group (T2), respectively. Standard errors (in parentheses) are clustered at the level of randomization (village). Inference is implemented using two tailed p-values which are presented in Columns (2) and (5) for each treatment arm. Columns (3) and (6) show randomization inference p-values adjusted to control for the FWER (Young 2019). Column (7) shows a t-test of equality of means of T1 and T2 coefficients. Column (8) reports the number of observations.

Table 6: Mediation analysis

	Mechanism relevance		Adding the mechanism		Mediation T1	Mediation T2
	The effect of T1 on M (1)	The effect of T2 on M (2)	The effect of T on Y (3)	The effect of T + M on Y (4)	(1) X (4) / (3) in % (5)	(2) X (4) / (3) in % (6)
Direct effect						
Information treatment (T1)			0.057	0.038	71.53	
			(0.058)	(0.054)		
Information and feedback treatment (T2)			0.209***	0.184***		64.83
			(0.055)	(0.048)		
Mechanisms						
Beliefs	0.023	0.051		0.140***	6.05	12.09
	(0.092)	(0.079)		(0.037)		
Social support	0.136*	0.154*		0.088***	22.42	23.08
	(0.077)	(0.088)		(0.027)		
Observations	855	855	855	855		
Oster bias-adjusted betas						
Information treatment				0.082		
Information and feedback treatment				0.192		
Beliefs				0.123		
Support				0.079		

Note: this table reports the results from a mediation analysis of the ITT estimates on maternal time investment. The mediators of interest are aggregate indexes beliefs and perceived social support (the construction of these indexes is explained in Section 8). Columns (1) and (2) report the ITT effects of T1 and T2, respectively, on beliefs and social support measures. Each regression includes controls as described in Table 2. Column (3) reports results from an OLS regression based on Equation 2 and shows ITT estimates on maternal time investment. Column (4) reports results from from an OLS regression based on Equation 3 (which is augmented with the mediators of interest and child development skills at baseline) and shows treatment effects on maternal time investment. Columns (5) and (6) report the mediating contribution of each mechanism for T1 and T2, respectively: the direct effect of T1 is calculated by dividing the coefficient reported in Column (4) by the coefficient reported in Column (3). The mediation effects are calculated by multiplying each coefficient from Column 1 (2) with the corresponding coefficient in Clumn 4 and by dividing this number by the coefficient on T1 (T2). The number is then normalized to 100 and reported in percentage (%). In the bottom panel we report the Oster bias-adjusted β to test if the coefficients on the mediators change based on the inclusion of observed controls (Oster 2019).

Table 7: Heterogeneous treatment effect

	(1) T1	(2) T2	(3) T1XBaseline characteristic	(4) T2XBaseline characteristic	(5) Baseline characteristic	(6) t-test (3) = (4)	(7) Obs
Child age	0.577	0.522	-0.011	-0.007	-0.003	0.618	855
	(0.430)	(0.366)	(0.009)	(0.008)	(0.007)		
Child gender	0.063	0.262**	-0.007	-0.102	0.113	0.504	855
	(0.116)	(0.099)	(0.184)	(0.164)	(0.144)		
Caregiver age	-0.247	-0.046	0.009	0.008	-0.015	0.909	855
	(0.432)	(0.419)	(0.013)	(0.012)	(0.009)		
Mother has primary education	0.039	0.185**	0.070	0.082	0.012	0.952	855
	(0.078)	(0.069)	(0.193)	(0.150)	(0.114)		
Asset index $>$ median	0.184*	0.470***	-0.238	-0.501***	0.321**	0.071	855
	(0.107)	(0.112)	(0.170)	(0.175)	(0.149)		

Note: the table shows estimates of heterogeneous treatment effects on maternal time investment. The sample includes mothers surveyed at baseline and endline. Each row shows results from an OLS regression based on Equation 2 and includes also an interaction term between each treatment dummy (T1 and T2) and the following variables measured at baseline: child age, child gender, mother's age, mother's education level (defined as a binary variable equal to 1 if the mother has at least primary education and 0 otherwise), and a dummy equal to 1 if the mother has an asset index greater than the median. All regressions control for the dependent variable at baseline, the total number of children in the household, and the caregiver's marital status. All regressions include strata fixed effects. The dependent variables is the maternal time investment aggregate index (defined in Appendix section A3). T1 is a dummy variable equal to 1 if the respondent participated in the information treatment group. T2 is a dummy variable equal to 1 if the respondent participated in the information and feedback treatment group. Columns 1 (2) report the T1 (T2) effects. Columns 3 (4) report coefficients on the interaction between the T1 (t2) dummy and each baseline variable as described above . Column 5 reports coefficients on each baseline variable. Column 6 reports p-values from a t-test on the equality of means between coefficients reported in Columns 3 and 4. Column 7 reports the number of observations. *p <10%, **p <5%, ***p <1%.

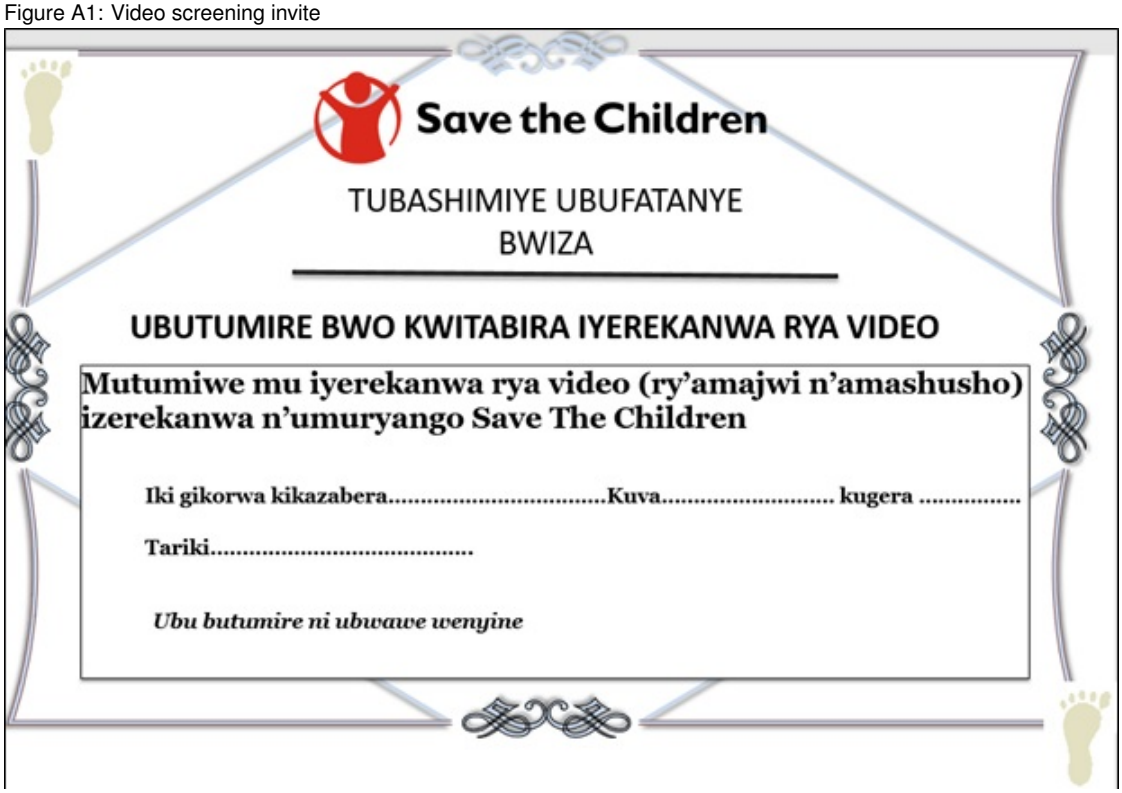
A Appendix

A1 Description of the intervention

Video screening. As discussed in Section 2, we designed two videos that have been screened to two distinct treatment groups. The control group was offered to watch a placebo video on agricultural practices related to Rwanda. The videos have been screened only once to all parents. During the baseline data collection in May 2018 we gave to each parent an invitation to the video screening (see Figure A1). Invited parents were expected to show up at an indicated location within the community on a specific day and time to watch the video. The invite indeed included the specific date, time and location where the screening would take place. Also parents in the control group received the invitation. At the end of the video screening the facilitator started a group-discussion with the parents to discuss about the key messages of the video. The duration of the first video was nine minutes and the duration of the second video was 16 minutes. The follow-up group discussion lasted approximately 30 to 60 minutes depending on the village. Therefore in total the intervention lasted approximately 45 minutes to one hour. The videos costed $11 per parent.

Facilitators. The facilitators were recruited through an open call application organized by Save the Children Rwanda. We hired the facilitators that successfully passed three rounds of tests: (i) written test, (ii) group discussions in English, and (iii) one-to-one interview in Kinyarwanda. Facilitators received one day of training. The training included also guidelines on how to set up the video screening on a laptop in the location and on how to conduct a group-discussion on the key topics. Facilitators were paid $37 a day. A supervising facilitator was recruited for the team (composed in total by 4 people). She received the same training of one day but was paid $48 a day. All facilitators also received a notebook to be used to note the impressions they collected about the video screening and the group discussion. A fieldwork supervisor from the research team also implemented three spot checks on the facilitators during the intervention.

Figure A1: Video screening invite



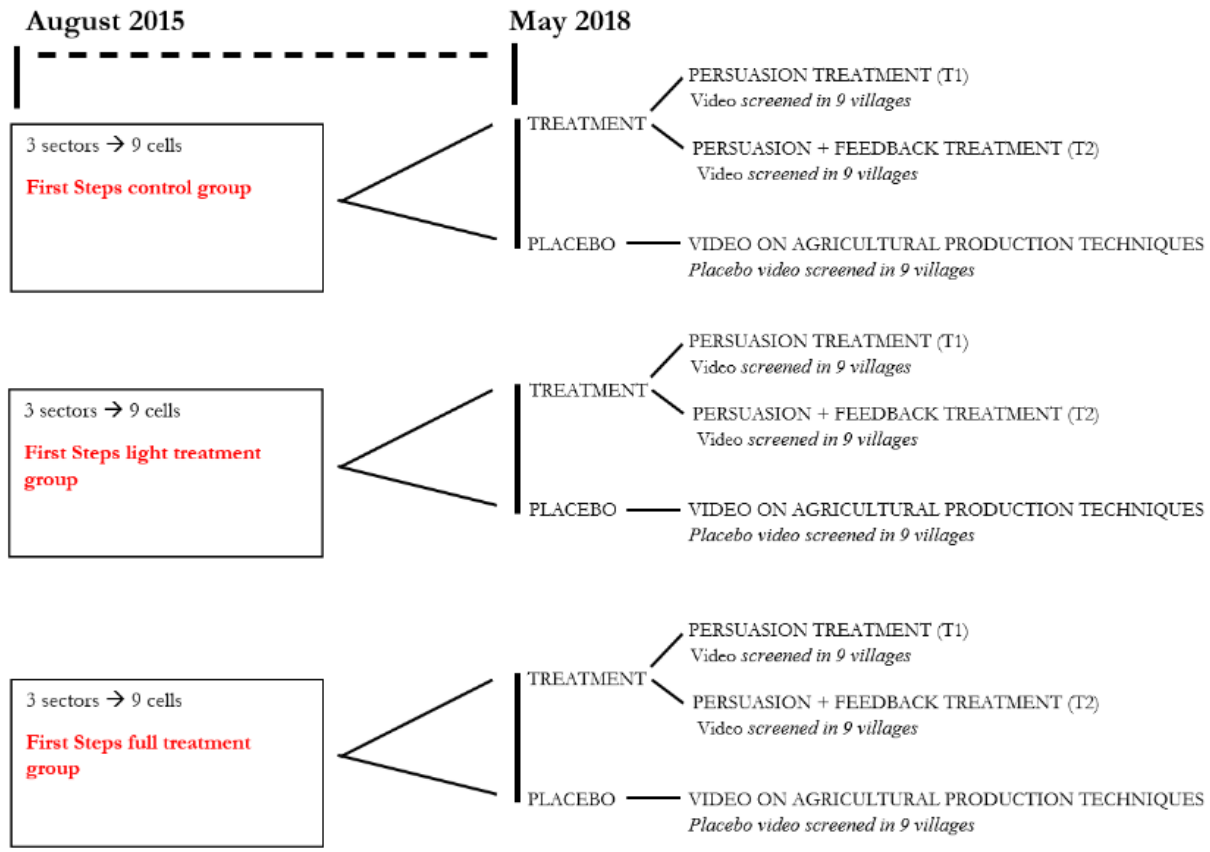
A2 Data and sampling

The intervention was evaluated using a cluster-randomized controlled trial with a control group and two treatment arms implemented in the Western Province in the Ngororero district. Rwanda is divided in five provinces, 30 districts, 416 sectors, 2148 cells and approximately 14837 villages. Provinces have a minimum of 3 districts (Kigali city) to a maximum of 8 districts (Southern province). The Western Province includes 7 districts. One of these is Ngororero, which includes 13 sectors. For each sector there are 6 cells. For each cell there are around 4 to 5 villages (National Institute of Statistics of Rwanda 2018). The sample includes 9 sectors within the Ngororero district, 27 cells and 80 villages. It includes families that have been part of a study that evaluated the impact of a parenting programme (First Steps) implemented in Rwanda in 2015.[23] First Steps was randomized at the sector level into three different arms: i) Light Treatment; ii) Full Treatment; iii) Control group. To assign the treatment arms of this study evenly across sectors (i.e., the randomization unit of First Steps), we randomized the video intervention at the village level and stratified at the cell level. The intervention was then randomly assigned, within each cell, to three villages that are part of a cell. In each cell, one village was assigned to the placebo group, another village to the information treatment group (T1) and the third village to the information and feedback treatment group (T2). Figure A2 shows the randomization tree of the intervention.

The First Steps control group was supposed to receive the parenting programme after the endline data collection in September 2016. However due to implementation issues, parents in these villages did not participate. During the design phase of this study we were not aware of these implementation issues and hence assumed that all families that were part of the First Steps study participated in First Steps. Therefore, it is for this unforeseen event that the sample on which we perform our main analysis includes only households from villages that received First Steps and drops the villages that were part of the control group in First Steps. Therefore the analytical sample used in this study includes 6 sectors, 18 cells and 54 villages. The fact that we use this reduced sample for our main analysis may have had statistical power implications. We discuss about ex-post power calculations in Appendix Section F1.

[23] See Justino et al. (2022) for a detailed description of the programme and the study.

Figure A2: Randomization tree of the intervention



Note: the figure shows the randomization of the intervention.

A3 Tools and variable construction

Parental investments

Parental time investment. We collected detailed data on the home environment and parents practices and behaviours. We used the Home Observation for Measurement of the Environment - Short Form (HOME-SF) tool adapted for the Rwanda context. The HOME-SF questionnaire was originally developed and later modified by Bradley and Caldwell (1977).

The questionnaire includes questions about primary caregivers' time investments in activities they engage with their child. In particular, the principal caregiver reports on whether she interacted with her child in the past week on a set of activities. In most cases (88 percent), these questions were answered by the mother, who answered questions for herself and also on behalf of her husband. In 8 percent of the cases, the principal caregiver was the father. In approximately 5 percent of the cases, the principal caregiver was neither the mother nor the father.[24]

The caregiver was asked to report about the frequency of interactions with the child across fifteen activities, including (i) positive discipline activities, such as praising, appreciation, and soothing when the child is upset; (ii) learning/play activities, such as playing, singing, and reading picture books; and (iii) negative discipline activities, such as criticizing, threatening, hitting, pushing and spanking the child. Two questions, (1) do you shout at your child and (2) do you hit your child, were reverse coded.

[24] Due to time and budget constraints, these caregivers were asked to report only on their activities, and not on those of the mother or the father of the child.

For each set of these three groups of activities, we created an area index by first summing the activities within each domain and then calculating standardized area indexes for each domain by subtracting the control group mean and dividing it by the control group standard deviation of the relevant survey wave. To test for multiple hypotheses, we also constructed an aggregate index by summing all activities and then standardized it. We also examined each activity as single outcomes and in order to do this we standardized each answer against the control group. The resulting indicator is defined as maternal time investment. This measure is constructed using observations corresponding to the mother when she is the respondent. As mentioned a small fraction of principal caregivers were fathers and we have corresponding observations on the activities they engaged with their child. As discussed above, each respondent is also asked to report on her partner time investment but we preferred not to use these reported measures as our main estimates. Results using these measures do not however change and are available upon request.

We studied these outcomes also as single standardized outcomes. The standardized scores were calculated by subtracting the control group mean of answers for each activity in each survey wave, and then dividing by the standard deviation of the control group.

Reading and play material in the home environment. We collected data also on the presence of children related reading material at home. In particular we asked whether story, pictures or colored books were present in the household. We asked also about the presence of toys and materials a child plays with at home. In particular we asked whether the child played with homemade and shop toys, with objects in or outside the household, with drawing material, puzzles, color, size and counting games. For each item we calculated a standardized score with respect to the control group in the relevant survey wave. We also calculated an average aggregate index by summing the answers to each question and then standardizing it against the control group.

Parental beliefs

Self-efficacy beliefs. We collected parental self-efficacy measures administering the *Tool to Measure Parenting Self-Efficacy*(TOPSE) (Kendall and Bloomfield 2005). In this questionnaire the respondent was asked to provide answers about self-efficacy statements using a scale from 1 (disagree a lot) to 5 (agree a lot) across eight different dimensions: (i) emotion and affection; (ii) play and enjoyment, (iii) empathy and understanding; (iv) control; (v) discipline and setting boundaries; (vi) pressures; (vii) self-acceptance; and (viii) learning and knowledge.

The enumerators were trained to read the following statement out loud before administering this question: '*The following section is about section 1 (emotion and affection). Using the scale below, please enter in the boxes how much you agree with each statement. The scale ranges from 1 (completely disagree) to 5 (completely agree). You may use any number between 1 and 5. Please answer all statements.*' The enumerator asked for example: "Can you point on the scale how much do you agree from 1 to 5 with the statement "I can show my child I love her"?" (this statement is taken from the first question of the section "emotion and affection").

For each dimension we created an area summary index calculated as the sum of each single statement within each domain. We then standardized this index by subtracting the control group mean and dividing it by the control group standard deviation of the relevant survey wave. To test for multiple hypotheses, we also constructed an average aggregate index by taking the average of each area index and then standardized it. We also examined each answer to the statements as single outcomes and in order to do this we standardized each answer against the control group.

Knowledge beliefs. Parental knowledge beliefs are examined along two dimensions: behavioural and socioemotional child-related practices and child development. Each answer is solicited as a dummy

equal to 1 if the parent agrees, and 0 otherwise. The enumerators were trained to read the following statement before administering each question: '*Do you agree with the following statement related to behaviour and socioemotional practices?*'. The enumerators asked for example: '*Children should be quiet all the time*' or '*children don't notice or hear when harsh words are shared between parents or when parents fight*'. We reverse coded all negative statements. We constructed two indexes over the two dimensions by summing the answers within each domain. Each index and all responses within each domain were standardized against the control group. We also constructed an aggregate average index by first summing all responses in each of the two domains and then standardizing it against the control group.

Perceived social support

We investigate the effect of the video screenings on some dimensions of perceived social support within the community. In particular we asked questions on whether parents received support by people in the community, whether they joined together to address a problem, whether there is trust in the community and whether the parent is an active member of a community group. As for the other outcomes we investigate each question individually standardizing them against the control group and also by creating an average aggregate index by summing the answers to each questions.

B Attrition

We tested for differential attrition in the endline survey. At endline, the attrition rate of caregivers was 3 percent. This attrition rate is well below the rates found in early child development programmes in Sub-Saharan Africa (Britto et al. 2017). Most of the families not found at endline moved away (46 families out of 1,525). This can generate two potential biases. First, selection bias may occur if across intervention groups those families who moved away have some common observable and unobservable characteristics related to parenting practices or household characteristics. Second, results may be biased if there is a higher likelihood of dropping out from the sample in specific intervention arms in relation to the other arms. To address these potential biases, we tested for whether attrition rates are balanced by treatment status.

The dependent variable in Appendix Table B1 is defined as 1 if the child dropped out at endline. We included in the specification T1 and T2 treatment dummies, child and household characteristics, and interacted each characteristic with the treatment dummies. In particular, we included child age and gender, caregiver age, a binary indicator for whether the caregiver completed at least primary education, whether the respondent is married, number of children in the household and a household asset index. The results in Table B1 indicate that families in T1 and married mothers were more likely to drop out at endline. The joint F-test of interactions with T1 is suggestive of the existence of some differences in the characteristics of caregivers who drop out of the sample at endline. To note that when we estimate the same model on the full sample (that includes also fathers) there is no evidence of such differential attrition (results available upon request).

To further account for potential differential attrition across treatment groups, we calculate treatment effects using inverse probability weighting (IPW), where the weights are calculated as the predicted probability of being in the endline sample based on the available baseline controls (Robins et al. 1994). This allows to adjust for any attrition bias determined by unobservable characteristics. First, logistic regressions are estimated to obtain the predicted probabilities of remaining at endline. We use as regressors the variables at baseline that are included as controls in our main specifications. Second, the predicted probabilities are then used as weights in the estimation of the treatment effects, so that a larger weight is given to individuals who are more likely to drop out from the sample as a result of attrition or survey wave non response (Doyle 2020). The results in Appendix Table B2 are consistent with the main findings of the paper. These results reassure us that selection bias caused by attrition is unlikely to affect substantially the validity of the results presented in the paper.

Table B1: Attrition test

	Test across groups		Test by characteristics	
	β	(SE)	β	(SE)
Information treatment (T1)	0.004	(0.021)	-0.425**	(0.209)
Information and feedback treatment (T2)	0.013	(0.023)	0.197	(0.204)
Child age			-0.003	(0.002)
Child is a girl			-0.002	(0.033)
Caregiver age			-0.002	(0.003)
Caregiver has at least primary education			-0.003	(0.030)
Caregiver is married			-0.108**	(0.045)
Number of children in the HH			0.008	(0.011)
HH asset index			-0.002	(0.007)
Participation in other ECD programmes			-0.044	(0.032)
Interactions: T1 × characteristics				
T1 × Child age			0.003	(0.004)
T1 × Child is a girl			0.061	(0.044)
T1 × Caregiver age			0.003	(0.004)
T1 × Caregiver has at least primary education			-0.053	(0.042)
T1 × Caregiver is married			0.219***	(0.056)
T1 × Number of children in the HH			-0.017	(0.017)
T1 × HH asset index			0.001	(0.015)
T1 × Participation in other ECD programmes			0.001	(0.050)
Interactions: T2 × characteristics				
T2 × Child age			-0.003	(0.003)
T2 × Child is a girl			0.024	(0.042)
T2 × Caregiver age			-0.005	(0.004)
T2 × Caregiver has at least primary education			-0.034	(0.052)
T2 × Caregiver is married			0.143**	(0.068)
T2 × Number of children in the HH			-0.003	(0.020)
T2 × HH asset index			-0.014	(0.010)
T2 × Participation in other ECD programmes			0.022	(0.042)
Joint F-test of Interactions (p-value)				
With T1			0.004	
With T2			0.155	
Observations	1335		1335	

Note: the table presents the test on differential attrition at endline. The sample includes mothers surveyed in the baseline survey (May 2018) and in the end-line survey (October 2018). All estimates show results from OLS regressions. The dependent variable (mother lost at end-line) is defined as 1 if the observation at endline is missing, and 0 otherwise. Regressions in columns 1 includes as independent variable the information treatment (T1) dummy defined as equal to 1 if the respondent participated in the information treatment group; the information and feedback dummy is defined as equal to 1 if the respondent participated in the information and feedback treatment group. Regression in columns 3 include also the following controls: the baseline values of child age and gender, the primary caregiver age and education, binary indicators for whether the mother and the father completed at least primary education, whether the respondent is married, number of children in the household, an asset index which include a number of household assets, whether children are now enrolled in pre-primary school and if parents participated in other parenting programs. Regression in column 3 include also the interactions terms between the T1 and T2 dummies and each of the control variables. Robust standard errors in parenthesis clustered at the village level are presented in Column (2) and (4). Joint F-test of interaction terms is an F-test - for each treatment arm - of the interaction between the treatment arm and the control variables at baseline. Observations are presented at the bottom of the table. *p <10%, **p <5%, ***p <1%.

Table B2: IPW for attrition

	(1) T1 β/SE	(2) Unadj p-value	(3) T2 β/SE	(4) Unadj p-value	(5) T1=T2 p-value	(6) Obs
Average aggregate index						
Time investment	0.056	0.350	0.213	0.000	0.006	855
	(0.059)		(0.054)			
Reading and play material	0.160	0.195	0.094	0.432	0.601	855
	(0.122)		(0.118)			
PSE beliefs	-0.047	0.725	0.013	0.906	0.631	855
	(0.133)		(0.112)			
Knowledge beliefs	0.112	0.082	0.078	0.251	0.598	855
	(0.063)		(0.067)			
Social support	0.128	0.098	0.149	0.096	0.791	855
	(0.076)		(0.088)			

Note: the table reports treatment effects on all outcomes using inverse probability weighting. Each row shows results from a regression. The dependent variables are indicated in rows. The sample includes mothers surveyed at baseline and endline. All estimates show results from OLS regressions based on equation 2. The dependent variables are standardized to be mean 0 and SD 1 in the control group, with positive values associated with more favourable outcomes (see Appendix A3 for a detailed description of the variables). All estimates are IPW estimations. The weights are calculated as the predicted probability of being in the endline sample based on the available baseline outcomes and controls. The weighting procedure is described in Appendix B. Column (1) and (3) present the ITT estimate of the information treatment (T1) and of the information and feedback treatment(T2), respectively. Standard errors (in parenthesis) are clustered at the level of randomization (village level). Inference is implemented using two tailed p-values which are presented in column (2) and (4) for each treatment arm. Column (5) reports a t-test of equality of means of T1 and T2 coefficients. Column (6) reports the number of observations.

C Balance checks

C1 Testing imbalance

As shown in Table 1, we observe that some domains of maternal self-efficacy measures along with the caregiver's marital status, are not balanced at baseline. To account for these unbalances at baseline, we estimated a model in which we included the full set of control variables and the outcomes at baseline, demeaned and interacted with the treatment indicators (Baranov, Bhalotra, et al. 2020). The interaction with the treatment variable allows for differing impacts of these characteristics on outcomes. We estimated this model for all the outcomes examined in the paper. Table C1 shows results that are consistent with the main results discussed in Section 7.

C2 IPW and AIPW estimates

To further account for the unbalances observed in some of the indicators and in general to provide additional robustness checks for all outcomes, we estimated models using inverse probability weighting (Cattaneo 2010). These models adjust for any difference in the pre-treatment variables if their distribution varies across treatment statuses (Imbens and Wooldridge 2009). We estimate the probability that an individual receives a given treatment (using a logit model) on the imbalanced variables shown in Table 1. These include the PSE measures at baseline and the imbalanced control variable (caregiver's marital status). In other words, we estimate a treatment model where the treatment status is the dependent variable regressed on the imbalanced outcome at baseline and the imbalanced control variable at baseline. We use the predictions from this estimated model to calculate the weights. These weights correspond to the inverse of the estimated probability that individual i receives a given treatment conditional on pre-treatment characteristics (Emsley et al. 2008). We then estimate our outcome model using the calculated weights from the treatment model. This outcome model gives less weights to the observations that in the T1 or T2 group show imbalance (e.g., with a higher PSE belief) and, at the same time, attribute more weight to the observations in the control group with the opposite characteristics (e.g., lower PSE belief). Results using the inverse probability weighting estimator are presented in Panel A of Appendix Table C2 and are consistent with our main findings.

As a further robustness check, we also estimated the average treatment effect by augmented inverse-probability weighting (AIPW). We estimate a treatment model as in the inverse probability weighting above. In addition, we also present an outcome model with the outcomes of interest as dependent variables and as covariates the treatment group along with the usual set of control variables used in the main regression. The IPW estimators rely on the correct specification of both the outcome model and of the treatment model (both in terms of the functional form and of the covariates included). As we do not know whether our model is correctly specified, we also use an Augmented Inverse Probability Weighted (AIPW) estimator which has the double-robust property. This model uses an augmentation term in the outcome model to correct the estimator in case the treatment model is misspecified (Cattaneo 2010). The results in Panel B of Appendix Table C2 are also consistent with our main findings. As maternal self-efficacy beliefs showed imbalances at baseline, we present the IPW and AIPW estimates for the specific sub-domains of these outcomes. Appendix Table C3 are in general consistent with the OLS estimates.

Table C1: Testing for imbalance

	(1) T1 β/SE	(2) Unadj p-value	(3) T2 β/SE	(4) Unadj p-value	(5) T1=T2 p-value	(6) Obs
Average aggregate index						
Time investment	0.031	0.596	0.199	0.001	0.005	855
	(0.058)		(0.054)			
Reading and play material	0.114	0.331	0.064	0.570	0.672	855
	(0.116)		(0.112)			
PSE beliefs	-0.059	0.638	0.001	0.990	0.608	855
	(0.125)		(0.105)			
Knowledge beliefs	0.089	0.156	0.063	0.341	0.692	855
	(0.062)		(0.066)			
Social support	0.134	0.080	0.160	0.069	0.741	855
	(0.075)		(0.086)			

Note: the table reports treatment effects on all outcomes controlling for baseline imbalance. Each row shows results from a regression. The dependent variables are indicated in rows. The sample includes mothers surveyed at baseline and endline. All estimates show results from OLS regressions based on equation 2. The dependent variables are standardized to be mean 0 and SD 1 in the control group, with positive values associated with more favourable outcomes (see Appendix A3 for a detailed description of the variables). Each regression includes controls as described in Table 2. The specification includes the full set of baseline characteristics demeaned and interacted with the treatment variables. These are the baseline values of the dependent variables, child age and gender, mother's age, a binary indicator for whether the mother completed at least primary education, whether the respondent is married, the number of children in the household, an asset index, and whether the caregiver participated in other ECD programmes. Column (1) and (3) present the ITT estimate of the information treatment group (T1) and of the information and feedback treatment group (T2), respectively. Standard errors (in parentheses) are clustered at the level of randomization (village level). Inference is implemented using two tailed p-values reported in column (2) and (4) for each treatment arm. Column (5) reports a t-test of equality of means of T1 and T2 coefficients. Column (6) reports the number of observations.

Table C2: IPW and AIPW

	(1) T1 β/SE	(2) Unadj p-value	(3) T2 β/SE	(4) Unadj p-value	(5) T1=T2 p-value	(6) Obs
Panel A: IPW						
Time investment	0.034	0.671	0.199	0.009	0.034	855
	(0.081)		(0.077)			
Reading and play material	0.100	0.215	0.038	0.644	0.478	855
	(0.081)		(0.083)			
PSE beliefs	-0.074	0.406	0.006	0.941	0.373	855
	(0.089)		(0.080)			
Knowledge beliefs	0.104	0.203	0.103	0.179	0.990	855
	(0.082)		(0.077)			
Social support	0.126	0.122	0.161	0.049	0.670	855
	(0.081)		(0.082)			
Panel B: AIPW						
Time investment	0.056	0.493	0.231	0.002	0.024	855
	(0.081)		(0.076)			
Reading and play material	0.116	0.149	0.051	0.536	0.458	855
	(0.080)		(0.083)			
PSE beliefs	-0.066	0.461	0.011	0.885	0.394	855
	(0.089)		(0.079)			
Knowledge beliefs	0.092	0.263	0.087	0.251	0.950	855
	(0.082)		(0.076)			
Social support	0.152	0.056	0.156	0.052	0.960	855
	(0.080)		(0.081)			

Note: the table reports the treatment effects on all outcomes using inverse probability weighting. Each row shows results from a regression. The dependent variables are indicated in rows. The sample includes mothers surveyed at baseline and endline. All estimates show results from OLS regressions based on equation 2. The dependent variables are standardized to be mean 0 and SD 1 in the control group, with positive values associated with more favourable outcomes (see Appendix A3 for a detailed description of the variables). In Panel A, all estimates are IPW estimations. In Panel B, all estimates are AIPW estimations with its doubly robust property. The treatment model controls for the baseline values of the outcome of interest and the imbalanced baseline covariates as described in Section C2. The outcome model, in AIPW , includes also controls as described in Table 2. Column (1) and (3) present the ITT estimate of the information treatment group (T1) and of the information and feedback treatment group (T2), respectively. Standard errors (in parenthesis) are clustered at the level of randomization (village level). Inference is implemented using two tailed p-values which are presented in column (2) and (4) for each treatment arm. Column (5) reports a t-test of equality of means of T1 and T2 coefficients. Column (6) reports the number of observations.

Table C3: IPW and AIPW PSE beliefs

	(1) T1 β/SE	(2) Unadj p-value	(3) T2 β/SE	(4) Unadj p-value	(5) T1=T2 p-value	(6) Obs
Panel A: IPW						
Average aggregate index	-0.074	0.406	0.006	0.941	0.373	855
	(0.089)		(0.080)			
Emotions	-0.118	0.204	-0.067	0.412	0.596	855
	(0.093)		(0.082)			
Play	-0.049	0.579	-0.065	0.406	0.860	855
	(0.089)		(0.078)			
Empathy	-0.112	0.205	-0.053	0.513	0.506	855
	(0.088)		(0.081)			
Control	0.026	0.739	0.068	0.385	0.568	855
	(0.078)		(0.079)			
Discipline	-0.004	0.968	0.036	0.659	0.655	855
	(0.088)		(0.081)			
Pressure	-0.035	0.683	0.049	0.543	0.324	855
	(0.085)		(0.080)			
Self acceptance	-0.135	0.133	0.019	0.812	0.092	855
	(0.090)		(0.081)			
Learning	-0.006	0.947	0.110	0.176	0.182	855
	(0.087)		(0.081)			
Panel B: AIPW						
Average aggregate index	-0.066	0.461	0.011	0.885	0.394	855
	(0.089)		(0.079)			
Emotions	-0.107	0.256	-0.066	0.418	0.677	855
	(0.094)		(0.082)			
Play	-0.045	0.611	-0.061	0.422	0.858	855
	(0.089)		(0.076)			
Empathy	-0.107	0.226	-0.053	0.505	0.545	855
	(0.088)		(0.080)			
Control	0.050	0.518	0.090	0.244	0.587	855
	(0.077)		(0.077)			
Discipline	-0.006	0.943	0.038	0.639	0.618	855
	(0.088)		(0.080)			
Pressure	-0.021	0.809	0.053	0.508	0.389	855
	(0.085)		(0.081)			
Self acceptance	-0.134	0.134	0.017	0.835	0.100	855
	(0.089)		(0.080)			
Learning	0.004	0.966	0.112	0.163	0.214	855
	(0.086)		(0.080)			

Note: each row shows results from a regression. The dependent variables are indicated in rows. The sample includes mothers surveyed at baseline and endline. All estimates show results from OLS regressions based on equation 2.The dependent variables are standardized to be mean 0 and SD 1 in the control group, with positive values associated with more favourable outcomes (see Appendix A3 for a detailed description of the variables). In Panel A, all estimates are IPW estimations. In Panel B, all estimates are AIPW estimations with its doubly robust property. The treatment model controls for the baseline values of the outcome of interest and the imbalanced baseline covariates as described in Section C2. The outcome model, in AIPW, includes also controls as described in Table 2. Column (1) and (3) present the ITT estimate of the information treatment group (T1) and of the information and feedback treatment group (T2), respectively. Standard errors (in parenthesis) are clustered at the level of randomization (village level). Inference is implemented using two tailed p-values which are presented in column (2) and (4) for each treatment arm. Column (5) reports a t-test of equality of means of T1 and T2 coefficients. Column (6) reports the number of observations.

D Weighted mean index

Our main estimates show results obtained using the mean index of the parenting outcomes constructed as unweighted mean indices. This implies that each dimension or activity is given the same weight in the index. Following Anderson (2008), we also estimated our models using an inverse co-variance weighted index. Considering a group of different outcomes, this procedure assigns less weights to the outcomes within the group which are highly correlated, while it rewards new information by giving a higher weight to outcomes that are less correlated within the same group. The weight for each outcome is the sum of the inverted covariance matrix that includes all outcomes in the group considered. Results in Appendix Table D1 are largely consistent with the main estimates. We observe that the effect of the information treatment (T1) on maternal time investment aggregate index is now larger and significant (0.11 SD). Although the inverse co-variance weighted index has some merit, most of the existing literature has shown a preference towards using the unweighted mean index because the statistical procedure used to assign the weights is not yet conclusive (Glennerster and Takavarasha 2013). Therefore, our main estimates use the unweighted mean index (Kling et al. 2007) and we presented the weighted estimates here for completeness and comparison.

Table D1: Weighted mean index

	(1) T1 β/SE	(2) Unadj p-value	(3) T2 β/SE	(4) Unadj p-value	(5) T1=T2 p-value	(6) Obs
Average aggregate index						
Time investment	0.111	0.082	0.187	0.002	0.204	855
	(0.062)		(0.056)			
Reading and play material	0.161	0.135	0.070	0.480	0.358	855
	(0.106)		(0.099)			
PSE beliefs	-0.039	0.753	0.028	0.794	0.589	855
	(0.124)		(0.107)			
Knowledge beliefs	0.065	0.282	0.087	0.186	0.718	855
	(0.060)		(0.065)			
Social support	0.139	0.076	0.151	0.088	0.877	855
	(0.077)		(0.087)			

Note: the table presents the treatment effects on all outcomes constructed as weighted mean index. Each row shows results from a regression. The dependent variables are indicated in rows. The sample includes mothers surveyed at baseline and endline. All estimates show results from OLS regressions based on equation 2. The dependent variables are standardized to be mean 0 and SD 1 in the control group, with positive values associated with more favourable outcomes (see Appendix A3 for a detailed description of the variables). The dependent variables are weighted mean indexes. The weighting procedure assigns less weights to the components of an outcome which are highly correlated, while it rewards new information by giving a higher weight to components of an outcome that are less correlated within the same group. A full description of the construction of the outcomes is in Section 5 and in Appendix A3. The weighting procedure is described in Appendix D. Column (1) and (3) present the ITT estimate of the information treatment group (T1) and of the information and feedback treatment group (T2), respectively. Standard errors (in parenthesis) are clustered at the level of randomization (village level). Inference is implemented using two tailed p-values which are presented in column (2) and (4) for each treatment arm. Column (5) reports a t-test of equality of means of T1 and T2 coefficients. Column (6) reports the number of observations.

E Robustness to the inclusion of control variables

Table E1 presents estimates of the effect of the treatments using the post-double selection LASSO (PDSL) procedure (Tibshirani 1996). The PDSL procedure provides a method for model selection in the presence of a large number of control variables. We use the LASSO machine learning technique to employ, among all the possible models, the specification which gives us the best predictions (Tibshirani 1996; Hastie et al. 2015).

Results in Table E1 show the ITT estimate on all measures of interest when using the selection of control variables chosen by LASSO. Results are consistent to our main ones.

Table E1: ITT effect on outcomes and mechanisms with LASSO control variables

	(1) T1 β/SE	(2) Unadj p-value	(3) T2 β/SE	(4) Unadj p-value	(5) T1=T2 p-value	(6) Obs
Average aggregate index						
Time investment	0.065	0.283	0.221	0.000	0.009	855
	(0.060)		(0.057)			
Reading and play material	0.159	0.211	0.088	0.452	0.563	855
	(0.126)		(0.116)			
PSE beliefs	-0.059	0.664	0.007	0.946	0.601	855
	(0.134)		(0.108)			
Knowledge beliefs	0.107	0.089	0.058	0.382	0.469	855
	(0.062)		(0.066)			
Social support	0.147	0.059	0.179	0.040	0.695	855
	(0.076)		(0.085)			

Note: the table presents the treatment effects on all outcomes. The estimated model includes control variables selected using the post-double selection LASSO (PDSL) procedure (Tibshirani 1996). The sample includes mothers surveyed at baseline and endline. The dependent variables are standardized to be mean 0 and SD 1 in the control group, with positive values associated with more favourable outcomes (see Appendix A3 for a detailed description of the variables).Robust standard errors (in parenthesis) are clustered at the level of randomization (village level). Inference is implemented using two tailed p-values which are presented in column (2) and (4) for each treatment arm. Column (5) reports a t-test of equality of means of T1 and T2 coefficients. Column (6) reports the number of observations. *p <10%, **p <5%, ***p <1%.

F Ex-post power calculations

An alternative explanation for small and mostly not significant treatment effects on some of the outcomes (e.g. maternal self-efficacy beliefs) is the lack of statistical power. Moreover, the fact that we had to rely on a smaller sample (i.e. that excludes the First Steps control group) may also affect power. Therefore, for each outcome we calculated ex-post minimum detectable effect size (MDE) using realized sample size and estimated standard errors. Specifically, we computed ex-post MDEs with 80% power at a significance level of 5% as 2.8 x $SE(\beta)$ (Haushofer and Shapiro 2016; McKenzie and Ozier 2019). The results in Appendix Table F1 show that the study was not powered for some outcomes to detect smaller changes. Because of this relatively low statistical power, we can pick up mostly relatively large effects.

Table F1: Ex-post power calculation estimates

	(1) T1	(2) s.e. (β)	(3) MDE	(4) T2	(5) s.e. (β)	(6) MDE	(7) Obs
Average aggregate index							
Time investment	0.057	0.058	0.164	0.209***	0.055	0.153	855
Reading and play material	0.153	0.123	0.345	0.075	0.118	0.331	855
PSE beliefs	-0.069	0.128	0.360	-0.006	0.108	0.302	855
Knowledge beliefs	0.099	0.064	0.178	0.078	0.068	0.190	855
Social support	0.136*	0.077	0.215	0.154*	0.088	0.246	855

Note: each row shows results from a regression. The dependent variables are indicated in rows. The sample includes mothers surveyed in the endline survey (October 2018). All estimates show results from OLS regressions based on equation 2.The dependent variables are standardized to be mean 0 and SD 1 in the control group, with positive values associated with more favourable outcomes (see Appendix A3 for a detailed description of the variables). Column (1) and (4) reports respectively the T1 and T2 estimated coefficients and columns (2) and (5) report the estimated standard errors. Column (3) and (6) show ex-post minimum detectable effect sizes (MDE) with 80% power at a significance level of 0.05 (MDE = 2.8 x SE(β)).
*p <10%, **p <5%, ***p <1%. Robust standard errors are clustered at the village level. Observations are presented in the last column.

G Appendix figures and tables

Table G1: PSE beliefs at baseline

	Obs	Mean	Standard deviation	Minimum	Maximum
PSE beliefs	962	22.09	2.38	13	27
Emotion and affection	962	26.18	2.95	16	30
Play and enjoyment	962	25.53	3.32	10	30
Empathy and understanding	962	25.21	3.34	12	30
Control	962	21.87	3.52	9	30
Discipline and setting boundaries	962	24.35	3.60	9	30
Pressures	962	15.18	2.91	5	20
Self-acceptance	962	25.92	3.23	10	30
Learning and knowledge	962	12.46	1.96	5	15

Note: the table presents the summary statistics of the PSE beliefs outcomes. The sample includes mothers surveyed in the baseline survey (May 2018). A full description of the construction of the outcomes is in Section 5 and in Appendix A3.

Table G2: Maternal time investment - single outcomes

	(1) T1 β/SE	(2) Unadj p-value	(3) FWER&RI p-value	(4) T2 β/SE	(5) Unadj p-value	(6) FWER&RI p-value	(7) T1=T2 p-value	(8) Obs
Time investment								
Learning								
Read books with the child	-0.038	0.628	0.603	0.096	0.195	0.189	0.125	855
	(0.077)			(0.073)				
Tell stories	0.044	0.619	0.615	0.150	0.051	0.039	0.196	855
	(0.088)			(0.075)				
Sing songs	-0.073	0.394	0.390	0.038	0.621	0.618	0.172	855
	(0.085)			(0.076)				
Take child outside	-0.022	0.762	0.763	0.066	0.304	0.282	0.286	855
	(0.072)			(0.064)				
Play any simple game	0.044	0.487	0.477	0.129	0.058	0.067	0.189	855
	(0.063)			(0.066)				
Teach alphabet	-0.012	0.884	0.891	0.161	0.047	0.067	0.032	855
	(0.078)			(0.079)				
Play counting games	0.006	0.947	0.939	0.111	0.125	0.137	0.235	855
	(0.082)			(0.071)				
Made book in traditional material	0.032	0.702	0.694	0.042	0.622	0.624	0.923	855
	(0.084)			(0.084)				
Positive discipline								
Child misbehaves, explain what wrong	0.078	0.239	0.273	0.118	0.066	0.069	0.538	855
	(0.065)			(0.063)				
Show affection	-0.012	0.871	0.852	0.058	0.392	0.392	0.299	855
	(0.073)			(0.068)				
Praised/encouraged the child	0.036	0.564	0.586	0.084	0.122	0.130	0.403	855
	(0.061)			(0.054)				
Use rules to encourage the child	-0.016	0.823	0.832	0.041	0.618	0.624	0.404	855
	(0.072)			(0.082)				
Negative discipline								
Speak negatively, yell and shout (reverse)	0.106	0.133	0.148	0.050	0.535	0.566	0.479	855
	(0.069)			(0.080)				
Shake, spank and hit (reverse)	-0.015	0.840	0.847	0.011	0.858	0.863	0.683	855
	(0.076)			(0.062)				
Took away something child wanted (reverse)	0.152	0.058	0.051	0.028	0.676	0.675	0.109	855

Note: the table presents the treatment effects on maternal time investment. Each row shows results from a regression. The dependent variables are indicated in rows.The sample includes mothers surveyed in the endline survey (October 2018). All estimates show results from OLS regressions based on equation 2. The dependent variables are standardized to be mean 0 and SD 1 in the control group, with positive values associated with more favourable outcomes (see Appendix A3 for a detailed description of the variables). Each regression includes controls as described in Table 2. Column (1) and (4) present the ITT estimate of the information treatment group (T1) and of the information and feedback treatment group (T2), respectively. Standard errors (in parenthesis) are clustered at the level of randomization (village level). Inference is implemented using two tailed p-values which are presented in column (2) and (5) for each treatment arm. Column (3) and (6) shows randomization inference p-values adjusted to control for the FWER (Young 2019). Column (7) shows a t-test of equality of means of T1 and T2 coefficients. Column (8) reports the number of observations.