

An evaluation of Tostan's Reinforcement of Parental Practices (RPP) Program

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Reinforcement of Parental Practices (RPP) program



In Senegal, many children never learn to read due to the poor quality of education and lack of family preparation for supporting children's learning early in life. To address these barriers to children's success and to the economic development of Senegal, Tostan developed a community-led approach to improving learner outcomes, the **Reinforcement of Parental Practices (RPP)** program. The initial goals of the RPP intervention were to enable caregivers to engage more effectively in verbal interactions with infants and young children, which in turn would cause change in children's early language skills, as a consequence of the richer cognitive stimulation they experienced. The longer-term goal of the RPP intervention is to show that these changes in caregiving practices and in children's language skills in the first three years will have cascading consequences, leading to stronger cognitive skills and greater school success in later years.



A mother and child demonstrate one of the RPP sessions used to facilitate verbal interaction and increase children's language skills. Keur Alpha, Senegal.

Hundreds of studies on early child development demonstrate the importance of rich non-verbal communication between parents and infants in the early months of life, to establish a strong foundation for language as well for social attachment. The value of parenting behaviors such as making eye contact with the baby and responding contingently to the infant's expressions and vocalizations have been well documented in research on parents and infants in middle-class populations in the U.S., Europe, and Asia. And parents' skill in establishing communicative routines with their infant has been linked to later success in language learning. However, in other populations, including certain agrarian societies in Central America and Africa, as well as in some minority groups in the U.S. and Europe, these strategies for early communication with infants are much less commonly used. Such differences are often simply dismissed as reflecting "cultural preferences" for different parenting styles. However, increasingly there is concern that such reduced levels of parent-infant engagement are costly to the developing child, as more and more evidence becomes available that age-appropriate social and cognitive stimulation starting at birth are critical for optimal brain development.

The RPP program aims to address this concern, building on the scientific discoveries of the crucial role of early language experience in cognitive development: Those children who hear more rich and varied language directed to them by caregivers develop vocabulary more rapidly and also become more efficient in real-time language processing – a critical skill that is predictive of later language development.

The Stanford-Tostan Evaluation Project (STEP)

The goal of the **Stanford-Tostan Evaluation Project (STEP)** is to provide a rigorous evaluation of the RPP program, by assessing both caregivers' and children's behaviors and skills using the same fine-grained quantitative and qualitative measures used in our laboratory research. The STEP team consisted of 9 highly-trained Senegalese university graduates who were all familiar with Wolof language and culture, along with researchers at the Language Learning Lab led by Dr. Anne Fernald at Stanford University. In order to compare parenting practices and children's language outcomes in a group who participated in Tostan's RPP program and a matched control group who did not, we conducted longitudinal assessments of over 500 caregiver-child pairs in Wolof-speaking communities in the Kaolack region.

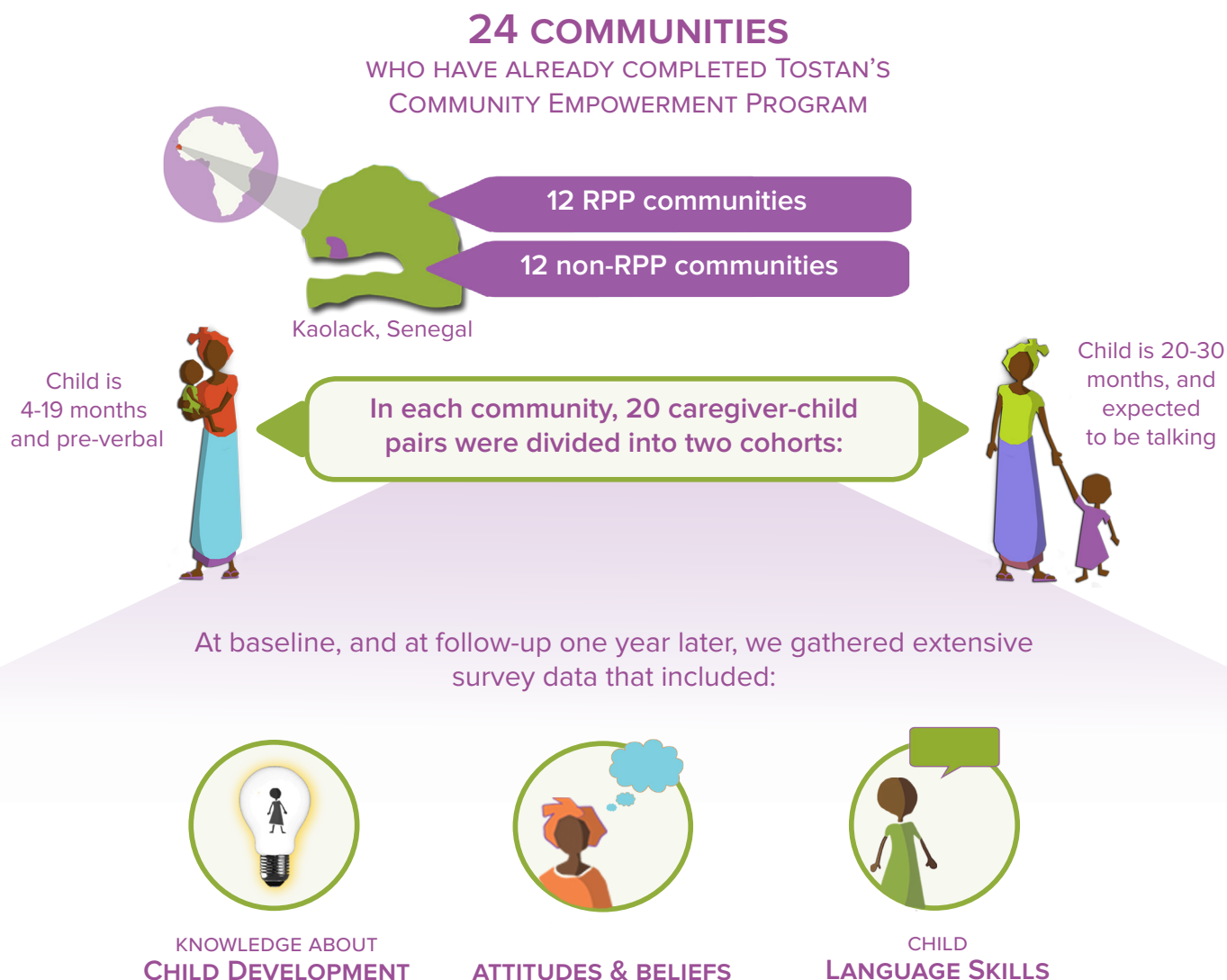
The STEP team gathered extensive survey, observational, and experimental data on both mothers and children at two time points – baseline, before the RPP program was implemented, and follow-up, one year later – and then spent many months coding and analyzing these data in Dakar and at Stanford. These rich and rigorous data will enable us to determine whether the RPP program in fact improves parenting practices, and if so, whether more effective parent-child interaction in turn causes change in children's early language development. The preliminary findings from this evaluation study are reported here.

Study Design and Sample

The evaluation study was a quasi-experimental design with assessments made pre- and post-program implementation in 24 rural communities in the Kaolack region of Senegal. All 24 communities were primarily Wolof-speaking, had formerly participated in Tostan's Community Empowerment Program (CEP), and were similar in population size and degree of isolation from main roads. Twelve villages received Tostan's parenting program; 12 comparison villages did not.

In each of the 24 villages, we recruited 20 caregiver-child pairs divided into two child-age cohorts: children

from 4 to 19 months of age who were mostly pre-verbal, and children from 20 to 30 months of age who were expected to be talking. All caregivers in the RPP group stated their interest in participating in the RPP at baseline, and all caregivers in both groups provided their consent to participate in the STEP evaluation study. At baseline, and at follow-up one year later, we gathered extensive survey data that included caregiver knowledge about child development, beliefs and attitudes about parenting practices, as well as children's language skills.





The Naturalistic Play Session

All children enrolled in the STEP study were video-recorded for 15 minutes at baseline in a naturalistic play session with their primary caregiver, and again at follow-up one year later. The purpose of the play sessions was to provide a standardized context in which to record spontaneous interaction between mother and child, enabling us to gather a naturalistic sample of each caregiver's speech to her child as well as speech by the child, along with data on the quality of nonverbal interaction. By comparing mother-child interactions in the play sessions both at baseline and at follow-up, we could assess the extent of change in both

mother's and child's behaviors over the one-year intervening period. Video recordings took place in a common testing locale identified in each village that was as private, quiet, and well lit as possible. The caregiver and child pair sat on a floor-mat with toys provided for the child to play with. At baseline, the plastic toys included a small bucket, shovel, rattle and a few other items. At follow-up, these toys were enhanced with a plastic car, wood animals, colorful pictures, and a picture book entitled "Anniko." A microphone was attached to the caregiver's clothing and a video camera set up on a tripod about 5 to 6 feet from the pair. The caregiver was asked to behave with her child just as she would at home, and was then left undisturbed in the room for 15 minutes at baseline and 8 minutes at follow-up. Analysis of the amount of language spoken by mother and child as well as non-verbal interactions focused on a 5-minute segment of the play session, after participants had time to become comfortable.



A caretaker and her child look at laminated pictures and play with toys during the play session at follow-up.

Five minutes of each recording were later transcribed word-for-word in Wolof by the native Wolof-speaking staff who served as research assistants on the STEP team. The transcripts were then processed and coded using the open-source software package CLAN (Computerized Language ANalysis) to obtain word counts and number of utterances for both the caregiver and the child.

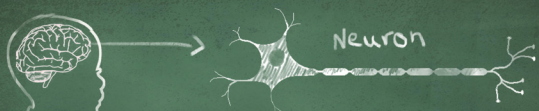
Main Findings



- When assessed one year after baseline, **caregivers in RPP villages nearly doubled the amount of speech directed to their child** during the 5-minute play session segment, whereas caregivers in control villages did not increase their quantity of talk from one year to the next (RPP effect estimate 1.6 SD units).



A magnifying glass with a black handle and a silver frame. The lens is clear and circular. The handle is cylindrical and tapers slightly towards the frame. The frame is a simple metal ring. The background is white.

- 
- Neuron
- 95% of RPP caregivers were scored as "very knowledgeable" compared to 34% of non-RPP at follow-up.



RPP caregivers reported greater gains in expressive vocabulary and language milestones achieved by their child.

- **Children in RPP villages showed impressively large gains in language skills one year later.** Although children in both groups more than doubled their speech production over the year between baseline and follow-up, the **increase in number of words produced during the naturalistic play session was 50% greater for children in the RPP** than for comparably-aged children in the non-RPP control villages (RPP effect estimate 0.58 SD units).
- **Children in RPP villages also showed smaller, but still statistically significant, improvements in two additional, widely-used, measures of language proficiency:** reported number of developmental milestones achieved and vocabulary words spoken by the child (RPP effect estimate for both ~ 0.3 SD units).



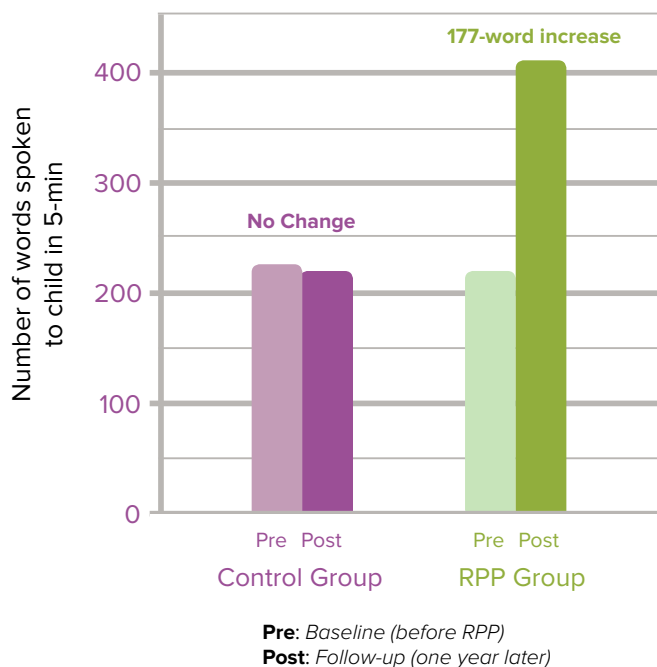
It is a common pattern for children in rural African villages to transition from being under the direct care of their mother during infancy to being cared for by an older sibling or other adult in the household by the end of the second year.

Changes in Caregivers



Overall, we found large and consistent changes in the caregivers in the RPP villages, as compared to the controls at the post-RPP follow-up. **Most impressively, caregivers in the RPP villages nearly doubled the amount of child-directed speech during 5 minutes in the naturalistic play session, as compared to caregivers from control villages** (Figure 1). Note that at baseline, before the RPP program was implemented, caregivers in all 24 villages spoke about the same amount to their child during the play session (mean=227 words).

Figure 1: Caregivers in the RPP group nearly double the amount of speech directed to their child in 5-minutes

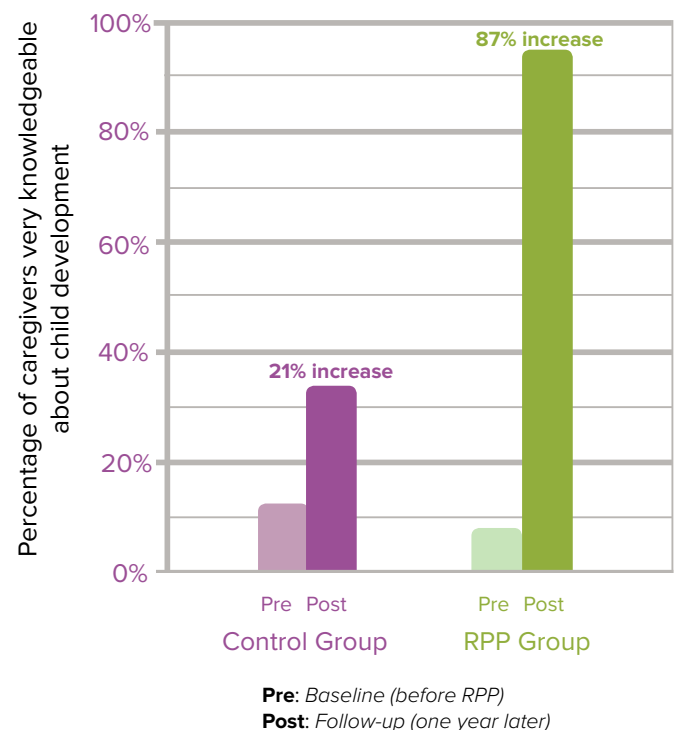


One year later, **caregivers in RPP villages showed a 78% increase in the amount of talk to their child compared to baseline.** In contrast, **caregivers in control villages showed no change in their amount of talk to their child over the year.** This very large program effect (equivalent to 1.6 standard deviation units) remains nearly the same when we adjust statistically for key factors that could bias the results (such as differences in maternal education). **Caregivers in the RPP villages also showed greater improvements in the warmth and quality of their verbal and nonverbal engagement with the child.**

In addition to assessing maternal behavior with the play session videos, we also interviewed caregivers about their knowledge of child development and their attitude towards the use of corporal punishment to discipline children.

To assess caregiver knowledge, we presented a series of 15 statements related to child development, and respondents were asked to agree or disagree with each statement on a 4-point scale – for example, “Children only understand words that they can say themselves”. We then categorized the caregivers into two groups: above and below a cut point for high level of knowledge. We refer to the group above this cut point as “very knowledgeable about child development” - for example, if they received full points for 10 out of 15 of the questions. Although both groups scored comparably at baseline, and both had increased in knowledge when we interviewed them one year later (Figure 2), **the caregivers in RPP villages made much greater gains in their knowledge of child development, such that 95% were categorized as “very knowledgeable” at follow-up.**

Figure 2: In the RPP group, the percentage of caregivers who were very knowledgeable about child development increased much more than in the control group.

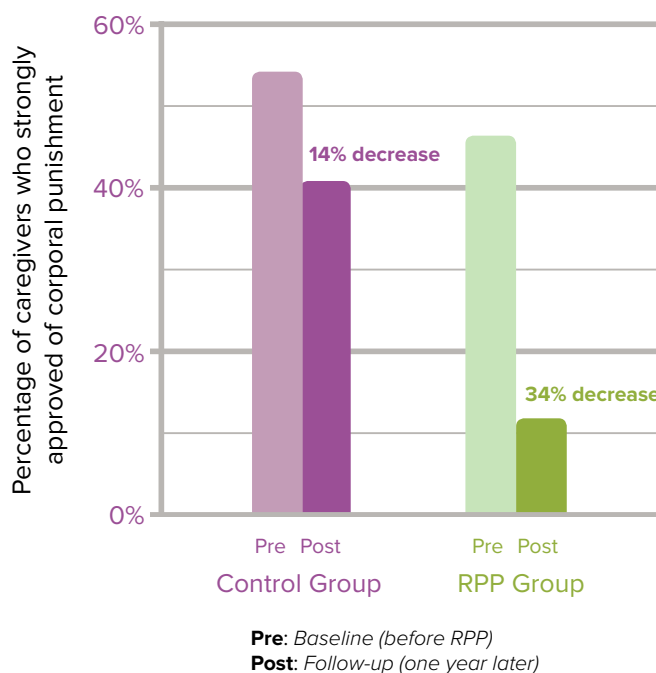


Changes in Caregivers cont'd

At baseline (pre-RPP), both groups of caregivers expressed favorable opinions of the use of corporal punishment with children, agreeing that it is acceptable for a parent to hit their child in situations such as disobeying an elder, fighting with others, and refusing to do chores. In fact, 13% of all caregivers at baseline said that they “strongly agreed” that hitting a child was appropriate in all 8 of the different situations that we presented. Again, we categorized the caregivers into two groups: above and below the median attitude score at baseline. We refer to the group above the median as “strongly approved of corporal punishment” – i.e., responding that they “strongly agreed” with hitting a child in 4 out of 8 situations and “agreed” with hitting in the other 4 situations.

As shown in Figure 3, fewer women in the RPP villages strongly approved of corporal punishment, even before the program started. However, at the follow-up assessment, **the percentage of caregivers who strongly approved of corporal punishment decreased much more in the RPP villages than in the control villages.**

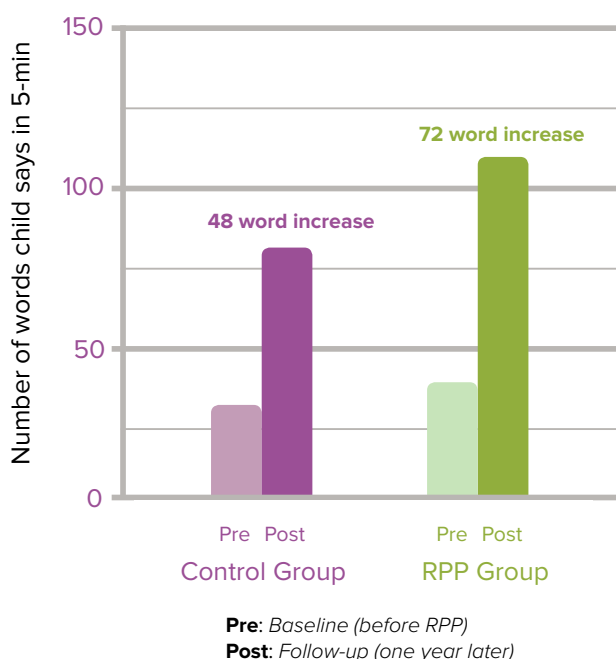
Figure 3: In the RPP group, there was a much bigger decrease in the percentage of caregivers who strongly approved of corporal punishment than in the control group.



Changes in Children

When we assessed the amount children talked in the play sessions, children in both groups had more than doubled the number of words they produced at follow-up compared to baseline, as expected since they had all aged by one year. **But the increase in number of words produced at follow-up was 50% greater in children in the RPP group compared to children in the control group.** Some of this was due to a baseline difference before the RPP started, but after subtracting out this baseline difference, we found that the increase over one year in the number of words produced during 5 minutes was significantly greater for children in the RPP group than for those in the control group (Figure 4). As in our analysis of the amount of caregiver talk, the estimated effect of the RPP on amount of child talk remained about the same (0.58 standard deviation units) when we adjusted statistically for key child factors that could bias the results (such as differences in age and nutritional status). These important results indicate a big change in amount of caregiver-child verbal engagement in the RPP program group during the naturalistic play session.

Figure 4: After one year, children in both groups more than doubled the number of words they said in the 5-min play session, but the increase was 50% greater for the children in the RPP group.



Changes in Children cont'd

In addition to amount of child talk during the play session, we also assessed child language proficiency using two maternal-report measures: number of developmental milestones achieved and number of vocabulary words spoken. Children's language development begins in infancy, long before the emergence of the first word. The language milestone checklist was developed to assess the communication skills of even the youngest children in our study and consists of a series of questions asked of the caregiver regarding increasingly advanced language skills in infants and young children.

For vocabulary, we adapted the MacArthur Communicative Development Inventory (CDI) in a multi-phase process

for which we obtained the approval of the CDI Advisory board. The CDI is used worldwide for assessing vocabulary development over the first three years of life. Mothers were asked whether their child "understands and says" each of the words in a carefully structured list of 105 Wolof words likely to be familiar to children in the 20 to 30 month age range. **We found small, but significantly greater, gains in developmental milestones as well as in expressive vocabulary for children in the RPP villages than for children in the control villages** (RPP effect estimates for both are ~0.3 standard deviation units). Data from additional measures of child language skill are more complex to analyze and work is ongoing to interpret these data.

The "Real-world" Language Environment of Children



While the video recording of mother-child interaction in the play session captures a short sample of speech by caregivers and children when they are alone and without distractions, this may be an atypical situation in rural Senegalese culture. For this reason, we also made use of a new technology called LENA™ (Language ENvironment Analysis) (<http://www.lenafoundation.org>), which enables unobtrusive all-day recordings of a child's language environment without an observer present. These recordings were made using the LENA™ digital recorder, which is placed in the chest pocket of specially designed clothing worn by the child. The recorder is designed to record the audio environment within a 1.2-1.8 m radius of the child. A subset of children in our study were selected to wear a LENA™ audio-recording device for 8 to 10 hours.

The audio data were later transferred and processed with LENA™ analysis software, which incorporates speech recognition algorithms to differentiate speech-related sounds from environmental background noise in an automated process. From the software we obtained two automated measures: child vocalization count and conversational turn count. A child vocalization is counted when child speech of any length is surrounded by greater than 5 seconds of silence or other sound that is not child speech. The child vocalization count does not include cries or vegetative sounds. A conversational turn is counted by LENA™ when a child vocalizes and an adult responds within 5 seconds – or the other way around – an adult speaks and a child responds. Each time that happens, one turn is counted. Because the length of the

recordings vary somewhat from child to child (depending on how early in the morning the device was put on the child and how late in the day it was removed), raw counts are converted to counts per hour.

Figure 5: The number of conversational turns that children experienced with adults throughout the day did not change substantially from baseline to follow-up.

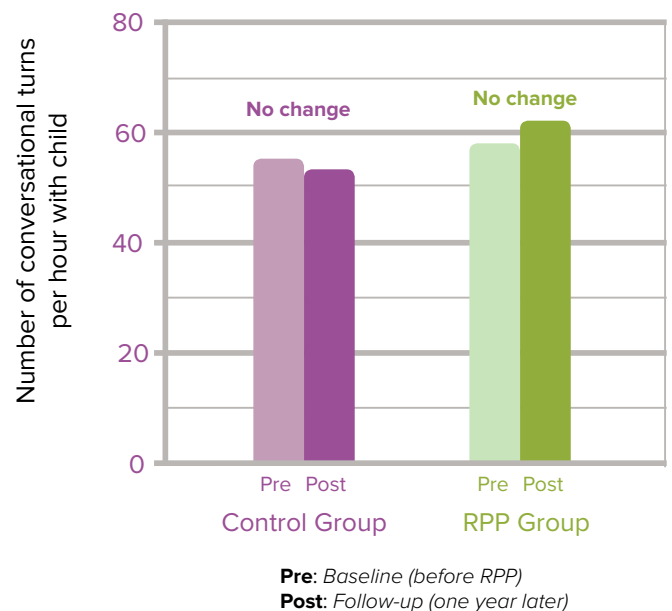


Figure 5 shows the average number of conversational turns per hour that children experienced with adults in a typical day. The increase in amount of child-directed speech by the mothers in RPP villages observed in the naturalistic play session at follow-up was not reflected in an overall increase in the number of conversational turns that the child experienced throughout their day.

These results suggest that children's actual language experience over the course of a typical day in the RPP villages did not change significantly overall as compared to children living in control villages. Since the LENA™ does not tell us who the child is conversing with, this is not necessarily inconsistent with our finding that RPP mothers increased their verbal engagement with the child following the RPP, nor does it imply that the RPP program

was ineffective in changing mothers' behavior. It is a common pattern for children in rural African villages to transition from being under the direct care of their mother during infancy to being cared for by an older sibling or other adult female in the household by the end of the second year. Thus it is possible that the caregiver who received RPP training was spending less and less time with the child throughout the year. Moreover, most of the mothers reported that they were multi-tasking throughout a typical day while also caring for the child. Although RPP caregivers may have understood the importance of talking to their child, many other individuals who had not participated in the RPP program may also have shared responsibility for looking after the child during their day-to-day routines.

Conclusions



Tostan RPP facilitators use a series of images to teach caretakers about brain development.

The results of our preliminary evaluation of the impact of the RPP on improving children's language skill through change in caregiver behavior are very promising. In particular, participation in the RPP led to a large and significant improvement in the quantity of verbal engagement between children and their primary caregiver in a naturalistic play session. In addition, exposure to the RPP program resulted in small, but statistically significant, improvements in children's language ability compared to the children in the control villages, as measured by their vocabulary knowledge and language developmental milestones achieved.

Data from all-day recordings of children's interactions with other adults and children suggests that the program's effectiveness might be improved by: a) addressing barriers to incorporating new behaviors into caregivers' everyday lives; b) providing RPP training to all of the child's caregivers, not just the mother; and c) disseminating information about child development more broadly. In fact, the practice of "adopting" other caregivers in the household and disseminating RPP information within and outside of the village are already a big part of the Tostan program. It takes time for knowledge to spread and for practices based on entrenched social norms to change. To address the barriers to change, we suggest that Tostan consider extending the duration of the infant module in the program and adding age-specific structure, content and materials to their home visiting program. It may seem like a simple thing to tell mothers to talk more to their children. However, it's not a simple matter to teach them how to be appropriately responsive and supportive and how to integrate these behaviors into everyday activities as the child grows and faces new developmental challenges.