Integrating a Parenting Intervention With Routine Primary Health Care: A Cluster Randomized Trial

Susan M. Chang, PhD[a], Sally M. Grantham-McGregor, MD[b], Christine A. Powell, PhD[a], Marcos Vera-Hernández, PhD[c], Florencia Lopez-Boo, PhD[d], Helen Baker-Henningham, PhD[a,e], Susan P. Walker, PhD[a]

abstract

OBJECTIVE: More than 200 million children globally do not attain their developmental potential. We hypothesized that a parent training program could be integrated into primary health center visits and benefit child development.

METHODS: We conducted a cluster randomized trial in the Caribbean (Jamaica, Antigua, and St Lucia). Fifteen centers were randomly assigned to the control (n = 250 mother-child pairs) and 14 to the intervention (n = 251 mother-child pairs) groups. Participants were recruited at the 6- to 8-week child health visit. The intervention used group delivery at 5 routine visits from age 3 to 18 months and comprised short films of child development messages, which were shown in the waiting area; discussion and demonstration led by community health workers; and mothers' practice of activities. Nurses distributed message cards and a few play materials. Primary outcomes were child cognition, language, and hand-eye coordination and secondary outcomes were caregiver knowledge, practices, maternal depression, and child growth, measured after the 18-month visit.

RESULTS: Eight-five percent of enrolled children were tested (control = 210, intervention = 216). Loss did not differ by group. Multilevel analyses showed significant benefits for cognitive development (3.09 points; 95% confidence interval: 1.31 to 4.87 points; effect size: 0.3 SDs). There were no other child benefits. There was a significant benefit to parenting knowledge (treatment effect: 1.59; 95% confidence interval: 1.01 to 2.17; effect size: 0.4).

CONCLUSIONS: An innovative parenting intervention, requiring no additional clinic staff or mothers' time, was integrated into health services, with benefits to child cognitive development and parent knowledge. This is a promising strategy that merits further evaluation at scale.

WHAT'S KNOWN ON THIS SUBJECT: More than 200 million children <5 years are not reaching their developmental potential. Lack of stimulating caregiving is a major cause, and effective scalable interventions are needed. Integrating parenting with health services has been recommended, but there are few evaluations.

WHAT THIS STUDY ADDS: An innovative parenting intervention can be delivered at routine visits for primary health care, with benefits to child cognitive development and parenting knowledge. This approach using films, discussion, and practice has the potential for delivery at scale.

[a]*Tropical Medicine Research Institute, The University of the West Indies, Kingston, Jamaica;* [b]*Institute of Child Health, and* [c]*Department of Economics, University College London, London, United Kingdom;* [d]*Social Protection and Health Division, Inter-American Development Bank, Washington, District of Columbia; and* [e]*School of Psychology, Bangor University, Bangor, United Kingdom*

Drs Walker, Grantham-McGregor, Chang, and Powell conceptualized and designed the study with input from Dr Lopez-Boo and Dr Baker-Henningham; Dr Chang coordinated the implementation of the study and oversaw training of the evaluation team; Drs Powell, Chang, and Walker led the development of the films, training manuals, and intervention materials with input from Drs Grantham-McGregor and Baker-Henningham; Dr Powell led the training of the intervention team (supervisors, nurses, community health workers) with input from Drs Baker-Henningham and Chang; Dr Vera-Hernández analyzed the data in consultation with Drs Walker and Grantham-McGregor; Dr Walker drafted the manuscript with contributions from Drs Chang and Vera-Hernández; and all authors contributed to the critical review and revision of the manuscript and approved the final manuscript as submitted.

This trial has been registered with the ISRCTN Register (identifier ISRCTN43108304).

www.pediatrics.org/cgi/doi/10.1542/peds.2015-0119

DOI: 10.1542/peds.2015-0119

Accepted for publication May 8, 2015

Early childhood is a critical period for brain development, and exposure to risks can modify brain structure and function.[1,2] More than 200 million children <5 years in low- and middle-income countries do not attain their developmental potential because of risks associated with poverty.[3,4] These children achieve lower levels of education, which is associated with lower adult income.[3] Investment in early childhood can reduce societal inequality, with benefits across the life course.[5,6] For example, home visits to improve parent-child interactions led to educational, behavioral, and income gains in adulthood.[7,8]

Many agencies, including the World Bank, the Inter-American Development Bank, the United Nations Children's Fund, and the World Health Organization (WHO), have recognized child development as a priority[9,10] and have called for integrating early child development (ECD) with health and nutrition programs.[9,11] Small-scale trials show that integrating ECD with nutrition does not diminish the impact of the individual interventions[12]; however, there have been few larger evaluations and there is a need for programs that are feasible and effective at scale. We developed a parent training package that could be delivered without additional staff and hypothesized that it could be integrated into routine primary health care visits, with benefits for parents' knowledge, stimulation provided, and children's developmental levels. We incorporated videos in the package because this method has the potential to reach more families and can be used to demonstrate new skills.[13]

METHODS

Study Design and Participants

The evaluation was a cluster randomized trial conducted in Jamaica, Antigua, and St Lucia with public health center as the unit of randomization. The structure of the primary care health system is similar across the 3 countries, with government health centers that provide free maternal and child health services. Routine services are delivered by nurses assisted by community health workers (CHWs). The English-speaking islands of the Caribbean have comparable levels of human development,[14] and countries were selected after the Ministries of Health indicated willingness to participate. Primary care services are available in all parishes/regions, and parishes were selected for logistical reasons. In Jamaica, the parishes of Kingston and St Andrew have a higher urban population than other parishes. Attendance is high at the postnatal clinics because immunizations are given and are required for school entry. Immunization rates are 93% to 99%.[14] Primary health centers serve predominantly lower and lower-middle income groups.

In Jamaica, of 24 centers in the parishes of Kingston and St Andrew, 4 were excluded (see Fig 1 for details). Ten of the remaining 20 centers were randomly selected for the study. In St Lucia and Antigua, health centers in northern St Lucia and northern and western Antigua were included. Ten centers in each country were randomly assigned to treatment or control groups by using a computer-generated randomization sequence. Randomization was performed by an independent statistician who was unaware of the identity of the health centers.

Thirty children were enrolled from each center in Jamaica and 10 each from centers in Antigua and St Lucia, where the population is smaller. After selection, 1 center in St Lucia closed and was dropped from the study. Ten additional participants were recruited from 2 other centers in the same arm of the trial.

Mothers and infants were recruited at the 6- to 8-week postnatal clinics. Consecutive mothers were recruited until the numbers per clinic were reached. Infants born preterm, multiple births, those aged ≥10 weeks, or those admitted to the special care nursery for >48 hours after birth were excluded. Participants were excluded if they intended to use a different center for child immunizations or if there was no consistent caregiver (Fig 1). Recruitment was conducted from August 2011 to March 2012.

Sample Size

A Jamaican trial of home visiting using CHWs showed an effect size of 0.8 SDs.[15] Because of the lower intensity of the new intervention, we hypothesized an effect size of 0.375 SDs for developmental quotient and an intracluster correlation of 0.03. With 15 health centers per group, a sample comprising 10 children in each health center achieves 80% power to detect the hypothesized effect. The sample enrolled was 250 in the control group and 251 in the intervention group.

Intervention

Short films were developed in collaboration with media consultants experienced in health education (Development Media International, London, United Kingdom). Topics were taken from our previous home-visit interventions,[16,17] selecting parental behaviors considered central to promoting child development. The process involved discussion of topic objectives with the film producer, development and review of scripts, filming, and editing to ensure fidelity with objectives. Filming was conducted in Jamaica with 5 mother-child pairs. Nine modules, each ~3 minutes in duration, covered the following topics: love, responding and comforting, talking to children, praise, using bath time to play and learn, looking at books, simple toys to make, drawing and games, and puzzles. The films showed mothers doing the behaviors we wished to encourage.

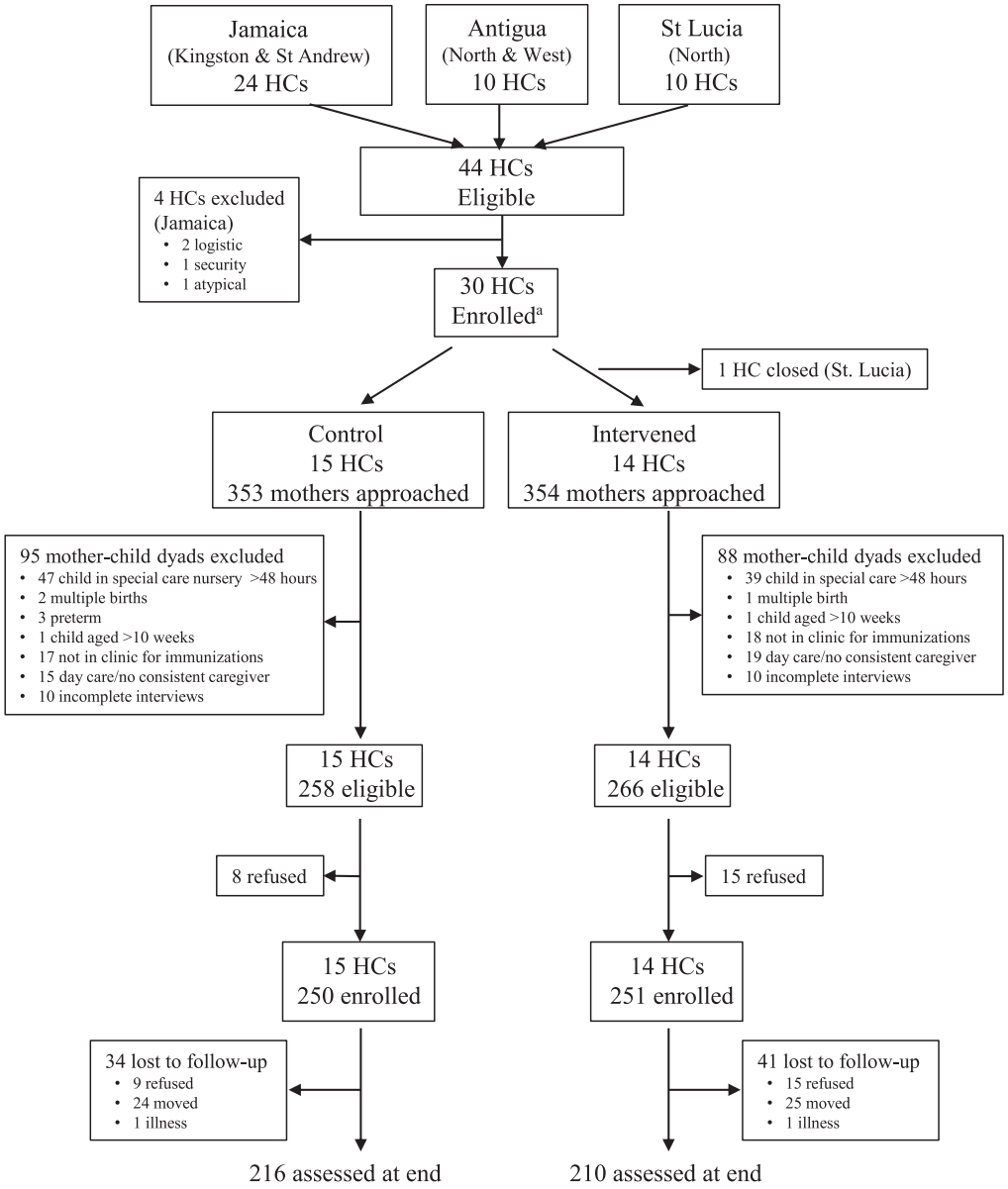

FIGURE 1
Trial profile. [a]Ten of 20 health centers in Jamaica were randomly assigned to the study. HC, health center.

DVDs comprising a set of 3 topics repeated twice were produced. A different combination of 3 topics was shown when the children in the evaluation sample attended the health visits at 3, 6, 9, 12, and 18 months of age. This approach allowed topics to be shown on more than one occasion.

In each center, CHWs discussed the activities shown with the mothers and demonstrated them. Viewing of films and discussion were conducted in the waiting area while mothers waited to see the nurse. Mothers practiced the activities with their children and were encouraged to make them part of their daily routine. Median duration of the discussion sessions was 16 minutes, with an interquartile range (IQR) of 14 to 20 minutes, and the median number of mothers during the sessions was 37 (IQR: 26–50).

CHWs had a minimum of 3 years' secondary-level education and received preservice training of up to 20 weeks or in-service training, with limited information on child development. Training in the intervention comprised 3-day workshops with viewing of films and role play. CHWs were given manuals that provided the steps and content for each health visit. Before a new set of topics was shown, a supervisor visited the clinic, reviewed the topics with the CHWs, and provided guidance in discussions and practice.

The supervisor monitored implementation quality every 6 weeks using 3-point ratings of how well the CHW involved the mothers and acknowledged and praised their efforts. The median rating of 8 (maximum: 9; IQR: 6–9) suggests that CHWs conducted the sessions satisfactorily. The supervisor provided supportive feedback after the session.

All children were seen by a nurse at each visit. The nurses gave the mothers message cards that reinforced the topics on the films and reviewed the cards with them. They encouraged the mothers to do the activities and to watch the films if they had not done so. At ages 9 and 12 months, nurses gave the parents a picture book, and at 18 months a 3-piece puzzle to take home. The estimated additional time for the nurses per mother was 2 to 3 minutes. We used materials from our home-visit intervention.[17] Book reading encourages maternal-child interaction and is associated with later cognitive and language development.[18] We selected 2 simple picture books so mothers could talk about the pictures and hoped that mothers would be encouraged to continue with other books. Puzzles build several skills related to the perception of shapes as well as task orientation, persistence, and attention. We selected a puzzle that helped mothers teach concepts such as in/out and big/little and the shapes circle and square.

Ethics

Centers in the control group provided usual care. All mothers attending intervention centers also received the parenting intervention whether or not they were in the evaluation. The study was explained to mothers invited to participate in the evaluation and written informed consent was obtained. It was explained that a new parenting program was being implemented in some health centers and that the center they attended would either continue as usual or receive the new program.

Ethical approval was obtained from the University of the West Indies Ethics Committee and from the Ministry of Health Advisory Panel on Ethics and Medico-Legal Affairs, Jamaica; the South East Regional Health Authority, Jamaica; the Ministry of Health, Antigua; and the St Lucia Medical and Dental Council.

Measurements

Baseline Measurements

Mothers were interviewed in the health center to obtain information on the following: mothers' age, education, and occupation; whether the child's father lived in the home; crowding (persons per room); and household possessions. Mothers' vocabulary was measured with the Peabody Picture Vocabulary Test (PPVT),[19] and maternal depressive symptoms with the Center for Epidemiologic Studies–Depression Scale.[20] Both measures have been piloted and used previously in Jamaica.

A parenting knowledge scale was developed with items from earlier questionnaires used in Jamaica.[15] Statements covered topics such as age of introduction of learning activities and importance of maternal-child interaction (Appendix), and mothers indicated whether they agreed completely, agreed a little bit, disagreed a little bit, or disagreed completely.

Information on the child's date of birth and birth weight was obtained from health records or, when not available, maternal recall. Child length, weight, and head circumference were measured by using standard procedures. Interviewers were trained and interobserver reliability determined comparing each of 5 interviewers with the trainer. Intraclass correlation coefficients were ≥0.94 for length measurements, 0.92 for head circumference, and equal to 1 for weight (a digital scale was used) (n = 10–17 children per interviewer). Coefficients were ≥0.99 for the PPVT, 1 for the parenting knowledge score, and ≥0.98 for the depression scale (n = 15 per interviewer).

Postintervention Measurements

Measurements were conducted between February and September 2013. Measurements were conducted in a room at the health centers a minimum of 2 weeks after the 18-month clinic visit. Primary outcomes were children's development and vocabulary measured by using the cognitive, language, and eye and hand coordination subscales of the Griffith Mental Development scales[21] and the MacArthur-Bates Short Form of the Communicative Development Inventory (CDI).[22] The Griffiths scales have been modified for Jamaica and are predictive of future IQ and school achievement.[23] The developmental quotient is calculated from the subscales and we used the UK test norms. The CDI was piloted and some words were changed to others more familiar to Caribbean children (eg, "bear" to "goat"). Interobserver reliabilities between the trainer and testers for both tests were ≥0.98 (n = 9–13 per tester).

Secondary outcomes included child growth, maternal depressive symptoms, and parenting knowledge. Two additional items were added to the knowledge scale. Maternal practices were assessed with 4 subscales from the Home Observation for Measurement of the Environment (HOME;[24] Involvement, Responsivity, Acceptance, and Learning Materials), administered at the clinic by interview and observation of mother and child. Interobserver reliability for the HOME was ≥0.90 (n = 12–16 per interviewer). Interviewers and

testers were blind to center assignment. Measurements were not conducted on child health clinic days, because these days were when the intervention was done.

Statistical Analysis

Analyses were conducted by using multilevel models with health center at level 2 and child at level 1. Random effects were specified at the health center level. Differences in baseline characteristics were assessed in the total enrolled sample and those assessed at follow-up. Intervention impacts were estimated including fixed effects for a constant term, group assignment, child's gender and age, country, and the following baseline variables: birth weight, height-for-age *z* score, adolescent mother (age ≤19 years), mother's PPVT score, mother's depressive symptoms, mother's educational grade, household crowding and possessions, and the baseline value of the outcome variable if collected. We included these covariates because child development was not measured at baseline (age 6 weeks). Hence, covariates that are plausibly associated with development might improve the precision of the estimates.

Inverse probability weighting was used to correct for possible bias because of loss to follow-up.[25,26] A logistic regression for the variable "assessed at trial end" (yes = 1, no = 0) was estimated over a constant term and adolescent mother status (the only variable associated with loss). The probability of being assessed was calculated and inverse probability weights computed.

Analyses were by intention to treat with intervention effects tested on 5 primary and 6 secondary outcomes. Multiple-comparison procedures were used to correct the risk of type 1 error (false positive). *P* values for the null hypothesis were adjusted by using the Holm-Šidák step-down procedure.[27,28] The family-wise type 1 error rate was fixed at 0.05 across the 11 outcomes tested.

Statistical analysis was carried out with Stata version 13.1 (StataCorp, College Station, TX).[29] *z* Scores for height-for-age, weight-for-height, and head circumference for age were calculated by using the WHO growth standards (WHO Anthro version 3.2.2; World Health Organization, Geneva, Switzerland)

RESULTS

We enrolled 501 mother-child pairs, and 426 were tested at the end of the trial. The children's mean age on assessment was 19.7 months (SD: 0.9 months). The trial profile with reasons for loss to follow-up is given in Fig 1. There were no significant differences between groups in enrollment characteristics (Table 1). Loss did not differ by group (16% of children were lost to follow-up in the control and 14% were lost to follow-up in the intervention). Adolescent mothers were more likely to be lost to study follow-up than other women ($P = .013$). There were no other significant differences between participants tested and those lost to study follow-up. The follow-up sample had a greater proportion of boys in the intervention group ($P = .021$). No other characteristics differed by treatment group (Table 1).

Attendance was high in both groups. The children's mother usually brought their child to the clinic, with 97.9% of children accompanied by their mother at the 3-month visit declining to 89.4% at 18 months; 83.1% of mothers attended all 5 visits. When mothers did not attend, children were brought by their father, other relatives, and occasionally by a nonrelative. According to parental report, <1% of children missed any of the visits.

The intervention had a significant benefit to children's cognitive development, with a treatment effect of 3.09 points (95% confidence interval [CI]: 1.31 to 4.87), which is equivalent to an effect size of 0.3 SDs (Table 2). Without adjustment for covariates or loss to follow-up, the treatment effect was similar (3.12 points; 95% CI: 0.86 to 5.39; Holm-Šidák *P* value = .07). There were no benefits to the language or hand and eye subscales, or the CDI vocabulary score.

Mothers in the intervention group improved significantly more in parenting scores than the control group (Table 2) (treatment effect: 1.59; 95% CI: 1.01 to 2.17; effect size: 0.4). There were no effects of intervention on the other secondary outcomes. The children's mean height-for-age, weight-for-height, and head circumference *z* scores were close to zero, indicating that growth was comparable to the WHO growth standards.

DISCUSSION

A parenting intervention implemented during routine primary health care visits in 3 Caribbean countries improved child cognitive development and mothers' knowledge of child development. The size of the cognitive benefit was comparable to other more intensive programs elsewhere,[30] although it was smaller than previous Jamaican home-visiting interventions.[15,17]

There were no benefits to the children's language or fine-motor development. In the current intervention, there was only 1 contact after 12 months, which is a time of rapid expansion in language. Moreover, the children's mean language scores were age appropriate and it may be easier to benefit developmental domains where deficits are greatest.

There are few evaluations of group delivery of ECD interventions for children in this age range.

TABLE 1 Demographic and Developmental Characteristics at Baseline

	Recruited at Baseline		Assessed at Study End	
	Intervention (n = 251)	Control (n = 250)	Intervention (n = 216)	Control (n = 210)
Infant characteristics				
Male infant, n (%)	138 (55)	120 (48)	124 (57.4)	97 (46.2)
Enrollment age, mo	1.67 ± 0.27	1.67 ± 0.27	1.67 ± 0.28	1.69 ± 0.28
Birth weight, kg	3.2 ± 0.46[a]	3.14 ± 0.47[a]	3.21 ± 0.45[a]	3.15 ± 0.48
Height-for-age z score	−0.29 ± 1.12	−0.31 ± 1	−0.31 ± 1.13	−0.28 ± 1.01
Head circumference-for-age z score	0.12 ± 1[b]	0.1 ± 1.05	0.13 ± 0.97[b]	0.08 ± 1.05
Weight-for-height z score	0.32 ± 1.25	0.27 ± 1.16	0.4 ± 1.21	0.22 ± 1.2
Maternal characteristics				
Mother's highest school grade level	10.1 ± 1.3	10 ± 1.3	10.1 ± 1.3	10 ± 1.4
Mother's PPVT score	153.02 ± 28.31	149.54 ± 28.46	153.56 ± 28.78	150.48 ± 26.71
Parenting knowledge score	32.43 ± 3.94[c]	32.49 ± 3.52[c]	32.41 ± 3.97[c]	32.36 ± 3.54[c]
Maternal depressive symptoms score	14.8 ± 10.85[a]	15.32 ± 10.68	14.58 ± 10.59[a]	14.96 ± 10.83
Adolescent mothers (age ≤19 y), n (%)	57 (22.7)	43 (17.2)	46 (21.3)	31 (14.8)
Mother's first child, n (%)	107 (42.6)	100 (40)	92 (42.6)	85 (40.5)
Mother works, n (%)	93 (37.1)	80 (32)	79 (36.6)	73 (34.8)
Mother passed secondary-level exams, n (%)	109 (43.4)	104 (41.6)	97 (44.9)	89 (42.4)
Household characteristics				
Crowding, persons per room	1.67 ± 1	1.84 ± 1.25	1.66 ± 1	1.79 ± 1.13
Number of possessions	8.61 ± 2.6	8.75 ± 2.72	8·65 ± 2.63	8.76 ± 2.7
Father lives in household, n (%)	130 (51.8)	142 (56.8)	111 (51.4)	121 (57.6)

Data are presented as means ± SDs or as n (%).

[a] Data are missing for 1 child.

[b] Data are missing for 2 children.

[c] Data are missing for 3 children.

Weekly group sessions on responsive feeding and stimulation in Bangladesh benefited children's language,[31] and a trial in Pakistan reported moderate effect sizes from monthly home visits and group sessions conducted from ages 3 to 24 months.[32] The children in those studies were considerably more disadvantaged than in the current study and had greater deficits in development.

The benefit to parenting knowledge indicates that mothers remembered the messages shown. The mothers in the films were of a social background similar to the women attending the clinics, which may have helped them

TABLE 2 Primary and Secondary Outcomes at Postintervention Measurements

	Intervention (n = 216)	Control (n = 210)	Adjusted Treatment Effect (95% CI)	P[a]
Primary outcomes				
Developmental quotient	96.14 ± 9.4	94.68 ± 8.25	1.1 (−0.45 to 2.65)	.72
Cognitive score	92.69 ± 11.65	89.52 ± 10.56	3.09 (1.31 to 4.87)	.007
Language score	99.78 ± 14.01	99.9 ± 13.58	−0.54 (−2.81 to 1.75)	.89
Hand and eye score	95.95 ± 10.25	94.62 ± 9.89	0.73 (−0.83 to 2.29)	.89
Vocabulary (CDI)	38 ± 18.42	39.57 ± 20.49	−0.94 (−3.49 to 1.61)	.89
Secondary outcomes				
Parenting score	41.35 ± 3.6	39.56 ± 4.09[b]	1.59 (1.01 to 2.17)	<.001
HOME score	29 ± 4.92	28.33 ± 4.85[b]	0.47 (−0.58 to 1.53)	.89
Depression score	18.25 ± 11.39[c]	17.27 ± 11.35[d]	1.66 (0.04 to 3.29)	.31
Head circumference-for-age z score	0.36 ± 1.06[b]	−0.01 ± 1.31	0.29 (0.06 to 0.52)	.13
Height-for-age z score	−0.1 ± 1.08	−0.11 ± 1.1	−0.01(−0.14 to 0.12)	.92
Weight-for-height z score	0.15 ± 1.02	0.15 ± 1.07[b]	−0.1 (−0.26 to 0.05)	.73

Data are presented as means ± SDs unless otherwise indicated. The model adjusts for child's birth weight, gender, height-for-age z score at baseline, age at postintervention assessment, adolescent mother, mother's PPVT score at baseline, mother's depression score at baseline, mother's educational grade, household crowding and possessions scores, country, tester, and the baseline value of the outcome variable if collected. The last 2 columns (Adjusted Treatment Effect and P) report results using inverse probability weighting. In general, 424 children are used in the estimation of the treatment effects because of missing data on birth weight and baseline depression score. Because of missing data at postintervention assessment, data on 423 children are used when estimating the models for the HOME and weight-for-height, and data on 417 mothers are used for depression. Because of a combination of missing data at both time points, data on 417 children are used for parenting score and 421 for head circumference. Intracluster correlation: developmental quotient, 0.017; cognition, 0.036; language, 0.001; hand and eye, 0.128; CDI, 0.001.

[a] P values were adjusted for multiple comparisons by using Holm-Šidák step-down procedure to preserve family-wise type 1 error at 0.05.

[b] Data are missing for 1 child.

[c] Data are missing for 5 mothers.

[d] Data are missing for 2 mothers.

see the behaviors depicted as relevant. Video modeling can assist with learning new health behaviors.[13,33] In addition, the discussion, demonstration, and practice would have reinforced the messages. Videos could be beneficial as part of parenting interventions with the use of other group-delivery platforms such as community mothers' groups. Benefits of showing videos alone should be investigated because there is some evidence that videos improve parent knowledge of other health behaviors.[34,35]

There were no intervention benefits for the HOME scores, which may require more modeling and practice than could be provided in the limited number of contacts in busy clinics. Maternal depressive symptoms were also not reduced, although benefits were seen from a home-visit parenting program.[36] It is likely that the relationship between mother and visitor is an important component of benefits for depression.

There were several challenges to implementation. Clinics were often noisy and crowded, and some mothers would have had difficulty hearing and seeing the films. It also made it difficult for the health workers to interact with the mothers during the demonstration.

Linking the intervention to primary care in these Caribbean countries has the advantage of excellent coverage and compliance with child health visits. The intervention required investment in equipment, materials, and staff training, but it was implemented by the existing clinic staff. It also did not require additional time at the clinic for the parents. There were no adverse effects of adding the intervention on nutrition or immunization status of the children, and other small studies suggest that ECD and nutrition activities can be integrated without negative impacts on either component.[12] However, this issue will need attention, especially in countries in which children's health and nutrition are poorer and the capacity of health services more limited.

The intervention was supervised by the research team, which may have facilitated success.[37] In planning for scale-up there is a need to identify staff to provide supervision. Furthermore, health service contacts are less frequent after 18 months and other programs will be required.

Our results show that it is feasible to integrate a parenting intervention in child health clinics without the need for additional staff or asking mothers to spend extra time at the clinic. Despite low intensity and challenging clinic conditions, the intervention benefited child cognitive development and parent knowledge. This innovative approach merits further evaluation to determine if similar benefits can be achieved at scale.

APPENDIX: PARENT KNOWLEDGE SCALE

1. Too much love and attention will spoil a child.
2. A parent needs to spank or beat young children when they are rude or they will grow up to be bad.
3. It is important that a busy mother spend plenty of time talking with her infant.
4. It is important that parents look at picture books with children who are <2 years old.
5. The best way to get a child to behave is to praise him/her when he/she is good.
6. It is important that a busy mother spend plenty of time playing with her young child.
7. There is no need to give toys to children <1 year old.
8. A time for play is important for young children.
9. Singing and chatting with your infant will help him/her learn.
10. Children should not be given crayons until they are ready to learn to write.
11. Young children should not be held when they cry because this will make them want to be held all the time.
12. How a parent behaves with her child when she/he is young affects how well she/he will learn in school.

Parents were asked to indicate if they agreed completely, agreed a little bit, disagreed a little bit, or disagreed completely with each statement. Items 1, 2, 7, 10, and 11 were reverse coded. Items 11 and 12 were added at follow-up assessment.

ACKNOWLEDGMENTS

We thank the Ministry of Health, Jamaica, in particular, the Kingston and St Andrew Health Department, and the Ministries of Health of Antigua and St Lucia for facilitating the study and their cooperation throughout. We thank the intervention supervisors and the evaluation team for their commitment and professionalism. We also thank the nurses and community health workers for their contribution to the success of the study and to the parents who made the study possible.

ABBREVIATIONS

CDI: Communicative Development Inventory
CHW: community health worker
CI: confidence interval
ECD: early child development
HOME: Home Observation for Measurement of the Environment
IQR: interquartile range
PPVT: Peabody Picture Vocabulary Test
WHO: World Health Organization

Address correspondence to Susan P. Walker, PhD, Tropical Medicine Research Institute, The University of the West Indies, Kingston 7, Jamaica. E-mail: susan.walker@uwimona.edu.jm

PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275).

FINANCIAL DISCLOSURE: The authors have indicated they have no financial relationships relevant to this article to disclose.

FUNDING: Supported by the Inter-American Development Bank.

POTENTIAL CONFLICT OF INTEREST: Dr Lopez-Boo is employed by the Inter-American Development Bank; the other authors have indicated they have no financial relationships relevant to this article to disclose.

REFERENCES

1. Hackman DA, Farah MJ, Meaney MJ. Socioeconomic status and the brain: mechanistic insights from human and animal research. *Nat Rev Neurosci*. 2010; 11(9):651–659
2. Hertzman C, Boyce T. How experience gets under the skin to create gradients in developmental health. *Annu Rev Public Health*. 2010;31:329–347
3. Grantham-McGregor S, Cheung YB, Cueto S, Glewwe P, Richter L, Strupp B; International Child Development Steering Group. Developmental potential in the first 5 years for children in developing countries. *Lancet*. 2007;369(9555):60–70
4. Walker SP, Wachs TD, Gardner JM, et al; International Child Development Steering Group. Child development: risk factors for adverse outcomes in developing countries. *Lancet*. 2007;369(9556): 145–157
5. Heckman JJ. Skill formation and the economics of investing in disadvantaged children. *Science*. 2006;312(5782): 1900–1902
6. Campbell F, Conti G, Heckman JJ, et al. Early childhood investments substantially boost adult health. *Science*. 2014;343(6178):1478–1485
7. Gertler P, Heckman J, Pinto R, et al. Labor market returns to an early childhood stimulation intervention in Jamaica. *Science*. 2014;344(6187):998–1001
8. Walker SP, Chang SM, Vera-Hernández M, Grantham-McGregor S. Early childhood stimulation benefits adult competence and reduces violent behavior. *Pediatrics*. 2011;127(5):849–857
9. Chan M. Linking child survival and child development for health, equity, and sustainable development. *Lancet*. 2013; 381(9877):1514–1515
10. Lake A. Early childhood development-global action is overdue. *Lancet*. 2011; 378(9799):1277–1278
11. Black MM, Dewey KG. Promoting equity through integrated early child development and nutrition interventions. *Ann N Y Acad Sci*. 2014; 1308(1):1–10
12. Grantham-McGregor SM, Fernald LC, Kagawa RM, Walker S. Effects of integrated child development and nutrition interventions on child development and nutritional status. *Ann N Y Acad Sci*. 2014;1308(1):11–32
13. Krouse HJ. Video modelling to educate patients. *J Adv Nurs*. 2001;33(6): 748–757
14. United Nations Development Programme. *Human Development Report 2014*. New York, NY: United Nations Development Programme; 2014
15. Powell C, Baker-Henningham H, Walker S, Gernay J, Grantham-McGregor S. Feasibility of integrating early stimulation into primary care for undernourished Jamaican children: cluster randomised controlled trial. *BMJ*. 2004;329(7457):89–92
16. Gardner JM, Walker SP, Powell CA, Grantham-McGregor S. A randomized controlled trial of a home-visiting intervention on cognition and behavior in term low birth weight infants. *J Pediatr*. 2003;143(5):634–639
17. Grantham-McGregor SM, Powell CA, Walker SP, Himes JH. Nutritional supplementation, psychosocial stimulation, and mental development of stunted children: the Jamaican Study. *Lancet*. 1991;338(8758):1–5
18. Raikes H, Pan BA, Luze G, et al. Mother-child bookreading in low-income families: correlates and outcomes during the first three years of life. *Child Dev*. 2006;77(4):924–953
19. Dunn LM, Dunn DM. *Peabody Picture Vocabulary Test*. 4th ed. San Antonio, TX: Pearson; 2007
20. Radloff L. The CES-D scale: a self-report depression scale for research in the general population. *Appl Psychol Meas*. 1977;1(3):385–401
21. Griffiths R, Huntley M. *The Griffiths Mental Development Scales From Birth to 2 Years*. Oxford, United Kingdom: The Test Agency Ltd; 1996
22. Fenson L, Marchman VA, Thal DJ, Dale PS, Reznick S, Bates E. *MacArthur-Bates Communicative Development Inventory*. Baltimore, MD: Brookes Publishing; 2003
23. Grantham-McGregor S, Powell C, Walker S, Chang S, Fletcher P. The long-term follow-up of severely malnourished children who participated in an intervention program. *Child Dev*. 1994; 65(2 spec no):428–439
24. Caldwell BM, Bradley RH. *Home Inventory Administration Manual*. Little Rock, AR: University of Arkansas; 2003
25. Heyting A, Tolboom JTBM, Essers JGA. Statistical handling of drop-outs in longitudinal clinical trials. *Stat Med*. 1992;11(16):2043–2061
26. Wooldridge J. *Econometric Analysis of Cross Section and Panel Data*. Cambridge, MA: MIT Press; 2002
27. Holm S. A simple sequentially rejective multiple test procedure. *Scand J Med*. 1979;6(2):65–70
28. Ludbrook J. Multiple comparison procedures updated. *Clin Exp Pharmacol Physiol*. 1998;25(12):1032–1037
29. StataCorp. Stata statistical software. Release 13 [computer program]. College Station, TX: StataCorp LP; 2013

30. Hamadani JD, Huda SN, Khatun F, Grantham-McGregor SM. Psychosocial stimulation improves the development of undernourished children in rural Bangladesh. *J Nutr*. 2006;136(10): 2645–2652

31. Aboud FE, Akhter S. A cluster-randomized evaluation of a responsive stimulation and feeding intervention in Bangladesh. *Pediatrics*. 2011;127(5). Available at: www.pediatrics.org/cgi/content/full/127/5/e1191

32. Yousafzai AK, Rasheed MA, Rizvi A, Armstrong R, Bhutta ZA. Effect of integrated responsive stimulation and nutrition interventions in the Lady Health Worker programme in Pakistan on child development, growth, and health outcomes: a cluster-randomised factorial effectiveness trial. *Lancet*. 2014; 384(9950):1282–1293

33. Tuong W, Larsen ER, Armstrong AW. Videos to influence: a systematic review of effectiveness of video-based education in modifying health behaviors. *J Behav Med*. 2014;37(2): 218–233

34. Dunn RA, Shenouda PE, Martin DR, Schultz AJ. Videotape increases parent knowledge about poliovirus vaccines and choices of polio vaccination schedules. *Pediatrics*. 1998;102(2). Available at: www.pediatrics.org/cgi/content/full/102/2/e26

35. Scheinmann R, Chiasson MA, Hartel D, Rosenberg TJ. Evaluating a bilingual video to improve infant feeding knowledge and behavior among immigrant Latina mothers. *J Community Health*. 2010;35(5):464–470

36. Baker-Henningham H, Powell C, Walker S, Grantham-McGregor S. The effect of early stimulation on maternal depression: a cluster randomised controlled trial. *Arch Dis Child*. 2005; 90(12):1230–1234

37. Yousafzai AK, Aboud F. Review of implementation processes for integrated nutrition and psychosocial stimulation interventions. *Ann N Y Acad Sci*. 2014; 1308(1):33–45

A DEADLY INFECTION: *My wife and I use a lot of olive oil in our meals at home. We may dip fresh bread into a small bowl of olive oil, or sprinkle olive oil over fresh tomatoes or a salad. We greatly enjoy the variety of tastes the different olive oils have. Some of our favorite olive oils come from southern Italy. Unfortunately, olive oil from southern Italy may soon become much harder to find.*

As reported in The New York Times *(World: May 11, 2015), a bacterial infection is wreaking havoc among olive groves in the Apulia region (roughly, the "heel") of southern Italy. The bacterium,* Xylella fastidiosa*, rapidly and easily transferred from tree to tree by feeding spittlebugs, causes a gel to form in the xylem – thereby restricting water flow to the branches and leaves, ultimately leading to the death of the tree. In Italy, the disease has been called "olive quick decline syndrome." Currently there is no cure – just prevention. Unfortunately, prevention is challenging. Authorities are trying to decide whether to quarantine the area or kill all the trees. Either way, the growers in the area will be hard hit. Many could face financial ruin. Experts estimate that 10% of the trees in the area (or almost 1,000,000) are infected. Nobody knows the total extent of the infection or how far north the bacterium has spread. Many suggest that the growers will have to learn how to co-exist with the bacterium, similar to the way grape growers in Brazil and California have had to adapt to the virulent strains of* Xylella *that infect grape vines.*

While worldwide production of olive oil has not declined and Spain still produces more olive oil than any other country, certain olive oils from southern Italy may become harder to find. My plan is to enjoy them while I can.

Noted by WVR, MD

Integrating a Parenting Intervention With Routine Primary Health Care: A Cluster Randomized Trial

Susan M. Chang, Sally M. Grantham-McGregor, Christine A. Powell, Marcos Vera-Hernández, Florencia Lopez-Boo, Helen Baker-Henningham and Susan P. Walker

Pediatrics 2015;136;272; originally published online July 6, 2015;
DOI: 10.1542/peds.2015-0119

PEDIATRICS®
OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

Integrating a Parenting Intervention With Routine Primary Health Care: A Cluster Randomized Trial

Susan M. Chang, Sally M. Grantham-McGregor, Christine A. Powell, Marcos Vera-Hernández, Florencia Lopez-Boo, Helen Baker-Henningham and Susan P. Walker

Pediatrics 2015;136;272; originally published online July 6, 2015;
DOI: 10.1542/peds.2015-0119