The Jamaican early childhood home visiting intervention

Sally Grantham-McGregor, Emeritus Professor of International Child Health, University College London, UK, and Susan Walker, Professor of Nutrition, University of the West Indies, Jamaica

Specific aims of the programme include improving mothers' self-esteem and enjoyment in bringing up their child and their knowledge of child development and child-rearing practices. Photo • Courtesy Jessie North

The Jamaican early childhood intervention has received considerable attention from child development experts, economists and policymakers interested in promoting the development of disadvantaged children aged under 4 years in middle- and low-income countries. This article outlines the intervention, reviews evidence of its effectiveness – with benefits to cognition found in 12 evaluations conducted in three countries – and discusses issues with adapting to new cultures and going to scale.

The development of the Jamaican early childhood home visiting intervention began in 1973. At the time, poor children in Kingston were generally developing well in the first year but showed dramatic declines thereafter (Grantham-McGregor and Back, 1971; Grantham-McGregor and Hawke, 1971). Meanwhile, the USA's Head Start Program was showing encouraging benefits to educational attainment and social behaviour.

We decided to use home visiting rather than a centre-based intervention for several reasons: it was lower cost; centres were not readily available; it would facilitate social support for the mothers and targeting the developmental level of each child; play activities could be more readily linked to the mother's everyday activities; the most disadvantaged women often did not come to centres; and, most importantly, if we could improve mothers' childrearing practices the benefits for the child were more likely to be sustained and might spread to siblings.

In our first pilot study, children showed large improvements in developmental quotients compared with a control group after eight months (Grantham-

McGregor and Desai, 1975). However, the model was too expensive, involving visits by a nurse or a doctor and the use of bought toys, so the curriculum was modified to use home-made toys and be delivered by para-professionals. The next study was conducted with severely malnourished children in hospital; they were played with daily in hospital and then visited weekly for two years after discharge and twice-weekly for a third year. Compared with a matched control group, the children in the intervention group showed marked improvements in developmental quotients (Grantham-McGregor *et al.*, 1980). At 17 years of age, they still had higher IQs than the controls (Grantham-McGregor *et al.*, 1994).

Two more studies were conducted with children in a poor Kingston neighbourhood (Powell and Grantham-McGregor, 1989). We aimed to determine how the frequency of visiting was related to the benefits and whether para-professionals could deliver the intervention with the same benefits as professionals. They found that para-professionals were just as effective, and benefits for the children increased with the visit frequency. We also developed books to use in the intervention that were culturally appropriate, reflecting people and environments familiar to the children and containing only pictures because of the limited literacy of many mothers. Following these pilot studies para-professionals, home-made toys and our own books were used in all future studies.

Principles and curriculum

The philosophy behind the intervention is to support mothers to promote their children's development. Specific aims include improving mothers' self-esteem and enjoyment in bringing up their child and their knowledge of child development and child rearing practices. Encouraged maternal behaviours include: responsiveness to child's mood, vocalisations, actions and interests, mediating the environment for the child (drawing attention to, describing, labelling) and introducing new objects, sounds, activities and concepts, giving positive feedback, celebrating the child's achievements and showing love.

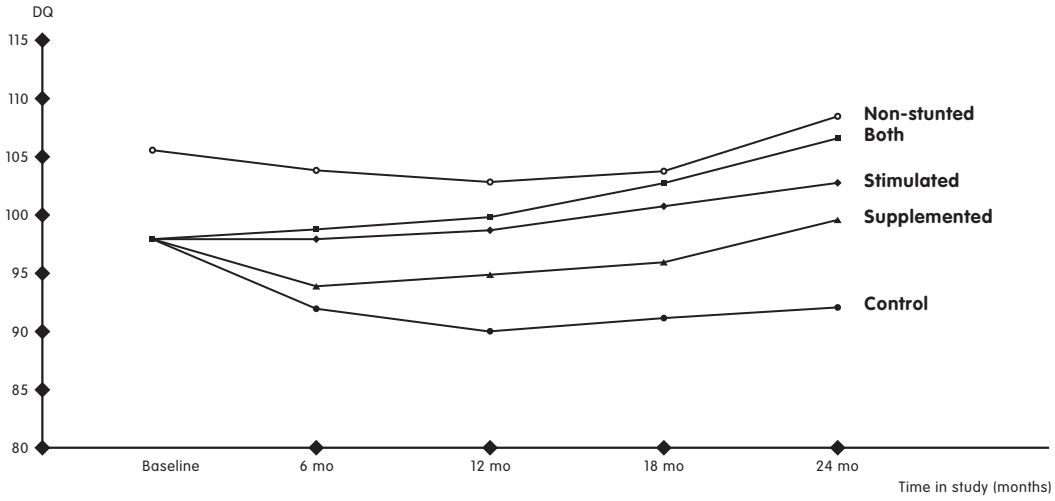
The methodology depends on developing a close relationship with the mother, to be able to motivate her. Training of community health workers included how to listen, ask mothers' opinions and give positive feedback. Teaching methods included observing what the child does, demonstrating and describing a new activity from the curriculum, helping the child to do it, allowing the child to practise and then do it alone, giving positive feedback and celebrating success. We also use and demonstrate 'scaffolding', ensuring that activities are not too easy or too difficult for the child (Vygotsky, 1978). The mother is encouraged to practise the activities and do them with her child in the following week.

All curriculum activities are arranged by week in order of difficulty and children usually move on to the next set of activities each week. The visitors are trained to adjust the position of each child on the curriculum if the general level is too difficult or easy. All activities and play materials were specially designed for the intervention, including blocks, dolls, sets of puzzles, sorting and classifying activities, and books. Many of the activities for under-2s were based on constructs assessed by Uzgiris and Hunt (1978), including object permanence, causation, vocal imitation, imitation of familiar and unfamiliar gestures and exploration of objects. Activities for older children were designed to facilitate the teaching of concepts included in Francis Palmer's concept curriculum (Palmer, 1971) including size, quantity, colour, shape, position, same/different, classification, etc. Activities were also included to facilitate the development of problem solving, attention and persistence, all part of task orientation, and language and general knowledge.

Evidence from Jamaica

The intervention has been rigorously evaluated with disadvantaged children in three countries, with consistent evidence of improving child development as well as some evidence of sustained benefits. In addition to the pilot studies, a further three randomised controlled trials (RCTs) were conducted in Kingston, Jamaica.

Figure 1 Mean developmental quotients (DQ) of stunted groups adjusted for initial age and score, compared with non-stunted group



Source: Grantham McGregor *et al.,* 1991

Stunted children

An RCT with 127 stunted children investigated whether nutritional supplementation had an independent effect on children's development and whether adding stimulation increased the benefits (Grantham-McGregor *et al.*, 1991). There were four groups: supplementation, stimulation, both interventions and control. A comparison non-stunted group was also enrolled. Both nutritional supplementation and stimulation had independent benefits for children's development, and the group with both interventions caught up with the non-stunted group after two years (Figure 1). However, follow-ups showed that the effects of supplementation were no longer apparent after 7 years (Grantham-McGregor *et al.*, 1997), whereas stimulation still showed wide-ranging benefits at the age of 22 years. As shown in Table 1, these included cognitive, social, educational and mental health benefits, and increased wages (Walker *et al.*, 2011; Gertler *et al.*, 2014). Interestingly, the benefits were smallest at 7 years, indicating the importance of longer-term follow-up.

Low-birthweight full-term babies

In 1999 we began a trial with low-birthweight infants born at term to test whether mothers were particularly receptive to intervention in the first eight weeks post partum. The eight-week intervention focused on improving the mothers' responsiveness to their infants, encouraging mothers to 'converse' with their infants, respond to their cues, show affection, and focus their attention on the environment. A few home-made toys were provided. Evaluation at 7 months showed benefits from intervention to infant problem-solving ability and behaviour (Meeks Gardner *et al.*, 2003). From 7 to 24 months the usual intervention was introduced but visit duration was reduced to 30 minutes. At 24 months there were significant cognitive and fine motor benefits (Walker *et al.*, 2004), though less comprehensive and of

smaller effect size than in previous studies. Follow-up at age 6 years showed benefits to performance IQ, visual–spatial memory and behavioural difficulties, suggesting that long-term benefits may occur following modest initial benefits (Walker *et al.*, 2010). A future check for longer-term benefits would be desirable.

Using primary healthcare

Another study evaluated whether the intervention could be delivered by the primary healthcare services using community health workers already employed in the clinics (Powell *et al.*, 2004). Clinics for undernourished children were randomised to stimulation or control and the workers in the intervention clinics were asked to visit a few children each. On average children were visited every 10 days for approximately 30 minutes. The children in the intervention showed marked benefits, but the research team provided supportive supervision, so the challenge remains how to make this supervision sustainable through the health service.

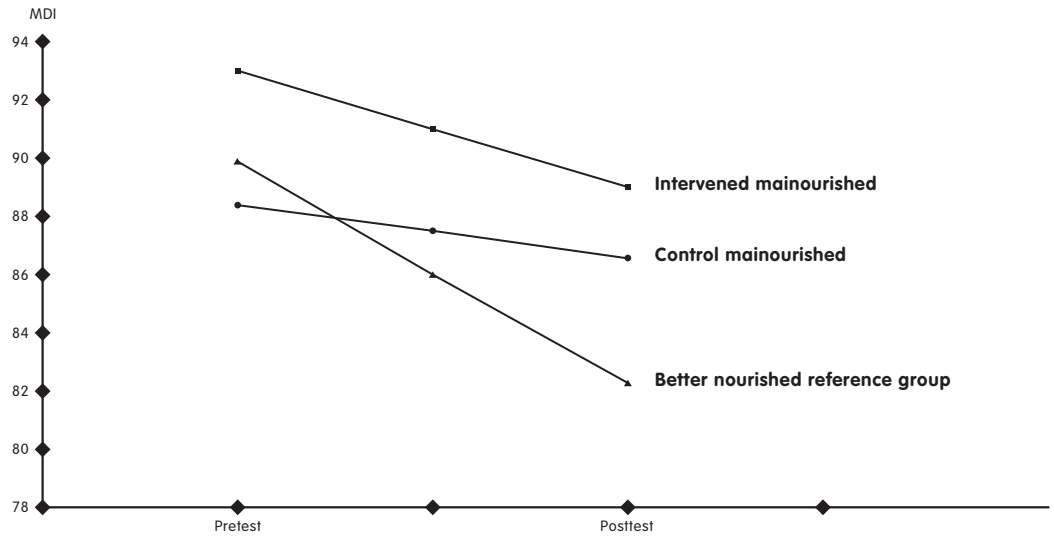
Bangladesh and Colombia

In Bangladesh four trials were conducted by researchers at the International Centre for Diarrhoeal Disease Research, the first a cluster randomised trial with moderately underweight children who were attending nutrition centres (Hamadani *et al.*, 2006). Mothers and children were visited weekly or twice a week for 10 months by trained local village women, with the children showing moderate benefits to their mental development (see Figure 2).

In another trial severely malnourished children and their mothers were given two weeks of daily individual and group sessions in hospital, followed by 18 play sessions over six months after discharge, either in the hospital outpatients clinic or at home. The children in the intervention group showed moderate benefits on mental development compared with the controls.

In a subsequent study (Nahar *et al.*, 2012), severely malnourished children were randomised to four groups: stimulation, supplementation, control or both treatments. Stimulation benefited mental development but supplementation had no effect, probably because it was given for too short a time.

Figure 2 Effect of stimulation on mental development index (MDI) of malnourished Bangladeshi infants at home



Source: Hamadani *et al.*, 2006

In a fourth cluster randomised trial, villages were randomised to stimulation or control (Tofail *et al.*, 2013). Groups of iron-deficient anaemic and non-anaemic children were enrolled from each village. After nine months of weekly home visits the intervened non-anaemic group showed moderate improvements in mental development, whereas the iron-deficient group made only small, non-significant improvements. It may be that iron-deficient children need more time to improve.

In Colombia, a randomised trial was conducted by the Institute of Fiscal Studies (Attanasio *et al.*, 2014) using a cash transfer programme to identify participants and home visitors. This was a first step in going to scale, as the programme spread over 96 municipalities with 1420 children. The study looked at stimulation and multiple micronutrient supplementation, with supervisors meeting with the visitors once every nine weeks rather than weekly or fortnightly as in previous studies. The children in the intervention group showed a small cognitive benefit from stimulation compared to the control, with no effect from supplementation.

Adapting the intervention for different cultures

Beyond Bangladesh, adaptations of the intervention are at present being implemented in India, Brazil, Madagascar and Peru, and there are plans to begin trials in China and Zimbabwe.

Adapting the curriculum to a new culture requires working with local professionals with a knowledge of childrearing practices and beliefs. Small surveys and group discussions with mothers are needed to identify local songs, games and play materials to be incorporated into the curriculum. Pretend games may need adapting to local activities (such as going to field to work, spinning wool). The pilot work is particularly important where the professionals do not have a detailed knowledge of the conditions of the project families, who usually live in poor areas. The process of translating the curriculum can introduce errors and back translation is necessary.

The books and play materials also need adaptation. Pictures should be redrawn by local artists where necessary, to reflect local living conditions, vegetation, dress, ethnicity, family structure and so on. Suitable waste materials need to be identified to produce some of the toys used. As family structure varies among countries, members of extended families should be included in the visit when they are present.
The intervention depends on having visitors who are friendly towards and supportive of the mothers, and supervisors who have a similar approach to the visitors. In more hierarchical cultures the training of visitors and supervisors needs to be alert to the tendency to instruct and evaluate rather than help and support.

Challenges in going to scale

Scaling-up of parenting interventions is limited by the technical capacity of organisations to implement them. In an initiative funded by Grand Challenges Canada, an international collaboration of academics headed by the Jamaican group at the University of the West Indies is developing an innovative web-based package based on the home-visiting programme that provides necessary materials, training and technical support to address this gap.

Programme materials comprise films, curriculum, training manuals, toy-making manuals and a cultural adaptation guide. The films facilitate the training of home visitors by illustrating the key steps in a home visit and particular activities and techniques. Filming was conducted in Jamaica, Peru and Bangladesh and the films are available in English, Spanish, French and Bengali, with additional translations planned. The training manual for supervisors includes a suggested training schedule, objectives and activities for each session, and guides for using the films in the training sessions.

The curriculum is designed for use by community workers with primary education and gives activities and goals for each visit. A simpler, briefer version of the visit guides will also be designed which could be produced on cards or adapted for mobile phones. A comprehensive

Table 1 Long-term effects of psychosocial stimulation: follow-up of the Jamaica study from age 7 to 22 years

Age at follow-up (years)	Outcome		
	Cognition	**Education**	**Behaviour**
7–8 (Grantham-McGregor *et al.*, 1997)	Stimulation groups (and supplement-only group) had better scores than control group on 13–14 of 15 tests (sign test $p = 0.01$). Significant benefits for perceptual motor function.	No significant benefits for school achievement.	Not assessed.
11–12 (Walker *et al.*, 2000; Chang *et al.*, 2002)	Significant benefits from stimulation for IQ (effect size 0.52 SD), reasoning ability, and vocabulary compared with control group. No benefits for two other language tests and tests of memory and attention.	Suggestive of benefits for reading, spelling, and comprehension (all $p < 0.1$) but not mathematics.	No benefits for behaviour by teacher and parent reports.
17–18 (Walker *et al.*, 2005, 2006)	Significant benefits to IQ (effect size 0.51 SD), vocabulary and reasoning ability compared with no- stimulation groups (control and supplement only).	Significant benefits for reading and comprehension. No benefits for mathematics. Reduction in school dropout rate.	Significant reduction in symptoms of anxiety and depression, and higher self-esteem. No effect on antisocial behaviour. Fewer attention problems by parents' report and suggestive of reduced oppositional behaviour ($p = 0.1$).
22 (Walker *et al.*, 2011)*	Significant benefits to IQ (effect size 0.6 SD).	Significant benefits for reading, mathematics, general knowledge, highest grade level attained.	Significant reduction in depressive symptoms and social inhibition. No effect on anxiety. Reduction in violent behaviour.

Adapted from Walker *et al.,* 2011
* Follow-up at 22 years also demonstrated 25% increase in average monthly earnings (Gertler *et al.,* 2014).

communication and advocacy strategy will promote the availability of the programme as well as providing materials to advocate for increased investment in parenting interventions for children under 3 years. As part of the initial roll-out of the package we are working with several countries to better understand implementation processes and challenges, to inform the development of ongoing technical support.

The most serious challenge in going to scale has been that political or funding pressures often drive the organisers to reduce the inputs to an extent that may threaten the intervention's effectiveness. This includes reductions in the duration of the training, as well as the amount of supervision given to the visitors – both critical components. There may be a tension between the need to maintain the basic principles and constructs of the curriculum and the desire to change materials and the approach to visits. If too much is changed, the effectiveness of the intervention may be lost.

Another common problem is high staff turnover, meaning that the people initially trained do not continue with the programme. Finally, the organisers often want to address several risks to child growth and development in the same intervention – but while integrating child development into health and nutrition services is potentially cost-effective, few such programmes have been evaluated at scale (Grantham-McGregor *et al.*, 2014) and more research is needed to understand the most efficient ways of integrating the components.

References

Attanasio, O.P., Fernandez, C., Fitzsimons, E.O., Grantham-McGregor, S.M., Meghir, C. and Rubio-Codina, M. (2014). Using the infrastructure of a conditional cash transfer program to deliver a scalable integrated early child development program in Colombia: cluster randomized controlled trial. *BMJ* 349: g5785.

Chang, S.M.,Walker, S.P., Powell, C.A. and Grantham-McGregor, S.M. (2002). Early childhood growth retardation and later behaviour and school achievement. *Journal of Child Psychiatry and Psychology* 43(6): 775–83.

Gertler, P., Heckman, J,, Pinto. R,, Zanolini, A., Vermeerch, C., Walker, S. *et al.* (2014). Labor market returns to an early childhood stimulation intervention in Jamaica. *Science* 344: 998–1001.

Grantham-McGregor, S.M. and Back, E.H. (1971). Gross motor development in Jamaican infants. *Developmental Medicine and Child Neurology* 13: 79–87.

Grantham-McGregor, S.M. and Hawke, W.A. (1971). Developmental assessment of Jamaican infants. *Developmental Medicine and Child Neurology* 13: 582–9.

Grantham-McGregor, S.M. and Desai, P. (1975). A home visiting intervention programme with Jamaican mothers and children. *Developmental Medicine and Child Neurology* 17: 605–13.

Grantham-McGregor, S., Powell, C., Walker, S., Chang, S. and Fletcher, P. (1994). The long-term follow-up of severely malnourished children who participated in an intervention program. *Child Development* 65, 428–39.

Grantham-McGregor, S., Stewart, M.E. and Schofield, W.N. (1980). Effect of long-term psychosocial stimulation on mental development of severely malnourished children. *The Lancet* 2, 785–9.

Grantham-McGregor, S.M., Fernald, L.C., Kagawa, R.M. and Walker, S. (2014). Effects of integrated child development and nutrition interventions on child development and nutritional status. *Annals of New York Acadamy of Science* 1308: 11–32.

Grantham-McGregor, S.M., Powell, C.A., Walker, S.P. and Himes, J.H. (1991). Nutritional supplementation, psychosocial stimulation, and mental development of stunted children: the Jamaican Study. *The Lancet* 338: 1–5.

Grantham-McGregor, S.M., Walker, S.P., Chang, S.M. and Powell, C.A. (1997). Effects of early childhood supplementation with and without stimulation on later development in stunted Jamaican children. *American Journal Clinical Nutrition* 66: 247–53.

Hamadani, J.D., Huda, S.N., Khatun, F. and Grantham-McGregor, S.M. (2006). Psychosocial stimulation improves the development of undernourished children in rural Bangladesh. *Journal of Nutrition* 136: 2645–52.

Meeks Gardner, J.M., Walker, S.P., Powell, C.A. and Grantham-McGregor, S.M. (2003). A randomized controlled trial of a home visiting intervention on cognition and behaviour in term low birth weight infants. *Journal of Pediatrics* 143: 634–9.

Nahar, B., Hossain, M.I., Hamadani, J.D., Ahmed, T., Huda, S.N., Grantham-McGregor, S.M. *et al.* (2012). Effects of a community-based approach of food and psychosocial stimulation on growth and development of severely malnourished children in Bangladesh: a randomised trial. *European Journal of Clinical Nutrition* 66: 701–9.

Palmer, F. (1971). *Concept Training Curriculum For Children Ages Two To Five*, vol. 1-V. Stony Brook: State University of New York.

Powell, C., Baker-Henningham, H., Walker, S., Gernay, J. and Grantham-McGregor, S. (2004). Feasibility of integrating early stimulation into primary care for undernourished Jamaican children: cluster randomised controlled trial. *BMJ* 329: 89–91.

Powell, C. and Grantham-McGregor, S. (1989) Home visiting of varying frequency and child development. *Pediatrics* 84: 157–64.

Tofail, F., Hamadani, J.D., Mehrin, F., Ridout, D.A., Huda, S.N. and Grantham-McGregor, S.M. (2013). Psychosocial stimulation benefits development in nonanemic children but not in anemic, iron-deficient children. *Journal of Nutrition* 143: 885–93.

Uzgiris, I.C. and Hunt, J.M. (1978). *Assessment in Infancy: Ordinal Scales of Psychological Development.* Chicago: University of Illinois Press.

Vygotsky, L.S. (1978). Mind in Society: The development of higher psychological processes. Cambridge, MA: Harvard University Press.

Walker, S.P. (2011). Promoting equity through early child development interventions for children from birth through three years of age. In: Alderman, H. (ed.) *No Small Matter. The impact of poverty, shocks and human capital investments in early childhood development.* Washington DC: World Bank.

Walker, S.P., Chang, S.M., Powell, C.A. and Grantham-McGregor, S.M. (2004). Psychosocial intervention improves the development of term low-birth-weight infants. *Journal of Nutrition* 134: 1417–23.

Walker, S., Chang, S., Powell, C. and Grantham-McGregor, S.M. (2005). Effects of early childhood psychosocial stimulation and nutritional supplementation on cognition and education in growth-retarded Jamaican children: a prospective cohort study. *The Lancet* 366: 1804–7.

Walker, S.P., Chang, S.M., Powell, C.A., Simonoff, E., Grantham-McGregor, S.M. (2006). Effects of psychosocial stimulation and dietary supplementation in early childhood on psychosocial functioning in late adolescence: follow-up of randomised controlled trial. *BMJ* 333: 472–4.

Walker, S.P., Chang, S.M., Vera-Hernandez, M. and Grantham-McGregor, S. (2011). Early childhood stimulation benefits adult competence and reduces violent behavior. *Pediatrics* 127: 849–57.

Walker, S.P., Chang, S.M., Younger, N. and Grantham-McGregor, S.M. (2010). The effect of psychosocial stimulation on cognition and behaviour at 6 years in a cohort of term, low-birthweight Jamaican children. *Developmental Medicine and Child Neurology* 52: e148–e154.

Walker, S.P., Grantham-McGregor, S.M., Powell, C.A. and Chang, S.M. (2000). Effects of growth restriction in early childhood on growth, IQ, and cognition at age 11 to 12 years and the benefits of nutritional supplementation and psychosocial stimulation. *Journal of Pediatrics* 137: 36–41.