

Effectiveness of a community-based child stimulation program in rural Bangladesh

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Abstract

Parenting programs are frequently offered to help promote practices that help children develop to their full potentials. In Bangladesh, these programs have entailed largely the transfer of knowledge to groups of mothers with young children. Frequently, the mothers acquire knowledge but do not translate it into behaviour. This study examined a behaviour-change strategy in a 5-session weekly program delivered to groups of mothers and their children 18-40 months of age. The strategy involved a demonstration by the peer educator followed by mothers' practicing the behaviour and receiving coaching. Mothers brought materials from home and practiced using responsive stimulation in the course of verbal and toy games. There were also discussions about the benefits of two-way stimulation. The pre-post intervention-control design allowed us to compare mothers who received the Responsive Stimulation program with those who received the Regular program. Results indicated that Responsive Stimulation mothers' scores on the HOME Inventory and their responsive conversations with their child while talking about pictures were significantly higher than the Regular group, controlling for baseline scores and sociodemographic variables. The benefits of this behaviour-change strategy and responsive stimulation are both discussed.

Introduction

The importance of care and stimulation of children less than 3 years has become especially critical as more children survive and their quality of life becomes a concern. Although still inconclusive, it appears that rapid growth in the brain during these early years may dissipate if unused (Nelson & Bloom, 1997). Thus, a variety of programs are being implemented around the world with the objective of fostering conditions that optimize child growth and development (Evans, Myers, & Ilfeld, 2000). The most common program in developing countries is a parenting education program addressed to mothers with or without a child component (e.g. Evans & Stansbery, 1998). Its aim is to foster more mother-child interaction for purposes of stimulation and nutrition. Although many parenting programs are implemented by organizations in developing countries, many are not particularly effective (see a recent review of these programs by Engle et al. 2007). It is therefore important to try some

new strategies to change mothers' behaviours and pass these benefits on to their child. This report describes an evaluation of a short behaviour-change program with mothers of young children aimed at greater responsive stimulation of children. The goal is to create an effective model to be added to other modules or expanded.

The rationale for parenting programs is two-fold. The first is that parents need to be involved when targeting child development because their sensitive responsiveness is crucial to secure attachment and its multiple consequences (e.g. NICHD, 1997). The second is that when children are at risk for poor language and cognitive development (Aboud, 2006), opportunities for stimulation and learning must be created at home if children do not attend preschool. Yet, illiterate parents are often uninformed about the need for stimulating experiences to enhance development (Guldan et al., 1993). Parenting programs can fill this gap by providing new information and demonstrating new practices for mothers of young children.

Little is known about parenting practices in rural Bangladeshi families. A recent survey found that almost half the rural mothers had no education, and that most were unaware of the importance of fostering curiosity and self-confidence in a child (UNICEF, 2001). The most commonly mentioned maternal behaviors for promoting mental development in children under 3 years were giving nutritious food (26%) and teaching a child to talk (21%); providing opportunities for play and conversation were rarely mentioned. Home observations and maternal recall of daily activities of children from 3 to 5 years of age supported the survey findings in that children spent many hours by themselves with few materials (Lusk, Hashemi & Haq, 2004). Despite this, parents want their children to excel at school and enroll over 80% in primary school. Consequently, Bangladeshi parenting programs focus on informing mothers about a home environment that promotes physical as well as mental development.

Although no one model is clearly best, studies have identified critical parenting practices and ways of measuring them (Engle, Menon, & Haddad, 1999). These include provision of responsive stimulation, language, hygiene and a varied diet. In Bangladesh, a home-visiting program lasting 12 months provided responsive stimulation through play and conversation to children 6 to 24 months of age (Hamadani et al., 2006). A play leader visited each child's home with toys and books and engaged the child while demonstrating to the mother what to do. This was combined with group sessions telling mothers about child development. It was found to prevent intervention children from losing ground, relative to their agetates, on the Bayley mental test. Mothers attained higher scores on a test of child development knowledge. The intervention was successful but costly and labour intensive in that on average 33 groups meetings and 68 individual home visits were conducted with each participant.

Most other programs find it cost-effective to meet mothers in groups and convey information regarding their child's need for homemade play/learning materials, conversation, varied foods, hygiene and sanitation, and gender equality (Plan Bangladesh, 2004). An evaluation of one such program found that mothers who attended the parenting session over the course of a year showed more knowledge about child development and slightly higher HOME scores than a control group, though both were low. Furthermore, the mothers did not talk differently to their child about pictures and no language benefit was passed on to the child (Aboud, 2007).

The present intervention tried to combine the direct mother-to-child strategy with group sessions. Mothers met in their usual parenting education groups but this time with their child with whom they practiced the behaviours. A behaviour-change approach was used based on Baranowski et al.'s (2002) social-cognitive learning theory. The peer educator discussed the purpose of the behaviour, then demonstrated it with a child, and finally coached the mothers while they practiced with their child. Instead of bringing toys and books to the child, peer educators requested mothers to fill a personal toy bag for their child with odds-and-ends from home and the village. Both responsive talk and responsive toy play were included as target behaviours. The specific behaviours selected for change were identified from among those on the HOME which had not changed after the regular parenting education program (Aboud, 2007). These items clustered on a subscale of the HOME, called Stimulation because the items referred to the provision of stimulating materials and conversation.

The objective, then, was to develop and implement a new module for mothers of young children that would increase responsive stimulation practices. A five-session module was developed and implemented and the outcome of these sessions was evaluated with the HOME Inventory and mother-child dialogue, and compared with a group of mothers who attended the regular child development sessions of Grameen Shikha, a sister concern of the Grameen Bank which implements PLAN's programs on child development.

Method

Design

A pre-post intervention-control design was used in the study. The Intervention group mothers attended the 5-session Responsive Stimulation module, after they had attended Grameen Shikha's regular 12-session child development parenting program. The Control group consisted of mothers who had attended only the regular 12-session child development program. Ethical approval was obtained from the advisory committee of the BRAC University's Institute of Educational Development.

Sample Size estimation

Using an alpha of .05 and power of .80, the sample size should be 80 per group to find a difference of .5 SD or 2.5 (i.e. SD = 5 and M = 30 on the HOME Inventory). Therefore the intention was to select 10 intervention groups and 10 control groups with 8 children in each group.

Recruitment

A list of parenting groups was used along with a random numbers table to select ones for the intervention and control groups. Subsequently, lists of mothers attending these groups were used to randomly select those from whom to collect data. All mothers attending these sessions with children between 18 and 40 months were invited to participate in data collection to evaluate the program. Those randomized to the intervention group were asked to attend 5 extra sessions for which they would have to bring their child. A few refused consent and were dropped without replacement. The intervention group therefore consisted of 76 mothers and the control group consisted

of 71 mothers. Ten intervention group mothers and 14 control group mothers were not available for the post-test.

Measurement of Outcomes

The 45-item HOME Inventory was administered, along with a Mother-Child picture-talking task pre- and 1 week post-intervention, along with a pre-intervention interview of the mother to obtain socio-demographic information and the child's height and weight. Research assistants were trained for 2 days and observed on their early assessment to ensure accuracy and reliability. They were kept blind to the mothers' group assignment.

The Home Observation for Measurement of the Environment (HOME, Bradley, Corwyn, & Whiteside-Mansell, 1996) is commonly used to measure the amount and quality of stimulation and support provided to a child in the family setting (e.g. of Bangladeshi studies are Black et al., 2004; Hamadani et al., 2001). A modified version of the infant-toddler inventory has 45 items which are to be scored based on observation wherever possible and otherwise on mothers' answers to questions. Factor analyses did not yield the usual six factors in prior research (Aboud, 2007). However, 14 items from the learning materials and involvement subscales loaded on the first factor and together had an alpha coefficient of .79, here an alpha of .86 on the post-test. They were therefore summed to create a subscale called Stimulation which was analyzed along with the total HOME score.

Mother-Child Interaction during Picture Task. To evaluate the mothers' role as a mediator of cognitive development of her child, we developed a task where the mother interacted verbally with her child (Hubbs-Tait et al., 2002; NICHD, 2001). The picture task required the mother and child to talk as they normally would about two provided coloured pictures of scenes from rural Bangladesh. The pictures were on two sides of a laminated sheet. One was a rural village scene and the second was a series of eight paintings of men and women engaged in productive activities such as driving a rickshaw, selling at the market, and embroidering. Different pictures with similar themes were used at the two assessment times. The task was allotted 5 minutes. A research assistant observed the interaction and tallied each mother and child utterance according to specific pre-arranged codes each time the corresponding utterance occurred. The mother codes were piloted to ensure completeness and were found to be reliable with these and previous assistants (Aboud, 2007). The codes fit 4 levels to reflect increasingly engaging verbal stimulation as follows: Level 0. negative evaluation, off-task/disengaged; Level 1. command, point/name an object; Level 2. question child, answer child, expand on detail beyond naming; Level 3. expand on child's behavior, encourage child to talk/act or ask to expand, positive evaluation. Child codes were included for completeness but not used to evaluate the program because they depended too much on the mother's input. The child codes were: off-task, point, repeat mother's words, answer, name, ask, and describe detail.

Responsive Stimulation Intervention

Mothers in both groups had completed 12 sessions on child development with the organization. These were based on a Manual and pictures (Plan, 2004) and covered topics such as how parents can help children learn, provide stimulation through toys and talk, and use gentle discipline. The sessions were delivered by peer educators with normally 8 to 10 years schooling and training by the organization. Some mothers

brought young children but most did not. The message was delivered using the usual educational format of instruction, stories, and dramas. The intervention consisted of a 5-session add-on which emphasized behaviour change on responsive stimulation. It was delivered by the same peer educators, who received extra training from the researchers in how to deliver each session. An 18-page manual was prepared for them to use (Aboud & Ottisova, 2007).

The term Responsive Stimulation referred to what sensory input that followed from the intended meaning of the child's actions, including vocalizations. Two kinds of responsive stimulation were described, one stimulation coming from the child's actions on the environment (e.g. toys) and another coming from the child's interaction partner:

(a) Children should be providing themselves with stimulation by acting with objects: when a child puts objects on top of one another, the act of putting the fifth object on the top may lead it to fall; they then see that objects fall in response to their putting the fifth object on top. The stimulation comes from seeing or hearing what happens when the child acts. This is responsive stimulation.

(b) Another form of responsive stimulation comes from the mother (family member or friend). The mother must observe what the child is doing with objects or looking at in a picture. Then the mother can follow the child's direction by talking or giving more objects in line with the child's wishes. For example, if the child is making something with materials, the mother can ask if he/she needs more and pass over more materials. If the child is looking at a picture or watching other people's activity, the mother can ask what the child sees, then repeat the child's words and add some more. In this way, the mother is responding positively to whatever the child is doing and building on it.

Five key messages were conveyed to the mothers/caregivers as follows:

1. Children need adult attention, adult talk and objects to play with.
2. Talk with your child. Ask open-ended questions and listen to them speak.
3. Children need to play with many different objects. Add a new object every week.
4. While you work, watch and listen as your child plays; respond with words.
5. Praise your child.

Each responsive stimulation session included specific behaviour-change activities: the peer educator demonstrated how to interact with the child during a specific talk or toy game, and then the mothers practiced interacting with their child while the peer educator coached them. Each session also included an explanation of why responsive talk and toy play was beneficial, and opportunities for mothers to discuss problems and solutions with other mothers. Starting in the second session, mothers were to start collecting materials for a toy bag from materials around the home village. These were to be multiple separate items that the child could put together in different ways along with pictures from magazines and materials for pretend play.

The sessions were as follows:

Session 1. Talking About a Picture

Through word games, the mothers learn how to ask open-ended questions of their child and how to expand on their child's talk.

Session 2. Collect Learning Materials for Each Child from the Village

Mothers gather learning materials appropriate for their child to explore and manipulate and make them easily reachable for their children in a toy bag.

Session 3. Responsive Play

Through games with materials collected, mothers practiced being verbally to their child in play. They observed the difference between non-responsive stimulation (controlling or instructive talk from mother to child) and responsive stimulation.

Session 4. Responsive Play while Doing Household Tasks

Mothers practiced engaging in responsive talk with the child while busy with chores. This skill helped to address a common complaint that mothers are too busy to engage in play with their child during the day. Mothers were shown how children can learn and explore while their mothers are busy with their daily tasks, like sweeping or cooking, and how mothers can supervise their child's play by having the child within earshot so they can talk while the child plays with objects and the mother works.

Session 5. Games Children Like to Play

Mothers practiced new games such as naming games, guessing games and point and describe games to stimulate their child.

Method of analysis

Child and family variables for the intervention and control groups were analyzed with t-tests to determine the success of the random assignment. Outcome variables from the HOME and mother-child picture talk were subjected to analyses of covariance in which group assignment was the between-subjects variable and the pretest value of the outcome was covaried along with other demographic variables, namely child's age and sex, height-for-age z score, mother's education, and family assets. Effect size *d* was calculated based on the number of standard deviations separating the two group means.

Results

Characteristics of the sample

The two groups do not differ much. As seen in Table 1, age and sex of the children did not differ in the two groups; neither did mothers' education, family assets in terms of 11 household items, ownership of arable land, home ownership, or household monthly income. In weight the two groups were similar, but the intervention children were more stunted.

Table 1
Mean (SD) and t-values comparing intervention and control groups

<i>Variable</i>	<i>Intervention</i> <i>n = 79</i>	<i>Control</i> <i>n = 71</i>	<i>t</i> <i>(1,148)</i>	<i>p-value</i>
Child's age (months)	30.37 (4.91)	28.42 (5.77)	2.21	ns
Mother education (year)	4.32 (3.91)	3.90 (4.03)	.64	ns
11 Household assets	5.70 (2.94)	5.25 (2.92)	.93	ns
Household income (Taka/month)	4941 (4539)	4615 (3802)	.47	ns
Child's height (cm)	82.46 (6.12)	82.87 (5.91)	.42	ns
Child's weight (kg)	10.62 (1.56)	10.43 (1.43)	.76	ns
Child's height for age	-2.24 (1.42)	-1.76 (1.55)	1.97	.05
Child's weight for age	-1.92 (1.05)	-1.91 (1.00)	.09	ns
% Girl	50.7	49.3		ns
% own homestead	100	97.2		ns
% own arable land	63.3	57.7		ns

* 1 Taka = 68.5 USD

HOME Outcomes

The 14-item stimulation subscale and total HOME scores were subjected to analyses of covariance, controlling for the pre-intervention score. A similar analysis was conducted for the four levels of mother-child talk. Results can be seen in Table 2 and corresponding graphs.

Table 2. Means (SD) and significance tests on Outcomes for Responsive Stimulation and Regular Control Groups.

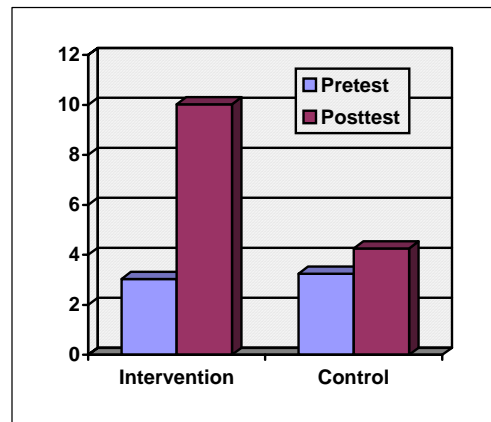
Variable	Responsive Stimulation Group <i>n = 66</i>		Regular Control Group <i>n = 57</i>		F (1, 115) <i>p-value, d effect size</i>
	Pre	Post	Pre	Post	
HOME Inventory					
14-item Stimulation	3.03 (2.28)	10.02 (2.09)	3.25 (2.12)	4.26 (2.87)	177.30 p<.0001, d = 2.34
45-item Total	19.33 (4.60)	30.05 (3.61)	19.47 (4.17)	21.46 (4.46)	139.56 p<.0001, d=2.13
Mother-Child talk					
Level 0	4.09 (3.31)	1.25 (1.93)	2.63 (2.55)	1.70 (1.74)	2.38 <i>ns</i>
Level 1	6.88 (4.31)	3.80 (4.39)	5.72 (4.20)	4.25 (4.47)	0.59 <i>ns</i>
Level 2	12.00 (6.26)	16.80 (4.99)	12.49 (5.96)	14.23 (5.26)	5.56 p= .02, d=0.49
Level 3	3.08 (3.42)	7.18 (5.18)	2.04 (2.27)	2.84 (2.66)	26.26 p<.0001, d=0.92

Note. Levels of Mother-Child talk were as follows: Level 0. negative evaluation, off-task/disengaged; Level 1. command, point/name an object; Level 2. question child, answer child, expand on detail beyond naming; Level 3. expand on child's behavior, encourage child to talk/act or ask to expand, positive evaluation.

Child stimulation subscale. On 14 items that

represent various forms of stimulation, the mean score of the intervention group increased from 3.03 to 10.02, while the score of the regular group mothers hardly increased from 3.25 to 4.26. Figure 1 shows the pre-post change in scores. The ANCOVA indicated that the responsive stimulation group was significantly higher post-intervention, with an effect size $d=2.34$.

Figure 1. Child stimulation



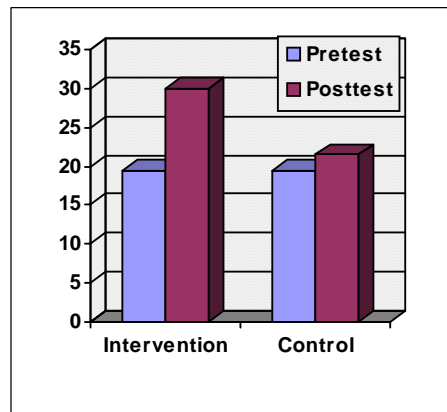
The table below shows the number (%) of mothers who satisfied the HOME items that measure stimulation at pre and post intervention for the two groups. Large differences were found on most items where over one-third of the intervention mothers were able to show the play materials or reported talking with the child over the past week. Two items were still low for both groups, namely providing slightly difficult materials for the child, on which the mother could help raise the child's competence, and having three or more books with pictures.

Table 3: Pre-post difference between the groups on stimulating items of HOME

HOME Stimulation items		Intervention group n=66		Control group n=57	
		Pretest No %	Posttest No %	Pretest No %	Posttest No %
24.	Child has a bag for playthings	21 (14.0)	64 (52.03)	26 (17.33)	17 (13.82)
26.	Gross motor play materials	35 (23.33)	61 (49.59)	38 (25.33)	25 (20.33)
27.	Push or pull play materials	10 (6.67)	56 (45.53)	11 (7.33)	25 (20.33)
28.	Wheel toys	15 (10.0)	34 (27.64)	13 (8.67)	13 (10.57)
30.	Dramatic play materials	49 (32.67)	64 (52.03)	50 (33.33)	41 (33.33)
31.	Structured games (clapping-singing games)	34 (22.67)	47 (38.21)	33 (22.0)	32 (26.02)
32.	Simple sensory-motor play materials	10 (6.67)	62 (50.41)	19 (12.67)	17 (13.82)
33.	Complex (2+ parts) sensory-motor materials	3 (2.0)	56 (45.53)	5 (3.33)	11 (8.94)
34.	At least one picture book (or pictures)	6 (4.0)	41 (33.33)	2 (1.33)	12 (9.76)
37.	Taught or showed new thing past week	22 (14.67)	48 (39.02)	21 (14.0)	18 (14.63)
38.	Gave child new play material in past month	18 (12.0)	61 (49.59)	17 (11.33)	17 (13.82)
39.	Looked at pictures with child past week	12 (8.0)	48 (39.02)	10 (6.67)	11 (8.94)
40.	Mother provides slightly difficult material	2 (1.33)	8 (6.5)	2 (1.33)	1 (0.81)
45.	Three or more picture book for child	2 (1.33)	11 (8.94)	1 (0.67)	3 (2.44)

Total HOME scores. As expected, total HOME scores were significantly higher in the intervention group at post-test. Mean score of the intervention group increased from 19.33 at pretest to 30.05 at posttest (out of 45). In the control group, this score increased very slightly, from 19.47 at pretest to 21.46 at posttest. Figure 2 shows the change in HOME scores for the two groups. The ANCOVA yielded a highly significant difference with an effect size d of 2.13. Thus, the 5-week intervention was successful in increasing HOME scores on more than the 14 stimulation items, though these were the focus of the program.

Figure 2. Total HOME scores



Mother-child interaction

Mothers' role as a mediator of cognitive development of her child was evaluated through a task where the mother interacted verbally with her child. Each mother utterance was coded as one of 4 levels to reflect increasingly engaging and responsive verbal stimulation. The findings, presented in Table 2 show a significant difference between groups at the post-test, namely that mothers in the Responsive Stimulation group showed an increase in the top two levels of talk whereas the Regular program mothers did not. Level 2 talk refers to the mother engaging her child to talk by answering the child's questions, asking questions, and expanding on detail beyond simply naming an object. Level 3 is particularly responsive in that mothers show evidence of expanding on the child's talk and asking the child to expand, as well as praising. Responsive Stimulation mothers more than doubled instances of their Level 3 talk.

Discussion

The findings from this 5-week module on Responsive Stimulation indicate that it was successful in its aims. In particular, mothers who attended the program, in comparison to mothers who attended the regular program, provided more stimulating materials and opportunities for their children at home. Furthermore, they talked in a more responsive and stimulating way with their child. Having more stimulating materials and using more stimulating talk were objectives of the program. They were also objectives of the regular program, but the difference was in the strategy used to meet these objectives.

The behaviour-change strategy used here went beyond knowledge transmission to include a demonstration by a peer model along with practice by the mothers. Practice is a necessary feature of behaviour change for several reasons: One is that the mothers had an opportunity to rehearse the behaviour which was possibly new to

them. Second, they had an opportunity to see how their child responded and so get a feeling of agency and satisfaction. If there were problems, they could make changes with the help of the peer educator and other mothers. Third, they could observe the practice of other mothers and so increase their options.

Several features of the program's content were different. Instead of showing mothers how to make toys, we required mothers to create a toy bag with loose materials that would be safe for children to play with. In particular, children's eye-hand coordination is improved by having them construct something themselves by putting together objects; less than 10% of the children in the Regular program had such material (HOME item #33). A single ready-made toy is not necessarily the best material for cognitive development unless it generates talk. Still, despite the sessions on responsive stimulation, only 52% at most of the mothers satisfied any one item on the HOME stimulation subscale – 52% had a play bag, 52% had some dramatic play materials, 50% gave a new play material in the past month, and 39% looked at pictures with their child in the past week. Another difference was that we showed mothers how to continue to be engaged with her child while she worked and the child played. Children of this age are mobile, so the mother needs to let the child move around while maintaining verbal contact across a distance.

Finally, the emphasis here was on two-way stimulation as opposed to the one-way instructional stimulation usually offered by parents. Research has shown that children older than 12 months want an adult to respond to their sounds and gestures, and if this is not forthcoming, they will stop gesturing and communicating (Liszkowski et al., 2004; Tomasello, 2007). Mothers often do not understand that children have intentions to communicate; they ignore their child's gestures as meaningless and communicate only when they themselves initiate the conversation. Unfortunately, this limits the child's expressive language.

In conclusion, this 5-week add-on module was very successful in increasing the stimulation provided to children, along with the mother's ability to communicate in a stimulating and responsive manner about pictures. The limitations are that 18% of mothers from both groups dropped out of the study, and that we did not examine benefits for the child. However, because the module was a short one, we would not expect to see immediate effects on the child's language or cognitive development. Follow-up assessment would be useful to determine if the program resulted in long-term sustainability in the mothers' behaviours and positive benefits for their children's development.

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