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Use of Videotaped Interactions During Pediatric Well-Child Care to Promote Child Development: A Randomized, Controlled Trial

Alan L. Mendelsohn, M.D., **Benard P. Dreyer, M.D.**, **Virginia Flynn, M.S.**, **Suzy Tomopoulos, M.D.**, **Irene Rovira, Ph.D.**, **Wendy Tineo, Ph.D.**, **Charissa Pebenito, M.D.**, **Carmen Torres, B.A.**, **Heidi Torres, M.A.**, and **Abigail F. Nixon, B.A.**

Division of Developmental-Behavioral Pediatrics, Department of Pediatrics, New York University School of Medicine and Bellevue Hospital Center, New York, New York

Abstract

The authors performed a randomized, controlled trial to assess the impact of the Video Interaction Project (VIP), a program based in pediatric primary care in which videotaped interactions are used by child development specialists to promote early child development. Ninety-three Latino children (51 VIP, 42 control) at risk of developmental delay on the basis of poverty and low maternal education (none had completed high school) were assessed for cognitive and language development at age 21 months. Results differed depending on the level of maternal education; the VIP was found to have a moderate impact on children whose mothers had between seventh and 11th grade education (approximately 0.75 SD for cognitive development, 0.5 SD for expressive language) but little impact on children whose mothers had sixth grade or lower education.

Index terms

child development; parent–child interaction; randomized; controlled trial

Poor, urban children have high rates of early childhood developmental delays, which are associated with inadequate school readiness and early school performance.[1–3] Because school readiness and early school performance predict long term academic trajectories, poor children are at increased risk of academic difficulties throughout their school careers.[4–6]

There are many factors associated with adverse developmental-behavioral outcomes that are found more frequently in economically disadvantaged households; one of the most important is low parental education.[7–11] Parent–child interaction, in particular, verbal engagement and responsiveness, mediates part of the relationship between poverty, low maternal education, and developmental behavioral outcomes.[12–14] For example, Hart and Risley[2] showed that children in poor households were exposed to less quantity of language and less maternal verbal responsiveness and that these differences predicted cognitive and language development at ages 3 and 9 years.

Address for reprints: Alan L. Mendelsohn, M.D., Department of Pediatrics, New York University School of Medicine, Bellevue Hospital Center, 550 First Avenue, New York, NY 10016; alm5@nyu.edu.

Health supervision visits, because of their frequency and near universality, present an opportunity for low-cost interventions for parenting.[15–18] Recent studies have demonstrated that such interventions can be effective. For example, Reach Out and Read, which facilitates literacy promotion in the context of routine well-child care has been documented to promote parent–child reading activities and is associated with improved expressive and receptive language.[19–31] As a result of this research, literacy promotion has become a standard of care in pediatric practice.[15,16] Perrin et al[32,33] have suggested the routine use of child development specialists in pediatric offices as a way to better address developmental-behavioral issues in the course of well-child care. Healthy Steps, a program that incorporates a child development specialist into each routine well-child visit, has been shown to increase the percentage of families receiving developmental counseling.[34–36]

Families who are at highest risk on the basis of poverty and low maternal education may benefit from additional, targeted interventions that address their special needs. In 1999, a working group was convened by the Department of Pediatrics at New York University School of Medicine and Bellevue Hospital Center to identify primary care–based approaches that might lead to improved child outcomes by addressing issues related to parenting and parent–child interaction. This working group consisted of developmental-behavioral pediatricians and early childhood development and education specialists. A low-cost, low-intensity intervention program called the Video Interaction Project (VIP) was developed.

The VIP is based in the pediatric primary care clinic and uses one-on-one sessions with the family at each well child visit in which a child development specialist covers a preventive curriculum focused on facilitating supportive parent–child interactions. During each session, the parent and child are videotaped interacting together; review of the tape by the parent and child development specialist leads to a discussion of verbal, cognitive, and socioemotional issues. The use of videotapes as an educational tool in the VIP intervention is based in part on the work of Bernstein and McDonough[37–40] and in part on the Seeing Is Believing Curriculum developed by Erickson et al.[41] The curriculum relating to verbal and emotional responsivity is based in part on the Partners in Parenting Education (PIPE) Curriculum,[42,43] which was developed to work with families at risk on the basis of poverty-related environmental factors. The VIP curriculum is relationship based, with a single facilitator building a caring relationship that becomes a foundation for the intervention.[44 – 46]

To assess the impact of the program, the VIP was implemented as a randomized, controlled trial. We enrolled a birth cohort of economically disadvantaged Latino children at high risk of developmental delay on the basis of low maternal education. In this paper, we report on the effects of the VIP intervention on cognitive and language development for Spanish-speaking families when the children were 21 months old. Future study is planned to determine the impact at 36 months.

METHOD

Study Design

The study was conducted as a single-blind, randomized, controlled trial. Institutional review board approval was obtained from New York University School of Medicine, Bellevue

Hospital Center, and the New York City Health and Hospitals Corporation. Parents provided informed consent prior to participation in the study.

Study Sample

Enrollment was performed in the postpartum ward of an inner-city public hospital between July 1999 and January 2002. On days when the study coordinator was available, we enrolled consecutive Latino mother–newborn dyads at risk of developmental delay on the basis of low maternal education (defined as not having graduated high school). Dyads were excluded if there were medical complications (e.g., prematurity or neonatal medical complication), psychosocial issues (e.g., adolescent mother, maternal history of substance abuse), or they did not plan follow up at our institution. We also excluded families without access to a VCR because an important component of the intervention involved the family viewing a videotape at home; however, we had previously determined that the vast majority of families attending the clinic had a television and a VCR in their homes. After enrollment, mother–newborn dyads were randomized to the Video Interaction Project (VIP) intervention or a control group based on the toss of a coin. Intervention and control families received the same well-child care by the same primary care pediatricians and including the same anticipatory guidance and periodic routine screening according to the guidelines of the American Academy of Pediatrics.[15] Incentives were not provided for participation in the intervention; however, small reimbursements for transportation and time were provided for both VIP and control families for their participation in the assessments.

Intervention

The VIP consists of 12 sessions in which a child development specialist meets with parents and children at the time of routine well-child care visits to the pediatrician. The sessions begin at the first visit to the pediatrician (2 weeks) and continue until the child is 3 years old. Sessions follow a curriculum designed to enhance cognitive, language, and socioemotional development. During each session (approximately 30–45 minutes), the following takes place:

1. There is a discussion of the child's development, addressing parental expectations and concerns about the child and the child's present and anticipated developmental progress. This discussion is facilitated using age-specific parenting pamphlets developed for the project in English and in Spanish.
2. The family is given a developmentally stimulating, age-appropriate learning material (e.g., toy or book). These learning materials were picked to be gender neutral and culturally sensitive and promote verbal engagement. Examples include a mirror at 2 months, a puppet at 6 months, and a telephone at 9 months.
3. A 5- to 10-minute videotape is made of the parent and child engaging in activities of the parent's choice. The tape is then rewound, and the parent and the child development specialist watch the tape together.

   The parent makes observations based on the videotape, with the specialist focusing on strengths and proposing activities to practice at home. The parent is given a copy of the tape to take home so that she can watch it together with other family

members. The parent is encouraged to bring the same tape back at the next visit, so that over time the tape provides a visual history of the parent and baby together.

Because the VIP is integrated into pediatric primary care and does not require home visits, it is relatively inexpensive. The cost of the VIP is approximately $240 per child per year, including $200 for staffing and $40 for learning materials.

Measures

Demographic and other descriptive data were collected based on chart review and parental interview, including child's gender, birth weight, gestational age, birth history, and attendance in pediatric well-child care visits; mother's age, country of origin, education level, primary language spoken, and occupation; father's education level and occupation; and family history of homelessness. Family Hollingshead Four-Factor Socioeconomic Status was determined based on parental education and occupation.[47]

Maternal depression was assessed when the infant was 6 months old using the Center for Epidemiological Studies-Depression Scale.[48] Mothers were considered to screen positive for depressive symptoms if the score was 16 or higher.

Child developmental assessments were performed by five research assistants. Four of these assistants were native Spanish speakers; the fifth had learned Spanish while living in a Spanish-speaking country. Each had been trained in performing assessments of children either during graduate work in clinical psychology or as staff working in our department. Each research assistant was masked to group assignment.

Cognitive development was assessed when the infant was 9 and 21 months old using the Bayley Scales of Infant Development, 2nd Edition, Mental Development Index (MDI).[49] The MDI was administered in the families' preferred language (English, Spanish, or both). No formal Spanish version exists; therefore, the raters agreed on common, appropriate language to use during administration of the MDI in Spanish. This approach represents our clinical practice in assessing for Early Intervention (EI) eligibility, which has been accepted by New York State EI assessment guidelines[50] and is the approach that was taken by the US Department of Health and Human Services in the recent evaluation of Early Head Start.[51] The MDI provides standardized scores, with a mean of 100 and an SD of 15.

Language development was assessed at 21 months using both standardized and semistructured methods:

1. Standardized language assessment was performed using the Preschool Language Scale–3 (PLS-3).[52] The PLS-3 provides an expressive score, a receptive score, and a total score. It is normed in English and in Spanish. The PLS-3 provides standardized scores, with a mean of 100 and an SD of 15.
2. Semistructured assessment of language was performed based on a 10-minute videotape made of the parent and child playing with a predetermined set of toys. These toys were different from those given to the family at intervention visits and included a playhouse with figures, a toy camera, a teddy bear, a toy plate/cup/spoon, a toy brush, a wind-up toy, a musical light-up toy, and bubbles for blowing.

Subsequently, two of the research assistants transcribed each word and vocalization of the child. Criteria based on the child language items of the Caregiver-Child Interaction Rating Scale were then applied to the transcripts (Catherine S. Tamis-LeMonda and Mark Spellmann, unpublished, 2000). Using these criteria, each child's language was categorized as "delayed" (no vocalizations, or babbling without communicative intent), "indeterminate" (babbling or jargoning with clear communicative intent), "normal"(single words and/or two- to three-word phrases). Interrater reliability was measured for this categorization of child's language; weighted kappa was .84.

For each of the standardized assessments (MDI and PLS-3), performance was considered to be in the normal range if the score was above a cut point of 1 SD below the mean, (i.e., a score of 85 and above). Performance was considered to be delayed if the score was below a cut point of 2 SDs below the mean (i.e., a score of 69 and below).

Finally, eligibility for EI services was determined based on the criteria used in our state: cognition, 2 SDs below the mean; language, 2 SDs below the mean; or both cognition and language, 1.5 SDs below the mean.

Statistical Analysis

Statistical analyses were performed based on intention to treat, i.e., outcomes were assessed according to group enrollment (and not according to degree of participation in the intervention).[53] Data were analyzed using SPSS version 11.5.[54] A two-tailed p value <.05 was considered to be statistically significant.

The VIP and control families were compared for baseline sociodemographic variables using t-tests and χ^2 as appropriate. Similar analyses were performed to compare families who did and did not remain in the study. Because of the potential importance of maternal education level in moderating response to the intervention, we decided a priori to assess whether the impact of the intervention might differ by level of maternal education. Maternal education was dichotomized so that children with mothers above the median level of education in the sample (seventh to 11th grade) could be compared with mothers below the median (with sixth grade or lower education). For the group as a whole, 2 × 2 analysis of variance was used, which included determination of main effects for the VIP group status and maternal education level as well as a group × education interaction. Subsequent analyses were performed in which the groups were stratified by maternal education level, and comparisons of outcome measures between the VIP group and controls were performed. For these analyses, comparisons of means were performed using independent sample t-tests. Categorical analyses were performed of the impact of the VIP on the probability of cognitive and language development being in the normal range and delayed and on the frequency with which children met criteria for EI services. Analyses of ordered categorical data (probability of development being normal, borderline, or delayed) were performed using Spearman rank correlation.

RESULTS

Sample Description

From July 1999 through January 2002, we screened 2558 mothers, of whom 794 were of Latina ethnicity and had not completed high school. Of the 794 dyads, 630 were deemed ineligible on the basis of one or more criteria (197 with medical complication or psychosocial issue, 433 with planned primary care outside our institution). Altogether, 164 families were identified who were eligible to participate, of whom 150 (91.5%) agreed to participate. After enrollment, 77 (51.3%) were randomized to the Video Interaction Project (VIP) group, and 73 (48.7%) were randomized to the control group.

For the 150 enrolled families, mean (SD) maternal education was 7.3 (2.4) years. In 88.7% of these families, the infant's mother was born outside the continental United States (62.7% from Mexico; 12.0% from Ecuador; 8.0% from the Dominican Republic; 1.3% each from El Salvador, Peru, and Puerto Rico; 0.7% each from Colombia, Honduras, and Nicaragua). Twenty percent of mothers screened positive for depression.

The 21-month assessment was performed for 100 of 150 enrolled families (66.7%). Rates of assessment were slightly higher for the VIP (54/77, 70.1%) than control (46/73, 63.0%) families ($p = .45$). Most of those not assessed had moved out of the area, in many cases returning to their countries of origin. When compared with families lost to follow-up, families undergoing the 21-month assessment were more likely to have mothers who were immigrants ($p < .001$), were Spanish speaking ($p < .001$), and have lower education ($p = .01$), and to have a father living at home ($p = .04$). Because only seven of the 100 dyads assessed at 21 months (three VIP and four control) spoke either English or were bilingual for Spanish and English, this analysis is restricted to the 93 dyads (51 VIP and 42 control) who were monolingual Spanish speakers. These 93 dyads are compared for baseline variables (stratified by maternal education) in Table 1; no statistically significant differences were seen.

Of the 93 dyads presented in this analysis, two children did not complete the Preschool Language Scale-3 (PLS-3) during the testing session, leaving 91 children available for analyses involving the PLS-3. In addition, one of the 93 videotapes was damaged, leaving 92 tapes for the semistructured analysis of language.

Pediatric well-child care exposure was similar for VIP and control families (for mothers with sixth grade or lower education: mean [SD] = 7.8 [1.1] vs 8.1 [1.8], $p = .62$; for mothers with seventh to 11th grade education: 6.8 [2.3] vs 7.0 [2.4], $p = .87$). Exposure to the intervention program for VIP families is presented in Table 2. VIP families participated in a majority of the intervention sessions in both the first and second year. Participation in the VIP did not differ depending on mother's level of education.

Impact on Developmental Outcomes

Table 3 provides the results of analyses comparing developmental standard scores using analysis of variance. For the Mental Development Index, a main effect for the VIP was present as well as a trend toward a group by education effect. For PLS-3, a group by

education effect was seen for expressive language. No effect was seen for receptive language.

Table 4 provides the results of analyses comparing developmental outcomes for VIP and control families, stratified by maternal education. Consistent statistically significant differences favoring the VIP group were seen for those children whose mothers had seventh to 11th grade education, including cognitive development and expressive language development (both standardized and semistructured). Early Intervention (EI) eligibility was lower in the VIP control group, but this did not reach statistical significance. No significant differences were seen for receptive language development. For children whose mothers had sixth grade or lower education, expressive language as measured by the semistructured assessment was significantly different for VIP families; all other measures were similar for the two groups.

DISCUSSION

To our knowledge, the Video Interaction Project (VIP) is the only pediatric primary care–based program in which videotaped interactions have been used by child development specialists to promote early child development in at-risk families. This randomized, controlled trial evaluated the degree to which the VIP had an impact on cognitive and language development in low socioeconomic status Latino toddlers. In this study, the VIP was found to have a moderate impact on children whose mothers had between seventh and 11th grade education but little impact on children whose mothers had sixth grade or lower education.

For mothers with seventh to 11th grade education, the VIP was associated with more than a 0.75-SD increase in cognitive development, an eightfold increase in the percentage of children who would be considered to have normal development, and a halving in the percentage who would be considered to have developmental delay. Regarding language development, there was an increase of approximately 0.5 SD on a standardized measure of expressive language as well as a fourfold increase in the percentage having normal language on a semistructured assessment–based on videotape. Finally, there was trend toward a decrease in Early Intervention (EI) eligibility, but this was not statistically significant. For mothers with sixth grade or lower education, effects of the VIP were limited to an increase in the percentage having normal language on the semistructured, videotaped assessment. No difference was seen for the other measures of cognitive or language development.

We found an impact of the VIP on expressive language but not receptive language. This may have been due to the emphasis of the impact of the intervention on interaction rather than vocabulary. This result is consistent with studies of reading aloud; although the impact of reading aloud is principally seen for receptive language,[20] studies of interventions targeting responsiveness and interaction have found a greater impact on expressive language.[55]

This was overall a very high risk sample, on the basis of both poverty and low maternal education, which was reflected in the low level of functioning in both groups. Control

children scored 1.3 to 2.0 SDs below the population mean on standardized measures; even in the group with seventh to 11th grade maternal education, VIP children scored between 1.0 and 1.3 SDs below the population mean. Although the impact of the VIP is likely to be clinically meaningful for the children whose mothers had a seventh to 11th grade education, there may be limits to the degree to which a low-intensity primary care–based program can influence child development. In general, there has not been a great deal of study of the impact of such programs on developmental outcomes, with the notable exception of Reach Out and Read.[23–25,28] Most programs demonstrating long-term effects on developmental outcomes in high-risk children have been of moderate to high intensity and cost, requiring home visitation or center-based educational programs or both.[56–62] It is possible that these higher intensity programs may be necessary for families with very low maternal education, at sixth grade level or lower.

Although this was a randomized, controlled trial, issues related to study implementation limit the validity of our results. With a loss to follow-up rate of 33%, there may have been systematic differences in the characteristics of intervention and control children undergoing assessment that could have biased the results in either direction. We sought to address the potential for differential follow-up by limiting the data analysis to monolingual Spanish speakers; this had the effect of increasing the homogeneity of the groups and decreasing the likelihood that a small number of English or bilingual Spanish-English speakers could have accounted for the differences seen. In our analysis of baseline characteristics in the two groups, we found no differences of any magnitude or statistical significance. Furthermore, we found that the numbers of well-child care visits were similar across the two groups, suggesting that differences in primary care did not account for our findings. Ultimately, there is no way to prove that differential follow-up did not account for the results presented here, and this must be considered an important limitation of this study.

In conclusion, this study supports the hypothesis that programs based in primary care pediatrics can influence the development of high-risk young children. Further research is needed to define the characteristics that determine which children and families are most likely to benefit from low-intensity, primary care–based interventions such as the VIP.

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Table 1

Baseline Characteristics According to Treatment Group

	Maternal Education <7 yr						Maternal Education ≥7 yr					
	VIP (n = 35)		Control (n = 25)				VIP (n = 16)		Control (n = 17)			
	Mean/%	SD	Mean/%	SD	Test[a]	*p*	Mean/%	SD	Mean/%	SD	Test[a]	*p*
					Child							
Birthweight, g	3517.7	414.9	3422.4	437.6	0.86	.40	3287.8	348.6	3490.6	405.1	1.54	.13
Gestational age, wk	39.1	1.1	39.1	1.4	0.36	.72	39.2	1.0	39.5	1.1	0.93	.36
Female	45.7%		48.0%		0.03	.86	18.8%		29.4%		0.51	.76
Breastfed	65.7%		88.0%		4.04	.13	50.0%		47.1%		0.04	.98
Bayley MDI at 9 mo	97.3	7.2	97.6	7.6	0.14	.89	97.3	5.8	94.4	7.6	1.23	.23
					Mother							
Age, yr	26.5	6.1	26.4	5.5	0.08	.94	28.0	5.1	27.8	7.1	0.11	.91
Education	5.3	1.2	5.3	1.4	0.10	.92	9.1	0.9	9.4	1.1	0.81	.42
Depressed	17.1%		28.0%		1.00	.49	37.5%		29.4%		1.49	.48
Working	5.7%		4.0%		0.00	.76	33.3%		29.4%		0.00	.99
					Family							
Hollingshead SES[b]	5.0	0.0	5.0	0.0	0.00	.99	5.0	0.0	4.9	0.2	0.97	.34
Father living in home	91.4%		88.0%		0.00	.99	81.3%		64.7%		3.14	.21
Homeless	2.9%		4.2%		0.00	.79	0.0%		5.9%		0.00	.99

VIP, Video Interaction Project; MDI, Mental Development Index; SES, socioeconomic status.

[a] Means were compared with *t* tests; percentage differences were compared with χ^2.

[b] SES classified as 1 to 5, with 5 representing lowest level of household resources.

Table 2

Exposure to VIP Visits

	Maternal Education <7 yr (n = 35)		Maternal Education ≥7 yr (n = 16)			
	Mean	**SD**	**Mean**	**SD**	**Test[a]**	***p***
Total visits[b]	7.8	1.2	7.3	1.8	1.4	.25
Visits prior to 12 mo[c]	5.4	0.8	5.1	1.0	1.1	.28
Visits 12–18 mo[d]	2.4	0.7	2.1	1.0	1.2	.24

VIP, Video Interaction Project.

[a] Means were compared with *t* tests.

[b] Maximum number of total visits: 9.

[c] Maximum number of visits prior to 12 months: 6.

[d] Maximum number of visits from 12 to 18 months: 3.

Table 3

Effect of VIP on Cognitive and Language Development at 21 Months: Entire Sample

		Intervention Group		Maternal Education		Group × Education	
Measures	n	F	*p*	F	*p*	F	*p*
Cognitive development							
Bayley MDI	93	5.4	.02	0.8	.38	3.7	.06
Language development							
PLS-3 expressive	91	2.0	.16	0.1	.82	4.5	.04
PLS-3 receptive	91	1.2	.27	0.1	.79	0.5	.49

VIP, Video Interaction Project; MDI, Mental Development Index.

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Table 4

Effect of VIP on Cognitive and Language Development at 21 Months, Stratified by Level of Maternal Education

	Maternal Education <7 yr						Maternal Education ≥7 yr					
	VIP (n = 35)		Control (n = 25)				VIP (n = 16)		Control (n = 17)			
Measures	**Mean**	**SD**	**Mean**	**SD**	**Test[a]**	***p***	**Mean**	**SD**	**Mean**	**SD**	**Test[a]**	***p***
Cognitive development												
MDI score	74.2	11.7	73.1	13.4	0.32	.75	81.8	12.5	70.3	11.9	2.70	.01
% Normal	22.9		16.0		0.10	.58	43.8		5.9		0.41	.02
% Borderline	48.6		52.0				43.8		64.7			
% Delayed	28.6		32.0				12.5		29.4			
Language development (standardized)												
PLS-3 expressive score	78.5	8.0	80.0	12.2	0.56	.58	83.3	8.8	76.1	4.1	2.85	.008
% Normal	14.3		32.0		0.10	.47	43.8		0.0		0.40	.03
% Borderline	71.4		48.0				50.0		100.0			
% Delayed	14.3		20.0				6.3		0.0			
PLS-3 receptive score	80.6	9.8	79.7	8.7	0.36	.72	82.5	9.8	78.9	7.3	1.17	.25
% Normal	25.7		20.0		0.13	.29	25.0		20.0		0.11	.56
% Borderline	71.4		68.0				69.8		66.7			
% Delayed	2.9		12.0				6.3		13.3			
Language development (semistructured)												
% Normal	31.4		16.7		0.27	.04	62.5		11.8		0.54	.001
% Indeterminate	57.1		50.0				31.3		52.9			
% Delayed	11.4		33.3				6.3		35.3			
Early Intervention eligibility												
% Eligible	60.0		52.0		0.08	.55	25.0		52.9		0.29	.11

VIP, Video Interaction Project; MDI, Mental Development Index; PLS-3, Preschool Language Scale-3.

[a]Means were compared with t-tests; ordered categorical data were compared using Spearman rank correlation (*r* is shown).