Randomized Controlled Trial of Primary Care Pediatric Parenting Programs

Effect on Reduced Media Exposure in Infants, Mediated Through Enhanced Parent-Child Interaction

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Objectives: To determine whether pediatric primary care–based programs to enhance parenting and early child development reduce media exposure and whether enhanced parenting mediates the effects.

Design: Randomized controlled trial.

Setting: Urban public hospital pediatric primary care clinic.

Participants: A total of 410 mother-newborn dyads enrolled after childbirth.

Interventions: Patients were randomly assigned to 1 of 2 interventions, the Video Interaction Project (VIP) and Building Blocks (BB) interventions, or to a control group. The VIP intervention comprised 1-on-1 sessions with a child development specialist who facilitated interactions in play and shared reading through review of videotapes made of the parent and child on primary care visit days; learning materials and parenting pamphlets were also provided. The BB intervention mailed parenting materials, including age-specific newsletters suggesting activities to facilitate interactions, learning materials, and parent-completed developmental questionnaires (Ages and Stages questionnaires).

Outcome Measures: Electronic media exposure in the home using a 24-hour recall diary.

Results: The mean (SD) exposure at 6 months was 146.5 (125.0) min/d. Exposure to VIP was associated with reduced total duration of media exposure compared with the BB and control groups (mean [SD] min/d for VIP, 131.6 [118.7]; BB, 151.2 [116.7]; control, 155.4 [138.7]; P = .009). Enhanced parent-child interactions were found to partially mediate relations between VIP and media exposure for families with a ninth grade or higher literacy level (Sobel statistic = 2.49; P = .01).

Conclusion: Pediatric primary care may represent an important venue for addressing the public health problem of media exposure in young children at a population level.

Trial Registration: clinicaltrials.gov Identifier: NCT00212576


Media exposure is increasingly recognized as a public health concern. There is emerging evidence of harm related to children younger than 3 years, especially for those with low socioeconomic status (SES) who are at greatest risk for developmental delay. One factor related to harm may be the reduced parent-child interaction associated with media. The American Academy of Pediatrics has recommended that parents reduce media while increasing interaction.

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marily middle-class white families. However, there have been no studies to date regarding whether interventions to promote parent-child interactions can reduce media exposure beginning earlier in infancy or in low-SES populations. In addition, although studies have shown that pediatric primary care–based interventions can be effective in promoting parent-child interactions, it is presently unknown whether such interventions can also affect media exposure.

In the context of a randomized controlled trial of 2 pediatric primary–care based interventions to enhance parent-child interactions and early child development (Bellevue Project for Early Language, Literacy, and Education Success), we sought to assess whether such interventions resulted in reduced media exposure and whether enhanced parenting mediated the effect on media exposure. The 2 interventions being studied were the Video Interaction Project (VIP) and Building Blocks (BB). The VIP intervention consists of 1-on-1 sessions with child development specialists who facilitate interactions in play and shared reading through review of videotapes made of the parent and child on primary care visit days; learning materials and parenting pamphlets are also provided. The BB intervention consists of monthly mailed parenting materials, including age-specific newsletters suggesting interactive activities, learning materials, and parent-completed developmental questionnaires (Ages and Stages questionnaires). As VIP and BB are each associated with enhanced parent-child interaction compared with controls at 6 months, we hypothesized that we would find reduced media exposure related to intervention assignment, in part mediated through enhanced parenting.

### METHODS

#### DESIGN

This was a single-blind, 3-way, randomized controlled trial with 2 intervention strategies (VIP and BB) compared with a control group who received routine well-child care. 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.

#### SAMPLE

Enrollment was performed in the postpartum ward of an inner-city public hospital (Bellevue Hospital Center) that serves individuals with low SES, primarily immigrant families, between November 2005 and October 2008. We enrolled 675 consecutive mother-newborn dyads who planned to receive pediatric primary care at our institution and met additional eligibility criteria. Eligibility criteria were chosen to provide homogeneity regarding medical status, to enhance feasibility, and to reduce likelihood of receipt of prior or concurrent comparable services. Medical criteria were having no significant medical complications, full-term gestation (≥37 weeks), birth weight of 2500 g or greater, and singleton gestation. Feasibility criteria were the mother being the primary caregiver, the mother being able to maintain contact, and mother’s primary language being English or Spanish. Criteria for no prior or concurrent services were the mother being aged 18 years or older and no participation in a prior study of VIP or BB.

#### RANDOMIZATION

Following enrollment, dyads were randomized to the VIP, BB, or control group using a random number generated by the project director using Microsoft Excel 2003 (Redmond, Washington). Randomization group assignments were concealed from research assistants who performed enrollment. Following enrollment, randomization group assignments were provided to study participants.

The VIP, BB, and control families received the same well-child care, delivered by the same primary care pediatricians. All 3 groups were scheduled to receive Reach Out and Read as part of routine care beginning at 6 months.

#### VIP Intervention

The VIP intervention, described in detail elsewhere, takes place from birth to 3 years of age, with fifteen 30- to 45-minute sessions taking place primarily on the day of primary care visits. Sessions were facilitated by a child development specialist who met 1 on 1 with families, providing an individualized, relationship-based intervention. The specialist delivered a curriculum focused on supporting verbal interactions in the context of pretend play, shared reading, and daily routines to enhance child development and school readiness. The VIP intervention uses 3 strategies: videotaping of mother-child interaction followed by review with the child development specialist, provision of learning materials, and provision of parenting pamphlets. Media exposure was not addressed in the context of videotaping and was not a primary targeted outcome of the curriculum. However, as part of the counseling regarding play and shared reading, one aspect regularly discussed with parents was replacement of media with these activities. In addition, one of the pamphlets provided for and discussed with parents prior to 6 months of age had a specific message addressing media exposure: “Plan for time together without TV or radio on.”

#### BB Intervention

The BB intervention, also described elsewhere, takes place from birth to 3 years of age. As with VIP, BB delivers a curriculum focused on supporting verbal interactions in the context of pretend play, shared reading, and daily routines to enhance child development and school readiness. In contrast to VIP, this curriculum is delivered through written pamphlets and learning materials that are mailed monthly to the family rather than by an interventionist. The BB intervention uses the following strategies: Building Blocks newsletters, learning materials, and parent-completed developmental questionnaires (Ages and Stages questionnaires).

Messages recommending no television for children younger than 2 years were included within BB pamphlets, but the first message was not provided until 6 months of age.

#### Control Group

As described above, control families received all standard pediatric care, including all routine anticipatory guidance and developmental surveillance as recommended by the American Academy of Pediatrics.

#### MEASURES

Assessments were performed by bilingual research assistants masked to group assignment.
We assessed sociodemographic and other data characterizing the sample based on parental interview at enrollment. For parents, this included mother’s age, country of origin, education, primary language, and marital status, and family Hollingshead Four Factor Socioeconomic Status26 based on parental education and occupation. Mothers were considered to be at increased social risk if they had 1 or more of the following characteristics: homelessness, victim of violence, involvement with child protective services, limited or late prenatal care, or history of mental illness including depression. For the child, we obtained information about sex and birth order. In addition, at the 6-month assessment, we assessed maternal literacy in the mother’s preferred language using the Woodcock-Johnson III/Bateria III Woodcock-Munoz Tests of Achievement, Letter-Word Identification Test29; this test correlates moderately with but tends to overestimate reading comprehension.30

**STATISTICAL ANALYSIS**

A total of 225 families were enrolled per group, based on power analyses related to assessment of parent-child interaction, as described previously.2,8 Statistical analyses comparing groups for media exposure were performed based on intention to treat. We performed comparisons of means using analyses of variance. Because estimates of media exposure for families in the BB group were comparable with those of control families, exploratory post hoc analyses were performed using Scheffé multiple contrasts, based on a null hypothesis of no difference between VIP and mean of BB and control. Effect size was assessed using partial eta squared. We performed comparisons of frequencies using χ² tests. Path analysis, with BB and controls collapsed into a single group, was used to determine whether enhanced parent-child interactions, measured by StimQ, mediated VIP-associated reductions in media exposure. Because the greatest effects on cognitive stimulation had been found for families with literacy levels of ninth grade or higher in this study,8 we also performed additional path analyses limiting the sample to these families. The Sobel test was used to statistically test for the presence of mediation.

Because the distribution of media exposure was significantly different than normal (Kolmogorov-Smirnov z = 3.1; P < .001) with positive skew (skewness [SE], 2.2 [0.1]), analyses of media duration and content were performed using log transformations; because some of the values were zero, a constant (1 minute) was added to each value prior to all transformations of media duration.31 This analytic approach was also consistent with theoretical concerns, as effects of media exposure are likely to be nonlinear. This has been found in a number of studies both of negative effects of exposure32-34 as well as of learning in relation to educational exposure.35

### RESULTS

#### SAMPLE

Enrollment has been described previously.8 A total of 410 families were assessed at a mean (SD) child age of 6.9 (1.3) months, including 126 of 225 in the VIP group (56%), 150 of 225 in the BB group (66.7%), and 134 of 225 controls (59.6%). Media exposure was missing for 3 families, all in the BB group. Table 1 shows characteristics by group at baseline and at 6 months. Groups did not differ for any sociodemographic characteristics or for word reading at...
either enrollment or assessment. Assessed mothers did not significantly differ from those who were not assessed for ethnicity, country of origin, marital status, SES, social risks, or child birth order or sex. However, assessed mothers were more likely to speak Spanish as their primary language (81.7% vs 66.8%; *P* = .001).

**MEDIA EXPOSURE**

Mean (SD) media exposure at 6 months of age was 146.5 (125.0) min/d, with a median of 120 minutes. A total of 14.0% (57 of 407) met the definition of very low media exposure (< 30 minutes). Of the total daily duration of media exposure, 24.7 (41.3) minutes were categorized as educational, 9.2 (24.6) as noneducational, 73.2 (81.9) minutes as older child/adult, and 39.4 (86.5) minutes as unknown.

**EFFECT OF GROUP ASSIGNMENT ON MEDIA EXPOSURE**

As shown in Table 2, differences were found across groups for duration of media exposure (*P* = .03), with children in the VIP group having less exposure compared with those in the BB and control groups by Scheffé test (*P* = .009). Effect size was small, with partial eta squared of 0.017 (95% confidence interval, 0.001-0.049). Effects were not found related to any specific content category (educational, noneducational, school-aged/adult), except for unknown media content, which was reduced for VIP families (*P* = .03). However, differences between groups were found in which there was reduced media directed to the child for VIP families (*P* = .006 by Scheffé). Children in the VIP group were reported to have been first exposed to media approximately 4 months earlier than those in the BB and control groups.

### Table 1. Maternal Characteristics at Enrollment and 6 Months

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>VIP (n=225)</th>
<th>BB (n=225)</th>
<th>Control (n=225)</th>
<th><em>P</em> Value</th>
<th>VIP (n=126)</th>
<th>BB (n=150)</th>
<th>Control (n=134)</th>
<th><em>P</em> Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mother</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>92.4</td>
<td>93.8</td>
<td>88.9</td>
<td>.16</td>
<td>91.3</td>
<td>95.3</td>
<td>92.5</td>
<td>.39</td>
</tr>
<tr>
<td>Immigrant</td>
<td>86.7</td>
<td>89.9</td>
<td>82.7</td>
<td>.14</td>
<td>89.7</td>
<td>86.0</td>
<td>88.1</td>
<td>.64</td>
</tr>
<tr>
<td>Spanish primary language</td>
<td>78.2</td>
<td>73.8</td>
<td>75.6</td>
<td>.54</td>
<td>80.2</td>
<td>79.3</td>
<td>85.8</td>
<td>.32</td>
</tr>
<tr>
<td>Married/partner</td>
<td>83.1</td>
<td>83.1</td>
<td>83.6</td>
<td>.99</td>
<td>82.5</td>
<td>86.7</td>
<td>82.8</td>
<td>.57</td>
</tr>
<tr>
<td>Maternal education, mean (SD)a</td>
<td>10.0 (3.7)</td>
<td>10.5 (3.7)</td>
<td>10.5 (3.5)</td>
<td>.30</td>
<td>10.2 (3.7)</td>
<td>10.3 (3.7)</td>
<td>9.6 (3.5)</td>
<td>.21</td>
</tr>
<tr>
<td>Maternal literacy, word reading, mean (SD)b</td>
<td>90.5</td>
<td>88.1</td>
<td>90.9</td>
<td>.57</td>
<td>89.7</td>
<td>87.9</td>
<td>91.7</td>
<td>.58</td>
</tr>
<tr>
<td>Low SESc</td>
<td>23.9</td>
<td>22.3</td>
<td>24.9</td>
<td>.81</td>
<td>26.4</td>
<td>22.0</td>
<td>22.0</td>
<td>.62</td>
</tr>
<tr>
<td><strong>Child</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female sex</td>
<td>52.9</td>
<td>45.3</td>
<td>48.9</td>
<td>.28</td>
<td>54.0</td>
<td>51.3</td>
<td>50.0</td>
<td>.81</td>
</tr>
<tr>
<td>First born</td>
<td>42.2</td>
<td>41.3</td>
<td>39.1</td>
<td>.79</td>
<td>42.1</td>
<td>40.7</td>
<td>41.8</td>
<td>.97</td>
</tr>
</tbody>
</table>

Abbreviations: ANOVA, analysis of variance; BB, Building Blocks (intervention); NA, not applicable; TV, television; VIP Video Interaction Project (intervention).

aLast grade completed.
bGrade level for word reading, measured at 6 months.
cHollingshead socioeconomic status level 4 or 5.
dOne or more of physical abuse, homelessness, child protection services involvement, late prenatal care, or mental illness.

### Table 2. Group Differences in Media Exposure at 6 Months

<table>
<thead>
<tr>
<th>Variable</th>
<th>VIP (n=126)</th>
<th>BB (n=147)</th>
<th>Control (n=134)</th>
<th>Test of Null Hypothesis of All Groups Equal (ANOVA)</th>
<th>Test of Contrast Between VIP and Mean of BB and Control (Scheffé Test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total daily duration of media, min/d</td>
<td>131.6 (118.7)</td>
<td>151.2 (116.7)</td>
<td>155.4 (138.7)</td>
<td>3.43 (.03)</td>
<td>2.62 (.009)</td>
</tr>
<tr>
<td>By content, min/d</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educational</td>
<td>20.9 (38.6)</td>
<td>27.3 (44.6)</td>
<td>25.4 (40.1)</td>
<td>0.34 (.71)</td>
<td>NA</td>
</tr>
<tr>
<td>Noneducational</td>
<td>7.9 (21.1)</td>
<td>10.8 (27.9)</td>
<td>8.7 (24.0)</td>
<td>0.12 (.89)</td>
<td>NA</td>
</tr>
<tr>
<td>Older child/adult</td>
<td>72.7 (82.0)</td>
<td>77.6 (84.6)</td>
<td>70.0 (79.3)</td>
<td>0.13 (.88)</td>
<td>NA</td>
</tr>
<tr>
<td>Unknown</td>
<td>30.2 (77.5)</td>
<td>35.5 (89.3)</td>
<td>52.4 (108.1)</td>
<td>2.5 (.08)</td>
<td>2.2 (.03)</td>
</tr>
<tr>
<td>Program on for child, min/d</td>
<td>48.7 (82.5)</td>
<td>63.2 (86.1)</td>
<td>64.1 (84.9)</td>
<td>3.18 (.04)</td>
<td>2.48 (.006)</td>
</tr>
<tr>
<td>Age first exposed to TV or videos, mo</td>
<td>4.0 (1.7)</td>
<td>3.5 (1.7)</td>
<td>3.5 (1.5)</td>
<td>3.81 (.02)</td>
<td>2.76 (.01)</td>
</tr>
</tbody>
</table>

Abbreviations: ANOVA, analysis of variance; BB, Building Blocks (intervention); NA, not applicable; TV, television; VIP Video Interaction Project (intervention).

aThree BB families receiving follow up at 6 months missed assessment of media exposure.
This study has demonstrated that a pediatric primary care parenting intervention, the Video Interaction Project, resulted in a small reduction in media exposure for 6-month-old infants. Exposure was reduced across several measures including overall duration, duration of exposure intended for the child, older age of initiating exposure, and greater likelihood of having very low exposure. Given increasing exposure to media earlier in childhood and recent studies suggesting adverse effects on early development and later school performance, these findings suggest pediatric primary care as a potential platform for addressing this significant public health issue.

This study provides the strongest evidence to date for a causal relationship, albeit indirect, between parent-child interactions and media exposure. In this randomized controlled trial, an intervention primarily targeting parent-child interactions resulted in reduced media exposure, in part mediated by enhanced parenting. The current findings replicate and extend Dennison and colleagues' study on child care by demonstrating effects for parents with low SES of young infants and by suggesting enhancement of parent-child interaction as a mechanism by which these effects were obtained. In addition, we have added significantly to existing observational studies showing limited measured spoken language exposure in association with media, limited report of talking about programs, and reduced shared reading and teaching, although the latter has not been a consistent finding. While our findings suggest enhancement of parenting as an avenue for reduction of media exposure, further research is needed to determine whether the converse is also true, ie, whether reductions in media would result in increased parent-child interactions.

While we did not find differences related to specific content, a trend was seen for group differences in exposure to unknown content, with reduced exposure for families in VIP. Media was typically coded as unknown when parents did not know enough about the program for us to determine the program’s name, making it impossible to categorize content. Together with the finding of reduced exposure to media for the child, this suggests that reductions in media in association with enhanced parenting were related primarily to exposure that was either in the background or unsupervised; further study is warranted.

Contrary to our hypothesis, no effects were found relating the BB intervention to media exposure. This finding may have been related to BB not including specific messages regarding television exposure prior to 6 months. It cannot be determined from the present data whether BB might have effects on media at later time points. In addition, BB, as a lower intensity intervention, may not have sufficiently enhanced interactions to the extent necessary to indirectly affect media exposure.

We would like to note some limitations of this study. First, while the use of media diaries allowed the collection of detailed information regarding content, we must acknowledge the possibility that data collected via this assessment tool cover only 1 typical day and may underestimate quantity of media in the home. Second, our results apply to exposure in infants primarily from Hispanic immigrant families with low SES and may not be generalizable to children in families with more resources. Third, there was a larger than expected loss to follow-up at 6 months owing to limitations in resources, which led us to prioritize later assessment points. The threat to validity resulting from loss to follow-up may have been limited, as assessed participants were equivalent across groups for all measures. However, differences between assessed and nonassessed participants, likely owing to differential accessibility, may limit generalizability. In addition, effects on media exposure were small. Additional study of the cohort, in progress, will enable us to determine whether the reduction in media found in these analyses mediates the effect of VIP on child development.

In conclusion, VIP, a pediatric primary care–based intervention, resulted in reduced exposure to media beginning in early infancy. This effect was partially mediated by enhanced parent-child interaction. Pediatric primary care may represent an important venue for...
addressing the public health problem of media exposure in young children at a population level. Additional research is needed to determine whether integration of more specific strategies to reduce media exposure in primary care parenting interventions results in greater effect.

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Author Contributions: Dr Mendelsohn had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: Mendelsohn, Dreyer, Brockmeyer, Berkle-Silberman, Huberman, and Tomopoulos. Acquisition of data: Mendelsohn, Brockmeyer, Berkle-Silberman, and Huberman. Analysis and interpretation of data: Mendelsohn, Dreyer, Brockmeyer, Berkle-Silberman, Huberman, and Tomopoulos. Drafting of the manuscript: Mendelsohn, Dreyer, Brockmeyer, Berkle-Silberman, Huberman, and Tomopoulos. Critical revision of the manuscript for important intellectual content: Mendelsohn, Dreyer, Brockmeyer, Berkle-Silberman, Huberman, and Tomopoulos. Statistical analysis: Mendelsohn, Dreyer, and Brockmeyer. Obtained funding: Mendelsohn, Dreyer, Brockmeyer, Berkle-Silberman, and Huberman. Administrative, technical, and material support: Mendelsohn, Dreyer, Brockmeyer, Berkle-Silberman, Huberman, and Tomopoulos. Study supervision: Mendelsohn, Dreyer, Brockmeyer, Berkle-Silberman, Huberman, and Tomopoulos.

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REFERENCES


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**Announcement**

**Trial Registration Required.** In concert with the International Committee of Medical Journal Editors (ICMJE), *Archives of Pediatrics and Adolescent Medicine* will require, as a condition of consideration for publication, registration of all trials in a public trials registry (such as http://ClinicalTrials.gov). Trials must be registered at or before the onset of patient enrollment. This policy applies to any clinical trial starting enrollment after July 1, 2005. The trial registration number should be supplied at the time of submission.

For details about this new policy, and for information on how the ICMJE defines a clinical trial, see the editorials by DeAngelis et al in the September 8, 2004 (2004;292:1363-1364) and June 15, 2005 (2005;293:2927-2929) issues of *JAMA*. Also see the Instructions to Authors on our Web site: www.archpediatrics.com.