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An Evaluation of Three Positive Parenting Practices and Their Combined Impact on Developmental, Social, or Behavioral Delays in Children Ages 1-5 in the United States

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Abstract

Objectives: (1) Determine whether three individual positive parenting practices (PPP) – reading to children, engaging in storytelling or singing, and eating meals together as a family – decrease the risk of developmental, behavioral, or social delays among children between the ages of 1-5 years in the United States. (2) Determine if a combination of these parenting practices has an additive effect on the outcome.

Methods: Multiple logistic regression and chi-square analyses were used to analyze data from the National Survey of Children's Health 2011/2012 in regards to the relationship between each of the three individual PPP as well as a total PPP score and the child's risk of being developmentally, socially, or behaviorally delayed (N=24,875). These analyses controlled for poverty and parental education. All analyses were completed using SAS Version 9.3.

Results: A strong correlation was found between each of the three PPP as well as the total PPP score and the child's risk of developmental, social, or behavioral delays ($p<0.05$ for each test). These associations were found to have a dose-response relationship ($p<0.05$ in all but one analysis).

Conclusions: This study found that parents engaging in daily PPP could possibly reduce the risk of delay in young children. Furthermore, we found that engaging in all three PPP daily has an additive effect in reducing risk of delays. Limitations of this study include its cross-sectional design, as well as potential recall and social desirability biases.

Introduction

Over 26% of children ages four months to five years have been found to be at risk for developmental, social, or behavioral delays in the United States (U.S.), according to the 2011/2012 National Survey of Children's Health (NSCH).[1] The first five years of life are a critical period for children's brain development, having a significant impact on cognitive, emotional, and social competencies, which influence how children will grow and function from preschool years through adolescence and into adulthood.[2,3] During these influential years, parents play a critical role in the promotion of children's learning and development. Studies have shown that parents' participation in literacy activities such as book reading and storytelling are foundational to children's language growth, emergent literacy, and cognitive development.[4-6] Similarly, family meals have been found to positively impact children's social and behavioral skills.[4,7,8] However, according to the NSCH and *Healthy People 2020*, only 47.8% of parents report that a family member reads to their child daily, 56.8% report engaging in daily storytelling or singing, and 60.6% report having a daily meal together.[1,9] These rates were not evenly distributed among the population, finding disparities along race, income, and educational divides.[1,3,6,10-13]

Research has shown that shared reading experiences directly relate to a child's vocabulary size, phonemic awareness, print concept knowledge, and positive attitudes toward literacy.[4] Literacy skills are a key contributing factor to success in academic outcomes such as progressing through grades, high school graduation, and overall performance on college entrance exams.[5,14] Reading to children and participating in storytelling or singing early in development have also been shown to have an impact on

literacy skills.[4,15] Further, literature suggests family mealtimes can have a positive impact on development because they provide an environment where children are a captive audience to adult conversations, which can be linguistically complex, cognitively challenging, and highly engaging.[8] Socially, mealtimes provide an opportunity for parents to model, coach, monitor, and control a child's behavior.[7,8]

Previous research has identified several negative risk factors for childhood delays during early years of development, including inadequate prenatal care, substandard child-care, poverty, adolescent mothers, and isolation from parents due to divorce or single parent households.[1,2,10,12,13,16,17] These factors have been found to have an additive effect for a child's risk of being developmental, social, or behavioral delayed. Specifically, if a child has only one of the risk factors, they are statistically the same as those with no identified risk factors; however, a child with two or more of the risk factors is four times more likely to develop social and academic problems.[2] While this additive impact of negative risk factors is known, the inverse, an evaluation of multiple positive factors having a cumulative preventative impact on delay, has never been studied. Similarly, there is extensive research evaluating the positive correlation between the individual acts of reading to children, engaging in storytelling or singing, and eating meals together as a family, and their positive impact on a child's cognitive, social, and behavioral development, however there is a gap in the literature looking specifically at daily rates of parental interactions in these three areas and their individual and collective impact on children's risk of being diagnosed with developmental, social, or behavioral delays.[3-5,8,14,15,18-23] Of particular importance is a focus on children ranging in age from 1-5 years. The first five years of life are extremely important for cognitive development and data

from this age group can be used in conjunction with other assessments to evaluate kindergarten readiness.[2,4,10]

Therefore, the purpose of this study was to determine if three specific positive parenting practices (PPP) – reading to children, engaging in storytelling or singing, and eating meals together as a family – decrease the risk of developmental, behavioral, or social delays among children between the ages of 1-5 years in the U.S. A secondary purpose of this study was to determine if the combination of these parenting practices had an additive effect on the outcome. By finding a positive correlation between these three PPP and children's decreased risk of diagnosed delays, this research may potentially lead to the development of interventions, strategies, or practices that will reduce the risk of delays before children enter into the educational system.

Methods

Design and Study Sample

The 2011/2012 NSCH was a cross-sectional, nationally-representative survey conducted by phone interview between February 2011 and June 2012.[24,25] The survey, which was funded by the Maternal and Child Health Bureau of the Health Resources and Services Administration, was designed to provide an estimation of national and state level prevalence of physical, emotional, and behavioral health indicators in children ages 0-18 years. These health indicators are evaluated in combination with information on the child's family context and neighborhood environment.[26] The NSCH was conducted using the State and Local Area Integrated Telephone Survey Program with the National Immunization Survey sampling frame. Random digit dialing selected by the Computer-

Assisted Telephone Interview program was used to contact interview households.[24,25] A total of 847,881 households were contacted via landline and cell phones for the survey. Of those households, 187,422 reported age-eligible children living in the home, which yielded 95,677 child-level interviews across the U.S., resulting in 1,811-2,200 interviews in each state.[25] The survey respondents were adults who were knowledgeable about the child's health; 68.6% of surveys administered were completed by the child's mother, 24.2% by fathers, and 7.2% by another relative or guardian.[25] The participation rate for the survey was 54.1% for participants surveyed on a landline and 41.2% for those surveyed on a cell phone.[25] The survey data was weighted in order to reflect all children ages 0-18 years in the U.S.

After determining if the household was eligible for participation, one child was randomly chosen from the household, and an attempt was made to conduct a full interview about that child. On average, the survey took between 30-35 minutes to complete; a detailed incentive plan was used in order to increase survey participation.[25]

The population of interest for this study included all 1-5 year old children in the 2011/2012 NSCH. Of the original 95,677 individuals, the following exclusions were made: (1) children less than 1 year and greater than 5 years of age, (2) cases with missing data for the dependent variable: being at risk for developmental, social, or behavioral delays, and (3) cases with missing data for the independent variables, daily rates of reading to children, engaging in storytelling or singing, or engaging in family meals.[3] The resulting population of interest included 24,875 study participants. The Institutional Review Board at the University of Kentucky waived review of this study because of the use of publically available de-identified secondary data.

Measures

Questions and scoring methods for the portions of the NSCH evaluating "Children at Risk for Developmental, Behavioral, or Social Delays: ages 4 months to 5 years" were adapted from the Parents' Evaluation of Developmental Status (PEDS). PEDS is a standardized child development screening tool designed to identify young children who are at risk for developmental, social, or behavioral delays.[27] PEDS used nine survey questions to compile delay risks on a scale of 0-3 for children ages four months to five years.

Dependent Variable:

The dependent variable of a child being at risk for developmental, social, or behavioral delays was determined using PEDS scoring results performed by the NSCH.[25] The PEDS test has shown high content validity levels and reports sensitivity of 84% and specificity of 74%.[28] If the PEDS score found no or low risk of delay, then the child was combined into a no/low risk group. If PEDS score found moderate to high risk of delay, then the child was coded as being at-risk. The nine questions used to calculate PEDS score can be found in Table 1.

Independent Variables:

The independent variables of (1) reading to child, (2) engaging in storytelling/ singing, and (3) having family meals were all coded so that: if parents reported zero days per week of a specific exposure then they were coded as no exposure (0); if they reported 1-3 days of the exposure, they were coded as low exposure (1); if they reported 4-6 days

of the exposure, they were coded as moderate exposure (2), and if they reported seven days of the exposure they were coded as high exposure (3).

These three independent variables were analyzed individually with the dependent variable, and were also combined to evaluate any additive effect of the three PPP. The combined PPP score was produced as a sum of the three independent variable scores, resulting in a total score ranging from 0-9. The score was then stratified into three categories: No/low rates of PPP (total PPP score of 0-5); moderate rates of PPP (total PPP score of 6-7), and high rates of PPP (total PPP score of 8-9). The survey questions used to evaluate rates of (1) reading to child, (2) engaging in storytelling/singing, and (3) having family meals can be found in Table 1.

Control Variables:

Three potential confounding variables were identified through an extensive review of literature: poverty, parental education level, and race.[2,3,11-13,17,23,29] After running multiple logistic regression analysis on these potential confounders, it was determined that collinearity existed between them, therefore only poverty and parent's education were used in the final statistical analysis. Poverty was divided into four categories: (1) households at or below poverty level, (2) households between 100% and 200% of poverty level, (3) households between 200% and 300% of poverty level, and (4) households over 300% of poverty level. Parental education was separated into three categories: (1) parents with less than a high school education, (2) parents with a high school education, and (3) parents with more than a high school education.

Data Analysis

Multiple logistic regression was used to analyze the relationship between (1) reading to children, (2) participating in storytelling or singing, (3) engaging in family meals, and (4) total PPP score and the child's risk of being developmentally, socially, or behaviorally delayed. These analyses included the control variables of poverty and parental education. All analyses were weighted to reflect the generalizability of the NSCH survey. Chi-square analysis was also performed between all independent, dependent and control variables. All analyses were conducted in 2013 using SAS Version 9.3.

Results

As shown in Table 2, the sample population was comprised of 24,875 children between the ages of 1-5, with the children's ages distributed as follows: 19.7% were one year of age, 17.4% were two years, 20.5% were three years, 21.2% were four years, and 21.3% were five years of age. The population was evenly distributed between male and female participants and 66.3% of the population was white. One quarter of the population reported living below the national poverty level (25.6%).

More than one-fourth (28.1%) of the population was found to be at moderate to high risk of being developmentally, socially or behaviorally delayed (Table 3). Half of the parents surveyed reported reading to children daily (50.9%) compared to 4.3% of parents who reported zero days per week. Similar rates were found with storytelling or singing, with 54.5% of parents reporting it as a daily practice compared to 4.1% reporting zero days per week. In regards to family meal rates, three out of every five parents

(60.4%) reported eating a meal together as a family daily. Less than one-quarter (22.7%) of the population was engaging in no/low levels of all three PPP, 33.4% were engaging in moderate levels, and 43.9% reported high levels of PPP activities.

A multiple logistic regression was used to produce adjusted odds ratios (aOR) to determine an association between children being at risk for developmental, social, or behavioral delays and the three individual PPP as well as for the total PPP Score, adjusting for poverty level and parent's education in all analyses. As presented in Table 4, children who were never read to were significantly more likely (aOR=1.86, 95% CI=1.24-2.80) to be at risk of developmental, social, or behavioral delay compared to children who were read to daily. A significant association was also found when comparing children read to 1-3 days per week (aOR=1.58, 95% CI=1.31-1.48) and 4-6 days per week (aOR=1.25, 95% CI=1.06-1.48) with children read to daily. Daily rates of storytelling or singing also had a significant relationship with a child's decreased risk for delays (Table 4), finding that children with parents reporting no activity were 1.67 times as likely to be at risk for delays when compared to parents reporting daily activity (95% CI=1.17-2.38). Significant association was also found when comparing1-3 days per week vs. daily reporting of storytelling/singing (aOR 1.63, 95% CI=1.34-1.98), but no significance was found between reports of the 4-6 days per week and daily activity (aOR 1.11, 95% CI=0.94-1.30). As shown in Table 4, all other levels of family meals were found to be significantly different than engaging in the activity daily. Comparing those who reported zero family meals per week to those reporting daily meals, children were found to be 1.51 times as likely to be at risk for delays (95% CI=1.01-2.28), where parents reported 1-3 days per week vs. daily meals, children were 1.46 times as likely

(95% CI=1.19-1.78), and 4-6 days per week vs. daily meals were 1.21 times as likely to be found at risk of delay (95% CI=1.03-1.42). Finally, when comparing total PPP scores with risk of developmental, social, or behavioral delays, it was found that participants with no/low rates of PPP when compared with those who reported high rates were 1.85 times as likely to be at risk for developmental, social, or behavioral delays (95% CI=1.54-2.23), and when comparing those who reported moderate rates of PPP, there was still significant association with PPP and all delays. (aOR= 1.30, 95% CI=1.11-1.52). In all analyses, poverty was found to be significantly associated with risk of being delayed for those below 300% of the poverty level. Both poverty and parent's education were found to have a dose-response relationship with risk of being delayed, with their impact reducing with increased income and education (Table 4).

Discussion

To the best of our knowledge, this is the first national study to find a correlation between daily rates of parents engaging in PPP and rates of children (ages 1-5) being at risk for developmental, social, or behavioral delays. Specifically, we found that parents engaging in daily storytelling or singing, reading to children, or family meals could possibly reduce the risk of delay in young children. Furthermore, we found that engaging in all three PPP daily is more beneficial in preventing delays than any of the practices individually, with a strong relationship between overall PPP score and risk of delay. These findings are supported by previous studies that have found correlations between PPP and cognitive and social development.[2,4,6,10,13] A dose-response relationship was found between all independent and control variables in relation to risk of delays, with increased rates resulting in a decreased risk. Reading, family meals, overall PPP score,

poverty, and parent's education were all found to have a dose-response across all levels of exposure. Engaging in zero or 1-3 days of storytelling or singing was found be associated with being at risk for delay in a dose-response manner. However, the measures of association for storytelling or singing 4-6 days and seven days per week and being at risk for delay were equivalent.

As a nationally-representative study with a large sample size, the results of this research have the potential to impact a significant number of American families. Studies have shown that reading test scores from as early as 3rd grade can be used as indicators for eventual dropout rates, suggesting reductions in the rates of these early diagnosed delays have the potential to greatly influence children's academic futures.[30] Further, it has been found that children who do not complete high school are more likely to become adults with employment problems, have higher rates of illness, and experience premature mortality.[31-33] Additionally, research has suggested that public health interventions focused on improving graduation rates would be more cost effective than later medical interventions targeted at health disparities.[31,34] Therefore, the finding of a statistically significant correlation between parent's daily rates of PPP and children's risk for diagnosed delays can be used by public health practitioners, physicians, home visitation programs (HANDS, First Steps, etc.), churches, community reading groups, our educational systems, and many others to encourage parents to engage in these relatively easy, non-resource dependent PPP. With further study, we could design, test, and ultimately disseminate, a positive practice checklist to parents of very young children, which would provide an evidence-based guideline of non-financially dependent practices they can engage in with their children that will potentially reduce their risk of delays

before they enter into the educational system. Through an early intervention program focused on encouraging parents to engage in these daily PPP, we may be able to positively impact these children's educational direction. Further, the long term outcomes of an intervention are potentially far reaching, impacting a child's ability to interact socially, improving coping skills, and increasing cognitive development, ultimately impacting future employment and overall health.

There are several limitations to this study, including both recall and social desirability biases. Studies have shown that parents will commonly misrepresent how frequently they read to their children due to social pressure to engage in the practice.[35] We believe that this could be a factor for all three of the positive parenting practices with parents reporting higher rates than may be accurate. There is also the concern of parents not correctly recalling the rates of practice, considering this is a cross-sectional study based completely on recall of past events. The study's cross-sectional design also prevents us from drawing causality from our findings. Further limitations of the study include the wording of some survey questions, which may not have fully captured the desired result. Specifically, the question on family meals, which can be observed in Table 1, does not specify whether or not the meal was eaten as a family with no distractions from television or electronic devices. We believe that this detail could decrease the statistical benefit seen from the practice, compared to what we may have observed if the question was more specific. An additional limitation of the study includes any potential bias created from the transformation of variables. For both dependent and independent variables, data was collapsed into categories in order to simplify our outcomes and to gain an overall picture of the potential benefit of these PPP. This

collapsing of data, both with the grouping of days and the grouping of levels of delay risk could have resulted in lost information in regards to the overall study results. Further, our large sample size could also have lead to statistically significant results that may not maintain significance in smaller populations.

Further study is suggested in order to define causality between these PPP and children's risk of being developmentally, socially, or behaviorally delayed, with the ideal longitudinal study following through adolescence and young adulthood in order to determine any potential correlation with dropout rates, employment outcomes, and overall health status. Investigation of parent's literacy rates in relation to rates of reported reading at home, as well as the potential impact of early learning centers and daycare reading to children are also suggested for future studies. Additionally, study is suggested on the impact of late onset of these positive parenting practices and their potential impact on delays.

Overall, our results indicate that parents have the ability to greatly influence a child's risk of being developmentally, socially, or behaviorally delayed by engaging with their child(ren) daily in several key positive ways. Taking the time to read, tell stories and sing, and eat meals together as a family may influence a child's success in the educational system and the world in general, positively impacting their entire future. Encouraging parents to adopt these daily practices is critical now that we know the positive impact these practices may have on the youth of our nation.

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Table 1: Questions from National Survey of Children's Health Used to Created Dependent and Independent Variables	
Dependent Variable: PEDS Questionnaire	
Question	**Response Options**
Do you have any concerns about [S.C.]'s learning, development, or behavior?	yes, no, don't know, or refused to answer
Are you concerned a lot, a little, or not at all about how [S.C.] talks and makes speech sounds?	a lot, a little, not at all, or don't know/refuse to answer
Are you concerned a lot, a little, or not at all about how [he/she] understands what you say?	
Are you concerned a lot, a little, or not at all about how [he/she] uses [his/her] hands and fingers to do things?	
Are you concerned a lot, a little, or not at all about how [he/she] uses [his/her] arms and legs?	
Are you concerned a lot, a little, or not at all about how [he/she] behaves?	
Are you concerned a lot, a little, or not at all about how [he/she] gets along with others?	
Are you concerned a lot, a little, or not at all about how [he/she] is learning to do things for [himself/herself]?	
Are you concerned a lot, a little, or not at all about how [he/she] is learning pre-school or school skills?	
Independent Variables	
During the past week, how many days did you or other family members read to [S.C.]?	Number of days per week (0-7), I don't know, or refuse to answer.
During the past week, how many days did you or other family members tell stories or sing songs to [S.C.]?	
During the past week, on how many days did all the family members who live in the household eat a meal together?	

Table 2: Characteristics of 2011/2012 National Survey of Children's Health Respondents, ages 1-5 (N=24,875)	
Variable	**Response Frequency (n, weighted %)**
Sex	
Male	12609 (50.8)
Female	12246 (49.1)
Age (years)	
1	4918 (19.7)
2	4047 (17.4)
3	5363 (20.5)
4	5300 (21.2)
5	5247 (21.3)
Race	
White	17351 (66.3)
Black	2469 (13.2)
Other	4361 (20.4)
Income	
Below Poverty Level	4207 (25.6)
Above 100-200% Poverty Level	4379 (22.5)
Above200-300% Poverty Level	3637 (16.1)
Over 300% poverty level	10420 (35.7)
Parent's Education	
Less than High School Education	2902 (18.5)
High School Education	7249 (30.4)
More than High School Education	133301 (51.1)

Table 3: Response Rates for Independent and Dependent Positive Parenting Practice Variables from the 2011/2012 National Survey of Children's Health Respondents, ages 1-5 (N=24,875)	
Dependent Variable	**n, weighted %**
At Risk for Developmental, Social or Behavioral Delays	
No/Low Risk	18475 (71.9)
Moderate/High Risk	6385 (28.1)
Independent Variables	**n, weighted %**
Days per week parents/guardian read to child	
0 days	669 (4.3)
1-3 days	3679 (20.0)
4-6 days	5815 (24.8)
7 days	14648 (50.9)
Days per week parents/guardian engaged in story telling or singing with child	
0 days	783 (4.1)
1-3 days	3901 (17.8)
4-6 days	5501 (23.7)
7 days	14602 (54.5)
Days per week parents/guardian had a family meal with child	
0 days	615 (2.6)
1-3 days	3037 (13.0)
4-6 days	6457 (24.0)
7 days	14724 (60.4)
Positive Parenting Practice Score	
0-5	4314 (22.3)
6-7	8006 (33.5)
8-9	12395 (44.2)

Table 4: Odds of Child Being at Risk of Developmental, Social or Behavioral Delays Compared to Positive Parenting Practices with Poverty and Parent's Education As Controlling Variables. Data from 2011/2012 National Survey of Children's Health Respondents, ages 1-5 (N=24,875)

	Daily Reading		**Daily Storytelling or Singing**		**Daily Family Meals**		**Positive Parenting Practice Score**	
	Adjusted Odds Ratio* (95% CI)	p-value	Adjusted Odds Ratio* (95% CI)	p-value	Adjusted Odds Ratio* (95% CI)	p-value	Adjusted Odds Ratio* (95% CI)	p-value
Rate of Activity (days per week)								
0 vs. 7	1.86 (1.24-2.80)	0.0027	1.67 (1.17-2.38)	0.0044	1.51 (1.01-2.28)	0.0472	-	-
1-3 vs 7	1.58 (1.31-1.94)	<0.0001	1.63 (1.34-1.98)	<0.0001	1.46 (1.19-1.78)	0.0002	-	-
4-6 vs 7	1.25 (1.06-1.48)	0.0087	1.11 (0.94-1.30)	0.2310	1.21 (1.03-1.42)	0.0218	-	-
Positive Parenting Practice Score								
0-5 vs. 8-9	-	-	-	-	-	-	1.85 (1.54-2.23)	<0.0001
6-7 vs. 8-9	-	-	-	-	-	-	1.30 (1.11-1.52)	0.0009
Poverty								
Below Poverty level vs. over 300%	1.74 (1.45-2.10)	<0.0001	1.87 (1.56-2.24)	<0.0001	1.96 (1.63-2.35)	<0.0001	1.82 (1.52-2.18)	<0.0001
100-200% vs. over 300%	1.19 (1.00-1.43)	0.0573	1.24 (1.04-1.48)	0.0196	1.27 (1.06-1.51)	0.0096	1.21 (1.01-1.45)	0.0344
200-300% vs. over 300%	1.03 (0.84-1.26)	0.8129	1.06 (0.86-1.29)	0.5946	1.08 (0.88-1.32)	0.4630	1.04 (0.85-1.28)	0.7126
Parent's Education								
Less than HS degree vs. more than HS degree	1.24 (1.00-1.53)	0.0508	1.23 (1.00-1.52)	0.0524	1.37 (1.12-1.68)	0.0027	1.20 (0.97-1.48)	0.0989
HS graduate vs. more than HS degree	1.03 (0.89-1.19)	0.7113	1.04 (0.90-1.21)	0.6059	1.08 (0.93-1.25)	0.3179	1.03 (0.88-1.19)	0.7401

*Adjusted for poverty and parent's education.

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