

Shared Reading and Risk of Social-Emotional Problems

Keith J. Martin, DO, MS,^{a,b} Andrew F. Beck, MD, MPH,^{b,c} Yingying Xu, PhD,^b Gregory A. Szumlas, MD,^{b,c}
John S. Hutton, MD, MS,^{b,c} Clare C. Crosh, DO,^b Kristen A. Copeland, MD^{b,c}

abstract

BACKGROUND AND OBJECTIVES: The American Academy of Pediatrics recommends literacy promotion as well as routine developmental surveillance during well-child visits to improve academic, relational, and health outcomes. In this study, we examined the possible association between shared reading and social-emotional problems among young children.

METHODS: We conducted a retrospective review of longitudinal records for children aged 30 to 66 months presenting for visits to an academic pediatric primary care center between July 1, 2013, and February 1, 2019. The outcome was evidence of social-emotional problems, defined by an Ages and Stages: Social Emotional Questionnaire (ASQ:SE) score above the established cutoff. The predictor was caregiver-reported frequency of shared reading (most = 5–7 days per week, some = 2–4 days per week, rarely = 0–1 days per week) at a previous visit. Generalized linear models with generalized estimating equations were used to assess the association between the longitudinal outcome and predictor, adjusting for child demographics and needs reported on routine social history questionnaires.

RESULTS: Analyses included 5693 children who completed at least 1 ASQ:SE (total of 7302 assessments) and had shared reading frequency documented before each ASQ:SE assessment. Children were predominantly Black (75%) and publicly insured (80%). Sixteen percent of ASQ:SE scores were suggestive of social-emotional concerns; 6% of caregivers reported sharing reading rarely. Children with rare shared reading had a higher risk of an ASQ:SE above cutoff compared with those with shared reading on most days (adjusted risk ratio, 1.62; 95% confidence interval, 1.35–1.92).

CONCLUSIONS: Less-frequent caregiver-reported shared reading was associated with higher risk of social-emotional problems in young children presenting for primary care. This highlights potential relational and social-emotional benefits of shared reading.



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^aDepartment of Pediatrics, School of Medicine, Johns Hopkins University, Baltimore, Maryland; ^bCincinnati Children's Hospital Medical Center, Cincinnati, Ohio; and ^cDepartment of Pediatrics, College of Medicine, University of Cincinnati, Cincinnati, Ohio

Dr Martin conceptualized and designed the study, drafted the initial manuscript, and reviewed and revised the manuscript; Dr Xu conceptualized and designed the analysis, conducted the statistical analysis, and reviewed and revised the manuscript; Drs Beck and Copeland conceptualized and designed the study, reviewed and assisted in interpreting the results, and contributed to the manuscript; Drs Szumlas, Hutton, and Crosh reviewed and assisted in interpreting the analysis and critically reviewed the manuscript for important intellectual content; and all authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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WHAT'S KNOWN ON THIS SUBJECT: The American Academy of Pediatrics recommends surveillance of social-emotional development and promotion of shared reading with infants and young children at all well-child checks. Although shared reading is known to promote literacy development, the extent of its association with social-emotional development is unknown.

WHAT THIS STUDY ADDS: More frequent shared reading at home, as endorsed by caregivers at primary care visits, was associated with decreased report of child social-emotional problems. Reading promotion during primary care visits could support improved social-emotional development and related outcomes for young children.

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Caregiver-child (“shared”) reading has been linked to cognitive, parent-child relational, and neurobiological benefits.¹⁻⁹ More frequent shared reading predicts school readiness,¹⁰ early school success,¹¹ and decreased need for early intervention services.¹² Most evidence has attributed these outcomes to enhanced language and literacy skills.^{1,13-15} However, relational benefits of shared reading are increasingly emphasized, particularly for young children.¹⁶⁻¹⁸ These include enhanced attachment, more positive parenting and reading attitudes, and reduced stress.^{6,17-20} Potential mechanisms include emotional nurturing via affection and responsiveness,^{21,22} reassuring reading routines,²³ and story-sharing practices such as child-directed speech.²⁴ These are likely reinforced by reciprocal neurobiological signaling pathways involving oxytocin and dopamine (love and pleasure, respectively).²⁵⁻²⁸ Given these potential mechanisms and signaling pathways, it stands to reason that shared reading may also be protective against social-emotional problems, which influence academic performance.²⁹

Pediatricians have a role in promoting both literacy and social-emotional development.³⁰ The American Academy of Pediatrics suggests promotion of shared reading starting as soon as possible after birth through programs like Reach Out and Read (ROR).³¹ ROR is a national, evidence-based clinic-based literacy promotion program in which, at every well-child visit up to 5 years of age, children are given age-appropriate books, and caregivers are counseled on the importance of reading aloud to children.³¹ Participation in ROR has been linked to increased frequency of shared reading, more positive attitudes toward reading, improved

child language and emergent literacy skills, increased school readiness, and decreased caregiver depression.³²⁻³⁷ Social-emotional benefits of ROR have been suggested^{16,18,38} but not formally established. For example, the Video Interaction Project (VIP) was designed to enhance ROR and has been linked to improvements in externalizing child behaviors.³⁹

Developmental surveillance, including for cognitive and social-emotional domains, is also recommended by the American Academy of Pediatrics during well-child visits beginning in infancy.^{30,40} Literacy has recently been suggested as a distinct domain.⁴¹ As a result, pediatric practices often now assess home reading behaviors alongside early development,^{30,38} affording opportunities to explore reading-development relationships. However, there has been limited study of associations between shared reading and social-emotional development in young children.⁴² In this study, we sought to test the hypothesis that less frequent shared reading would be associated with more caregiver-reported social-emotional problems.

METHODS

Study Design and Data Source

This was a retrospective review of longitudinal data in the electronic medical record (EMR) for an urban primary care setting. Our study population of interest was children aged 30 to 66 months who presented for well-child, ill, or follow-up visits to the Pediatric Primary Care Center (PPCC) between July 1, 2013, and February 1, 2019. The PPCC is a large (~35 000 annual visits) primary care site located at an academic medical center. The PPCC has participated in ROR since 1998. This study was reviewed and approved

as nonhuman subjects research by the Cincinnati Children’s Institutional Review Board.

Outcome, Predictors, and Covariates

The outcome of interest was presence of social-emotional problems, assessed longitudinally by a score above (versus below) the established “fail” cutoff for the Ages and Stages: Social Emotional Questionnaire (ASQ:SE). This score functions as a referral (or action) cutoff in our setting. The ASQ:SE is a set of age-specific questions assessing self-regulation, compliance, communication, adaptive functioning, autonomy, affect, and interpersonal interactions.⁴³ Caregivers of children 36 to 41, 42 to 53, and 54 to 60 months old complete 36-, 48-, and 60-month versions of the ASQ:SE, respectively. Each version has a fail cutoff score above which further evaluation is recommended (cutoff scores: 59 for 36-month and 70 for 48- and 60-month versions).⁴³ The ASQ:SE has a 71% to 85% sensitivity and a 90% to 98% specificity when compared with the Child Behavior Checklist and professional diagnosis of a social-emotional disability,^{43,44} and takes ~10 minutes to complete.⁴⁵ At the time of this study, ASQ:SEs were completed by caregivers on paper. Providers then hand-calculated and manually entered the score into the EMR, indicating whether it was above or below cutoff. In this study, we examined the ASQ:SE outcome both as a dichotomous (fail versus pass) and as a continuous (ASQ:SE score) variable. We captured information on all (eg, multiple or repeated) ASQ:SEs completed for included children between 30 and 66 months of age. ASQ:SEs of children <30 months of age were excluded to help determine if earlier shared reading impacts later social-emotional development of our target

population of preschool-aged children. We opted to exclude ASQ:SE scores in younger children so as to ensure that the outcome variable would be more responsive to a child's verbal cues and shared reading across stages of development.

The predictor was shared reading frequency, assessed longitudinally at the newborn through 5-year well-child visits via the question: "How often did you and other family members read stories or look at books with your child in the past week?" and recorded in the EMR. Response options are: "Most (5-7) days of the week," "Some (2-4) days of the week," or "Rarely have time (0-1 days of the week)." For each ASQ:SE score, we examined shared reading documented in the previous visit closest to the index ASQ:SE assessment in question, regardless of child age. Therefore, each individual child included in the data set contributed 1 or multiple assessment pairs of ASQ:SE and shared reading frequency.

Potentially relevant covariates^{46,47} were abstracted from the EMR from the same visits where ASQ:SE assessments were completed. These included child age at visit (in months), sex, parent-reported child race and ethnicity, insurance status (public or private), responses to standardized social screening questions, visit type (well-child visit versus ill or follow-up visit), and visit stream ("walk-in" versus scheduled appointments). The PCC social history questionnaire⁴⁸ includes questions assessing food insecurity, housing insecurity, and caregiver depression. Food insecurity was coded as a positive response to 1 of the 2 Hunger Vital Sign questions⁴⁹ or to the question "Are you currently having any problems with your Women, Infants & Children (WIC), Supplemental Nutrition Assistance Program (SNAP)/food stamps?" Housing

insecurity was denoted by a positive response to "Are you having any housing problems such as overcrowding, roaches, rodents, utilities, mold, lead that your landlord is not helping you with?" or "Are you currently being threatened with eviction or losing your home?" Food and housing insecurity was coded as a composite variable (ie, food or housing insecurity). Caregiver depression was indicated by a positive response to the Patient Health Questionnaire-2.⁵⁰ Visit stream was defined as those who presented with or without scheduled appointments. The "walk-in" clinic opened in July 2013 to enable expanded access.⁵¹

Data Analysis

We examined descriptive statistics for data distribution, outliers, and missing patterns in the data. Bivariate relationships were assessed by using χ^2 statistics. We examined the association between shared reading and ASQ:SE outcome (fail versus pass) using generalized linear models with generalized estimating equations (GEEs)⁵² to account for correlated measures within individual patients. Standard GEE methods use available

predictor-outcome pairs with complete covariate data to generate unbiased regression parameter estimates, under the assumption that data are missing completely at random. We chose "most days of the week" as the referent group for the shared reading variable based on previous study of the benefits of more frequent shared reading.^{4,11,53} Because the overall rate of ASQ:SE score above cutoff in the sample was 16% (common outcome), the odds ratios estimated from the models were converted into risk ratios by using the method described by Zhang and Yu.⁵⁴ We also investigated adjusted associations between continuous ASQ:SE scores and shared reading (most versus some versus rare days). We estimated adjusted least square means of ASQ:SE scores by shared reading response group. In the multivariable models, we also explored potential effect modification by evaluating interaction terms between the shared reading predictor and each covariate. All analyses were pursued by using SAS version 9.4 (SAS Institute, Inc, Cary, NC).

RESULTS

Of the 11 383 patients aged 30 to 66 months that presented between July

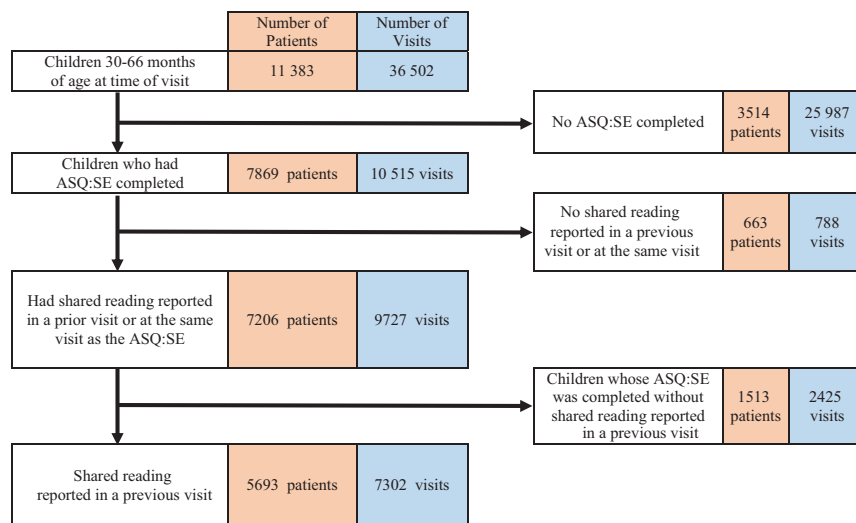


FIGURE 1

Flowchart of patient and visit selection for this retrospective study of longitudinal EMR data.

1, 2013, and February 1, 2019, 7869 children completed at least 1 ASQ:SE assessment (Fig 1). We excluded 2176 children whose ASQ:SE assessments did not have a previous shared reading assessment (28% of 7869). The final analytic sample included 5693 children whose caregivers completed ASQ:SE assessments at a total of 7302 clinic visits (Table 1). The sample was 51% male, 75% Black, and 80% publicly insured. Six percent of caregivers reported food or housing insecurity; 3% reported caregiver depression. There was a median of 13 months (interquartile range of 12–16 months) between shared reading and ASQ:SE assessments. Demographics

of the 5693 children included in the current analysis were similar to the 5690 children not included; however, those excluded were less likely to report Black race ($P < .001$) and have public insurance ($P < .05$) (Table 2).

Of the 7302 ASQ:SE assessments, 16% scored above the cutoff. For shared reading assessments, 54% of caregivers reported shared reading most days of the week, 40% reported shared reading some days of the week, and 6% reported rarely having time for shared reading. More children with public insurance had scores above the ASQ:SE cutoff than those with private insurance

(17% vs 8%; $P < .0001$) (Table 3). There were also more children with ASQ:SE scores above the cutoff among those whose caregivers reported any versus no food or housing insecurity (26% vs 16%; $P < .0001$) and any versus no caregiver depression (33% vs 16%; $P < .0001$).

The proportion of ASQ:SE scores above the cutoff decreased in a stepwise pattern as reported shared reading increased. Specifically, for those reporting sharing reading rarely, 23% of ASQ:SE scores were above cutoff. This was compared with 17% for those reporting some shared reading and 14% for those reporting shared reading on most days. In an unadjusted model (Table 4), compared with caregivers who reported shared reading on most days, those who reported sharing reading rarely had a child with a higher risk of having an ASQ:SE above the cutoff score (unadjusted risk ratio [uRR], 1.66; 95% confidence interval [CI], 1.37–1.99). Similarly, caregivers who reported reading on some days had a higher risk of having children with ASQ:SE scores above cutoff compared with those reporting reading on most days (uRR, 1.21; 95% CI, 1.08–1.35). The association between above-cutoff ASQ:SE scores and less frequent shared reading persisted after adjustment for pertinent covariates (adjusted risk ratio [aRR], 1.62; 95% CI, 1.35–1.92 and aRR, 1.20; 95% CI, 1.07–1.33) among children with “rare” and “some” shared reading frequencies, compared with children with reporting shared readings on most days. The adjusted ASQ:SE above cutoff rate decreased in a stepwise fashion from 32% to 24% and to 20% as shared reading frequency increased.

In the adjusted model, we also found that children whose caregivers reported food or housing insecurity

TABLE 1 Demographic Characteristics of Patients ($n = 5693$) at First ASQ:SE Assessment

	<i>n</i>	Percentage
Child age, mo		
30–36	344	6.0
37–66	5349	94.0
Child sex		
Male	2885	50.7
Female	2808	49.3
Child race		
Non-Hispanic Black	4270	75.0
Non-Hispanic White	771	13.5
Hispanic	61	1.1
Other ^a	504	8.9
Missing	87	1.5
Insurance		
Public	4541	79.8
Private	499	8.8
Missing	653	11.5
Food or housing insecurity ^b		
Yes	348	6.1
No	4972	87.3
Missing	373	6.6
Caregiver depression ^c		
Yes	181	3.2
No	5129	90.1
Missing	383	6.7
Visit stream		
Unscheduled visit (“walk-in”)	964	16.9
Scheduled visit	4729	83.1
Visit type		
Well-child check	3606	63.3
Ill or follow-up visit	2087	36.7

^a Included American Indian and Alaska native, Asian American, Middle Eastern, Native Hawaiian and Pacific Islander, and Multiracial.

^b Food insecurity was coded as a positive response to one of the 2 Hunger Vital Sign questions or to the question “Are you currently having any problems with your WIC, SNAP/food stamps?” Housing insecurity was denoted by a positive response to (1) “Are you having any housing problems such as overcrowding, roaches, rodents, utilities, mold, lead that your landlord is not helping you with?” or (2) Are you currently being threatened with eviction or losing your home?”

^c Caregiver depression was indicated by a positive response to the Patient Health Questionnaire-2.

TABLE 2 Demographic Characteristics of Patients Included Versus Not Included in Analysis

	Patients Included (<i>n</i> = 5693)		Patients Not Included (<i>n</i> = 5690)		<i>P</i> ^a
	<i>n</i>	Percentage	<i>n</i>	Percentage	
Child sex					.37
Female	2808	49.3	2758	48.5	
Male	2885	50.7	2931	51.5	
Child race					<.001
Non-Hispanic Black	4270	75.0	3948	69.4	
Non-Hispanic White	771	13.5	903	15.9	
Hispanic	61	1.1	71	1.2	
Other	504	8.9	644	11.3	
Missing	87	1.5	124	2.2	
Insurance					.02
Public	4541	79.8	4426	77.8	
Private	499	8.8	565	9.9	
Missing	653	11.5	699	12.3	

Age at visit, caregiver depression, and food or housing insecurity were not included in this analysis because these items are visit specific.

^a *P* value for comparison between patients included versus patients not included, based on χ^2 test on available data.

had a higher risk of an ASQ:SE above cutoff compared with those who reported no food or housing insecurity (aRR, 1.44; 95% CI, 1.18–1.75). Similarly, children whose caregivers reported depressive symptoms had a higher risk of an ASQ:SE above cutoff compared with those who did not endorse such symptoms (aRR, 1.64; 95% CI, 1.23–2.13). In the adjusted model, we found no significant interaction between shared reading and each of child sex, age at visit, food or housing insecurity, and caregiver depression.

Finally, examining ASQ:SE scores as a continuous variable showed that, as caregiver report of shared reading frequency decreased, there was a significant corresponding increase in the least squares means of ASQ:SE scores from 46.0 (95% CI, 42.0–50.0) to 50.1 (95% CI, 46.2–54.1) to 54.9 (95% CI, 49.5–60.3) (Fig 2). Differences in rare versus most and some versus most shared reading were both significant ($P < .0001$).

DISCUSSION

We sought to explore the relationship between caregiver shared reading practices and child social-emotional problems, which are 2 core aspects of pediatric well-

child care. In this large retrospective study of ambulatory pediatric EMR data, increased shared reading frequency was inversely associated with report of child social-emotional problems as reported on the ASQ:SE. Our findings suggest that more frequent shared reading in early childhood has the potential to influence social-emotional health, consistent with previous evidence associating more frequent reading with increased social-emotional competence.^{18,42,55}

A possible mechanism connecting shared reading and social-emotional health is social-emotional reciprocity and emotional coregulation between caregiver and child.^{56,57} Shared reading invokes caregiver-child joint attention,⁵⁸ a pillar of social, cognitive, language, and literacy development.^{59–61} On a physiologic level, nurturing, dyadic experiences exemplified by shared reading may activate the biological clock, cardiac pacemaker, and attachment hormones like oxytocin.^{27,62} Brain-to-brain neural synchrony has also been described in preschool-aged children as a biomarker of interaction quality⁶³ and emotional regulation.⁶⁴ Shared reading may similarly promote child emotional resilience through improved

caregiver-child relationships,⁶ protective against academic difficulties.⁶⁵ Thus, shared reading may be framed as a core component of strengths-based approaches to intervention, enhancing social-emotional health through increased caregiver warmth and sensitivity, decreased caregiver stress,¹⁶ and more secure attachment.^{66,67}

In our primary care setting, shared reading promotion is operationalized through ROR. All families who present for well-child through age 5 are exposed to ROR guidance and a book to take home. We currently do not measure the effect of ROR on the quality of shared reading at home; however, the stability in reported frequency of shared reading within our sample suggests that ROR, as currently deployed, may help maintain the frequency of shared reading at home. Further assessment of how ROR directly affects shared reading and social-emotional development over time represents an important opportunity for future study.

One existing program with improved child social-emotional and caregiver-child relational outcomes is the VIP, in which families receive empowering feedback on reading, play, and routines with their child.^{17,68} Our findings suggest that ROR, VIP, and other pediatric programs that support book reading may have impacts on child social-emotional development. Although the ROR evidence base is currently centered on cognitive abilities and reading attitudes,^{32–34,36} extensive evidence linking social-emotional benefits with shared reading,^{16,18,42,55,67} bolstered by findings here, could motivate more explicit integration of these two components into the program and future research.

The caregiver-child relationship is an important driver of shared

TABLE 3 Demographic Characteristics by Shared Reading & ASQ:SE Outcome at First ASQ:SE Assessment

	Row Total ^a	Shared Reading			ASQ:SE	
		Most Days of the wk, <i>n</i> (%) ^b	Some Days of the wk, <i>n</i> (%) ^b	Rarely Have Time, <i>n</i> (%) ^b	Fail, <i>n</i> (%) ^b	Pass, <i>n</i> (%) ^b
Total	5693	3050 (53.6)	2288 (40.2)	355 (6.2)	928 (16.3)	4765 (83.7)
Child age, ^d mo						
30–36	344	188 (54.7)	140 (40.7)	16 (4.7)	75 (21.8)	269 (78.2)
37–66	5349	2862 (53.5)	2148 (40.2)	339 (6.3)	853 (15.9)	4496 (84.1)
Child sex ^{c,d}						
Male	2885	1492 (51.7)	1199 (41.6)	194 (6.7)	574 (19.9)	2311 (80.1)
Female	2808	1558 (55.5)	1089 (38.8)	161 (5.7)	354 (12.6)	2454 (87.4)
Child race ^c						
Non-Hispanic Black	4270	2235 (52.3)	1765 (41.3)	270 (6.3)	705 (16.5)	3565 (83.5)
Non-Hispanic White	771	471 (61.1)	260 (33.7)	40 (5.2)	122 (15.8)	649 (84.2)
Hispanic	61	23 (37.7)	29 (47.5)	9 (14.8)	10 (16.4)	51 (83.6)
Other	504	279 (55.4)	197 (39.1)	28 (5.6)	75 (14.9)	429 (85.1)
Missing	87	42 (48.3)	37 (42.5)	8 (9.2)	16 (18.4)	71 (81.6)
Insurance ^{c,d}						
Public	4541	2397 (52.8)	1849 (40.7)	295 (6.5)	785 (17.3)	3756 (82.7)
Private	499	306 (61.3)	170 (34.1)	23 (4.6)	42 (8.4)	457 (91.6)
Missing	653	347 (53.1)	269 (41.2)	37 (5.7)	101 (15.5)	552 (84.5)
Food and housing insecurity ^{c,d}						
Yes	348	169 (48.6)	145 (41.7)	34 (9.8)	92 (26.4)	256 (73.6)
No	4972	2671 (53.7)	2003 (40.3)	298 (6)	770 (15.5)	4202 (84.5)
Missing	373	210 (56.3)	140 (37.5)	23 (6.2)	66 (17.7)	307 (82.3)
Caregiver depression ^d						
Yes	181	87 (48.1)	78 (43.1)	16 (8.8)	59 (32.6)	122 (67.4)
No	5129	2747 (53.6)	2067 (40.3)	315 (6.1)	801 (15.6)	4328 (84.4)
Missing	383	216 (56.4)	143 (37.3)	24 (6.3)	68 (17.8)	315 (82.2)
Visit stream ^c						
Walk-in visit	964	555 (57.6)	365 (37.9)	44 (4.6)	160 (16.6)	804 (83.4)
Scheduled	4729	2495 (52.8)	1923 (40.7)	311 (6.6)	768 (16.2)	3961 (83.8)
Visit type ^d						
Well-child check	3606	1902 (52.7)	1478 (41)	226 (6.3)	560 (15.5)	3046 (84.5)
Ill or follow-up visit	2087	1148 (55)	810 (38.8)	129 (6.2)	368 (17.6)	1719 (82.4)

^a Row total is total of numbers across shared reading groups (equivalently, total of numbers across ASQ:SE outcome groups).

^b Percentages are based on row total.

^c Significant difference in shared reading group by characteristic.

^d Significant difference in ASQ:SE outcome by characteristic.

reading frequency.^{16,66} To drive high-quality shared reading, promotion of the “5 Rs” of early education (reading, rhyming, routines, rewards, relationships) is recommended for pediatric primary care.³⁸ Reading-related anticipatory guidance affords primary care providers a concrete, accessible way to empower families to simultaneously foster caregiver-child emotional bonds and improve literacy environments.^{30,38} Approaches may include brief encouragement during clinical visits (eg, recommending caregiver-child “special time”) or more structured, specific guidance at certain ages.³⁰

Such an integrated approach follows evidence in support of behavioral health promotion in primary care settings (eg, positive parenting)^{69–71} and the National Academies of Sciences, Engineering, and Medicine’s statement that “universal, comprehensive behavioral care in child primary health care practices may be one of the best opportunities to address the agenda of fostering mental, emotional, and behavioral health in the first years of life at a population level.”^{69,72} Thus, future models of behavioral health integration within pediatric primary care may benefit from a focus on promotion of shared reading.

Although not the primary focus of this study, an intriguing finding was that caregivers reporting food or housing insecurity had a significantly greater risk of reporting child social-emotional problems compared with those reporting no food or housing insecurity. These are consistent with previous findings linking the challenges of poverty with child hyperactivity, emotional symptoms, and conduct problems.^{73–75}

Caregivers reporting any depression also had significantly greater risk of reporting child social-emotional problems than those who reported

TABLE 4 uRR and aRR of ASQ:SE Above Cutoff

Variables	uRR (95% CI) ^a	aRR ^b (95% CI) ^a
Shared reading		
Rarely have time	1.66 (1.37-1.99)	1.62 (1.35-1.92)
Some days of the wk	1.21 (1.08-1.35)	1.20 (1.07-1.33)
Most days of the wk	Reference	Reference
Child age, mo	0.99 (0.98-0.99)	0.99 (0.98-0.99)
Child sex		
Female	0.62 (0.55-0.7)	0.62 (0.55-0.71)
Male	Reference	Reference
Child race		
Black	1.08 (0.94-1.24)	—
Non-Black ^c	Reference	—
Food or housing insecurity		
Any	1.68 (1.42-1.97)	1.44 (1.18-1.75)
None	Reference	Reference
Caregiver depression		
Any	1.94 (1.52-2.41)	1.64 (1.23-2.13)
None	Reference	Reference
Visit stream		
Unscheduled visit	0.91 (0.79-1.05)	—
Scheduled visit	Reference	—

—, not applicable.

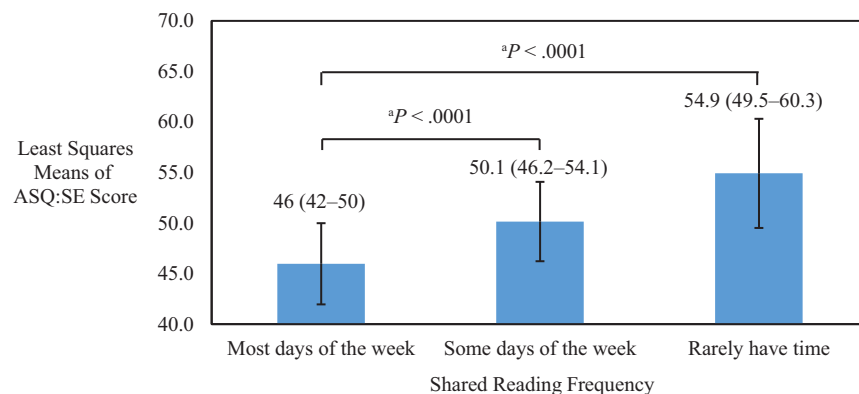
^a Based on generalized linear models with GEE examining association between shared reading (some days of the week or rarely have time versus most days of the week) and ASQ:SE outcome.

^b Model was adjusted for child sex, age at visit, food and housing insecurity, and caregiver depression. Visit stream and child race were not significant in the adjusted model and therefore not retained in the model. Although abstracted from the EMR, insurance was not included as a covariate in the model because the majority of patients were publicly insured.

^c White, Hispanic, and other (American Indian and Alaska native, Asian American, Middle Eastern, Native Hawaiian and Pacific Islander, and Multiracial).

no caregiver depression. This finding is consistent with previous studies documenting a bidirectional relationship between caregiver and child mental health problems.⁷⁶⁻⁷⁸ Integration of shared reading into primary care interventions targeting

caregiver depression thus may help to simultaneously improve both child and caregiver outcomes.⁷⁹ Although many of these factors are likely highly correlated with one another, these findings are worthy of further study.

**FIGURE 2**

Association between ASQ:SE scores and shared reading: most versus some versus rare. Based on generalized linear model with GEE, adjusting for child sex, age at visit, food or housing insecurity, and caregiver depression. The least squares mean is the mean ASQ:SE score by shared reading group estimated from the GEE model with adjustment of covariates. Error bars are 95% confidence intervals of the least squares means. ^a $P < .0001$ for ASQ:SE score comparisons between rare versus most, and some versus most, respectively.

This study has limitations. First, included children were predominantly publicly insured and Black, limiting generalizability to more affluent populations and other racial and ethnic groups. Second, the ASQ:SE is a caregiver-completed screening tool, not a diagnostic assessment of social-emotional problems. Reporting biases on the part of certain caregivers (eg, self-report bias, social desirability bias) may lead to indications that a child does not have social-emotional problems when they actually do, or vice versa. Completion of the ASQ:SE while caregivers are focused on another presenting medical concern may also reduce accuracy of responses. Yet, we would expect any bias introduced because of ASQ:SE limitations would be nondifferential between shared reading groups. Third, our data included only those variables charted in our EMR and not other potentially important variables (eg, caregiver education, history of developmental delay, or prematurity). The absence of these variables raises the possibility that the association observed between shared reading and social-emotional development occurs as a function of an unmeasured third variable.⁸⁰ Fourth, because our reading category of most days of the week (5-7 days per week) included daily reading (7 days per week), we suspect that our findings may have been stronger if there was a separate category for daily shared reading, particularly given data demonstrating the benefit of daily shared reading.^{4,5} Fifth, because our EMR does not capture data on the fidelity of the ROR intervention, we cannot determine if or how ROR exposure or uptake plays into the associations we observed between shared reading and social-emotional problems. Sixth, physician accuracy in calculating and reporting ASQ:SE scores as well as provider verification of caregiver report of

shared reading frequency is not captured in this study or in typical clinical practice. The branching logic of our EMR asks for what was done in response to an ASQ:SE above cutoff. Thus, our EMR responses are more likely to be biased toward true failures than documenting false passes. We would not expect these misclassifications to be associated with shared reading. Finally, our study design used caregiver-completed screening tools that did not allow for formal assessments of social-emotional development, including temperament at baseline. Our analysis of each ASQ:SE assessment in association with the most recently reported shared reading also does not allow us to

evaluate the potential bidirectional relationship between caregiver shared reading and child social-emotional development.^{16,18,39,64} Future research is needed to delineate the influence of caregiver shared reading frequency and quality, given a child's baseline temperament.

CONCLUSION

Increased frequency of caregiver shared reading is associated with better social-emotional health in young children. Our findings support future study, funding, and dissemination of programs that promote shared reading in the primary care setting, notably ROR.

ABBREVIATIONS

aRR: Adjusted risk ratio
ASQ:SE: Ages and Stages: Social Emotional Questionnaire
CI: confidence interval
EMR: electronic medical record
GEE: generalized estimating equations
PPCC: Pediatric Primary Care Center
ROR: Reach Out and Read
uRR: unadjusted risk ratio
VIP: Video Interaction Project

Address correspondence to Keith J. Martin, DO, MS, Division of General Pediatrics, Johns Hopkins University School of Medicine, David Rubenstein Child Health Building, 200 N Wolfe St #2022, Baltimore, MD 21287. E-mail: kmart116@jhmi.edu

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