

Does reading to infants benefit their cognitive development at 9-months-old? An investigation using a large birth cohort survey

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Abstract

This study uses a nationally representative sample of 9-month-old infants and their families from the Growing Up in Ireland (GUI) study to investigate if reading to infants is associated with higher scores on contemporaneous indicators of cognitive development independently of other language-based interactions between parent and infant, such as showing them pictures or talking to them. Reading to infants had an independent positive effect on scores for both the problem-solving and communication subscales of the Ages and Stages Questionnaire (ASQ), while the positive effect of showing pictures was independent only for communication scores. The effects of both of these activities were, however, less substantial than the positive effect observed for the more informal activity of frequently talking to the infant while doing other things; and this was observed for both communication and problem-solving. The analyses were robust to adjustment for several other factors including maternal education, gestational age, non-parental care, breastfeeding, attachment and presence of siblings. The findings highlight the potential of reading and talking to infants, not just for language and literacy development but also for other aspects of cognitive development.

Keywords

Cognitive development, communication, infants, language, reading

I Introduction

Reading to young children has long been recognized as an important precursor to language and literacy development (e.g. Highberger and Brooks, 1973; for a review, see Bus et al., 2007). It

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encourages vocabulary development (Highberger and Brooks, 1973; Mol et al., 2008), positive attitudes to reading as well as strengthening emotional ties between the child and parent (Bus et al., 1995). Reading to pre-school-age children can make starting school easier for them as well as providing a head start in literacy (Bus et al., 1995; for a review, see Saracho and Spodek, 2010), an advantage that may be retained in later childhood (Blatchford and Plewis, 1990). For example, the Avon Longitudinal Study of Parents and Children (ALSPAC) found that as part of the child's early communication environment the number of books owned at 6 months was a predictor of their expressive language at 24 months and of their school entry assessment (Roulstone et al., 2011). DeBaryshe (1995) has also shown that reading to younger children is more effective than reading to older children in promoting literacy skills. Reading to young children also helps them to develop social skills such as listening and interacting with an adult (Kupetz and Green, 1997).

To date, much of the research has focused on the association between reading to young children and the later development of language and literacy skills. Relatively few studies have examined book-reading with infants, and they rarely investigate the beneficial effects for cognitive development (Richman and Colombo, 2007). Those studies that have examined book-reading with infants have tended to focus on factors that affect the prevalence and quality of book-reading (Fletcher and Reese, 2005) rather than investigate an association between book-reading and infants' cognitive development: this research aims to address this point using a large dataset of 9-month-old infants. Below we describe the prevalence of parents reading to infants, the mechanisms by which reading might influence cognitive development and we report findings on reading and cognitive development from a nationally representative sample of over 7,000 infants.

1 Reading to infants

The average age for parents to begin reading to infants is between 7 months (DeBaryshe, 1993) and 9 months (Senechal et al., 1998). Richman and Colombo (2007) found that 90% of parents reported beginning to read to their infant by 6 months of age. A study of over 2,000 US children aged between 4 and 35 months found that of infants aged 4 to 9 months 70% of them were read to regularly, 21% were read to one or two times a week and 9% were never read to (Kuo et al., 2004). However, the frequency of regularly reading to infants increased as the infants got older. Raikes et al. (2006) report similar findings for mothers reading to 14- to 36-month-olds in a sample of over 2,000 low-income families in the USA.

A number of studies have investigated the factors that influence book-reading with infants. Karrass et al. (2003) found that mothers from higher income families and those who reported less parenting stress were more likely to read to their 8-month-old infants, while there was no effect of infant's gender or temperament. Other studies have shown that parental factors such as maternal beliefs about the importance of literacy experiences influence the frequency of reading (DeBaryshe, 1995).

Besides reading more frequently with older infants, parents also read differently to infants depending on their age. Senechal et al. (1995) compared how parents read to infants that were aged 9, 17 and 27 months and found that parents adapted their reading style to suit the age of the infant. Parents of older infants tended to use more questions and feedback remarks, whereas parents of younger infants used more elaborations, verbalizations and finger-pointing to draw the infant's attention to the book.

Richman and Colombo (2007) investigated the impact of the frequency and type of book-reading sessions on the expressive and receptive vocabularies of 10- to 17-month-old infants. They found the more frequently, and the greater variety of books, the parent read to him or her the higher

the infant's vocabulary scores. Although previous research supports a positive association between book-reading and vocabulary, this is one of the few studies to consider children less than 18-months-old and highlights the importance of introducing book-reading to children in the first year of life.

Research suggests that one of the benefits of reading to children is the opportunity for joint attention. Joint attention is the sharing of attention by two individuals (e.g. Williams et al., 2001). Joint attention skills undergo a period of rapid development between 9 and 12 months of age (Tomasello et al., 1993), although there is evidence that these skills begin to develop earlier in the first year of life (Cleveland et al., 2007). Joint attention is implicated in the development of language and a theory of mind (Tomasello et al., 1993) and it affects long-term memory processing in 9-month-old infants (Kopp and Lindenberger, 2011). It is also important for social referencing and for word-object mapping in the second year of life (Baldwin, 1993), and influences problem-solving in middle childhood (de la Ossa and Gauvain, 2001). Data from the Longitudinal Study of Australian Children (LSAC) also showed that joint attention and parent-child book-reading at 9 months predicted a child's vocabulary at 34 months and at 58 months (Farrant, 2012; Farrant and Zubrick, 2011). In the case of parents reading to infants, the parent may draw attention to particular pictures or aspects of the story and encourage the infant to share the parents' focus of attention. In this way reading to infants provides an opportunity to regularly and explicitly engage in an activity requiring joint attention, more so than some other activities (e.g. block building) (Sugai et al., 2010).

Fletcher and Reese (2005) state that the majority of research on book-reading with children has adopted a Vygotskian framework in order to analyse and interpret the interactions between the parent and child during the book-reading. The social nature of parent-child book-reading and the learning opportunities that arise therein (e.g. new vocabulary, joint attention) provide a situation where the parent can readily engage with the child and structure the activity within the child's zone of proximal development. The zone of proximal development is the distance between a child's current ability and their potential ability with the support of a more experienced individual, such as an adult or older child. Vygotsky (1978) emphasized the importance of social interaction and language for cognitive development. Therefore we would expect that infants who are read to would show more advanced cognitive development, compared with infants who are not read to.

2 The current study

The analysis reported below investigates the association between reading and cognitive development in 9-month-old infants. In addition to looking at whether or not infants were read to we also considered other types of language activities that might promote cognitive development, specifically whether or not the parent showed the infant pictures, and how often the parent talked to him or her in general. We included these two measures along with reading in order to tease out the influence of a structured language activity like reading, in contrast to less structured activities like showing pictures and talking to the infant while the parent does other things. Previous research shows that during parent-child book-reading parents have more lexically complex utterances, are more responsive to child utterances and engage in a higher level of abstraction and of questioning than in other contexts (e.g. during dressing, mealtimes or other types of play) (Crain-Thoreson et al., 2001; Hoff-Ginsberg, 1991; Lewis and Gregory, 1987; Sorsby and Martlew, 1991). Similarly, Dunn et al. (1977) found that during book-reading maternal speech contained more characteristics that were positively associated with language development compared to other contexts such as during caretaking interactions or times when the mother was occupied with housework. Therefore, we expected that reading would have a larger positive effect on cognitive development than the other language activities.

The data were drawn from the infant cohort of the Growing Up in Ireland (GUI) study (www.growingup.ie). This research involved a nationally representative sample of 9-month-old infants and their parents who responded to a battery of measures used to investigate the factors that might influence development during childhood. In addition to the language-based activities, we controlled for a selection of other key variables that might reasonably be expected to influence the relationship between parental activities or characteristics and cognitive development (e.g. maternal education, attachment, childcare, and breastfeeding).

II Method

I Participants

The GUI infant sample was selected from the national Child Benefit Register, which in Ireland has virtual universal coverage of the child population. Infants were selected based on a systematic random sample so as to be in their tenth month at the time of interview (i.e. 9-months-old). Participation in the study was voluntary and the total achieved sample was 11,134, which represents a net response rate of 64.3%. The final sample compares well to the target population on several key socio-demographic variables: for example, 73.3% of mothers in the (unweighted) sample were born in Ireland compared to 74.7% in the population; similarly, 23.3% of the sample and 24% of the population were never-married mothers (Quail et al., 2011a). Boys made up 51% of the sample. The main informant was the primary caregiver (almost always the mother, and henceforward referred to as 'mothers'), and if the mother was living with a spouse/partner then an interview was also sought with him (this person was nearly always the child's biological father).

2 Procedures

Information was collected in face-to-face interviews from both parents (the mother only in lone-parent households) during a visit to the family home by a field interviewer. Translated questionnaires were available to non-English-speaking participants. Materials and procedures were approved by an independent research ethics committee, and signed consent was collected from the mother. Data were weighted (but not grossed) to the relevant population using a weighting variable constructed by the GUI study team based on the 2006 Census and Child Benefit Register. All statistics are weighted unless otherwise specified.

3 Measures

The main outcome measures were the communication and problem-solving subscales from the Ages and Stages Questionnaire (2nd edition, Squires et al., 1999). This is a parent-report measure divided into five subscales, with gross motor, fine motor and personal-social being the other three scales. These scales were completed by the mother. There are six milestones for the age group under each heading, and mothers were asked if the infant could do them: 'yes' (10 points), 'sometimes' (5 points) or 'not yet' (0 points). There were six milestones in each subscale giving a possible range of scores on each of 0–60.¹

The three main predictor variables are the language-based activities that the parents engaged in with the infant: reading, showing pictures and talking to him or her. Information on 'reading stories to the child' and 'showing the child pictures in books' was collected from the father (secondary caregiver), included as part of a set of questions about the division of infant-care tasks between couples. For this analysis the original response categories were combined into a

dichotomous variable of ‘someone does this’ or ‘no-one does this’. Separately, mothers were asked about how often they talked to the infant ‘while they were busy doing other things, e.g. housework’. The original five-point answer scale was condensed to ‘never/rarely/sometimes’, ‘often’ and ‘always’.

Information to create the control variables was primarily collected during the mother’s interview (further details on the structure and conduct of the GUI study are available in Quail et al., 2011b). These include the mother’s level of education, whether the infant was in regular non-parental childcare, whether the infant had ever been breastfed, the length of gestation, and the number of other children in the household (questionnaires are available to download from the GUI website: www.growingup.ie/index.php?id=236). In addition, both mothers and fathers completed the ‘quality of attachment’ subscale from the Condon and Corkindale maternal/paternal postnatal attachment scale (Condon & Corkindale, 1998; Condon et al., 2008). This subscale has nine items on the maternal version and five on the paternal version (possible ranges of 9–45 and 5–25, respectively). For ease of comparison in this analysis the continuous scores were divided into two groups to give two dichotomous variables, ‘maximum attachment score’ and ‘other attachment score’, on the basis of whether a score at or below the maximum score was recorded. The scores on these particular scales were heavily skewed towards high attachment so that the higher and lower categorizations are relative rather than objective: based on the entire sample, the mean for the ‘other attachment score’ group was 41.4 (maximum = 45) and for fathers’ ‘other attachment score’ the mean was 22.6 (maximum = 25).

III Results

I Analysis

As the questions on reading and showing pictures to the child were only asked of fathers, the analysis is necessarily confined to two-parent families where the father completed his interview. All subsequent statistics refer to the set of 7,845 infants (8,010 unweighted) with full information on all of the variables used in the analysis; the main reason for missing data was the absence of a father interview, either because he was not resident ($n = 1,359$) or was resident but did not take part ($n = 1,143$, both unweighted). The Ages and Stages Questionnaire (ASQ) problem-solving score of those who were excluded from the main analysis ($M = 46.1$, $n = 2,669$) did not differ significantly from those who were included ($M = 46.1$, $t(10,512) = 0.14$, $p = .89$). However, there was a difference in communication score with those who were excluded having a slightly higher score ($M = 45.5$, $n = 3,218$) than those who were included ($M = 44.3$, $t(11,060) = 4.86$, $p < .001$). While this finding may seem counter-intuitive, similar trends are also seen in the full sample (e.g. infants in lower income families had higher communication scores) and may relate to the communication scale at this age interval not being a vocabulary measure per se.

2 Descriptive statistics

Showing pictures to the child was a more popular activity (94% of infants had someone do this for them) than reading to him or her (80.5%), as shown in Table 1. A majority of mothers reported ‘always’ talking to the child while busy (65.9%). In terms of scores on the ASQ scales, the overall mean for communication was 44.3, and for problem-solving it was 46.1. Examination of the relevant confidence intervals in Table 1 indicates that infants’ scores on these measures were higher for those who were read to or shown pictures, and for those who were ‘always’ talked to compared to infants whose mothers talked to them less frequently.

Table 1. Descriptive statistics for each of the main predictor variables of reading, showing pictures and talking to the infant on the Ages and Stages Questionnaire (ASQ) problem-solving and communication scores.

	<i>n</i>	Percentage	Mean ASQ communication score (95% CI)	Mean ASQ problem-solving score (95% CI)
<i>Reading:</i>				
No-one reads to the child	1,526	19.5	43.1 (42.5–43.6)	44.6 (43.9–45.3)
Someone reads to the child	6,319	80.5	44.7 (44.4–44.9)*	46.5 (46.2–46.8)*
<i>Showing pictures:</i>				
No-one shows pictures to the child	471	6.0	41.5 (40.4–42.5)	44.2 (43.0–45.4)
Someone shows pictures to the child	7,374	94.0	44.5 (44.3–44.8)*	46.2 (45.9–46.5)*
<i>Mother talks to child while doing other things:</i>				
Never, rarely or sometimes talks	794	10.1	41.3 (40.5–42.1)	42.8 (41.7–43.8)
Often talks	1,881	24.0	42.4 (41.9–42.9)	44.0 (43.3–44.6)
Always talks	5,170	65.9	45.5 (45.2–45.8)*	47.4 (47.1–47.7)*

Note. * Indicates significantly higher score on the development sub-scale for this frequency of the activity over lower/ none of the activity, i.e. 95% confidence intervals do not overlap.

The frequency for reading, showing pictures and ‘always’ talking to the infant by each of the control variables is given in Table 2. Chi-square tests indicate significant associations between maternal education and reading ($\chi^2(3) = 22.01, p < .001$), showing pictures ($\chi^2(3) = 12.38, p < .01$) and talking to the child ($\chi^2(6) = 49.50, p < .001$), although talking was less frequent among the highest educated while reading and showing pictures were more frequent. There were also significant associations between breastfeeding and reading ($\chi^2(1) = 9.76, p < .01$), showing pictures ($\chi^2(1) = 9.08, p < .01$) and talking ($\chi^2(2) = 15.13, p < .01$); maternal attachment and talking ($\chi^2(2) = 109.01, p < .001$); paternal attachment and reading ($\chi^2(1) = 20.71, p < .001$), showing pictures ($\chi^2(1) = 8.29, p < .01$) and (maternal) talking ($\chi^2(2) = 92.92, p < .001$); child-care and talking ($\chi^2(6) = 14.32, p < .05$); and between number of siblings and reading ($\chi^2(2) = 69.47, p < .001$), showing pictures ($\chi^2(2) = 65.38, p < .001$) and talking ($\chi^2(4) = 52.45, p < .001$).

3 Regression analysis

Separate ordinary least squares regressions were used to determine the extent to which each of the activities of interest (reading to, showing pictures to, talking to) predicted scores on the two outcome measures independently of the other activities (steps 1–3), and independently of the control variables (step 4). Table 3 shows the results of these analyses for communication and problem-solving, respectively. By step 3 with all of the main predictors entered into each model, we can see that reading to the infant and talking to him or her independently contribute to an increase in both communication and problem-solving scores, and that showing pictures has an independent significant effect on communication but not on problem-solving. Entering all the control variables to the models in step 4 reduces the value of the unstandardized co-efficients for reading and talking, but both remain significant on each outcome measure; and showing pictures remains significant in relation to communication. In the final model, reading adds 1.35 points to the problem-solving

Table 2. Frequency of reading, showing pictures and 'always' talking to the infant among each of the control variables, and the mean Ages and Stages Questionnaire (ASQ) communication and problem-solving score for each.

	<i>n</i>	Percentage	Someone reads to the infant	Someone shows pictures to the infant	Mother 'always' talks to the infant	Mean ASQ communication score (95% CI)	Mean ASQ problem-solving score (95% CI)
<i>Gestation:</i>							
Very early	97	1.2	82.7	93.9	60.8	30.2 (27.1–33.3)	32.5 (28.9–36.2)
Somewhat early	406	5.2	80.3	93.6	66.8	40.4 (39.2–41.5)	42.6 (41.2–44.0)
On time	6,447	82.2	80.3	93.9	65.6	44.5 (44.2–44.8)	46.2 (45.9–46.5)
Late	894	11.4	82.1	94.5	68.3	46.6 (45.9–47.2)	48.4 (47.6–49.2)
<i>Maternal education:</i>							
Lower secondary or less	1,025	13.1	77.3	93.6	68.0	46.7 (46.1–47.3)	46.4 (45.6–47.2)
Upper secondary	2,481	31.6	78.7	92.7	69.7	44.8 (44.3–45.3)	45.7 (45.1–46.2)
Certificate/diploma	1,679	21.4	82.5	94.8	64.3	44.8 (44.2–45.3)	46.9 (46.3–47.5)
Degree or above	2,660	33.9	82.3	94.8	62.6	42.8 (42.3–43.2)	45.9 (45.4–46.4)
<i>Breastfeeding:</i>							
Never breastfed	3,162	40.3	78.8	93.0	68.4	44.9 (44.6–45.3)	45.7 (45.2–46.2)
Ever breastfed	4,682	59.7	81.7	94.7	64.2	44.0 (43.6–44.3)	46.4 (46.0–46.8)
<i>Maternal attachment:</i>							
Maximum attachment group	2,563	32.7	81.2	94.2	73.9	45.2 (44.8–45.7)	47.0 (46.6–47.5)
Other attachment group	5,282	67.3	80.2	93.9	62.0	43.9 (43.6–44.2)	45.7 (45.3–46.0)
<i>Paternal attachment:</i>							
Maximum attachment group	4,983	63.5	82.1	94.6	69.8	45.0 (44.7–45.3)	46.4 (46.0–46.7)
Other attachment group	2,861	36.5	77.9	93.0	59.1	43.1 (42.7–43.6)	45.6 (45.1–46.1)
<i>Childcare:</i>							
Parental care only	4,714	60.1	80.5	93.6	66.4	44.5 (44.2–44.8)	45.9 (45.5–46.3)
Relative care	1,201	15.3	81.5	94.6	68.5	45.7 (45.1–46.3)	46.9 (46.2–47.6)
Non-relative care	1,026	13.1	78.8	94.0	61.8	43.3 (42.7–44.0)	45.3 (44.5–46.2)
Centre care	904	11.5	81.6	95.0	64.6	43.0 (42.3–43.7)	46.9 (46.2–47.7)
<i>Number of siblings under 14 years:</i>							
Only child	3,080	39.3	84.9	96.4	70.3	44.8 (44.5–45.2)	47.3 (46.9–47.8)
One sibling	2,800	35.7	79.0	93.4	63.5	44.2 (43.7–44.6)	45.7 (45.3–46.2)
Two or more siblings	1,965	25.0	75.9	91.0	62.3	43.8 (43.3–44.3)	44.7 (44.1–45.3)
Total	7,845		80.5	94.0	65.9	44.3	46.1

Table 3. Regression models with dependent variables (a) Ages and Stages Questionnaire (ASQ) communication score and (b) ASQ problem-solving score.

		Communication		Problem-solving	
		B	Adjusted R-squared	B	Adjusted R-squared
1. Add 'reading'	(Constant)	43.07***	.003	44.60***	.003
Reading (ref: no-one)	Someone reads to the child	1.59***		1.87***	
2. Add 'showing pictures'	(Constant)	41.33***	.005	44.00***	.003
Reading (ref: no-one)	Someone reads to the child	0.97**		1.65***	
Showing pictures (ref: no-one)	Someone shows pictures to the child	2.38***		.83	
3. Add 'talking to child'	(Constant)	38.49***	.03	40.85***	.02
Reading (ref: no-one)	Someone reads to the child	0.84*		1.51***	
Showing pictures (ref: no-one)	Someone shows pictures to the child	2.35***		.80	
Mother talks to child while doing other things (ref: never or rarely talks)	Often talks	1.04*		1.15*	
	Always talks	4.13***		4.57***	
4. Add 'covariates'	(Constant)	37.22***	.08	41.25***	.05
Reading (ref: no-one)	Someone reads to the child	0.84*		1.35**	
Showing pictures (ref: no-one)	Someone shows pictures to the child	2.23***		.46	
Mother talks to child while doing other things (ref: never or rarely talks)	Often talks	1.05*		0.95	
	Always talks	3.66***		4.11***	
Gestation (ref: on time)	Very early	-14.71***		-13.79***	
	Somewhat early	-4.28***		-3.60***	
	Late	1.81***		1.85***	
Maternal education (ref: degree level or above)	Lower secondary or less	3.88***		1.31**	
	Upper secondary	1.83***		.13	
	Certificate/diploma	1.89***		1.27**	
Breastfeeding (ref: never breastfed)	Ever breastfed	-.11		.78*	
Maternal attachment (ref: other group)	Maximum (maternal) attachment group	0.66*		1.21***	
Paternal attachment (ref: other group)	Maximum (paternal) attachment group	1.20***		.10	
Childcare (ref: parental care only)	Relative care	1.00**		.56	
	Non-relative care	-0.64		-.55	
	Centre care	-1.07**		.76	
Number of siblings under 14 (ref: only child)	One sibling	-0.52		-1.17**	
	Two or more siblings	-1.03**		-2.13***	

Notes. *** $p < .001$, ** $p < .01$, * $p < .05$.

score and 0.84 to communication. 'Always' talking adds 4.11 points to the problem-solving score relative to 'never/rarely/sometimes' talking to the child, and 3.66 to communication. Showing pictures adds 2.23 points to the communication score. Between the three language activities, they explained 3% of the variance in the communication model, and 2% for problem-solving; with the co-variables contributing an additional 5% and 3% respectively.

Elsewhere in the fully-adjusted final models, we note that a number of the control variables had a significant effect on both sets of cognitive scores. As expected, infants who were born prematurely – particularly very early at 32 weeks or less – had much lower scores than those born on time (37–41 weeks). Higher maternal attachment was associated with an increase in scores but having siblings was associated with a decrease.

IV Discussion

This study showed that reading to the child and 'always' talking to the child while doing other things had a positive and statistically significant association with infant cognitive scores, and these effects were robust to adjustment for a wide range of potentially confounding variables including maternal education and maternal attachment. In the final model, having someone read to the infant was associated with a 1.35 point increase in problem-solving score and a 0.84 point increase in communication. However for both measures, always talking to the infant contributed over three points. The third activity that was examined, showing pictures to the infant, did not contribute to problem-solving scores independently of reading to him or her (although the relationship was in a positive direction) but did make a significant impact on communication scores.

These findings suggest that joint attention activities such as reading may be important in influencing cognitive development in 9-month-old infants. It is worth noting however that the joint attention activity of showing pictures to the infant did not significantly contribute to the problem-solving model independently of reading, but talking to the infant did. It may be the case that positive effects of reading for this particular skill arise due to an increased opportunity for communication or linguistic activity with the child as opposed to an increased opportunity for joint attention, bearing in mind that someone who reads to the child probably also showed them pictures. In addition, the finding that talking to the child with increased frequency had the strongest impact on both ASQ measures was somewhat surprising given previous research findings on the quality of parental speech during book-reading compared to other activities (e.g. Dunn et al., 1977). However, the finding supports a Vygotskian perspective that communication/language plays a key role in fostering cognitive development. Vygotsky (1978) suggests that language fosters cognitive development by allowing the internalization of information from the external world and also by encouraging self-control over cognitive processes such as memory and thought. It may also be the case that more time was spent talking to the child during other activities than in formal book-reading, and this is why there was a larger effect.

The findings of this study indicate that the majority of Irish parents read to and show pictures to their 9-month-old infants as well as talking to them while they were engaged with other activities. Given the results of the analysis reported above and findings from previous studies the level of parental engagement is very positive. However, there are still a substantial minority of Irish parents that do not engage in some of these activities: 10.1% in the case of (never/rarely/sometimes) talking to the infant and 19.5% in the case of reading to the infant. The percentage of Irish infants who are not read to is higher by comparison with studies of US infants that report only 9% to 10% of infants were not read to (Kuo et al., 2004; Richman and Colombo, 2007). It may be the case that Irish parents are not aware of the benefits of early reading with their infants or perhaps need more

encouragement to do so. In particular it would seem that parents who are already taking the time to show pictures to the infant could easily extend this into a reading activity.

The United Kingdom and many other countries around the world have a national book-gifting programme for infants and young children. For example, Bookstart gives free books to approximately 95% of all babies born in the UK through public service professionals such as library staff, health visitors and early years professional. Although Ireland has some organizations apart from public libraries that provide books for infants and young children (e.g. Books4Babies, Preparing for Life) these only operate at a local community level and cover a very small percentage of the population. Children's Books Ireland, a charitable organization and the national children's book organization of Ireland, aims to set up a national book gifting programme in the coming years. In the meantime, public service professionals should be encouraged to actively promote reading to infants, particularly health professionals who have contact with all infants during the infant's first year of life.

While the findings of our study highlight the importance of reading and other language-based activities for current cognitive development, other studies show that the positive effects of reading during childhood can last decades and have a wide ranging impact. For example, findings from the 1970 British Cohort Study show that compared to poor readers, competent readers at the age of 10 were more likely to be in high paid employment and have fewer periods of unemployment during early adulthood (Parsons et al., 2011). The data from this cohort also showed that children with language problems at age 5 were less likely to have been read to and were more likely to have parents who were poor readers (Law et al., 2009). Compared to children with normal language skills they were also more likely at age 34 to be at risk for problems with literacy, mental health and employment (Law et al., 2009; Schoon et al., 2010a, 2010b). These findings highlight the importance of encouraging early reading.

When interpreting the findings from this study on 9-month-old infants it is important to consider a number of limitations. It is unfortunate that the way the data were collected means that information on reading and showing pictures was effectively recorded only for two-parent families; however, we demonstrated that one of the outcome measures (problem-solving score) did not differ significantly between those included and excluded in the analysis, while communication scores were actually higher for the excluded group. In addition, the phrasing of the relevant questions for these particular activities is not a frequency measure, only whether the child was read to or not. However, drawing on previous studies (Kuo et al., 2004; Raikes et al., 2006) the majority of those who report reading to their child at all are likely to do so on a regular basis.

As these data are cross-sectional for the moment, it is only possible to identify associations between parenting activities and outcomes. Although these associations are robust to controls for a range of possible confounding variables such as maternal education parental attachment, type of childcare and number of siblings, it is possible that another variable that was not controlled for may also have had an influence on cognitive development. For example, parents who engage in activities like book-reading or showing the infant pictures may be more likely to play educational games with their infants. Future research would benefit from having a more detailed measure of parent-child activities, including frequency of reading and the types of books being read.

While activities such as reading and talking to the infant explain just a small proportion of the variance in cognitive scores at this young age – and obviously other unmeasured factors contribute significantly – it is also true that these activities are low in economic cost and may ultimately have additional benefits such as fostering the parent-child relationship. It would be useful to be able to demonstrate a measurable effect of reading on cognitive development in follow-up work that could utilize an experimental design, with more objective measures of development and a smaller sample

size: while large cohort designs such as this have greater statistical power and allow for the control for a wider range of variables, they may also increase the risk of a Type I error.

Finally, the cross-sectional data also mean that there are limitations in the conclusions that can be drawn from the data. For example, it is not possible to assess the extent to which infants who are cognitively 'advanced' might somehow elicit or encourage interactions such as talking and reading from parents; a recent observational study by Song et al. (2013) found that children's cognitive development at age 2 years was associated with quality of maternal language at age 3 follow-up. The present analysis was therefore adjusted for two of the potential biological drivers of 'advancement' or 'delay' at 9 months in an attempt to reduce bias: breastfeeding and gestational age. Future work will be able to more fully consider the longitudinal impact of parental activities with infants when subsequent waves of data are collected from this cohort. Follow-up data will ultimately be available for these children at age 3 and again at age 5. Other studies which have followed infants longitudinally have found that social and environmental factors that were considered important for communication, and vocabulary development make only a small predictive contribution (e.g. Reilly et al., 2007, 2010; Zubrick et al., 2007). It may be the case that the small positive influence of language-based activities found in this study in 9-month-old infants will not be present when the children are older.

V Conclusions

Shared activities based on language such as reading to young children and infants is associated with a number of positive outcomes for future cognitive, language and literacy development as previous studies have shown, and for current cognitive development as this study shows. Unlike other countries that have programmes to actively promote reading to infants, Ireland currently does not have such a policy. Although the vast majority of parents are prepared to spend time in learning activities with their infants, there may be a lack of awareness that reading to an infant is potentially beneficial even if he or she is unlikely to understand the content of what is being read. Even for parents who may feel uncomfortable with their own reading skills, or who lack time to sit down to focus on reading a story, this research suggests that just talking to the child and engaging him or her in an (apparently) one-sided conversation can make a positive contribution to the child's cognitive development.

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The authors declare that there is no conflict of interest.

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Note

1. Note that the 10-month set of milestones are used here, although the study did also ask the set relating to 6, 8 and 12 month milestones.

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