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## Shared reading in infancy and later development: Evidence from an early intervention

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## ABSTRACT

This study uses data from an evaluation of an early intervention programme, *Preparing for Life*, to estimate the impact of book gifting on shared reading during infancy and the association between reading and later development. Participants were randomised during pregnancy to a high intensity intervention group, receiving mentoring and book packs ( $n = 78$ ), and a low intensity intervention group, receiving book packs only ( $n = 80$ ). A no-intervention comparison group were allocated using non-random assignment ( $n = 78$ ). At 6 and 12 months both the high and low intensity groups were more likely to read to their infant a few times per week or daily than the comparison group. The intervention groups did not differ statistically on reading frequency. Daily reading at 6 months predicted higher vocabulary comprehension and production, cognition, and socioemotional competence at 12 months. Book gifting may offer an efficient means of reading promotion in disadvantaged communities.

## 1. Introduction

Shared book reading has been identified as a promising means of promoting children's early development, particularly as a vehicle for redressing socioeconomic disparities in children's skills at school entry (Arnold & Doctoroff, 2003; Brooks-Gunn & Markman, 2005). Gifting books to families is amongst the most widely utilised strategies to support early reading and has been linked to language gains for toddlers and preschool-aged children (Wade & Moore, 2000; Zuckerman, 2009). Recently there have been recommendations that shared reading between parents and children should start from birth (American Academy of Pediatrics [AAP], 2014). Yet questions remain regarding the level of support needed to shape regular reading habits and the areas of development that may benefit. The present study sought to address these gaps by exploiting data from a wider randomised controlled trial study of an early intervention programme, *Preparing for Life*, to compare the benefits of book gifting, versus book gifting combined with home visits from trained mentors. It further examined whether reading at 6 months was associated with children's language, cognitive, and socioemotional development at 12 months.

## 1.1. Shared reading and children's development

A consistent body of meta-analytic evidence has established links between shared book reading and greater language, literacy, and cognitive skills amongst toddler, preschool, and early school-aged children (e.g., Bus, van IJendoorn, & Pellegrini, 1995; Mol & Bus, 2011; Scarborough & Dobrich, 1994; Sénéchal & Young, 2008). The magnitude of the benefit is modest, with shared reading typically explaining about 8–12% of the variance in outcomes. Yet these gains are thought to intensify over time due to “snowball” (Raikes et al., 2006) or “upward spiral” (Mol & Bus, 2011) effects, such that reading to young children facilitates the development of basic literacy skills, which builds interest in books, leading to increased shared reading, which ultimately translates into gains in language and comprehension.

This idea draws on transactional models of development (Sameroff & Fiese, 2000), whereby the child and environmental inputs (such as parents) influence each other reciprocally (Raikes et al., 2006). Similar cycles have been described by Fletcher and Reese (2005) using a sociocultural perspective to conceptualise how frequent reading promotes parents' sensitivity to their infant/toddler's linguistic abilities, allowing

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them to better match their strategies to their child's development. If such models are accurate, it is arguable that outcomes may be amplified when reading is set in motion as early as possible, a position recommended by the American Academy of Pediatrics [AAP] (2014). Starting reading early is also likely to extend opportunities for frequent reading routines to become established, and confer greater cumulative effects ahead of school entry.

Early reading may also capitalise on sensitive periods of brain development in infancy (Halfon, Shulman, & Hochstein, 2001). This approach is also developmentally viable. From birth, infants prefer familiar nursery rhymes that had previously been read aloud during pregnancy (DeCasper & Spence, 1986). Neurobiologically, it appears that infants possess neural memory for such sounds (Partanen et al., 2013), and have a striking ability to detect and process speech during story telling (Peña et al., 2003). Over the next six months, infants experience a dramatic increase in periods of alertness, object perception and spatial orienting (Colombo, 2001), with joint visual attention consolidating from around 4 months of age (Butterworth, 2001). In shared reading contexts, the first six months see infants begin to attend to books, follow their parent's cues, and attempt to physically manipulate books (e.g., scratch, tap and grab) (Lamme & Packer, 1986). Although little is known about caregivers' early book sharing behaviour, studies with 6–18 month olds suggest that reading offers a particularly rich and supportive context for parents' use of pointing, labelling, and commenting, which are optimal supports for children's language and cognitive development (Fletcher & Reese, 2005).

The design of baby books themselves, which includes features such as simple elements that repeat over several pages, also make them ideal for vocabulary development (Murray, 2014). Repeated pictures that retain the referent's core elements, allow the infant to grasp its defining features and couple their direct experience of the subject with the word used to represent it (Murray, 2014). This is particularly helpful in developing vocabulary for subjects that are dynamic or fleeting in the environment (e.g., actions, emotional expressions) or those that are not easily experienced in everyday life (e.g., jungle animals) (Fletcher & Reese, 2005; Murray, 2014).

Studies testing the impact of very early shared reading, however, are both sparse and equivocal and have yet to be subjected to meta-analysis (Mol & Bus, 2011). Generally, infants who are read to before 12 months outperform their peers with later reading experiences, particularly regarding language and literacy skills (Dunst, Simkus, & Hamby, 2012). Yet it remains unclear whether reading in the first six months confers developmental gains. Niklas, Cohrsens, and Tayler's (2016) recent retrospective study found an association between recalled initiation of reading in the first six months and rhyming ability and verbal comprehension (Woodcock-Johnson Tests of Cognition and Achievement; Mather & Woodcock, 2001a, 2001b) in kindergarten. However, Tomopoulos et al. (2006) failed to find prospective associations for reading at 6 months and expressive and receptive language (Preschool Language Scale; Zimmerman, Steiner, & Pond, 1992) and cognitive development (Bayley Mental Developmental Index; Bayley, 1993) at 21 months. In Karrass and Braungart-Rieker's (2005) prospective study, reading at 8 months, but not 4 months, was related to expressive and receptive language abilities (composite scores from language items on the Bayley Mental Scale; Bayley, 1969) and parent report on the Sequenced Inventory of Communicative Development-Revised Expressive and Receptive Scales; Hendrick, Prather, & Tobin, 1984) at 12 and 16 months, although reading at 4 months did predict reading at 8 months. Cohort studies have also found support for associations between reading at 9 months and concurrent language and cognitive development (parent report on the Ages and Stages Questionnaire communication and problem solving subscales; Squires, Potter, & Bricker, 1999) and later expressive language development (parent report on the MacArthur Communicative Development Inventory; Fenson et al., 2006) however data on earlier reading were not available/reported (Farrant & Zubrick, 2011; Murray & Egan, 2014).

It is also uncertain whether reading offers wider benefits beyond cognition and language (Mol & Bus, 2011). Shared reading, being inherently social, and in early infancy primarily affective (Lamme & Packer, 1986), may provide an ideal context for emotionally satisfying parent-infant interactions (Bus, 2002; Fletcher & Reese, 2005; Murray, 2014; Tomopoulos et al., 2006). Although few studies have examined the impact of shared reading on socioemotional development at any age, a recent randomised controlled trial (RCT) of parent training in book sharing with 14–16 month old toddlers showed treatment effects for greater prosocial behaviour in a helping task (modelled on Buttleman, Carpenter, & Tomasello, 2009) and imitations of affectionate dolls play at a two month follow up (Murray et al., 2016).

Joint attention may be fundamental to book sharing's role in fostering both language and socioemotional outcomes. Mundy and Newell (2007) highlight how joint attention, the ability to coordinate attention with a social partner in relation to a third object or event, underpins language and social development. From 3 to 6 months of age infants begin to show capability for joint attention through behaviours such as following another's gaze, head turns and pointing (Mundy & Sigman, 2006; Scaife & Bruner, 1975). This encourages socioemotional reciprocity in interactions and co-regulation of interest and emotions, which helps facilitate the incorporation of objects such as books into shared interactions (Farrant & Zubrick, 2013). Crucially, joint attention occurs more commonly in book sharing than in other contexts (Murray, 2014).

Episodes of joint attention scaffold very early language development by helping the child to couple the adult's attentional focus with its linguistic referent, particularly when adults match their focus to that of the child (Tomasello & Farrar, 1986). Joint attention also serves social functions as it offers a means of sharing experiences and is associated with infants' tendency to share positive affect with others (Mundy et al., 2007). In this way joint attention may be associated with aspects of social competence such as showing interest in and sharing positive emotions with others (Mundy & Sigman, 2006; Vaughan Van Hecke et al., 2007). In high quality book sharing experiences, instances of joint attention are also likely to be characterised by parental warmth, responsiveness, and sensitivity (Vally, Murray, Tomlinson, & Cooper, 2015), behaviours associated with positive socioemotional development (van der Voort, Juffer, & Bakermans-Kranenburg, 2014). Evidence supporting the importance of joint attention also can be seen in studies documenting its associations in infancy (9–12 months) with later language ability at 5 years (Farrant & Zubrick, 2011) and social competence and externalising behaviour at 2.5 years (Vaughan Van Hecke et al., 2007).

Overall, it remains unclear whether the developmental value of reading prior to 6 months is negligible, confined to habit formation, or masked by limited variability in shared reading levels (Tomopoulos et al., 2006). Examining this question is important if we are to avail of the earliest opportunities to optimise development. By 12 months, infants' linguistic skills already uniquely discriminate their language, literacy, and cognitive trajectories through to school entry, more so than other cognitive domains (Dickinson, Griffith, Golinkoff, & Hirsch-Pasek, 2012; Peyre, Charkaluk, Forhan, Heude, & Ramus, 2017). Socioemotional development also shows some stability from 12 months, at least when measured using screening tools/checklists (Briggs-Gowan, Carter, Bosson-Heenan, Guyer, & Horwitz, 2006; van Zeijl et al., 2006). A corollary of any impact, however, is the need for supports that can effectively promote early reading. In their meta-analysis of 11 studies (including predominantly US samples and a high number of socioeconomically 'at-risk' samples) Dunst et al. (2012) report an average age of reading onset of 22 months, although Phillips and Lonigan (2009) report age of onset closer to 6 months in their mixed socio-economic sample. In addition studies of US nationally representative samples suggest that only a minority of families read daily to young infants; Kuo and colleagues found that less than half of parents read daily to 4–9 month-olds (Kuo, Franke, Regaoado, & Halfon, 2004),

while Britto, Fuligni, and Brooks-Gunn (2002) found that only 22% of parents read daily to infants aged 12 months or younger. Britto et al. (2002) conclude that parents need to be better informed that shared reading can benefit even very young children, for example, in acquiring rudimentary literacy behaviours such as handling a book.

### 1.2. Socio economic status, reading, and developmental outcomes

Shared reading may also lie at the nexus of socioeconomic status (SES) disparities in children's outcomes and may offer a key means of intervention. There is robust evidence linking poverty and SES to nearly all aspects of children's development (McLoyd, Aikens, & Burton, 2006). Inequalities in language ability appear early, tend to remain stable or widen over time, and influence the course of children's school readiness and ongoing educational trajectories (Pace, Luo, Hirsh-Pasek, & Michnick-Golinkoff, 2017). Hart and Risley's (1995) well-known study estimated that children from lower SES backgrounds were exposed to about 30 million less words by the time they were 4 than peers from higher SES backgrounds. Similar disparities have been identified in the quality of parent-child interactions and children's access to learning resources (Pace et al., 2017).

Poverty may impinge on families' abilities to provide care as optimally as they would like, including the quality of the home learning environment (HLE; Smith, Brooks-Gunn, & Klebanov, 1997; Snow, Dubber, & de Blauw, 1982). This encompasses access to books, library visits, and shared reading interactions (Kelly, Sacker, Del Bono, Francesconi, & Marmot, 2011; Melhuish et al., 2008). Lower SES is typically associated with lower book ownership and less frequent reading interactions across childhood (Bradley, Corwyn, McAdoo, & García Coll, 2001; Duursma, 2014), and less stimulating reading with preschool-aged children (Aram, Fine, & Ziv, 2013; Korat, Ron, & Klein, 2008). For example, Bradley et al. (2001) found that nonpoor mothers were twice as likely to read to their infants and toddlers several times per week than were poor mothers. While marked income-disparities in book ownership reported by early studies (e.g., McCormick & Mason, 1986) appear to have lessened somewhat over time, income-gaps in daily reading appear to have increased, as the gains in reading frequency made by top-income families have outstripped those of low-income families (Kalil, Ziol-Guest, Ryan, & Markowitz, 2016).

Lower literacy activities amongst low SES families may be influenced by the tendency for caregivers facing socioeconomic disadvantage to hold weaker beliefs about their role as teachers of school related skills and the value of reading to preschool children (DeBaryshe, 1995; Harris, Loyo, Holahan, Suzuki, & Gottlieb, 2007). This may be compounded further by environmental factors, such that low-income neighbourhoods are less likely to have access to books and reading materials in preschools, libraries, and other community settings, compared with middle-income neighbourhoods (Neuman & Celano, 2001). While the relationship between SES and literacy behaviours is complex and often less linear than these patterns suggest (Phillips & Lonigan, 2009), equitable access to books and supports to foster their use have become important targets for intervention.

### 1.3. Book gifting interventions

Book gifting is amongst the most widely utilised strategies to support shared reading. Two delivery models have emerged, both of which promote shared reading through book provision, but offer different levels of adjunct literacy supports. The more intensive model, *Reach Out and Read* (ROR; see Zuckerman, 2009 for review), originated in the US and operates through pediatric primary care settings. ROR targets young children (6 months–5 years) and comprises three elements: book gifting, literacy advice from pediatricians, and volunteer reading/literacy rich waiting rooms. Large scale quasi-experimental studies have linked exposure to ROR to greater reading frequency and language gains in children between 18 months and 6 years, but not for younger

toddlers (13–17 months) (High, Hopmann, LaGasse, & Linn, 1998; High, LaGasse, Becker, Ahlgren, & Gardner, 2000; Mendelsohn et al., 2001; Needlman, Tokar, Dreyer, Klass, & Mendelsohn, 2005). However, it is unclear which elements of the programme underlie these improvements. In addition, an experimental evaluation of a similar Australian initiative, *Let's Read*, found no effects for children's language and literacy skills at either 2 or 4 years of age (Goldfeld et al., 2011 and Goldfeld et al., 2012; see also Mendelsohn, 2012).

The less intensive model of intervention involves gifting books to low income families in the community. The first of these initiatives, *Bookstart*, provided families of 9 month-old infants in an inner-city community in the UK with books and educational literature on reading. Similar initiatives have followed in Europe, Asia, and Canada. Experimental evidence has identified positive effects of *Bookstart* with 2 year olds on parents' own attitudes to reading, but no effects for parents' attitudes towards children's reading, and negative effects for library use (O'Hare & Connolly, 2010). In terms of children's development, quasi-experimental research has linked *Bookstart* to language gains at 15 months for temperamentally reactive children (van den Berg & Bus, 2014), and children's achievement scores at school entry and age 7 (Wade & Moore, 1998, 2000). Qualitative research has also endorsed *Bookstart's* acceptability to professionals and parents (Hall, 2001; Moore & Wade, 2003; Vanobbergen, Daems, & van Tilburg, 2009).

To our knowledge, only one study, the US *Baby Books Project* (Auger, Reich, & Penner, 2014), has examined the practice of book gifting in the first months of life to low-income mparents. Using an RCT design, they found that book gifting from pregnancy through the first year improved maternal beliefs about the importance of reading, but these effects did not emerge until infants were 12 months old. Crucially, no treatment effects were observed for reading practices and child outcomes were not examined.

### 1.4. Home visiting programmes and reading

Recently, researchers have questioned whether reading interventions may be more powerful when coupled with supports targeting the wider parent-child relationship (Scott et al., 2012). Home visiting interventions are one such example, adopting a holistic intervention model to address socioeconomic disparities in child development. While home visiting programmes (HVPs) do not focus on reading exclusively, they do aim to enhance parenting practices and the quality of the HLE, which often includes literacy-related activities. However, this is typically in the absence of book provision itself, implying that HVPs often anticipate impacts on reading through the types of activities and strategies promoted by the home visitor. Treatment effects for shared reading behaviours with toddlers and school-aged children have been demonstrated in a number of HVPs including *Parents as Teachers* (PAT; Zigler, Pfannenstiel, & Seitz, 2008), *Play and Learning Strategies* (Landry et al., 2012), and *Early Head Start* (Love et al., 2005; Raikes et al., 2006). Importantly, Zigler and colleagues found that reading acted as an indirect pathway in producing treatment effects for school readiness. Additionally, quasi-experimental evidence has linked the *Healthy Steps* programme (Johnston, Huebner, Tyll, Barlow, & Thompson, 2004; Minkovitz, Strobino, Hughart, Scharfstein, & Guyer, 2001) to increased shared reading as early as 3 months. Yet a RCT of *Healthy Families Arizona*, found no effects on shared reading when children were 6 and 12 months old (LeCroy & Krysik, 2011).

Examining reading in the context of HVPs provides a number of advantages. Unlike most book gifting initiatives, HVPs often begin antenatally or at birth, maximising the opportunity to influence early brain development. HVPs seek to educate parents on developmental milestones and the value of educational experiences in the context of an established relationship with programme staff who can model, scaffold, and reinforce high quality reading interactions. In particular, guidance from trusted health professionals has been found to be an acceptable means of reading promotion amongst families facing socioeconomic

disadvantage (Berkule-Silberman, Dreyer, Huberman, Klass, & Mendelsohn, 2010). Moreover, research suggests that HVP goals targeting parental efficacy, parenting stress, and attachment may offer spillover effects for reading practices (Bus & van IJzendoorn, 1995; Can & Ginsburg-Block, 2016). Lastly, the overall HVP delivery model, being both intensive yet flexible (see Azzi-Lessing, 2011), may be particularly suited to reading promotion (Mendelsohn, 2012; Swick, 2009), especially where home visitors are aware of the importance of joint attention and its developmental precursors (Farrant, 2012).

### 1.5. The present study

The present study uses data from a randomised controlled trial evaluation of a HVP in Ireland, *Preparing for Life (PFL)*, to address gaps in the literature. The *PFL* trial included two randomised conditions, a low intensity treatment involving book gifting, and a high intensity treatment involving book gifting and home visits from trained mentors, as well as a comparison condition which received no intervention. Specifically, the study sought to test whether book gifting very early in infancy (at approximately 3 months) was associated with shared reading at 6 and 12 months and whether this association was potentiated when delivered with home visiting support. We anticipated that book gifting would promote shared reading amongst families facing socioeconomic disadvantage who otherwise may have limited access to books. We also anticipated that reading would be highest amongst families who received mentoring to underscore the benefits of very early reading, encourage regular reading habits, promote parents' sense of efficacy, and model and coach high quality reading interactions. Secondly, the study aimed to test whether early shared reading at 6 months was associated with language, cognitive, and socioemotional outcomes at 12 months. We anticipated that regular shared reading interactions would enhance children's receptive and expressive language, cognition, and socioemotional development. Our hypotheses are as follows:

1. Book gifting at 3 months will be associated with increased shared reading at 6 and 12 months compared with no supports.
2. Book gifting coupled with home visiting will be associated with increased shared reading compared with both book gifting alone and no support.
3. Shared reading at 6 months will be associated with greater receptive and expressive language, cognitive and socioemotional outcomes at 12 months.

## 2. Method

### 2.1. Study and participants

This study took place in the context of a wider impact evaluation of an early intervention programme, *PFL*, concerned with identifying the programme's impact on children's school readiness skills at age 4/5. The institution's Human Research Ethics Committee approved all aspects of the trial protocol.

The larger intervention study included two randomised conditions, of low and high intensity, recruited in one disadvantaged community in Dublin, Ireland. The catchment area had above national average rates of unemployment, early school leaving, lone parent households, and public housing (Doyle, 2013). Ethical considerations amongst the community groups involved in the design of the intervention, in addition to the low birth rate, precluded the inclusion of a third randomised 'no treatment' group within the intervention community. Thus, a 'no treatment' comparison group was recruited from another socio-demographically similar community located approximately 10 km from the intervention community. It was selected due to its similarity on small area population statistics from the Census and the absence of any other early intervention programme in operation. The comparison group was

not involved in the randomisation process and the participants did not receive any of the supports provided to the intervention groups.

All pregnant women living in the intervention and comparison areas were eligible to participate, regardless of parity. There were no exclusion criteria. Participation was voluntary and recruitment took place between January 2008 and August 2010 through two maternity hospitals or self-referral in the community. Participants from the intervention community were randomised using an unconditional probability randomisation strategy to high ( $n = 115$ ) and low ( $n = 118$ ) intensity conditions. No stratification or block techniques were used. The comparison group ( $n = 99$ ) was recruited, using the same procedures as the intervention groups. The population based recruitment rate was 52% for the intervention groups and 36% for the comparison group based on the number of live births during the recruitment window.

Demographic and outcome data were collected from participants across all three groups during face-to-face interviews at baseline (post randomisation and pre-treatment,  $M = 22.67$  weeks pregnant;  $SD = 7.27$  weeks) and when the infants were 6 and 12 months old. A separate maternal cognitive assessment was conducted when infants were 3 months old. Interviews were conducted by trained researchers who were blind to participants' group status and were not involved in intervention delivery. Participants were interviewed in their homes and offered a nominal shopping voucher as a thank you for their contribution.

Fig. 1 shows the participant flow through the study. In total, 304 (high = 104; low = 101; comparison = 99) participants completed a baseline assessment, when they were on average 22.67 weeks pregnant ( $SD = 7.27$  weeks). Prior to this a small number of participants miscarried (2: high = 1; low = 1; comparison = 0), withdrew from the programme before the baseline assessment (19: high = 6; low = 13; comparison = 0), and did not participate in the baseline assessment (7: high = 4; low = 3; comparison = 0). A maternal cognitive assessment was completed by 271 participants (high = 91; low = 92; comparison = 88) when their infants were three months old. A 6 month interview was completed by 257 participants (high = 83; low = 90; comparison = 84) and the 12 month interview was completed by 247 participants (high = 83; low = 82; comparison = 82).

The baseline assessment included measures of participants' characteristics in terms of family socio-demographics, maternal wellbeing, health and pregnancy, parenting and social support. Analysis of 129 baseline measures found that the participants randomly assigned to the high and low intensity groups did not statistically differ on 97% of measures, indicating that the randomisation was successful (Doyle & the *PFL* evaluation team, 2010). However, the comparison group, which was selected using non-random assignment, statistically differed from the intervention groups on 25% of measures. The areas on which differences were identified indicated that the comparison group was of a relatively higher SES (see author reference). A wide range of baseline measures were collected to provide detailed information about these marginalised communities for which limited domestic data exist and in order to improve estimates of causal inference.

#### 2.1.1. Estimation sample

The estimation sample for this study included the 236 mothers who completed the baseline and cognitive assessments, as well as interviews when their infants were 6 and 12 months old (high intervention = 78, low intervention = 80, comparison = 78). The large majority (96%) of participants identified as being Irish, 2% identified as being Irish travellers, and 2% identified as being of other ethnic backgrounds. The ethnicity of the community at the time of recruitment, based on census statistics, show that 95.3% of individuals identified as being White Irish/White Traveller/Any Other White, 0.5% identified as being Black or Black Irish, 0.7% identified as being Asian or Asian Irish, 0.8% identified as being Other, and 2.6% were not stated. A selection of sociodemographic characteristics and social support measures for the baseline sample and the estimation sample are displayed in Table 1 and

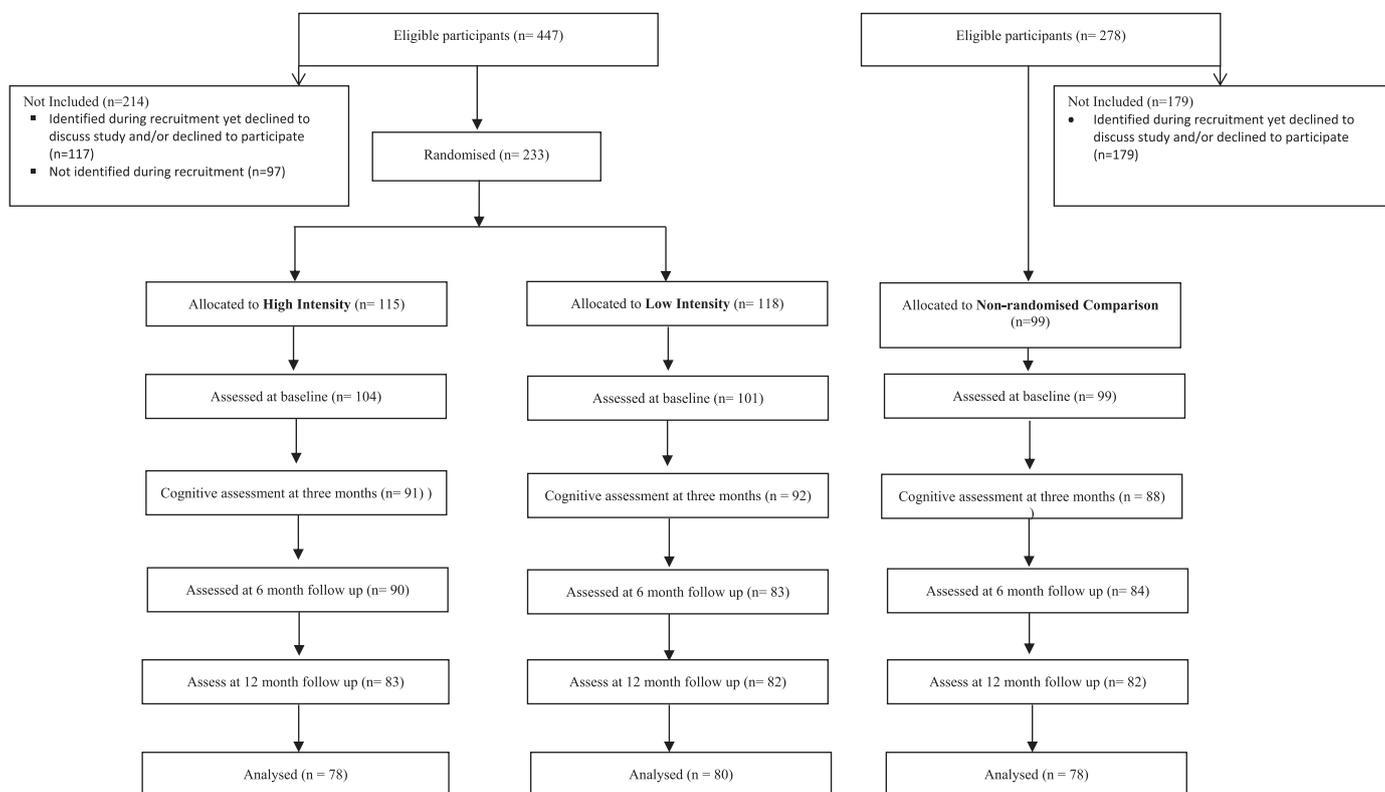


Fig. 1. Participant flow.

demonstrate that both samples are largely equivalent. In addition, analysis of the baseline characteristics that predicted retention in the study (not reported) indicated relatively little evidence of differential attrition across the three groups. Where differences were observed, they indicated that parents who remained in the study at 6 and 12 months had less risk factors than those who dropped out.

Within the estimation sample comparison mothers appeared to be of a relatively higher SES than intervention mothers. Specifically, on average, mothers in the high and low intensity groups were 25 years of age at baseline, while mothers in the comparison group were 27 years old. A lower proportion of comparison mothers were first time mothers (42%) than intervention mothers (~50%), with mothers across all

Table 1  
Participants' baseline characteristics.

	Full sample			Estimation sample		
	%/M (SD)			%/M (SD)		
	High	Low	Comparison	High	Low	Comparison
Mother's age	25.46 (5.85)	25.30 (5.99)	27.28 (6.20)	25.83 (5.83)	25.33 (5.97)	27.13 (6.28)
Weeks in pregnancy at recruitment	21.59 (7.85)	21.34 (6.95)	25.16 (6.33)	21.59 (7.90)	21.20 (7.00)	24.50 (6.21)
Infant's age in weeks at 6 months	~	~	~	27.60 (2.10)	27.28 (2.19)	27.42 (2.52)
Infant's age in weeks at 12 months	~	~	~	53.65 (3.20)	53.38 (2.68)	53.46 (2.18)
No. of children in household	1.94 (1.31)	1.91 (1.15)	2.11 (1.35)	1.95 (1.26)	1.96 (1.18)	2.06 (1.22)
Married	14.42 (35.30)	17.82 (38.46)	18.18 (38.77)	16.67 (37.51)	16.25 (37.12)	16.67 (37.51)
Low maternal education <sup>a</sup>	33.65 (47.48)	39.60 (49.15)	25.25 (43.67)	28.21 (45.29)	28.75 (45.54)	25.64 (43.95)
Maternal employment	36.54 (48.39)	39.60 (49.15)	43.30 (49.81)	44.87 (50.06)	43.75 (49.92)	42.31 (49.72)
Public housing	55.34 (49.96)	55.44 (49.95)	42.86 (49.74)	52.56 (50.26)	53.75 (50.17)	40.26 (49.36)
In receipt of social welfare payments	64.42 (48.11)	64.64 (48.05)	63.54 (48.39)	61.54 (48.97)	60.26 (49.25)	63.64 (18.42)
Experience of domestic violence	3.45 (18.40)	3.39 (18.17)	7.01 (25.76)	2.56 (15.91)	5.00 (21.93)	7.69 (26.82)
Experience of addiction	7.0 (25.26)	3.39 (18.17)	11.11 (31.59)	8.69 (26.81)	5.00 (21.93)	14.10 (35.03)
Receives 'alot of support' from partner	97.53 (15.61)	92.94 (25.77)	91.86 (27.50)	96.92 (17.40)	92.54 (26.48)	91.30 (28.38)
Receives 'alot of support' from parents	78.80 (40.36)	75.51 (43.22)	71.28 (45.49)	82.43 (38.31)	75.32 (43.39)	70.27 (46.02)
Receives 'alot of support' from relatives	64.42 (48.11)	58.00 (49.60)	53.06 (50.16)	66.67 (47.45)	60.76 (49.14)	51.28 (50.31)
Receives 'alot of support' from friends	53.85 (50.01)	54.45 (50.05)	50.52 (50.26)	56.41 (49.91)	53.75 (50.17)	50.65 (50.32)
Receives 'alot of support' from neighbours	14.43 (35.32)	12.77 (0.36)	19.10 (39.53)	12.68 (33.51)	9.21 (29.11)	16.67 (37.53)
Infant's sex						
Boy	~	~	~	51.28 (50.31)	35.00 (48.00)	57.28 (50.31)
Girl	~	~	~	48.2 (50.31)	65.00 (48.00)	48.72 (50.31)

Note. Original sample at baseline n = 304 (Low Intensity = 101; High Intensity = 104; Non-randomised Comparison = 99). Estimation sample n = 236 (Low Intensity = 80; High Intensity = 78; Non-randomised Comparison = 78).

<sup>a</sup> Low education denotes participants who have not completed the junior cycle of secondary education which equates to three years of secondary education.

groups reporting an average of 2 children in the household. A higher proportion of mothers in the high and low intensity groups had less than three years secondary school education (28%) and reported being in social housing (53%), than mothers in the comparison group (26%; 40% respectively). However, a similar proportion of mothers in all three groups (~40%) reported being employed at baseline. A minority of mothers reported experience of domestic violence and addiction, although this was slightly higher in the comparison group (8%; 14%) than in the high (3%; 9%) and low (5%; 5%) intensity intervention groups respectively. Over 90% of mothers in each group reported receiving 'a lot of support' from their partner, with roughly 50% reporting this level of support from friends. Mothers in the intervention groups generally reported more support from parents and relatives and less support from neighbours compared with mothers in the comparison group.

## 2.2. Preparing for Life programme

*Preparing for Life* is a manualised home visiting programme that provides a range of supports to participants from pregnancy through to school entry at age four/five. The programme is a community-based initiative developed in response to evidence that children from the catchment area lagged behind their peers in terms of school readiness skills, including physical health and wellbeing, social and emotional development, approaches to learning, language development, and cognition (Doyle, 2013). It was developed using a bottom-up approach involving consultation with 28 different community groups, local service providers, and community representatives, including teachers and parents. This knowledge was combined with consultations with international experts and a review of international and national policy and evidence on school readiness (see *Preparing for Life and Northside Partnership, 2008* for more information). This study uses data on reading collected as part of the evaluation of *PFL* when infants were 6 and 12 months old and data on development when children were 12 months old.

### 2.2.1. Book gifting

Both the high and low intensity groups were provided with a book pack when their infants were approximately 3 months old. It contained 7 books (including story books and books introducing concepts such as colours, shapes, numbers, animals, and words) and a Tip Sheet encouraging early reading and providing advice on reading strategies and expectations (see *Appendix A*). This Tip Sheet was self-administered by the low intensity group and administered by a mentor in the high intensity group. At the time of the 12 month interview, the majority of the low (85%) and high (96.1%) intensity groups had received the book pack. The rate of book pack delivery may be higher for the high intensity group as the mentors had more frequent opportunities to deliver the packs during home visits, whereas the low intensity group had to collect the book packs from the village centre themselves. The comparison group did not receive book packs or any other intervention.

### 2.2.2. Home visiting programme (high intensity)

The high intensity group were prescribed bi-monthly home visits lasting approximately one hour. Each family was assigned the same mentor over the course of the intervention where possible. The mentors had college degrees in education, social care, and youth studies and received extensive training prior to programme implementation. This training involved a two-day workshop in the programme manual which covered the mentoring role including the evidence-base for mentoring programmes; relationships and activities; outcomes and evaluation; policy and practice alignment; and the *PFL* logic model (*Preparing for Life and Northside Partnership, 2008*). Training also included 21 other relevant courses including child protection, attachment theory, and fidelity. Fidelity to the intervention was tracked during monthly two-hour supervision sessions based on the model commonly used by social

workers in Ireland. Qualitative implementation analysis identified mentors' self-reported emphasis on and adherence to fidelity as a key component of programme effectiveness (Doyle & the *PFL* evaluation team, 2013).

Home visits were guided by a set of 210 *PFL*-developed Tip Sheets based on pre-existing domestic guidelines and succinctly presented best-practice information on pregnancy, parenting, and child development. The visits typically began with a family update and revision of previous goals, followed by the Tip Sheet(s) for that visit, and goal setting for the next visit. The mentors used role modelling, demonstration, coaching, discussion, encouragement, and feedback during the delivery of the intervention. The model prescribed that all families were given the full curriculum of Tip Sheets as an on-going resource. The timing of Tip Sheet delivery and use of the *PFL* strategies varied depending on the child's age and the mentor's perception of family need, as well as maternal engagement and learning style.

The *PFL* manual identifies the provision of books, regular, high-quality reading interactions, and literacy activities (e.g., visits to library) as key mechanisms in promoting children's development (*Preparing for Life and Northside Partnership, 2008*). The Tip Sheets prescribed between pregnancy and 12 months addressed a broad range of topics including children's cognitive, language, socioemotional, and motor development, nutrition, rest and routine, parents' wellbeing and their supports, and supervision and safety. Books and reading comprised a recurrent theme across 13 of the 82 (15.9%) Tip Sheets delivered during this period including visits targeting children's language, cognitive, and emotional development, as well as advice on children's coordination, movement, and rest and routine. Mentors used these Tip Sheets and the book pack, along with a dedicated Tip Sheet on reading (see *Appendix A*), to foster positive attitudes towards the value and enjoyment of reading in infancy and encouraged parents to read frequently to their infant (such as during nightly bedtime routines), use varied books, point at and name pictures including those of familiar objects, repeat phrases to build language, follow their infant's interests, and encourage their infant to reach for, handle, and play with the books. The affective context for reading was highlighted in one Tip Sheet which emphasised that infants enjoy being close to their parent during reading and learn if their parent is happy from the way they look and speak. The importance of joint attention was encouraged through a dedicated pre-birth tip sheet on mutual gaze. In addition Tip Sheets encouraging reading in the first year did so by explaining infants' emerging developmental capacity to turn their head towards their parent, imitate their expressions, sounds, and actions, follow their parents' pointing and labelling, and point to an object in a picture book when it is labelled by their parent. The Tip Sheets did not recommend explicit reading frequencies beyond reading regularly and as part of daily routines.

High intensity participants were prescribed 36 visits between pregnancy and 12 months. On average, participants received 6 visits during the prenatal period, 8 visits in the first 6 months, and 7 visits between 6 and 12 months. Thus the number of realised visits was less than prescribed (58%), yet similar to other HVPs (Gomby, Culross, & Behrman, 1999).

### 2.2.3. Additional common supports (low intensity intervention)

In addition to the book packs, both the low and high intensity groups received a number of common supports. These included (1) encouragement to attend public health workshops on stress management and healthy eating which were already taking place in the community, (2) support in accessing community services (unrelated to parenting or child development) provided by a support worker in the case of the low intensity group or the mentor in the case of the high intensity group, and (3) developmental packs. The first developmental pack was distributed to both groups in the third trimester of pregnancy and included a baby gym, food utensils, and safety items. The second pack was distributed on the child's first birthday and included an

assortment of developmental toys.

### 2.3. Measures

All measures were administered during interviews conducted in participants' homes by trained research assistants.

#### 2.3.1. Book reading frequency

Mothers were asked how often they read to their child when infants were 6 and 12 months of age. Different response options were used at each time point as the questions were embedded in different instruments. The 6 month interview (based on items measuring parental engagement activities taken from [Cabrera et al., 2004](#)) asked “How often in the past month did you read stories to [infant]?” with six possible response categories: *more than once a day, about once a day, a few times a week, a few times a month, rarely, and not at all in the past month*. At the 12 month interview mothers were asked two standalone questions about reading. Mothers who answered positively to the first question “Do you read to [infant]?” were then asked “How often?” with five possible response categories including: *every day, two or three times a week, once a week, once a month, or less than once per month*. As previous research has indicated that reading at least daily or several times per week is beneficial for low income children ([Raikes et al., 2006](#); [Smart, Sanson, Baxter, Edwards, & Hayes, 2008](#)), response options at both time points were recoded into one of three categories: ‘daily’, ‘a few times per week’, and ‘rarely/never’. At 6 months ‘daily’ reading comprised the original options of *more than once a day and about once a day*; a ‘few times per week’ comprised the option *a few times a week*; and ‘rarely/never’ comprised the options *a few times a month, rarely, and not at all in the past month*. At 12 months, ‘daily’ reading comprised the original option of *every day*; ‘a few times per week’ comprised the options *two or three times a week and once a week*; and ‘rarely/never’ comprised the options *once a month, less than once per month, and those cases where mothers reported never reading to their infants*.

#### 2.3.2. Language development

Communicative skills and language development was measured by maternal-report on the *MacArthur Communicative Development Inventories Words and Gestures* (CDI; [Fenson et al., 2007](#)) at 12 months. The CDI includes an 89-word vocabulary checklist with 3 response options; *understands, understands and says, and does not understand or say*. Two scores were derived: a CDI Words Produced Score and a CDI Words Understood Score, which were normed by age and gender. The Cronbach's alphas for CDI Words Understood, and CDI Words Produced were 0.97, and 0.91 respectively.

#### 2.3.3. Cognitive development

Cognitive development was assessed using maternal report on the cognitive subscale of the *Developmental Profile 3* (DP-3; [Alpern, 2007](#)) at 12 months. The DP-3 includes 38 items on cognition, starting at item number 1 and continuing until five consecutive no responses are recorded. Items refer to tasks which require cognitive skill (e.g., perception, concept development, reasoning, memory) and are arranged in ascending difficulty, e.g., “When an adult points to something, does the child usually look where the adult has pointed?” Mothers were asked whether the child ‘does’ or ‘can’ perform the task in question. Yes responses were tabulated to create a continuous score, whereby higher values indicated greater cognitive development. The Cronbach's alpha was 0.64.

#### 2.3.4. Socioemotional development

Social and emotional development was assessed using maternal report on the *Brief Infant-Toddler Social and Emotional Assessment* (BITSEA; [Briggs-Gowan & Carter, 2002](#)) and the *Ages and Stages Questionnaire: Social-Emotional* (ASQ:SE; [Squires, Bricker, & Twombly, 2002](#)) at 12 months.

The BITSEA is a 42-item screening tool for social-emotional/behavioural problems in children aged 12–36 months. The measure yields a Problem score and a Competence score. Problem behaviour items include externalising (6 items), internalising (8 items) and dysregulation problems (8 items). Competencies include areas of attention, compliance, mastery, motivation, pro-social peer relations, empathy, play skills, and social relatedness (11 items). Items were rated on a 3-point scale (0 = *not true/rarely*, 1 = *somewhat true/sometimes*, 2 = *very true/often*) and summed to obtain two total scores, with higher Problem scores indicating greater levels of social-emotional or behavioural problems and lower Competence scores indicating possible delays/deficits in competence. Scores were normed by child gender. The Cronbach's alphas for Problem and Competence scores were 0.88 and 0.62 respectively.

The ASQ:SE is a screening tool used to identify children from 6 to 60 months of age who are in need of further social and emotional behavioural assessment. Questions on the ASQ:SE pertain to self-regulation, compliance, communication, adaptive functioning, autonomy, affect, and social interaction (22 items). For each domain mothers indicated if their child exhibited behaviours *most of the time, sometimes, or never* and whether the behaviour was a concern. Responses were rated on a 0–10 scale with an additional 5 points added for every indication of concern. Scores were summed to provide a total ASQ:SE score, with a possible range of 0 to 285. Higher scores indicate risk of poor social-emotional development. The Cronbach's alpha was 0.68.

Details of control variables (maternal age, education, IQ [Wechsler Abbreviated Scale of Intelligence, WASI; [Wechsler, 1999](#)], consideration of future consequences [CFC; [Strathman, Gleicher, Boninger, & Edwards, 1994](#)], parenting and child rearing attitudes [Adult Adolescent Parenting Inventory 2, AAPI 2; [Bavolek & Keene, 1999](#)], attachment style [Vulnerable Attachment Style Questionnaire, VASQ; [Bifulco, Mahon, Kwon, Moran, & Jacobs, 2003](#)] and infant's sex and age) are included in [Appendix B](#).

### 2.4. Analytic strategy

To address the first research question, reading frequency (daily, a few times per week, and never/rarely) was examined as a function of group membership (high intensity, low intensity, and non-randomised comparison) at both 6 and 12 months, while controlling for baseline differences across the three groups. To determine which measures to include as controls we tested 129 baseline measures using *t*-tests to identify significant group differences between the high intensity, low intensity, and comparison groups. Measures on which there was a statistically significant difference, and was theoretically related to the reading outcome, were identified as relevant controls. This allowed us to control for any observed differences between the groups that could conceivably influence reading frequency. No controls were included in the experimental model (high v low) as the randomization process was successful. The controls in the quasi-experimental model (high v comparison and low v comparison) included maternal IQ (WASI), maternal low education (three years of secondary school education), consideration of future consequences (CFC), parenting and child rearing attitudes (AAPI), and vulnerable attachment style (VASQ).

As the dependent variable included three ordered categories, ordered logistic regressions were employed with the inclusion of the identified controls. Two different reference categories were used at each time point in order to obtain coefficients for comparisons between all three groups (i.e., high versus low, high versus comparison, and low versus comparison). The assumption of proportional odds required for ordered logistic regressions was also examined. To test the robustness of the results we also restricted the sample to those who actually received the 3 month book pack and re-estimated the models. These are presented as Supplementary Materials. As an additional test, we also estimated the 12 month reading models while controlling for reading at 6 months. These results are also available as Supplementary Materials.

**Table 2**  
Descriptive statistics for reading frequency at 6 and 12 months.

	High Intensity		Low Intensity		Comparison	
	<i>n</i>	(%)	<i>n</i>	(%)	<i>n</i>	(%)
Reading 6 months						
Daily	32	(41)	23	(29)	19	(24)
A few times per week	24	(31)	20	(25)	14	(18)
Never/rarely	22	(28)	37	(46)	45	(58)
Reading 12 months						
Daily	31	(40)	40	(50)	29	(37)
A few times per week	32	(41)	25	(31)	17	(22)
Never/rarely	15	(19)	15	(19)	32	(41)

To address the second research question, a series of multiple regressions were computed using each of the six outcome measures at 12 months as dependent variables (i.e. CDI, DP-3, BITSEA, and ASQ-SE scores) and reading frequency at 6 months as the predictor variable. The models controlled for group membership and theoretically important covariates that may influence children's development. A core set of controls was used for all outcomes including: infant's sex and age and mother's age and education. Different controls were then used in the cognitive and socioemotional models to reflect the different factors influencing each domain. For example, the cognitive/language outcomes models controlled for IQ while the socioemotional outcome models controlled for parenting and child rearing attitudes and maternal attachment style; see Appendix B for measure descriptions and supporting evidence. As a robustness test, we also estimated the outcome models by controlling for reading at 12 months. These results are available as Supplementary Material.

There were no missing data on reading frequency and the highest level of missing data across the four outcome measures was 3.81%. Missing data for individual items were imputed using the mean for that individual's group plus a random residual value (Roderick, Little, & Rubin, 2002). This method was employed as replacement using only the group mean may lead to under-estimation of the variance. As is typical in the literature, and in order to measure the effectiveness of real world practice, an intention-to-treat analysis was applied. All analyses were conducted using STATA 12.

### 3. Results

#### 3.1. Descriptive results

Table 2 shows the shared reading frequency at 6 and 12 months disaggregated by group. Table 3 shows the descriptive statistics for the 12 month outcome measures disaggregated by group.

**Table 3**  
Descriptive statistics for language, cognitive, and socioemotional outcomes.

	All				High intensity			Low intensity			Comparison		
	<i>n</i>	M	SD	Range	<i>n</i>	M	SD	<i>n</i>	M	SD	<i>n</i>	M	SD
Language outcomes													
CDI Words Understood	236	75.23	22.05	5–99	78	73.75	24.96	80	79.26	18.60	78	72.56	21.90
CDI words produced	236	57.09	32.36	5–99	78	56.37	35.29	80	59.11	31.93	78	55.74	29.98
Cognitive outcomes													
DP-3	236	114.76	15.24	75–135	78	116.42	13.77	80	115.03	16.32	78	112.83	15.48
Socioemotional outcomes													
BITSEA problem	236	8.79	6.17	0–36	78	15.35	3.43	80	14.85	3.62	78	15.26	2.76
BITSEA competence	236	15.15	3.28	4–22	78	8.81	5.81	80	8.9	6.46	78	8.67	6.28
ASQ-SE	236	21.61	17.74	0–150	78	22.95	21.00	80	21.25	16.22	78	20.64	15.70

**Table 4**  
Ordered logistic regressions predicting reading frequency at 6 and 12 months as a function of group membership.

	Reading at 6 months				Reading at 12 months			
	B	SE	OR	95% CI	B	SE	OR	95% CI
Low vs. comparison <sup>a</sup>	0.75*	0.32	2.11	(1.14, 3.98)	1.06***	0.32	2.88	(1.53, 5.44)
High vs. comparison <sup>a</sup>	1.21***	0.32	3.35	(1.78, 6.32)	0.69*	0.32	1.99	(1.07, 3.72)
High vs. low <sup>b</sup>	0.42	0.30	1.52	(0.85, 2.72)	−0.28	0.29	0.77	(0.43, 1.34)

Note. Controls for high v comparison and low v comparison: Maternal IQ (WASI); Consideration of Future Consequences Scale (CFC) – total score; Vulnerable Attachment Style Questionnaire (VASQ) – at risk of proximity seeking behaviour; Adult Adolescent Parenting Inventory (AAPI) – total score; maternal low education.

\*  $p < 0.10$ .

\*\*  $p < 0.05$ .

\*\*\*  $p < 0.01$ .

\*\*\*\*  $p < 0.001$ .

<sup>a</sup> Comparison is the omitted category.

<sup>b</sup> Low is the omitted category.

#### 3.2. Differences in daily reading by group membership at 6 and 12 months old

Ordered logistic regressions were computed to model reading frequency as a function of group membership with controls. A test of the proportional odds assumption was conducted for each time point and neither provided any evidence that the assumption was violated. Likelihood ratio tests indicated that group membership significantly improved the fit of the 6 and 12 month models at the 0.1% significant levels in each model.

The results are presented in Table 4 and show the odds of moving from reading *daily* to a *few times per week* and *rarely/never*. For reading at 6 months, the results show that mothers in the low intensity group were two times more likely to read *daily* to their infants (vs the combined *few times per week* and *rarely/never*) than mothers in the comparison group (odds ratio = 2.11,  $p = 0.021$ ). In addition, mothers in the high intensity group were over three times more likely to read *daily* than mothers in the comparison group (odds ratio = 3.35;  $p < 0.0001$ ). There was no statistically significant difference between the high and low intensity groups regarding reading frequency ( $p = 0.156$ ).

When infants were 12 months, low intensity mothers were almost three times more likely to read *daily* (vs the combined *few times per week* and *never/rarely*) to their infants than mothers in the comparison group (odds ratio = 2.88;  $p = 0.001$ ). Similarly, mothers in the high intensity

Table 5

Multiple regressions predicting language, cognitive, and socioemotional outcomes at 12 months as a function of reading frequency at 6 months.

	CDI words produced		CDI words understood		DP-3 cognition		ASQ social emotional		BITSEA problem		BITSEA competence	
	B	SE	B	SE	B	SE	B	SE	B	SE	B	SE
Reading 6 m <sup>a</sup>												
A few times per week	1.28	5.76	8.14*	3.67	1.02	2.52	-2.14	2.99	-0.62	1.00	1.32*	0.55
Daily	10.54*	4.97	15.20***	3.16	8.31***	2.17	0.59	2.83	-0.48	0.95	2.22***	0.52
Constant	35.05	45.80	91.66**	29.15	26.90	20.04	-14.03	25.62	7.36	8.59	4.65	4.72

Note. N = 236. Controls for CDI and DP3 models: group membership; infant sex; infant gender; maternal age, maternal low education, maternal IQ (WASI). Controls for ASQ and BITSEA: group membership; infant sex, infant gender, maternal age, maternal low education, Adult Adolescent Parenting Inventory (AAPi) – total score; Vulnerable Attachment Style Questionnaire (VASQ).

\*  $p < 0.05$ .\*\*  $p < 0.01$ .\*\*\*  $p < 0.001$ .<sup>a</sup> Omitted Category is 'Rarely/Never'.

group were almost two times more likely to read *daily* (vs the combined *few times per week* and *rarely/never*) to their infants than mothers in the comparison group (odds ratio = 1.99,  $p = 0.030$ ). The comparison between the high and low intensity groups was not significantly associated with greater reading frequency ( $p = 0.343$ ). Replicating the analysis by restricting the sample only to those families who had received the book pack did not materially affect the results (these results are available in Table S1 in Supplementary Materials). When the 12 month reading models were replicated by including controls for reading frequency at 6 months, the difference between the low intensity and comparison groups was maintained, however the difference between the high intensity and comparison groups was no longer statistically significant (please see Table S2 in Supplementary Materials). This suggests that the high intensity group established and maintained their reading levels from six months onwards, while the low intensity group and the comparison group appeared to increase their reading frequency during this time.

Thus at both 6 and 12 months, after accounting for baseline differences between the groups, both low and high intensity group mothers were significantly more likely to read to their infants than comparison group mothers. However, there were no differences between the low and high intensity groups.

### 3.3. Reading frequency as a predictor of outcomes at 12 months

Table 5 presents the results for the multiple regression analyses computed for children's language, cognitive, and socioemotional outcomes. For Words Produced, the addition of reading frequency, following controls, improved the fit of the model at the trend level  $F(2, 226) = 2.52$ ,  $p = 0.083$ . In addition, *daily* reading ( $B = 10.54$ ;  $p = 0.035$ ), but not reading *a few times per week* ( $p = 0.825$ ), was positively associated with Words Produced scores. For Words Understood, the addition of reading frequency, following controls, significant improved the fit of the model  $F(2, 226) = 8.74$ ,  $p = 0.000$ . In this model both *daily* reading ( $B = 15.20$ ;  $p = 0.000$ ), and reading *a few times per week* ( $B = 8.14$ ;  $p = 0.028$ ), were positively associated with Words Understood. For cognition, the addition of reading frequency, following controls, significantly improved the fit of the model  $F(2, 226) = 8.16$ ,  $p = 0.000$ . *Daily* reading, but not reading *a few times per week*, was positively associated with DP-3 scores ( $B = 8.31$ ,  $p = 0.000$ ).

For BITSEA competence, the addition of reading frequency, following controls, significantly improved the fit of the model  $F(2, 224) = 9.09$ ,  $p = 0.000$ . Both reading *daily* ( $B = 2.22$ ,  $p = 0.000$ ) and reading *a few times per week* ( $B = 1.32$ ,  $p = 0.02$ ) were positively associated with competence scores. However, neither *daily* reading ( $p = 0.536$ ) nor reading *a few times per week* ( $p = 0.616$ ) were significantly associated with BITSEA problem scores. Similarly, neither *daily* reading ( $p = 0.834$ ) nor reading *a few times per week* ( $p = 0.476$ ) were significantly associated with ASQ-SE scores.

In sum, reading *daily* was significantly associated with a higher number of Words Produced and Words Understood, as well as improved cognition. However, the only socioemotional outcome significantly associated with *daily* reading was BITSEA competence.

Table S3 in the Supplementary Materials presents the outcome results while controlling for reading at 12 months. It shows that while two of the three significant results for daily reading at 6 months remain statistically significant (i.e., CDI Words Understood, DP3 Cognition), the result for BITSEA Competence no longer reaches conventional levels of significance. In addition, reading at few times a week at 6 months is not associated with outcomes. In contrast, daily reading at 12 months is associated with higher CDI Words Understood, CDI Words produced, DP3 Cognition and BITSEA Competence. However, as reading at 12 months was measured concurrently to the outcome data and given the moderate correlation between reading at 6 and 12 months, the models focusing on reading at 6 months are our main results.

## 4. Discussion

The present study examined whether book gifting to low SES families when infants were approximately three months was associated with increased shared reading frequency at six and 12 months, and whether this association could be potentiated when book gifting was embedded within an intensive home visiting programme. It further considered the association between shared reading at six months and children's language, cognitive, and socioemotional development at 12 months. The study used data from an Irish HVP, *Preparing for Life (PFL)*, which involved high (book gifting and mentoring) and low (book gifting) intensity groups and a comparison group who received no intervention. We found that both high and low intensity mothers were almost three and two times more likely to read more frequently to their infants at 6 months respectively, than mothers in the comparison group. By 12 months, our findings suggest that reading levels were maintained by the high intensity mothers and increased by the low intensity and comparison mothers. Specifically, both the high and low intensity groups had a greater likelihood of reading more frequently, twice and three times respectively, than the comparison group at 12 months. Crucially, there were no differences between the two intensity groups in reading levels at 6 or 12 months.

Developmentally, infants who were read to daily at 6 months were more likely to display higher levels of vocabulary (in terms of both production and comprehension), cognition, and socioemotional competence at 12 months, than peers who were read to rarely or never. However, daily reading was not associated with socioemotional problem scores, or socioemotional scores on the ASQ-SE. Reading a few times per week was also positively associated, albeit less strongly, with later vocabulary comprehension and socioemotional competence.

#### 4.1. Book gifting, mentoring and reading frequency

These findings suggest that book gifting can be an effective vehicle for promoting reading frequency early in childhood, and moreover, is equally effective in doing so as book gifting coupled with more intensive mentoring. The discrepancy between these findings and the weak impacts observed in previous trials of book gifting in *Bookstart* (O'Hare & Connolly, 2010) and the *Baby Books Project* (Auger et al., 2014), may be explained by the generous number of books included in the PFL bookpacks ( $n = 7$ ), which was three times as many books as are typically provided in these interventions. Such resources may be especially valuable to families with constrained economic means, who otherwise may have limited access to reading resources (Kalil et al., 2016; Neuman & Celano, 2001). That mothers in the high intensity home visiting condition also read more frequently than comparison mothers is encouraging in light of the mixed results for infants reported in other HVPs (LeCroy & Krysik, 2011; Minkovitz et al., 2001). Again, this may be driven by the material provision of books in the PFL intervention, which is not typically included in similar HVPs.

That early reading appeared to be maintained between 6 and 12 months in the high intensity group, versus a more dynamic upward shift in the low intensity group, is interesting. One possibility is that reading habits take shape in different ways in the context of different supports. In the absence of any intervention, families may not begin to read until closer to their children's second year (Ninio, 1979) when reading becomes more intuitive as infants start to say their first words (Blake & Maiese, 2008). For families receiving high intensity supports, the mentor-parent relationship and mentor strategies may help to initiate very early reading habits in a targeted way from the outset of the programme. For families receiving book gifting alone, they may commence reading at different stages across the first year, perhaps as children's capacities, interests, and skills develop. Overall, the general upward shifts in reading frequency across all three groups broadly accord with 'snowball' models of reading (Mol & Bus, 2011; Raikes et al., 2006), yet longer follow up is needed to test this hypothesis explicitly.

#### 4.2. Book reading and child development

In regards children's development, the association between daily reading at 6 months and children's language and cognition at 12 months is broadly similar to previous research examining the outcomes of toddlers (Raikes et al., 2006). Importantly, these findings are consistent with the findings of Niklas et al. (2016) which demonstrates that reading in the first 6 months is associated with development in toddlerhood, although the results are inconsistent with some other studies in the field, which have failed to find associations for reading prior to 8 months and children's development (Karrass & Braungart-Rieker, 2005; Tomopoulos et al., 2006). Nonetheless, the present results suggest particularly meaningful and timely gains in language that may have cascading effects on infants' ongoing developmental trajectories (Dickinson et al., 2012; Peyre et al., 2017).

This study also provides some preliminary evidence that there may be an association between reading frequency and infant socioemotional competence, in keeping with recent evidence with older toddlers (Murray et al., 2016). One possibility is that daily reading provides a practice ground for joint parent-child attention, which in turn supports healthy socioemotional development (Vaughan Van Hecke et al., 2007). Alternatively, drawing on a sociocultural perspective, gains in socioemotional competence may be driven by advantages conferred by improvements in language (Dickinson et al., 2012). That these results did not extend to problem scores is perhaps unsurprising, as reading in infancy may not be sufficiently powerful to mitigate the development of later externalising, internalising, and dysregulation problems. The inconsistency between the BITSEA and ASQ-SE results may be accounted for by the ASQ-SE's broader scope, however we cannot exclude the possibility that the BITSEA competence finding is spurious.

In keeping with previous research (Raikes et al., 2006), daily reading in particular showed the strongest associations with development; an additional 11 points on the Words Produced scale, or a third of a standard deviation, and 15 points on the Words Understood scale, over a half of a standard deviation. Similarly, daily reading was associated with an additional 8 points, or a half of a standard deviation, on the DP-3 measure of cognitive ability, and an additional 2 points on the BITSEA competence scale, the equivalent of two thirds of a standard deviation. Notably, however, associations for reading a few times per week were not trivial, particularly for language comprehension, which may be a better indicator of language abilities than expressive skills at this age.

#### 4.3. Limitations

These results should be considered in the context of several limitations. It is important to note that while few families in the low intensity condition availed of the services of the support worker, we cannot be certain that the effects attributed to the book gifting would be replicated in the absence of the other provisions available to the group. In addition, it is possible that parents in the comparison group received information on the importance of literacy activities elsewhere. In particular, we found that the comparison group reported receiving a higher proportion (66%) of parenting information (leaflets, guides, books) from non-PFL staff compared to the high (28%) or low (33%) intensity groups. While much of this material was provided by health professionals, and was unlikely to be focused on literacy activities, it is possible that the estimated effects are an underestimation if the comparison group received such information.

Another limitation of the study is that the survey questions of reading frequency were not identical at 6 and 12 months and it is possible that this may have led to differences in responding at the two time points, which may explain the different findings at 6 and 12 months concerning reading frequency. Our results also rely on maternal-report, which may be less reliable than objective measures of reading frequency. This could be particularly important in the current sample given that the intervention mothers were not blind to their treatment status. However, there was no evidence of differential misreporting between the 3 groups based on 6 month scores on the defensive responding scale embedded within the Parenting Stress Index (Abidin, 1995) (not reported). In addition, while misreporting may imply an overestimation of reading frequency, Mol and Bus (2011) report that single questions on reading frequency, as used here, may in fact underestimate associations between reading and development.

The study is also limited by an absence of data on the quality of parent-infant reading interactions, particularly as the PFL logic model predicts gains in this area. Indeed, skilled reading behaviours do not come naturally to all parents, and face-to-face support is more beneficial in improving reading quality than self-instruction (Huebner & Meltzoff, 2005). It is possible that reading frequency is more important than quality for literacy development, especially for infants (Scarborough & Dobrich, 1994) and that sensitivity may develop naturally from increased reading interactions (Fletcher & Reese, 2005). As Raikes et al. (2006) highlight, any benefits conferred by reading rely firstly on interactions occurring on a frequent basis. It is equally possible that the associations between reading frequency and outcomes are better explained by improvements in general parenting practices and parent-child interactions, or that reading and parent-child interactions are reciprocally related. Thus, it would be important to include observed measures of these interactions in future research. In addition the use of observed (Murray et al., 2016) or broader measures of socioemotional development, rather than the screeners used here, may better capture the underlying construct and offer greater predictive power for positive educational outcomes (Halle & Darling-Churchill, 2016).

Another limitation is that knowledge of programme fidelity is limited to self-report by programme staff and parents. Video and audio

data of the home visits would not only elucidate the proportion of the visits dedicated to reading, but also the strategies used to target its promotion (Korfmacher, Duggan, & Filene, 2016). The generalisability of the results is also limited by the small sample size and the individuality of the PFL programme, as HVPs are characterised by their differences (Sweet & Applebaum, 2004). It is also noteworthy that unlike the randomised groups, the comparison group was selected using a matched comparison design, resulting in a relatively higher SES sample. While observable differences between the groups were controlled for, if there were any unaccounted differences, the impact of the programme on reading may be an underestimation of the true treatment effect. Finally, findings relating to outcomes with lower levels of internal consistency (i.e. cognition and socioemotional competence) should be interpreted cautiously until further replicated.

#### 4.4. Practical implications and future research

Despite the study's limitations, these findings may be instructive for future research and practice. Most notably, these results suggest that book gifting alone may provide an effective and efficient means of promoting very early reading habits for families facing socioeconomic disadvantage. This is particularly valuable given that recruitment to intensive literacy interventions can be difficult (Huebner, 2000). The uptake of the book packs was in keeping with the national uptake of post-natal health visits, signaling confidence regarding its broader acceptability (Office of the Nursing and Midwifery Services Director, 2012). Where HVPs are in operation, we recommend that they consider reading promotion and the material provision of books in their remit. In the main, the findings accord with the position statement of the AAP who highlight the broad developmental benefits of reading from early infancy. While reading daily appears to be particularly beneficial, our results suggest that encouraging reading at least a few times per week also offers gains for children's development.

In regards future research, meta-analysis is needed to draw more definitive conclusions across studies. More objective data on reading frequency, duration, and quality will help in better identifying the thresholds of reading needed to optimise development than the current subjective categorical data allows. Digital language processors such as the LENA device, which can be worn by children to capture environmental speech, are promising in this regard (see Bindman, Miller, Davis-Kean, & Morrison, 2014; Christakis et al., 2009). Observational measures may help in identifying potential mechanisms by which reading may support socioemotional outcomes. Additionally, longitudinal designs that can track temporal shifts in reading frequency across infants' first year would be valuable in guiding practice. Cost

effectiveness studies should consider comparing the differential impact of varying book pack sizes to provide more precise estimates of the most efficient resource provision. Intervention studies may also benefit from expanding the focus to fathers' reading behaviour given its contribution to outcomes (Malin, Cabrera, & Rowe, 2014). Finally, should treatment effects be observed for the primary outcomes of the PFL trial, mediation analysis will help in establishing whether reading acts as a pathway for intervention effects on school readiness (see Zigler et al., 2008), which would allow theories of 'snowball' effects to be tested more explicitly in an experimental context.

#### 4.5. Conclusion

Our study is amongst only a handful to test the effects of book gifting using an experimental and quasi-experimental design and provides important empirical support for this widely employed strategy. The findings also suggest that broad parent-child interventions like home visiting provide a useful context for reading promotion and the integration of these interventions could help provide more seamless supports for low-income families (Farrant, 2012). Our findings suggest that the provision of books to families may offer broad developmental benefits, and we are amongst the first to examine this question in the context of socioemotional outcomes. Further studies are needed to confirm potential associations between reading and socioemotional development, elucidate the longitudinal implications of reading in infancy, and further refine our understanding of how best to support frequent, high quality, and enjoyable reading interactions amongst families facing socioeconomic risk.

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Appendix A. Tip sheet on reading provided in the 3 month book pack

## *It's never too early to start sharing stories.*



- ✓ Point out the pictures and encourage your child to babble.
- ✓ Your child will love the sound of your voice. Find a quiet place to enjoy a story.
- ✓ It's good to share favourite stories again and again. Repeating phrases helps build children's language.
- ✓ Introduce your child to a wide variety of books. Books come in all shapes and sizes - squashy books, books which make noises, books with 'touchy feely' bits.
- ✓ If your child shows no interest in a book which you are keen to share, don't push it just keep trying. Very small children don't always follow a story easily so it may be that you simply spend time looking at a single picture.

*Here are some helpful Do's and Don'ts when reading to your child:*

<i>Do</i>	<i>Don't</i>
✓ Make it fun for both you and the child and praise him or her	Worry if the child chews the books (even library books)
✓ Talk about the book and its pictures even if you think your child doesn't understand	Expect too much of your child or criticise
✓ Let your child hold and handle the book and turn the pages	Be disappointed if your child isn't interested - try again later
✓ Take your child to the library and let your baby choose the books	Have the television on at the same time because it's distracting
✓ Read a book lots of times because your child won't get bored	Feel guilty or embarrassed about taking time out to read to your child



## Appendix B. Control measures

Maternal intelligence was measured using the *Wechsler Abbreviated Scale of Intelligence* (WASI; Wechsler, 1999), which was administered by trained assessors when the infant was three months old. The WASI is a short version of the Wechsler Adult Intelligence Scale (WAIS; Wechsler, 1995). The measure includes four subtests ('vocabulary', 'similarities', 'block design', and 'matrix reasoning') and yields three scores for 'verbal', 'performance', and 'Full Scale IQ' scores. The present study employed the Full Scale score to control for mothers' general intellectual ability. Maternal IQ was included as a theoretical control as it has been linked to children's developmental outcomes (Tong, Baghurst, Vimpani, & McMichael, 2007).

Parenting and child rearing attitudes were measured at baseline using the *Adult Adolescent Parenting Inventory 2* (AAPI 2; Bavolek & Keene, 1999). The AAPI measures parents' agreement with statements on a 5-point Likert scale. These responses were used to calculate an index of risk (high, medium, low) based on known behaviours considered to be related to abuse/maltreatment. The scale yields scores for five subdomains 'inappropriate parental expectations of children', 'parental lack of empathy', 'strong belief in the use of corporal punishment', 'reversing parent-child roles', and 'oppressing children's power and independence'. A total scale score was used in the present study by summing the raw scores for the five sub-domains. Higher scores are indicative of lower risk, such that high scores are representative of positive, nurturing parenting attitudes and a low risk of abuse. Parenting and child rearing attitudes have been linked to children's socioemotional outcomes (e.g., Kiang, Moreno, & Robinson, 2004).

Maternal attachment style was measured using the *Vulnerable Attachment Style Questionnaire* (Bifulco et al., 2003) is a 23 item brief self-report tool to assess attachment style across two dimensions: insecurity and proximity seeking. Mothers indicated their agreement to statements relating to behaviours, emotions, and attitudes concerning attachment on a five point Likert scale. A total scale score is calculated by summing item responses. Higher scores are indicative of vulnerable attachment. The measure can be also used to identify those at risk of depressive disorder. Adult attachment has been linked to children's socioemotional outcomes (Crowell & Treboux, 1995), and maternal depression has been shown to be negatively related to children's socioemotional development (e.g., Murray et al., 1999).

The extent to which mothers considered immediate versus distant consequences of potential behaviours was measured using three items on the *Consideration of Future Consequences Scale* (Strathman et al., 1994). Mothers rated how much a statement was like them on a five point Likert scale.

*Maternal low education* represents a binarised measure which distinguishes mothers who have completed the junior cycle of secondary education in Ireland, which equates to three years of secondary school education, from those who have not. Maternal education has been linked to children's developmental outcomes (e.g., Carneiro, Meghir, & Parey, 2013).

*Maternal age* was included as a theoretical control as it has been linked to children's developmental outcomes (e.g., Sutcliffe, Barnes, Belsky, Gardiner, & Melhuish, 2012).

## Appendix C. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.appdev.2017.12.001>.

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