

Relationship Between Age of Onset and Frequency of Reading and Infants' and Toddlers' Early Language and Literacy Development

Carl J. Dunst
Andrew Simkus
Deborah W. Hamby

The effects of age and frequency of reading to infants and toddlers on their early literacy and language development was examined in a meta-analysis of 11 studies that included 4,020 participants. The average age of onset of adult reading to the infants and toddlers was 22 months. Variations in both age of onset and frequency of reading were related to variations in the study outcomes and predicted differences in literacy and language development some 36 months after reading was first begun. Both the shortcomings and the implications of the findings for research and practice are described.

The adage that “it is never too early to begin reading to infants and toddlers” appears throughout both the professional and popular literatures (e.g., Bush, 1990; Chang, 2006; Kuo, Franke, Regalado, & Halfon, 2004; McMahon, 1996; Miller, 1998; Ramsburg, 1998). Mol and Bus (2011) noted, as part of their meta-analysis of the relationship between print exposure and language and literacy capabilities, that “To the best of our knowledge, there are no previous attempts to [test the “it is never too early” adage] by synthesizing the evidence available across developmental levels” (p. 267).

The Mol and Bus (2011) meta-analysis included 99 studies, 29 of which comprised preschool and kindergarten children. However, only one of the 29 studies included 36 month old children, only two studies included some children less than 36 months of age, and no study examined children who were read to when they were infants or young toddlers. Consequently, the Mol and Bus (2011) meta-analysis does not provide a direct test of the contention that “it is never too early to read to infants and toddlers.”

The purpose of the meta-analysis reported in this *CELLreview* was to examine the relationships between age of onset and frequency of reading to infants and toddlers and early literacy and language development. The meta-analysis included studies where all or most of the infants and toddlers were first read to when they were 36 months of age or younger. The goal was to ascertain if variations in age and frequency of reading to infants and toddlers was related to variations in the infants' and toddlers' early literacy and language outcomes consistent with the *it is never*

too early hypothesis. A companion *CELLreview* includes a meta-analysis of intervention studies of the effects of reading to infants and toddlers on their early language development (Dunst, Simkus, & Hamby, 2012).

Search Strategy

Studies were located using *reading aloud, read-aloud, story reading, book reading, oral reading, storytelling, story-telling, storybook reading, picture-book reading, shared reading, joint reading, joint book reading, picture book AND infant*, infancy, neonat** as search terms. These were combined with more than 20 literacy and language search terms to identify studies with outcomes of interest. Both controlled-vocabulary and natural-language searches were conducted (Lucas & Cutspec, 2007).

Psychological Abstracts (PsycINFO), Education Resource Information Center (ERIC), Medline, Academic Search Premier, Education Research Complete, and CINAHL were searched. These were supplemented by Google Scholar, Scirus, Ingenta, JStor, and Socindex searches, as

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well as a search of an EndNote Library maintained by our Institute. Hand searches of the reference sections of all retrieved journal articles, book chapters, books, dissertations, and unpublished papers were also examined to locate additional studies. Studies were included if the age of reading or frequency of reading to infants and toddlers were reported and these measures were correlated with the children's early literacy or language development.

Search Results

Eleven studies were located that included 15 samples of children (Burgess, 1997, 2002; Burns, 2002; Crain-Thoreson & Dale, 1992; DeBaryshe, 1993; Duursma, Pan, & Raikes, 2008; Farver, Xu, Eppe, & Lonigan, 2006; Lee, 1993; Lyytinen, Laakso, & Poikkeus, 1998; Payne, Whitehurst, & Angell, 1994; Raikes et al., 2006; Sénéchal, LeFevre, Hudson, & Lawson, 1996). The studies included 4,020 participants, nearly equally divided between boys (51%) and girls (49%). Six of the samples were infants and toddlers who were typically developing and 15 samples were infants and toddlers who were considered at-risk for poor outcomes due mostly to socio-environmental factors. Appendix A includes the background characteristics of the children at the time the studies were conducted and Appendix B includes the ages of the infants and toddlers when first read to.

The average age of onset of adult reading to infants and toddlers was 22 months (SD = 10, Range = 7 to 41). The predictor variables in the meta-analysis were age of onset of shared reading (i.e., child age when the adults started reading to the infants) in six samples and frequency of reading in nine samples. The outcome measures included expressive language (N = 11 samples), receptive language (N = 13 samples), literacy-related skills (N = 4 samples), or a composite measure (N = 1 sample) of the children's literacy and language development.

The weighted average correlations between the predictor and outcome measures were used to estimate the sizes of effect for age of onset and frequency of reading to infants and toddlers. The correlation coefficients between age of shared reading and the study outcomes were reversed for the calculation of the average effect sizes since reading to infants at a younger age was expected to be associated with more beneficial literacy and language outcomes. (The age at which the adults first started reading to the infants and toddlers would be expected to be negatively correlated with the study outcomes; the younger the age of the child, the better the child outcomes.)

The 95% confidence intervals (CI) for the average effect sizes were used for substantive interpretation of the findings. A 95% CI not including zero indicates that the average effect size differs significantly from zero at the $p < .05$ level (Rosenthal, 1994). A correlation effect size be-

tween 0.10 and 0.24 is considered small, a correlation effect size between 0.25 and 0.39 is considered medium, and a correlation effect size equal to or greater than 0.40 is considered large (Dunst & Hamby, 2012; Lipsey & Wilson, 2001).

Synthesis Findings

Appendix C includes the correlations (effect sizes) between the predictor and outcome measures in each of the studies. The average weighted effect size for all predictors and all outcomes combined was 0.14 (95% CI = 0.12 – 0.16). The average weighted effect size between age of onset of shared reading and the outcomes was 0.24 (95% CI = 0.21 – 0.28) and the average weighted effect size for the frequency of reading and the outcomes was 0.10 (95% CI = 0.08 – 0.12). These results show that the relationships between the two predictors and the study outcomes were small but statistically significant as evidenced by confidence intervals not including zero.

Figure 1 shows the weighted effect sizes for the relationships between the two predictors (age of onset and frequency) and three different types of outcomes. The average effect sizes for the relationship between reading to infants and toddlers and both expressive and receptive language were small but statistically significant, whereas the average effect size for the reading to infants and toddlers and literacy-related outcomes was medium and twice as large as that for the two language outcome measures.

Whether differences in age of onset of shared reading were associated with differential literacy and language benefits was assessed by examining the effect sizes for contrasting onset age ranges (< 12 months, 13-24 months, 25-36 months). The results are shown in Figure 2. Reading to infants younger than one year of age was most strongly related to early literacy and language development, although reading to infants and toddlers at any age younger than 36

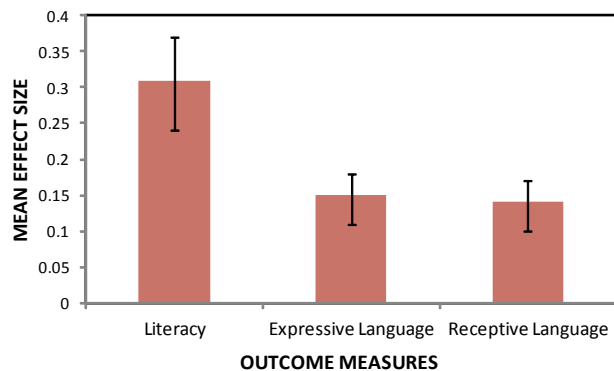


Figure 1. Average effect sizes and 95% confidence intervals for the relationship between the early reading predictors and the literacy-related, expressive language, and receptive language outcome measures.

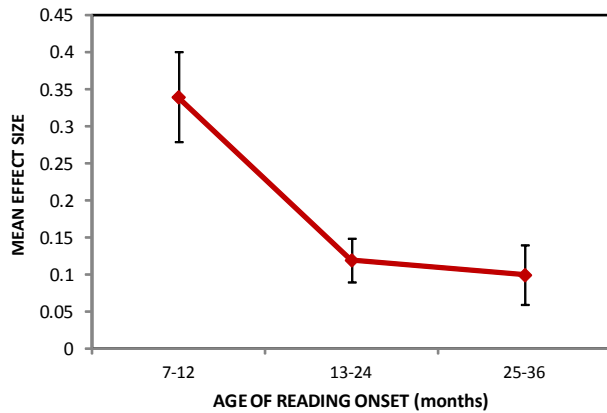


Figure 2. Average effect sizes and 95% confidence intervals for the relationships between age of shared reading onset and the literacy and language outcome measures.

months was significantly related to the study outcomes as evidenced by confidence intervals not including zero.

The outcome measures in the studies were obtained at the same age as the early reading predictors or at some later time. Figure 3 shows the average effect sizes for the relationship between the early reading predictors and whether the outcome measures were obtained concurrently, 12 to 35 months later or 36 or more months later. The results show that the effects of reading to infants and toddlers become larger the later the outcome measures were obtained, indicating that early reading onset is associated with longer term literacy and language benefits.

The extent to which the relationships between the early reading predictors and the literacy and language outcomes were affected by study and participant characteristics were assessed through moderator analyses. Year of study (< 2000 vs. 2000+) and type of publication (unpublished vs. peer reviewed) were the two study variables examined. The two participant variables examined were child condition (typi-

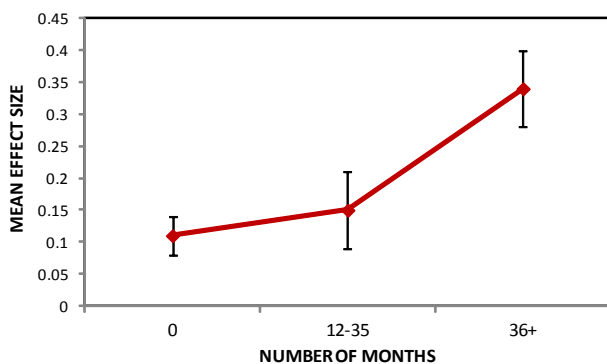


Figure 3. Average effect sizes and 95% confidence intervals for the relationships between the early reading predictors and whether the outcome measures were obtained concurrently, 12 to 35 months later or 36 or more months later than the early reading measures.

cal vs. at-risk) and ethnicity (mixed vs. non-mixed). The results are shown in Table 1. The relationships between the early reading predictors and the study outcomes were all statistically significant regardless of the moderators as evidenced by confidence intervals not including zero. There were, however, between contrast group differences for 3 of the 4 moderators (Year of publication, type of publication, child condition). The average effect sizes were 2 to 3 times larger for studies completed before 2000, non-peer reviewed studies, and for studies of typically developing children.

Discussion

Findings reported in the *CELLreview* indicate that there is empirical support for the contention that “it is never too early to begin reading to infants and toddlers.” Age of onset of reading to very young children was associated with differences in the study participants early literacy and language development: The younger the children were read to, the better were their literacy and language skills. The sizes of effect were, however, small to medium in nearly all the analyses. The frequency of early reading onset also was related to the literacy and language outcomes, albeit not as strongly as the age of onset of reading.

One limitation of this meta-analysis was the inability to code and analyze the characteristics of the reading experiences afforded the children which are known to affect children’s early literacy and language development (e.g., Trivette, Dunst, & Gorman, 2010). This was the case, to a large degree, because too little information about the reading experiences afforded the study participants was included in the primary studies which precluded more in depth analysis. There is certainly a need for better designed and implemented studies to identify the types of reading experiences and the conditions under which they are afforded infants and toddlers to identify the kinds of reading opportunities that are best suited for very young children.

Implications for Practice

Notwithstanding the limited information about the characteristics of reading experiences afforded to infants and toddlers, recommendations about how to engage very young children in shared reading abound (e.g., Haas & Haas, 2000; HighReach Learning, 2005; Zeece & Churchill, 2001). (A Google search for *reading to infants and toddlers* identified more than 37,000,000 sources of information including “tips for reading to infants and toddlers.”) The recommendations, suggestions, and “tips” offered by early reading experts tend to emphasize the same kinds of practices: Reading with enthusiasm, responsiveness to children’s attempts to engage in looking at and playing with books, reading stories that include rhythms and rhymes, following children’s interests, repeated reading of children’s favorite

Table 1

Moderators of the Relationships Between the Onset of Shared Reading and the Literacy and Language Outcomes

Moderators	Number of Effect Sizes	Average Effect Size	95% Confidence Interval
<i>Study Characteristics</i>			
Year of Publication			
1993-1999	18	.25	.20-.29
2000-2008	20	.11	.09-.13
Type of Publication			
Peer Reviewed	36	.14	.12-.16
Non-Peer Reviewed	2	.30	.12-.48
<i>Child Characteristics</i>			
Condition			
Typical	21	.27	.23-.31
At-Risk	17	.10	.08-.13
Ethnicity			
Mixed	13	.10	.08-.13
Non-mixed	12	.15	.10-.21

stories and rhymes, and engaging children in reading episodes just long enough to maintain engagement.

The many different CELL practice guides (www.earlyliteracylearning.org) for reading to infants and toddlers incorporate these recommendations as well as characteristics identified in other *CELL* reviews as important for early literacy and language development (e.g., Dunst, Jones, Johnson, Raab, & Hamby, 2011; Dunst, Meter, & Hamby, 2011; Trivette et al., 2010). Learning to engage in reading experiences that are pleasurable is made easier when those experiences are fun, enjoyable, and interesting to infants and toddlers, and which actively engage the children in the reading experiences as they become increasingly enthralled by books and stories.

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Authors

Carl J. Dunst, Ph.D., is Co-Director and Research Scientist at the Orelena Hawks Puckett Institute, Asheville and Morganton, North Carolina. and Co-Principal Investigator of the Center for Early Literacy Learning (CELL). Andrew Simkus, B.S., is a Research Assistant at the Puckett Institute, and Deborah W. Hamby, M.P.H., is a Research Analyst at the Puckett Institute.

Appendix A

Background Characteristics of the Study Participants

Study	Sample Size	Child Age (Months)		Child Gender		Child		Child Condition
		Mean	Range	Male	Female	Ethnicity	Percent	
Burgess (1997, 2002)	97	60	48-70	48	49	NR	NR	Typical
Burns (2002)	59	41 ^a	29-52	NR	NR	NR	NR	At-risk
Crain-Thoreson & Dale (1992)	25	24	NR	9	16	NR	NR	Typical
Debaryshe (1993)	41	26	21-30	17	24	Caucasian	100	Typical
Duursma et al. (2008) (Time 1)	191	24	NR	98	93	Caucasian African American Latino	51 27 18	At-risk
Duursma et al. (2008) (Time 2)	268	36	NR	138	130	Caucasian African American Latino	61 30 5	At-risk
Farver et al. (2006)	122	45	39-49	57	65	Latino	100	At-risk
Lee (1993)	40	48	NR	NR	NR	NR	NR	Typical
Lyytinen et al. (1998)	108	14	NR	62	46	Finnish	100	Typical
Payne et al. (1994)	236	54	45-65	130	106	Caucasian African American Latino Asian American	50 42 6 2	At-risk
Raikes et al. (2006) (Time 1) (Sample 1)	932	14	NR	475	457	Caucasian African American Latino Other Not Reported	48 38 6 5 3	At-risk
Raikes et al. (2006) (Time 2) (Sample 1)	906	24	NR	462	444	Caucasian African American Latino Other Not Reported	48 38 6 5 3	At-risk
Raikes et al. (2006) (Time 3) (Sample 1)	770	36	NR	393	377	Caucasian African American Latino Other Not Reported	48 38 6 5 3	At-risk
Raikes et al. (2006) (Time 3) (Sample 2)	108	36	NR	55	53	Latino	100	At-risk
Senchal et al. (1996) (Study 2)	117	52	40-69	63	54	NR	NR	Typical

^a Median.

NR = Not reported.

Appendix B

Type of Research Designs and Comparisons Between the Independent and Dependent Measures

Study	Type of Design	Age of Onset of Reading (Months)		Child Measures	
		Mean	Range	Reading	Outcome
Burgess (1997, 2002)	Correlation	7	0-18	Child's age at onset of shared reading	Literacy Expressive Language Receptive Language
Burns (2002)	Correlation	41	29-52	Frequency of mothers reading to their child during infancy	Receptive Language
Crain-Thoreson & Dale (1992)	Correlation	24	– ^a	Frequency of parents reading to their child during infancy	Literacy Expressive Language Receptive Language
Debaryshe (1993)	Correlation	26	21-30	Child's age at onset of shared reading	Expressive Language Receptive Language
Duursma et al. (2008) (Time 1)	Correlation	24	– ^a	Frequency of fathers reading to their child	Expressive Language Receptive Language
Duursma et al. (2008) (Time 2)	Correlation	36	– ^a	Frequency of fathers reading to their child	Expressive Language Receptive Language
Farver et al. (2006)	Correlation	13	0-48	Child's age at onset of shared reading	Literacy Receptive Language
Lee (1993)	Correlation	12	1-36	Frequency of parents reading to their child during infancy	Literacy
Lyytinen et al. (1998)	Correlation	14	12-17	Child's age at onset of shared reading	Expressive Language Receptive Language
Payne et al. (1994)	Correlation	<30	NR	Child's age at onset of shared reading	Expressive Language Receptive Language
Raikes et al. (2006) (Time 1)	Correlation	14	– ^a	Frequency of mothers reading daily to their child	Expressive Language Receptive Language
Raikes et al. (2006) (Time 2)	Correlation	24	– ^a	Frequency of mothers reading daily to their child	Expressive Language Receptive Language
Raikes et al. (2006) (Time 3)	Correlation	36	– ^a	Frequency of mothers reading daily to their child	Expressive Language Receptive Language
Raikes et al. (2006) (Time 3) (Spanish Speaking)	Correlation	36	– ^a	Frequency of mothers reading daily to their child	Expressive Language Receptive Language
Senechal et al. (1996) (Study 2)	Correlation	11	0-48	Child's age at onset of shared reading	Literacy/Expressive/ Receptive Language

^a All children were assessed at the same age.

Appendix C

Effect Sizes for the Relationship Between the Predictor Measures and the Study Outcomes

Study	Predictor	Type of Measure	Outcome Measure	Child Age (Months)	Correlation Effect Size
Burgess (1997, 2002)	Age	Rhyme oddity detection task and alliteration oddity task (adapted Bryant et al. 1990) blending task and elision task (adapted Wagner et al. 1994)	Composite phonological sensitivity measure	60	0.31
				72	0.47 ^a
		Grammatical subtest of the Illinois Test of Psycholinguistic Abilities (Kirk et al. 1968)	Child's ability to provide grammatically correct word to complete a sentence	60	0.24 ^a
		Grammatical subtest of the Test of Language Development-Primary (Newcomer & Hammill, 1991)	Child's ability to select correct picture out of three choices that corresponds to a sentence spoken by examiner	60	0.22 ^a
Burns (2002)	Frequency	Peabody Picture Vocabulary Test-Revised (Dunn & Dunn, 1981)	Child's ability to point to one of four pictures that shows a particular spoken word	41	0.29
Crain-Thoreson & Dale (1992)	Frequency	Peabody Picture Vocabulary Test-Revised (Dunn & Dunn, 1981)	Child's ability to point to one of four pictures that shows a particular spoken word	24	0.09
		MLU (Miller, 1981)	Child's mean length of utterance	24	0.10
Debaryshe (1993)	Age	Reynell Developmental Language Scales (Reynell & Gruber, 1990)	Child's ability to follow verbal commands involving toys	26	0.39 ^a
			Child's ability to name objects and describe pictures	26	0.33 ^a
Duursma et al. (2008) (Time 1)	Frequency	Bayley Scales of Infant Development (Bayley, 1993)	Composite language score	36	0.16
		Peabody Picture Vocabulary Test-Revised (Dunn & Dunn 1981)	Child's ability to point to one of four pictures that shows a particular spoken word	36	0.05
Duursma et al. (2008) (Time 2)	Frequency	Bayley Scales of Infant Development (Bayley 1993)	Composite language score	36	0.16
		Peabody Picture Vocabulary Test-Revised (Dunn & Dunn 1981)	Child's ability to point to one of four pictures that shows a particular spoken word	36	-0.03
Farver et al. (2006)	Age	Home literacy environment questionnaire (Non-standardized)	Frequencies and types of child literature involvement	45	0.10 ^a
		Peabody Picture Vocabulary Test-Revised or Spanish equivalent Test de Vocabulario en Imagenes Peabody (Dunn et al. 1986)	Child's ability to point to one of four pictures that shows a particular spoken word	45	-0.03 ^a

Appendix C, continued

Study	Predictor	Type of Measure	Outcome Measure	Child Age (Months)	Correlation Effect Size
Lee (1993)	Frequency	Test of Language Development-Primary (Newcomer & Hammill, 1988)	Composite language measure	48	0.31
Lyytinen et al. (1998)	Age	MacArthur Communicative Development Inventories: Words and Gestures (Fenson et al., 1993), adapted into Finnish by Lyytinen et al. (1996)	Child's vocabulary comprehension	14	0.35 ^a
			Child's vocabulary production	14	0.17 ^a
				24	0.12 ^a
			Child's use of suffixes	24	0.04 ^a
			Child's maximum sentence length	24	0.05 ^a
		Bayley Scales of Infant Development (Bayley, 1993)	Combined score of child's ability to name pictures and objects	24	0.02 ^a
Payne et al. (1994)	Age	Peabody Picture Vocabulary Test-Revised (Dunn & Dunn, 1981)	Child's ability to point to one of four pictures in response to spoken words	54	0.23 ^a
		Expressive One Word Picture Vocabulary Test (Gardner, 1981)	Child's ability to correctly name items in pictures	54	0.22 ^a
Raikes et al. (2006) (Time 1)	Frequency	MacArthur Communicative Development Inventories: Words and Gestures (Fenson et al., 1993)	Child's vocabulary comprehension	14	0.17
			Child's vocabulary production	14	0.15
			Bayley Scales of Infant Development (Bayley, 1993)	Combined score of child's ability to name pictures and objects	14
Raikes et al. (2006) (Time 2)	Frequency	MacArthur Communicative Development Inventories: Words and Gestures (Fenson et al. 1993)	Child's vocabulary production	24	0.10
		Bayley Scales of Infant Development (Bayley 1993)	Combined score of child's ability to name pictures and objects	24	0.10