CELLreviews

Relationships Between Inferential Book Reading Strategies and Young Children's Language and Literacy Competence

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The relationships between different types of adult-support inferential book reading strategies and young children's language and literacy competence were examined in 18 studies that included 1134 study participants. van Kleeck's (2006) descriptions of two levels of inferencing and different types of inferential strategies at each level were used to code and analyze the patterns of correlations between the book reading strategies and the child outcomes. Results showed that parents' and teachers' use of different types of inferencing strategies were related to variations in the child outcomes, and that the effects of inferencing were conditioned on the children's ages. Implications for practice are described.

The purpose of the meta-analysis described in this *CELLreview* was to determine the manner in which different types of inferential book reading strategies used by adults were associated with young children's language and literacy behavior and development. van Kleeck and her colleagues describe adult-supported text inferencing as provision of or requests for information that is related to a story which requires a child to "deal with language at varying levels of abstraction" (van Kleeck, Gillam, Hamilton, & McGrath, 1997, p. 1261). This includes, but is not limited to, language not directly stated in a book; language about similarities, differences, and other connections between people and events in a story; language that involves causation or predictions involving events or characters; and provision or requests for abstract meaning or reasoning (van Kleeck, 2006).

According to van Kleeck (2006), there are two different styles of adult book reading; one that involves "literal language [which] refers to information that is perceptually present in the pictures of a book or directly stated in the text" (p. 282), and the other which "corresponds to inferential language because it provides additional information about objects, actions, or events that are not directly available from the perceptual scene of the picture or in the text of a book" (p. 282). She describes two types of literal book reading strategies and two types of inferential book reading strategies. The four styles of book reading differ along a continuum from concrete to abstract use of language in the context of shared book reading (Blank, Rose, & Berlin, 1978a).

According to van Kleeck (2006), the two types of inferential book reading strategies differ in terms of the amount of reasoning, abstraction, or cognitive demand necessary for a child to process the inferential language during shared book reading episodes. The first, which van Kleeck labels Level 3 inferential language, includes "comments or questions somewhat beyond concrete discussion of what is immediately (or has just recently been) perceptually present" (van Kleeck et al., 1997, p. 1266). The second, which van Kleeck labels Level 4 inferential language, includes strategies that involve reasoning about the story being read and includes "utterances [that] pose the highest level of abstraction or representational demand" (van Kleeck et al., 1997, p. 1267).

van Kleeck's (2006) framework for categorizing different types of inferencing strategies was used to develop the different types of inferencing shown in Table 1. The descriptions were used to code the types of book reading inferencing strategies examined in the studies in the meta-analysis where the use of the strategies were correlated with variations in

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Table 1

Definitions of the Characteristics of the Readers Use of Inferential Language During Book Reading Episodes

Type of Inferential Language	Definition
LEVEL 3 STRATEGIES	Includes comments or requests for information about similarities, differences, causes, judgments, etc. that go beyond what is stated in the text of a book (van Kleeck et al., 1997).
Provide or request information	Comments or requests about judgments or evaluation of different aspects of a story (e.g., Bus & Van IJzendoorn, 1997).
Ask open-ended questions	Open-ended questions used to elicit new information that goes beyond what is stated in the text (e.g., Bus & Van IJzendoorn, 1997).
Provide or request elaborations or expansions	Comments or requests that include elaborations or expansions on the story (e.g., Fletcher, Cross, Tanney, Schneider, & Finch, 2008).
Identify similarities or differences	Comments or requests that include similarities or differences between the story and other events or between different parts of the story (e.g., Allison & Watson, 1994).
Relate story to child's experiences	Comments that involve relationships between the story and a child's personal experiences (e.g., Blake, Macdonald, Bayrami, Agosta, & Milian, 2006).
LEVEL 4 STRATEGIES	Comments or requests that go beyond story or actions that require child reasoning (van Kleeck, 2006).
Ask for predictions	Requests for child predictions or inferences about the story (e.g., Hoff-Ginsberg, 1987).
Provide or request decontextualized information	Comments or requests that include definitions, explanations, inferences, etc. that require abstract child judgments (e.g., Sigel & McGillicuddy-DeLisi, 1984).
Provide or request decontextualized explanations	Provide or request abstract explanations of the meaning of the story or how the story relates to decontextualized events (e.g., de Temple, 1995).

children's language and literacy competence. The goal was to identify which inferencing strategies were associated with children's expressive language, receptive language, and literacy competence, and to identify the conditions under which the strategies were most effective.

Search Strategy

Studies were located using *inferential* OR *inferencing* OR *inferenc** OR *decontextualized* OR *decontextualised* OR *disembedded* OR *nonimmediate* OR "*high distancing*" OR "*high cognitive demand*" OR "*cognit* challeng**" AND *language* OR *comprehension* OR *literacy* AND "*story book*" OR "*story-book*" OR "*storybook*" OR "*book reading*" OR "*book-reading*" OR "*story reading*" OR "*story-reading*" OR "*book sharing*" or "*book-sharing*" AND *infant** OR *infancy* OR *toddler* OR *preschool* as search terms. PsychInfo, ERIC, and MEDLINE were searched for studies. These were supplemented by Google Scholar, Scirius, and Google searches as 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 examined to locate additional studies. Studies were included if the majority of children were 6 years of age or younger, and the correlations between one or more of the inferential book reading strategies listed in Table 1 and child language or literacy outcomes were included in the research reports.

Search Results

Twelve studies were located that included data on 18 samples of children. The 18 samples included 1134 study participants. Appendix A shows the background characteristics of the children. The average age of the children was 43 months (Range = 8 to 74 months). The average sample size in the studies was 63 (Range = 18 to 159). Fifty-eight percent of the children were male and 42% were female. Thirteen samples of children were typically developing, three samples were children considered at-risk for socioeconomic reasons, and two samples were children with communication delays or impairments.

Four Level 3 strategies (asking open ended questions, provision or requests for similarities or differences, provision or request for elaborations or expansions, and relating the story to a child's personal experiences) and three Level 4 strategies (provision or requests for decontextualized explanations, provision or requests for decontextualized information, and requests for predictions) were used in the studies. In those instances where two or more inferencing strategies were coded as one practice in the primary research studies, the adult supported book reading practice was assigned to the strategy that best matched what was measured by the study investigators.

The outcome measures in the studies included both standardized and investigator coded measures of expressive

language, receptive language (including comprehension), and different types of literacy-related competencies. The standardized measures included, but were not limited to, the *Peabody Picture Vocabulary Test* (Dunn & Dunn, 1981, 1997), *Woodcock-Johnson Test* (Woodcock, McGrew, & Mather, 2001), *Preschool Language Assessment Instrument* (Blank, Rose, & Berlin, 1978b), *MacArthur Communication Development Inventories* (Fenson et al., 1993), *Test of Early Reading Ability* (Reid, Hresko, & Hammill, 1989), and the *Wechsler Preschool and Primary Scale of Intelligence* (Wechsler, 1967). The investigator-coded child outcome measures included, but were not limited to, mean length of utterance, verbal expression, and emergent reading.

The weighted average correlations between the predictor and child outcome measures were used to estimate the sizes of effect for the inferential book reading strategies. 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 an average effect size differs significantly from zero at the $p < .05$ level (Rosenthal, 1994). A weighted average correlation effect size between 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). The Q_{BET} was used to test for between condition differences (e.g., Level 3 vs. Level 4 inferencing). Q_{BET} is "analogous to the omnibus *F*-test for variations in a one-way ANOVA" (Hedges, 1994, p. 292).

Synthesis Findings

Appendix B shows the inferencing strategies that were used in the studies, the van Kleeck (2006) level of abstrac-tion the strategies represented, the story book reader, the outcome measures used in the studies, the age at which the outcome measures were obtained, and the effect sizes for the relationships between the inferencing strategies and child outcomes. The average effect size for all studies and all strategies combined was .29 (95% CI = .26 - .31), $Z = 20.01$, $p = .0000$, indicating that the use of the inferencing strategies was associated with more positive child language and literacy outcomes.

Table 2 shows the results for the different types of inferencing strategies. The use of each of the different strategies was associated with positive child language and literacy outcomes as evidenced by statistically significant *Z*-tests. The use of open-ended questions and relating the story to a child's personal experiences were the best Level 3 predictors of the child outcomes and the use of provision of or requests for decontextualized explanations was the best Level 4 predictors of the child outcomes.

The outcomes in the studies were categorized as expressive language measures, receptive language (and comprehension) measures, or literacy-related outcome measures. The relationships between the inferencing strategies and these outcomes are shown in Figure 1. The inferential book reading strategies were related to all the outcomes as evidenced by confidence intervals not including zero, although the findings clearly showed that the inferencing strategies were most effective in terms of influencing children's expressive language. The size of effect for the relationship between the inferencing strategies and the expressive language outcomes ($r = .41$, 95% CI = .18 - .27, $Z = 17.99$, $p = .0000$) was twice as large as the effect sizes for either the receptive language ($r = .22$, 95% CI = .18 - .27, $Z = 10.46$, $p = .0000$) or literacy

Table 2

Average Effect Sizes and 95% Confidence Intervals (CI) for the Relationship Between the Inferential Book Reading Strategies and the Child Outcomes

Inferential Strategy	Number		Average Effect Size	95% CI	Z-test	*p*-value
	Studies	Effect Sizes				
Level 3 Strategies						
All Strategies Combined	7	22	0.34	.29 - .39	12.82	.0000
Open-Ended Questions	5	12	0.39	.33 - .46	12.33	.0000
Relatedness	2	4	0.37	.21 - .54	4.45	.0000
Similarities/Elaborations[a]	3	6	0.15	.04 - .26	2.59	.0095
Level 4 Strategies						
All Strategies Combined	12	42	0.26	.23 - .30	15.55	.0000
Decontextualized Explanations	2	7	0.62	.54 - .69	16.20	.0000
Ask for Predictions	3	16	0.26	.19 - .32	8.03	.0000
Decontextualized Information	7	19	0.13	.09 - .18	5.72	.0000

[a]Combination of provision of or requests for similarities and differences and elaborations or expansions.

($r = .15$, 95% CI $= .08 - .22$, $Z = 4.38$, $p = .0000$) child outcome measures.

The children in the studies were divided into two groups, those younger than 48 months of age, and those older than 48 months of age, to determine if the Level 3 and Level 4 inferencing strategies were differentially related to the child outcome measures. The results are shown in Figure 2. There is a clearly discernible interaction between child age and type of inferencing strategy. The Level 3 strategies were more effective than the Level 4 strategies when used with younger children, $Q_{BET} = 14.57$, $df = 1$, $p = .0001$, whereas the Level 3 and 4 strategies were equally effective when used with older children, $Q_{BET} = 0.15$, $df = 1$, $p = .6901$. The results indicate, as would be expected, that the effects of inferencing are an age-related developmental phenomenon (Pillow, Hill, Boyce, & Stein, 2000).

The outcome measures in the studies were obtained at either the same time the Level 3 or Level 4 inferencing strategies were measured or 8 to 30 months after the inferencing strategies were coded. The concurrent and predictive relationships between the inferential book reading strategies and the child outcomes are shown in Figure 3. The average effect sizes were all statistically significant as evidenced by confidence intervals not including zero, although the inferencing strategies were differentially related to the outcomes. There was no difference between the sizes of effects for the Level 3 and Level 4 strategies when measured concurrently with the outcome measures, $Q_{BET} = 1.19$, $df = 1$, $p = .2230$. In contrast, the average effect size for the Level 3 strategies was larger than the average effect size for the Level 4 strategies when the outcomes were obtained eight or more months after the inferencing strategies were measured, $Q_{BET} = 25.15$, $df = 1$, $p = .0000$.

The extent to which the relationships between the inferential book reading strategies and the child outcomes were moderated by year and type of publication, types of outcome measure (standardized vs. nonstandardized), child condition, and intervener are shown in Table 3. The relationships between the inferencing strategies and child outcomes were all statistically significant regardless of the moderator variables as evidenced by Z-tests with p-values equal to .0000. However, as shown in Table 3, there were between subgroup differences for 4 of the 5 moderators, $Q_{BET} = 5.53$ to 110.24, $df = 1$, $p = .0187$ to .0000. The strength of the relationships between the inferencing strategies and the child outcomes were stronger for studies published before 2000, non-peer reviewed studies, studies where the child outcomes were collected as part of the book reading activities (nonstandardized measures), and for studies of typically developing children.

Discussion

Findings from the meta-analysis indicated that adults' use of inferential book reading strategies was associated with variations in young children's language and literacy compe-
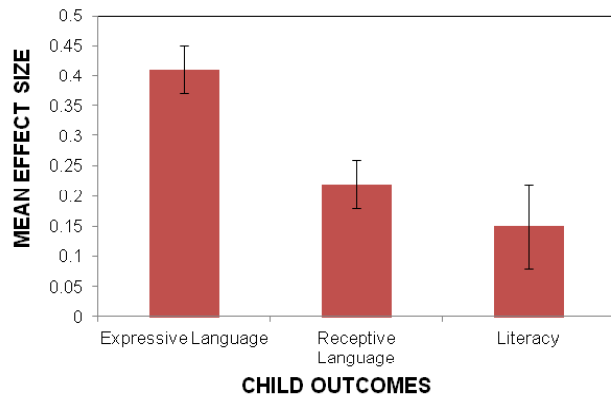

Figure 1. Average effect sizes and 95% confidence intervals for the relationships between the inferential book reading strategies and the child outcome measures.
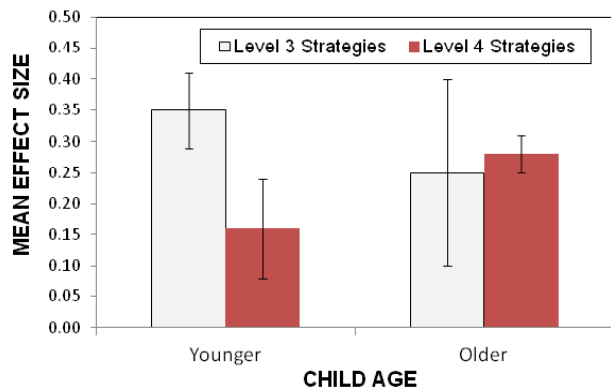

Figure 2. Average effects and 95% confidence intervals for the relationships between the Level 3 and Level 4 inferential book reading strategies and the outcome measures at two different child ages.
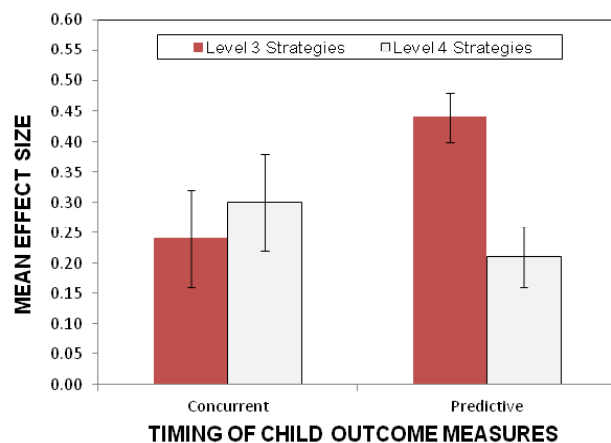

Figure 3. Average effect sizes and 95% confidence intervals for the concurrent and predictive relationships between the inferencing strategies and the child outcomes.

Table 3

Moderators of the Relationships Between the Inferential Book Reading Strategies and the Child Outcomes

Moderators	Number		Average Effect Size	95% CI	Z-test[a]	Q_{BET}	p-value
	Studies	Effect Sizes					
Year of Publication							
1983 - 1999	12	41	0.35	.31 - .38	17.56	19.46	.0000
2000 - 2012	6	23	0.22	.18 - .26	10.57		
Type of Publication							
Peer-Reviewed	15	48	0.25	.21 - .28	15.18	27.11	.0000
Non-Peer Reviewed	13	16	0.42	.36 - .48	14.03		
Outcome Measure							
Standardized	12	38	0.18	.14 - .21	9.96	110.24	.0000
Nonstandardized	8	26	0.49	.44 - .54	20.28		
Child Condition							
Typically Developing	13	51	0.30	.27 - .33	18.76	5.53	.0187
At-Risk/Disability	5	13	0.22	.16 - .28	7.31		
Intervener							
Parent	17	57	0.29	.26 - .32	18.40	1.32	.2506
Teacher	4	7	0.25	.19 - .32	7.95		

[a]All Z-tests are significant at $p = .0000$.

tence. All six of the inferencing strategies that were examined in the synthesis were related to the child outcomes, although certain strategies proved to be better predictors than others. The particular inferencing strategies that had the largest effect sizes were asking children open-ended questions, providing or requesting decontextualized explanations of a story, relating events and persons in the story to a child's personal experiences, and asking children to make predictions about different aspects of a story. The results, taken together, provide support for the contention that inferencing has positive effects on young children's language and literacy development (e.g., Lepola, Lynch, Laakkonen, Silven, & Niemi, 2012; Tompkins, Guo, & Justice, 2012; van Kleeck, 2006).

A particular finding worth noting was the differential effects of low and high level abstraction on younger and older children (Figure 2). Children's ability to process and benefit from inferential story book reading strategies would be expected to be influenced by their developmental status (Gelman, Star, & Flukes, 2002; Pillow et al., 2000; Sodian & Wimmer, 1987), which was exactly what was found in the meta-analysis. Younger children whose cognitive processing abilities were presumably at a lower level benefited more from Level 3 inferencing, whereas older children whose cognitive abilities presumably were higher benefited more from both Level 3 and Level 4 inferencing.

Implications for Practice

The findings have direct implications for practice since any of the inferencing strategies examined in the meta-analysis, as well as those described elsewhere (e.g., Lepola et al., 2012; Tompkins et al., 2012; van Kleeck, 2006, 2008), can easily be incorporated into parent-mediated or teacher-mediated shared book reading activities (e.g., Ezell & Justice, 2005; Justice & Kaderavek, 2002). A number of other *CELLreviews* of adult-child book reading practices (e.g., Dunst, Simkus, & Hamby, 2012; Trivette & Dunst, 2007; Trivette, Dunst, & Gorman, 2010; Trivette, Simkus, Dunst, & Hamby, 2012) include findings which indicate the characteristics of shared reading that are most likely to have optimal child benefits. Two of those characteristics are actively involving a child in story book reading and relating the story to a child's interests and personal experiences. Inferencing strategies are especially amendable to incorporating these characteristics into shared book reading, and in fact are specifically designed to do so.

One caveat needs to be considered when using inferencing strategies to promote young children's language and literacy competence. The particular strategies that are used need to be developmentally appropriate (e.g., Curtis & Carter, 1996; Hansen, 2004; Morrow, 2004). This requires that a child's or children's cognitive capabilities be taken into consideration when choosing which inferencing strategies

are most likely to be effective.

Many of the *CELL* practice guides (www.earlyliteracylearning.org) for encouraging young children to be actively involved in book reading activities could easily be modified to incorporate inferencing strategies into the activities. This seems especially the case for the toddler and preschooler book reading practice guides. The outcomes should be improved child language and literacy competence.

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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	
Allison & Watson (1994)	30	74	68-81	12	18	Caucasian African American	94 6	Typically developing
Blake et al. (2006) (Sample 1)	26	15	14-16	15	11	Caucasian	100	Typically developing
Blake et al. (2006) (Sample 2)	27	27	26-28	14	13	Caucasian African Canadian	97 3	Typically developing
Bus et al. (1997)	92	10	NR	92	0	Caucasian	100	Typically developing
DeTemple (1995)	54	47	42-51	24	30	Caucasian African American Latino	72 22 6	At-risk
Fletcher et al. (2008)	87	24	NR	44	43	African American Latino Other Caucasian	75 11 8 6	At-risk
Hindman et al. (2008)	130	47	34-63	65	65	Caucasian Asian African American Middle Eastern	80 10 5 5	Typically developing
Hindman et al. (2012)	153	40	36-48	91	62	African American Other	99 1	At-risk
McLellan (1998)	45	8	6-12	22	23	African American	100	Typically developing
Minami (1999)	20	54	48-60	10	10	Japanese	100	Typically developing
Reese (1995)	20	40	NR	11	9	Caucasian	100	Typically developing
Shanahan & Hogan (1983)	18	58	NR	NR	NR	Caucasian	100	Typically developing
Sigel & McGillicuddy-Delisi (1984) Study 2 (Sample 1)	60	48	42-53	NR	NR	NR	NR	Communication impairment
Sigel & McGillicuddy-Delisi (1984) Study 2 (Sample 2)	60	48	43-53	NR	NR	NR	NR	Typically developing
Sigel & McGillicuddy-Delisi (1984) Study 3 (Sample 1)	60	62	58-68	NR	NR	NR	NR	Communication impairment
Sigel & McGillicuddy-Delisi (1984) Study 3 (Sample 2)	60	62	56-67	NR	NR	NR	NR	Typically developing
van Kleeck et al. (1997)	27	44	42-49	18	9	NR	NR	Typically developing
Zucker (2010)	159	52	41-60	88	71	African American Caucasian Multi-racial Latino Asian	44 40 9 4 3	Typically developing

NR = Not Reported.
[a]Median.

Appendix B

Types of Inferential Language and Effect Sizes for the Relationships with the Child Outcomes

Study	Type of Inferential Language	Van Kleeck Classification of Abstraction	Reader	Mean Age at Measure	Child's Outcome	Pearson's r
Allison & Watson (1994)	Similarities/differences	3	Parent	74	Emergent reading level	0.12
	Similarities/differences	3	Teacher	74	Emergent reading level	0.41
Blake et al. (2006) (Sample 1)	Open-ended questions	3	Parent	15	Number of words produced (VOC)	0.09
				15	Mean length of utterance (MLU)	0.33
	Relatedness	3	Parent	15	Number of words produced (VOC)	0.19
				15	Mean length of utterance (MLU)	0.49
Blake et al. (2006) (Sample 2)	Open-ended questions	3	Parent	27	Number of words produced (VOC)	0.39
				27	Mean length of utterance (MLU)	0.29
	Relatedness	3	Parent	27	Number of words produced (VOC)	0.42
				27	Mean length of utterance (MLU)	0.32
Bus et al. (1997)	Open-ended questions	3	Parent	18	Child commenting frequency	0.28
				18	Child initiating frequency	0.16
				18	Child labeling frequency	0.62
DeTemple (1995)	Decontextualized explanations	4	Mother	67	Receptive vocabulary score (PPVT)	0.32
				67	Story comprehension score	0.35
				67	Emergent literacy score	0.33
				67	Superordinates task score	0.44
Fletcher et al. (2008)	Open-ended questions	3	Parent	24	Receptive language score (CDI)	0.30
				24	Expressive language score (CDI)	0.24
	Elaborations/expansions	3	Parent	24	Receptive language score (CDI)	0.04
				24	Expressive language score (CDI)	0.09
Hindman et al. (2008)	Decontextualized information	4	Parent	47	Letter-Word score (WJ-III)	0.02
				55	Letter-Word score (WJ-III)	0.06
				47	Picture-Vocabulary score (WJ-III)	0.07
				55	Picture-Vocabulary score (WJ-III)	0.08
	Decontextualized information	4	Teacher	47	Letter-Word score (WJ-III)	0.18
				55	Letter-Word score (WJ-III)	0.27
				47	Picture-Vocabulary score (WJ-III)	0.16
				55	Picture-Vocabulary score (WJ-III)	0.30
Hindman et al. (2012)	Decontextualized information	4	Teacher	40	Picture-Vocabulary score (WJ-III)	0.15
McLellan (1998)	Predictions/inferences	4	Mother	24	TERA score	-0.02
				24	Receptive language score (CELF)	0.09
				24	Expressive language score (CELF)	-0.04
	Predictions/inferences	4	Mother	36	TERA score	0.04
				36	Receptive language score (CELF)	0.07
				36	Expressive language score (CELF)	0.14
	Predictions/inferences	4	Mother	48	TERA score	0.11
				48	Receptive language score (CELF)	0.17
				48	Expressive language score (CELF)	0.29

Appendix B, continued

Study	Type of Inferential Language	Van Kleeck Classification of Abstraction	Reader	Mean Age at Measure	Child's Outcome	Pearson's r
Minami (1999)	Decontextualized explanations	4	Mother	54	Child's utterances	0.66
				54	Child's contextual language	0.07
				54	Child's noncontextual language	0.87
Reese (1995)	Predictions/inferences	4	Mother	70	Print Concepts score (CAP)	0.44
				70	Receptive vocabulary score (PPVT)	0.38
				70	Story comprehension score	0.46
				70	Story retelling score	0.26
				70	Story production score	-0.06
Shanahan & Hogan (1983)	Open-ended questions	3	Parent	58	Print awareness score (CAP)	0.23
	Open-ended questions	3	Parent	58	Print awareness score (CAP)	0.22
Sigel& McGillicuddy-Delisi (1984) Study 2 (Sample 1)	Decontextualized information	4	Mother	48	Verbal score (WPPSI)	0.29
	Decontextualized information	4	Father	48	Verbal score (WPPSI)	0.35
Sigel& McGillicuddy-Delisi (1984) Study 2 (Sample 2)	Decontextualized information	4	Mother	48	Verbal score (WPPSI)	-0.07
	Decontextualized information	4	Father	48	Verbal score (WPPSI)	-0.01
Sigel& McGillicuddy-Delisi (1984) Study 3 (Sample 1)	Decontextualized information	4	Mother	72	Receptive vocabulary score (PPVT)	-0.05
	Decontextualized information	4	Father	72	Receptive vocabulary score (PPVT)	0.06
Sigel& McGillicuddy-Delisi (1984) Study 3 (Sample 2)	Decontextualized information	4	Mother	72	Receptive vocabulary score (PPVT)	0.01
	Decontextualized information	4	Father	72	Receptive vocabulary score (PPVT)	-0.17
van Kleeck et al. (1997)	Similarities/differences	3	Parent	56	Level 3 gain score (PLAI)	0.19
				56	Level 4 gain score (PLAI)	0.26
	Decontextualized information	4	Parent	56	Level 3 gain score (PLAI)	0.28
				56	Level 4 gain score (PLAI)	0.41
Zucker et al. (2010)	Predictions/inferences	4	Teacher	52	Expressive vocabulary score (CELF)	0.41
				52	Receptive vocabulary score (PPVT)	0.36