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Review article

The Effects of Home Literacy Environment on Children's Reading Comprehension Development: A Meta-analysis

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Abstract

A rich home literacy environment (HLE) fosters students' academic achievement. However, the link between HLE and children's reading comprehension is unclear. This study examined the effects of HLE factors on children's reading comprehension through a meta-analysis of 59 studies conducted between 1998 and 2018. Results of the meta-analysis indicated three main findings. First, the overall positive correlation between HLE and children's reading comprehension was moderate ($z = .32$). Second, sampling area, type of home literacy resource and parental involvement styles did not show a significant interaction effect between each HLE factor and children's reading comprehension. Third, parents' involvement and literacy expectations of children had a significantly higher correlation with children's reading comprehension than home literacy resources did. Findings of this study suggest that parental literacy activities involvement and parental literacy expectations contribute more to children's literacy knowledge enhancement.

Keywords

Home literacy environment • reading comprehension • meta-analysis

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Home literacy environment (HLE) refers to literacy activities or the availability of literacy resources at home which can be used to facilitate children's literacy development (Puglisi, Hulme, Hamilton, & Snowling, 2017). HLE plays a vital role in children's complex cognitive and academic performance development (Ciping, Silinskas, Wei, & Georgiou, 2015; Gottfried, Schlackman, Gottfried, & Boutin-Martinez, 2015; Tichnor-Wagner, Garwood, Bratsch-Hines, & Vernon-Feagans, 2016; Van Bergen, Zuijen, Bishop, & Jong, 2017). Past studies confirm the importance of HLE to the cultivation of children's reading abilities (e.g., Liu, Georgiou, & Manolitsis, 2018; Sénéchal & LeFevre, 2014; Van Bergen et al., 2017). In addition, empirical research shows that four key HLE factors contribute to children's reading development. These are: (i) parental literacy beliefs (PLB), also referring to parental expectations of children's performance; (ii) parental education years at school (PEY), also called parental education level; (iii) parental literacy involvement in their children's activities (PLI); and (iv) home literacy resources (HLR; Duursma et al., 2007; Inoue, Georgiou, Parrila, & Kirby, 2018; Leseman & Jong, 1998; Puglisi et al., 2017; Sénéchal, 2006; Weigel, Martin, & Bennett, 2006). However, the majority of studies that examined HLE effects on children's reading comprehension development focused on specific HLE only, included a range of grade levels, or used various types of parental activity measures (e.g., Howard et al., 2014; Skwarchuk, Sowinski, & LeFevre, 2014; Tichnor-Wagner et al., 2016; Yeung & King, 2016). Thus, the relative contributions of HLE factors (PLB, PEY, PLI, and HLR) to reading comprehension across grades remain unclear.

Home Literacy Environment and Reading Comprehension

Parental literacy belief refers to parents' wishes, goals or desires which enhance their children's reading comprehension performance through literacy knowledge acquisition. Previous studies report that PLB enhanced children's reading performance through intrinsic motivation enhancement (Englund, Luckner, Whaley, & Egeland, 2004; Whitehurst & Lonigan, 1998), but generate inconsistent results on the effect of PLB on children's reading performance. For example, Whitehurst and Lonigan (1998) found that the effect size of the correlation between PLB and reading comprehension was small, while Weigel et al. (2006) reported a moderate correlation between PLB and reading comprehension. Conversely, Stephenson, Parrila, Georgiou, and Kirby (2008) reported a significant correlation between PLB and reading comprehension.

Parental education years at school refer to the duration of education that parents received in their school learning period. Past studies showed a positive relationship between parents' education level and children's reading comprehension achievement (Dearing, Kreider, Simpkins, & Weiss, 2006; Hindman, Skibbe, Miller, & Zimmerman, 2010). However, they also found a range in correlation from low to high between PEY and children's reading comprehension. For example, Curenton and Justice (2008) reported that PEY had a moderate correlation with reading comprehension, while Manolitsis, Georgiou, and Parrila (2011) reported that the correlation between PEY and reading comprehension was large.

Parental literacy involvement in their children's activities refers to literacy activities in which parental behaviors interact with children's literacy learning. The major benefit of PLI on literacy acquisition is that children can receive knowledge through the interaction with their parents (Johnson, Martin, Brooks-Gunn, & Petrill, 2008; Sénéchal, 2006). Johnson et al. (2008) reported a moderate relationship between PLI and reading comprehension. However, Sénéchal (2006) argued for a stronger relationship between PLI and reading comprehension. The inconsistent findings may be due to the two distinct approaches to defining PLI. The first approach focuses on parents teaching children (parental-teaching-centered) literacy knowledge directly, which included parental literacy knowledge transfer such as literacy acquisition strategy teaching, and literacy knowledge teaching (Martini & Sénéchal, 2012; Silinskas et al., 2012). The second is

an indirect teaching (children-learning-centered) approach for children's literacy knowledge acquisition, such as shared reading, parents encouraging children's learn literacy knowledge through questions and answers, or feedback on students' literacy learning performance (Sénéchal & LeFevre, 2014; Strasser & Lissi, 2009). In order to reconcile the inconsistencies, we examine whether these two approaches moderate the correlation between PLI and reading comprehension in this study.

Home literacy resources refer to literacy equipment (e.g., TV or radio), literacy materials (e.g., story books, CD) and literacy language environment which are available at home for children's literacy knowledge development. The number of HLR categories and the amount of HLR available at home are two important factors which contribute to children's literacy knowledge development (Johnson et al., 2008; Strasser & Lissi, 2009). Previous studies showed different results between HLR and children's reading comprehension performance. For example, Johnson's team (2008) reported a relatively weak correlation between PLI and reading comprehension. However, Leseman and De Jong (1998) demonstrated a moderate correlation between them. There are two types of HLR - tangible resources vs. intangible resources. Tangible resources mainly refer to the hardware materials (e.g., TV, CD, and literacy books) which are available at times and children can determine whether they need them. The intangible resources refer to the forms of support given by family members (e.g., parental language habit at home, and parental language ability). As these two types of HLR may have differential effects on children's learning, we examine their effects as a potential moderator in the relationship between HLR and reading comprehension.

Moderators. HLE studies mainly draw on the information-transfer theory application (Dearing et al., 2006; Hindman et al., 2010; McCoach, O'Connell, Reis, & Levitt, 2006). This is when parents move their literacy knowledge which contains meaningful information to children through home-relevant literacy activities interaction. To demonstrate this, Inoue et al. (2018) constructed a longitudinal association model between parental home teaching and children's literacy skills, which evinced that parental teaching could impact children's reading performance from kindergarten to later school age. HLE might have different effects on children's reading comprehension at different grades, therefore, children's level of grade is considered as a potential moderator. Finally, children's learning growth model in home effect studies showed that the home environment is a key factor predicting children's reading comprehension in various sampling areas (Ciping et al., 2015; Niklas & Schneider, 2013). Therefore, sampling area is examined as a potential moderator.

Past Meta-analysis Research on Home Literacy Environment

A few meta-analysis studies examined HLE effects on children's learning. They focused on two main areas. First, they reported the HLE effect on children's overall academic performance. For example, Castro et al. (2015) reported that parental supervision of students' academic learning enhances students' academic performance. Second, they mainly examined the HLE intervention effect size on students' academic performance (Manz, Hughes, Barnabas, Bracaliello, & Ginsburg-Block, 2010; Sénéchal & Young, 2008; Van Steensel, McElvany, Kurvers, & Herppich, 2011). For example, Manz et al. (2010) conducted a meta-analysis to investigate the family-based emergent literacy intervention in low-income, non-English-speaking and ethnic minority groups. In another meta-analysis, Sénéchal (2006) selected 16 intervention studies to evaluate the effect of parent-child reading activities on children's reading performance, reporting the positive effect of parents' involvement. However, little is known about the relative effects of specific HLE factors on reading comprehension across grades.

The Present Research

This review systematically examines the relationship between HLE and children's reading comprehension and extends previous literature in several ways. First, this study synthesizes the overall correlation between HLE and children's reading comprehension. Second, it reports and compares the correlation between specific HLE factors and children's reading comprehension. Last, the effects of potential moderators (e.g., grade, sampling area, HLR type, parental involvement styles) on the correlation between HLE and children's reading comprehension are analyzed.

Methods

Literature Search

Following the guidance of *PRISMA*, we replicated the search procedure from relevant studies in reading academic research (e.g., Mol & Bus, 2011). We tried to include all potential materials (journal articles, dissertations, book chapters) from the following popular databases - PsycINFO, ERIC, Pro-Quest Dissertations and Theses databases - which included almost all high-quality academic resources in the reading field. We set up two search groups for key words. The first group of words related to HLE (HLE*, home literacy practice*, home literacy activity*, shared reading*, book reading*, shared reading*, home language*, parental education*, parental involvement*, parent-child interaction*, family literacy*, home reading*, and parental contribution*). The second group of keywords related to reading comprehension (reading comprehension*, reading performance*, reading skill*, reading ability*, passage comprehension*, paragraph comprehension*, phrase comprehension*, terms comprehension*, and sentence comprehension*). Studies were limited to those conducted in a 20-year range, from 1 January 1998 to 31 December 2018, and the initial search yielded 718 articles.

Inclusion and Exclusion Criteria

We first ensured the quality of all materials based on their inclusion in peer-reviewed journals in the database in order to meet the research standards (e.g., Van Steensel et al., 2011). Second, we read the abstract and methodology of each article and discarded those that incorporated the following (exclusion) criteria: (i) participants were not primary school or junior secondary grades' students, because the language rapid development period will be the end at around grade 9 (García & Cain, 2014), (ii) non-empirical studies, (iii) single case research, (iv) no correlation was tested between HLE and text reading, and (v) participants had disabilities that would impact their learning (e.g., people with brain lesions, deafness).

Next, the remaining articles had to meet the following inclusion criteria for inclusion in our review: (i) information on HLE had been collected, (ii) participants were students (Tichnor-Wagner et al., 2016; Van Bergen et al., 2017), (iii) the measurement provided information which could be used to calculate the effect size between children's reading comprehension performance and HLE effect, and (iv) the correlation indicators included correlation r and sample size which could be transformed into a Fisher's z effect size. There were no restrictions regarding research design or on participants' first language or country, as long as the article did not report a case study and was written in English, French, Dutch, or German. All articles, dissertations, and conference contributions were retrieved before January 2019.

Last, each study only provided at least one effect size in one category – PLB, PEY, PLI, or HLR. If the findings of the same sample were published in different papers, we included the one which was published

with the highest impact factors (Mol & Bus, 2011). As a result, a total of 59 studies met all the inclusion criteria.

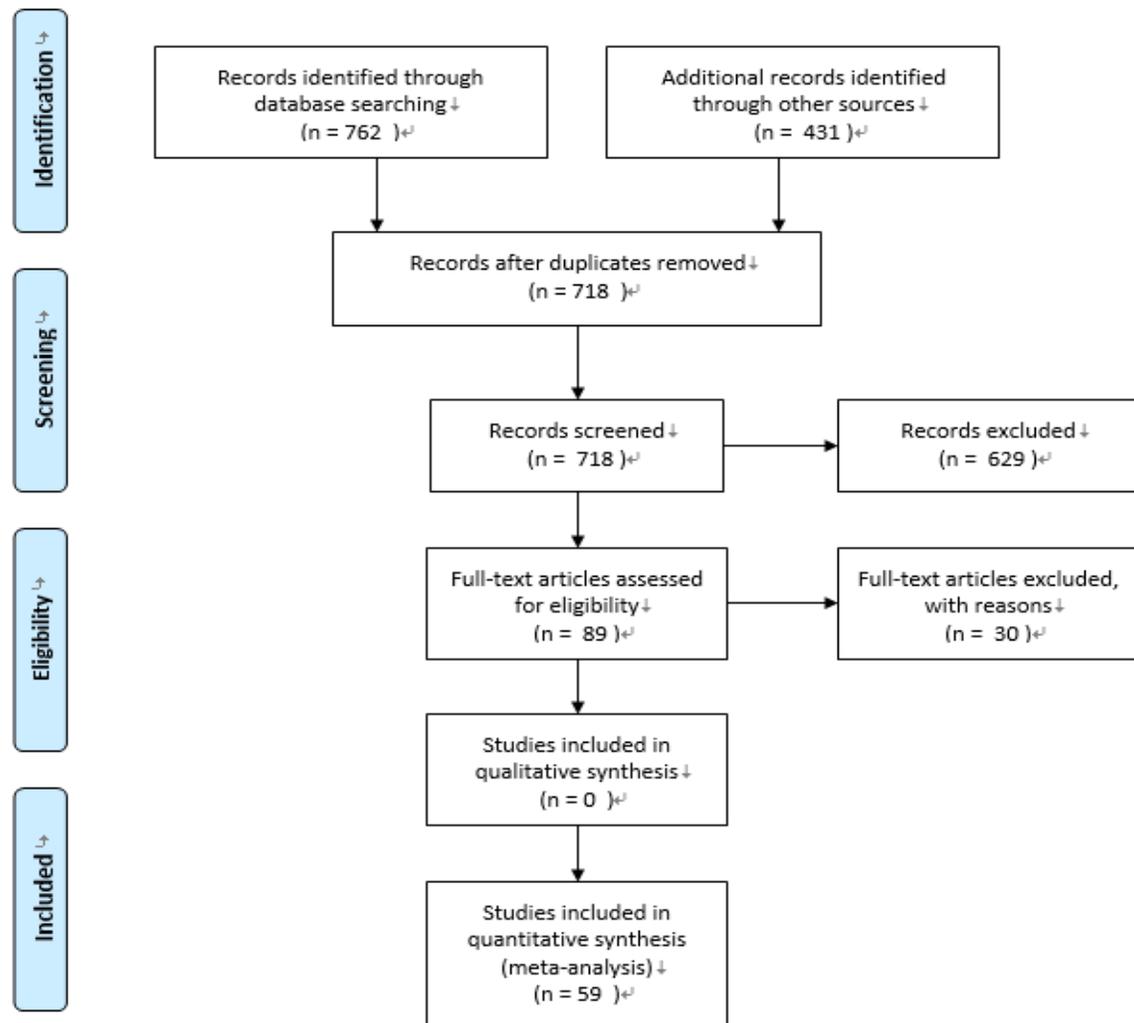


Figure 1. Flow diagram

Coding

We coded studies according to sampling characteristics, the characteristics of the assessments used to measure HLE and reading comprehension and basic information (e.g., publication time, and first author's name). If the information which was used for effect size estimation was insufficient, we contacted the corresponding author of the original materials for the missing information. In addition to these variables, we coded the number of participants used to obtain each correlation. If one study provided more than one available effect size, the robust analysis was applied (Tanner-Smith, Tipton, & Polanin, 2016), ensuring that each study only included effect size in its analysis. The coding system for individual studies is given in Table 1.

Table 1. Moderators and outcomes for meta-analysis

First Author & year	Area	Grade ^a	Sample size	Language ^b	HLE		PLB		PEY		PLI		HLR	
					overall		z	SE	z	SE	z	SE	z	SE
Levy (2006)	Canada	L	474	E	.30	0.05					.30	0.05		
Deckner (2006)	USA	K	55	E	.40	0.14								
Deckner (2006)	USA	K+L	55	E	.59	0.14								
Whitehurst (1998)	USA	M	230	E	.14	0.07	.14	0.07						
Englund (2004)	USA	M	187	E	.27	0.07	.29	0.07	.26	0.07	.24	0.07		
Englund (2004)	USA	K	187	E	.32	0.07	.33	0.07	.28	0.07	.34	0.07		
Bennett (2002)	USA	K	143	E	.44	0.08								
Curenton (2008)	USA	K	45	E	.33	0.15	.33	0.15	.32	0.15				
Sénéchal (2014)	Canada	K	110	E	.22	0.10	.29	0.10	.20	0.10	.23	0.10		
Sénéchal (2014)	Canada	L	110	E	.27	0.10	.33	0.10	.27	0.10	.21	0.10		
Sénéchal (2014)	Canada	M	110	E	.26	0.10	.23	0.10	.28	0.10				
Aram (2005)	Israeli	M	38	Arabic	.40	0.17			.40	0.17				
Weigel (2006)	USA	K	85	E	.35	0.11	.33	0.11	.31	0.11				
Poe (2004)	UK	L	77	E	.38	0.12			.29	0.12				
Sénéchal (1998)	Canada	L	58	E	.37	0.13					.37	0.13		
Laakso (1999)	Finland	L	111	E	.33	0.10					.33	0.10		
Weigel (2005)	USA	K	85	E	.35	0.11	.33	0.11	.31	0.11				
Stephenson (2008)	USA	L	61	E	.31	0.13	.52	0.13						
Stephenson (2008)	USA	K	61	E	.33	0.13	.50	0.13						
Taboada (2009)	USA	H	205	E	.32	0.07								
Strasser (2009)	USA	L	188	E	.27	0.07					.27	0.07		
Leseman (2007)	Netherlands	K	68	D	.40	0.12								
Carlson (2012)	USA	H	3,104	E	.35	0.02								
Niklas (2013)	Germany	L	921	German	.31	0.03								
Leseman (1998)	Netherlands	L	89	T+D	.31	0.11							.28	0.11
Leseman (1998)	Netherlands	L	47	D	.28	0.15							.28	0.15
De Jong (2001)	Netherlands	M	69	D	.38	0.12								
Martini (2012)	Canada	L	108	E	.38	0.10	.39	0.10			.37	0.10		
Reese (2000)	USA	H	66	E	.31	0.13								

Bingham (2007)	USA	K	60	E	.31	0.13							
Aram (2002)	Israeli	L	41	Arabic	.32	0.16							
Froiland (2013)	USA	K+L	551	S	.42	0.04		.30	0.04				
Johnson (2008)	USA	L	455	E	.15	0.05				.15	0.05	.15	0.05
Altschul (2011)	Mexico	H	1,609	S	.30	0.02						.27	0.02
Sénéchal (2002)	Canada	L	93	E	.32	0.11				.32	0.11		
Sénéchal (2002)	Canada	M	45	E	.33	0.15				.33	0.15		
Christian (1998)	USA	L	538	E	.37	0.04		.29	0.04				
Cottone (2012)	USA	K	92	E	.33	0.11	.33	0.11					
Jordan (2000)	USA	K	248	E	.31	0.06							
Sawyer (2014)	USA	K	119	E	.24	0.09		.28	0.09	.21	0.09		
Burgess (2002)	USA	K	115	E	.41	0.09							
Rashid (2005)	USA	L	65	E	.44	0.13		.26	0.13				
Manolitsis (2011)	Greece	H	70	Greek	.38	0.12		.47	0.12	.29	0.12		
Gest (2004)	USA	K	76	E	.32	0.12		.34	0.12	.29	0.12		
Laakso (1999)	Finland	K	128	F	.31	0.09				.31	0.09		
Verhoeven (2006)	Netherlands	H	2,424	D	.33	0.02				.33	0.02		
Sénéchal (2006)	France	L	90	French	.31	0.11		.22	0.11	.40	0.11		
Sénéchal (2006)	France	H	90	French	.29	0.11		.26	0.11	.33	0.11		
Dickinson (2003)	UK	K	533	E	.22	0.04		.22	0.04				
Aram (2013)	Israeli	L	88	Arabic	.27	0.11				.27	0.11		
Korat (2009)	Jewish	L	88	Hebrew	.37	0.11		.42	0.11	.31	0.11		
Rodriguez (2009)	US	K	1,046	E	.33	0.03				.26	0.03	.18	0.03
Silinskas (2012)	Finland	L	684	F	.28	0.04		.20	0.04	.35	0.04		
Silinskas (2012)	Finland	L	752	F	.27	0.04		.20	0.04	.32	0.04		
Davis-Kean (2005)	USA	M+H	868	E	.34	0.03	.35	0.03	.40	0.03	.29	0.03	
Yeo (2014)	Singapore	L	193	Chinese + Malays	.39	0.07				.30	0.07		
Hamilton (2016)	UK	L	72	E	.32	0.12				.32	0.12		
Hamilton (2016)	UK	L	116	E	.28	0.09				.28	0.09		
Lindgren (2013)	Spain	H	734	S	.32	0.04		.20	0.04				

Note. ^a K = year 3 of kindergarten and grade 1 of primary school, L = grade 2 to grade 3 of primary school, M = grade 4 of primary school, H = grade 5 to grade 6 of primary school; ^b S = Spanish, E = English, T = Turkish, F = Finnish, D = Dutch.

Any difference in coding result was discussed until agreement was achieved. We coded (i) year of publication, (ii) first author's name, (iii) the sampling characteristic (area, grade, language, sample size), and (iv) HLE factors (overall HLE and four factors: PLB, PEY, PLI, and HLR). We recorded the strength of the correlation between HLE and reading comprehension to avoid interpretative problems, because the current study only investigates the strength of the correlation between HLE and reading comprehension (García & Cain, 2014).

Overview of Studies

We used 59 studies in the meta-analysis representing a total of 19,230 participants. The majority of studies used a correlational design. We included studies with different types of methods employed to analyze relationships between variables, such as structural equation modeling, regression equations, factor analysis, and latent variable studies. There were two longitudinal studies and a few experimental/instructional studies.

Meta-analysis Procedures

The Comprehensive Meta-Analysis 3.0 software was used for effect size (Fisher's z) calculation. Fisher's z is a constant effect size and the distribution followed asymmetry (Borenstein, Hedges, Higgins, & Rothstein, 2009). We used Fisher's z for further analyses. Regarding the results, .10, .31 and .55 were usually interpreted as small, moderate, and large effect sizes, respectively (Borenstein et al., 2009).

Because reading comprehension has several outcome domains (text level, paragraph level, and sentence level), the final effect size came from the robust analysis to ensure that each HLE factor only has one reading comprehension outcome domain if a test provided more than one outcome domain (Mol & Bus, 2011). The overall effect size came from the cluster weighting analysis from PLB, PEY, PLI and HLR (Hedges, Tipton, & Johnson, 2010).

Regarding point estimation, we applied the random-effects model from a conservative perspective (Borenstein et al., 2009). The point estimation was regarded to be significant if the 95% confidence interval (95% *CI*) did not cross zero (Pigott, 2012). The minimum number of studies for meta-analysis is four.

For point estimation comparison, we cross-compared the four HLE factors in the following steps: $Teta = \text{Fisher's } z_1 - \text{Fisher's } z_2$, $Beta = \sqrt{\text{Variance } z_1 + \text{Variance } z_2}$, $Diff = Teta/Beta$, if $|Diff| \geq 1.96$. From this, we can interpret whether the difference between the two effect sizes is significant (Borenstein et al., 2009).

To assure the quality of the current meta-analysis, we took Rosenthal's fail-safe number for publication bias test checking, which reflects how many missing studies with non-significant results would need to be added to lead to non-significant overall findings (Borenstein et al., 2009). We also used funnel plots to check whether there were studies with Fisher's z beyond 2.5 standard deviations, in order to address the potential impact of publication bias.

Results

Descriptive Analysis

From the forest plot examination (see Figure 2 to Figure 5), all the integrated random effect sizes for the correlation between HLE and children's reading comprehension were significant ($p < .05$), and the confidence interval for each effect size did not cross zero.

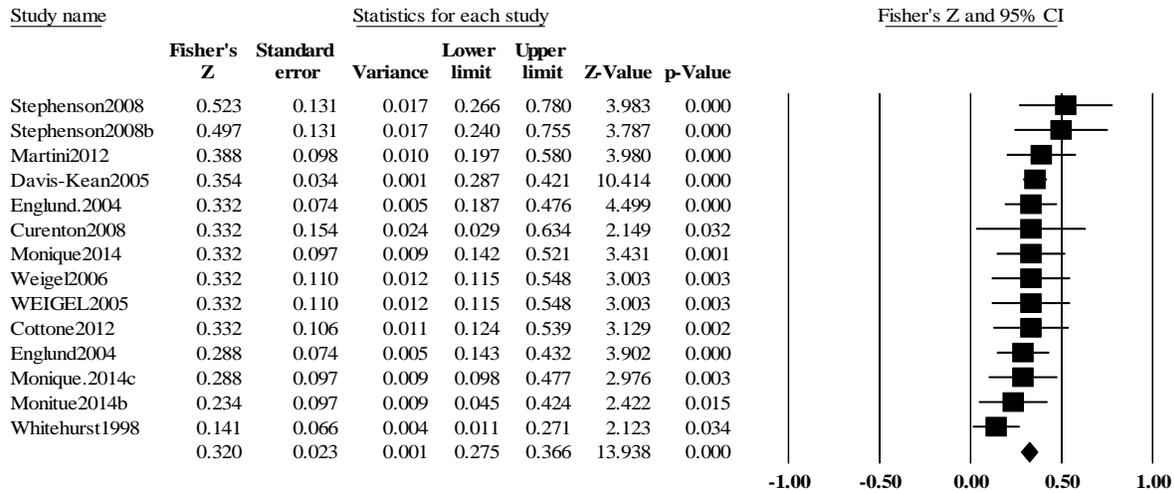


Figure 2. Forest plot of parental literacy beliefs

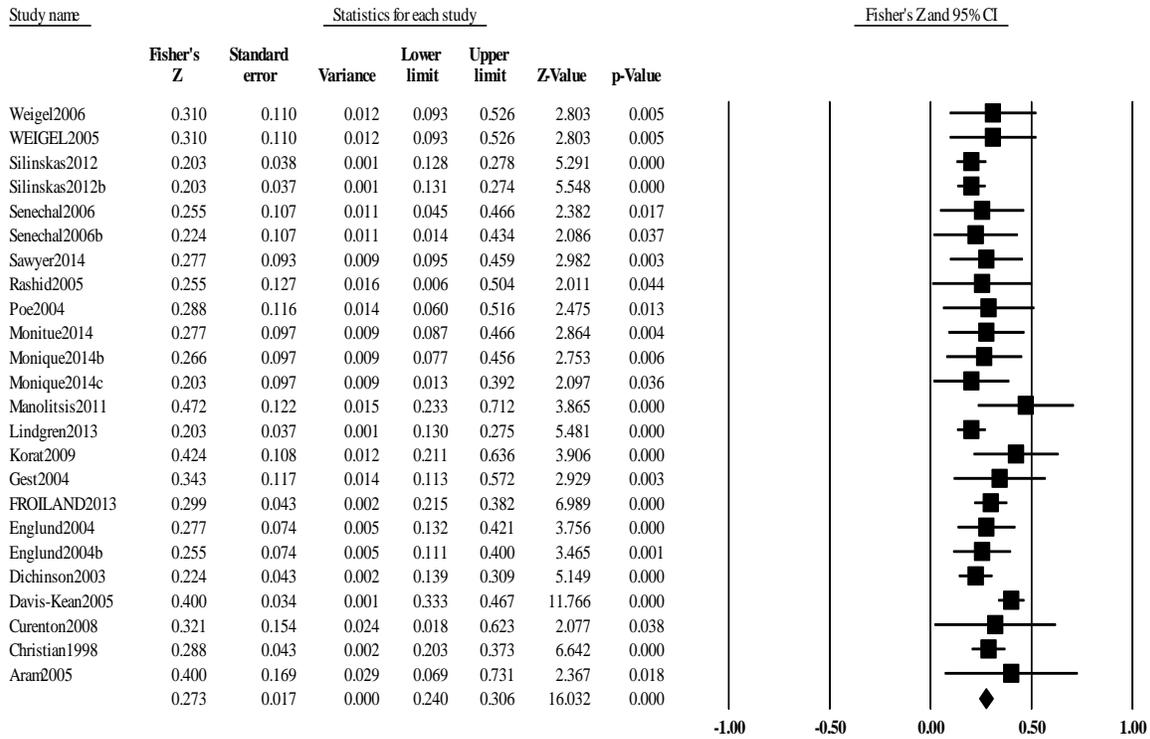


Figure 3. Forest plot of parental education years at school

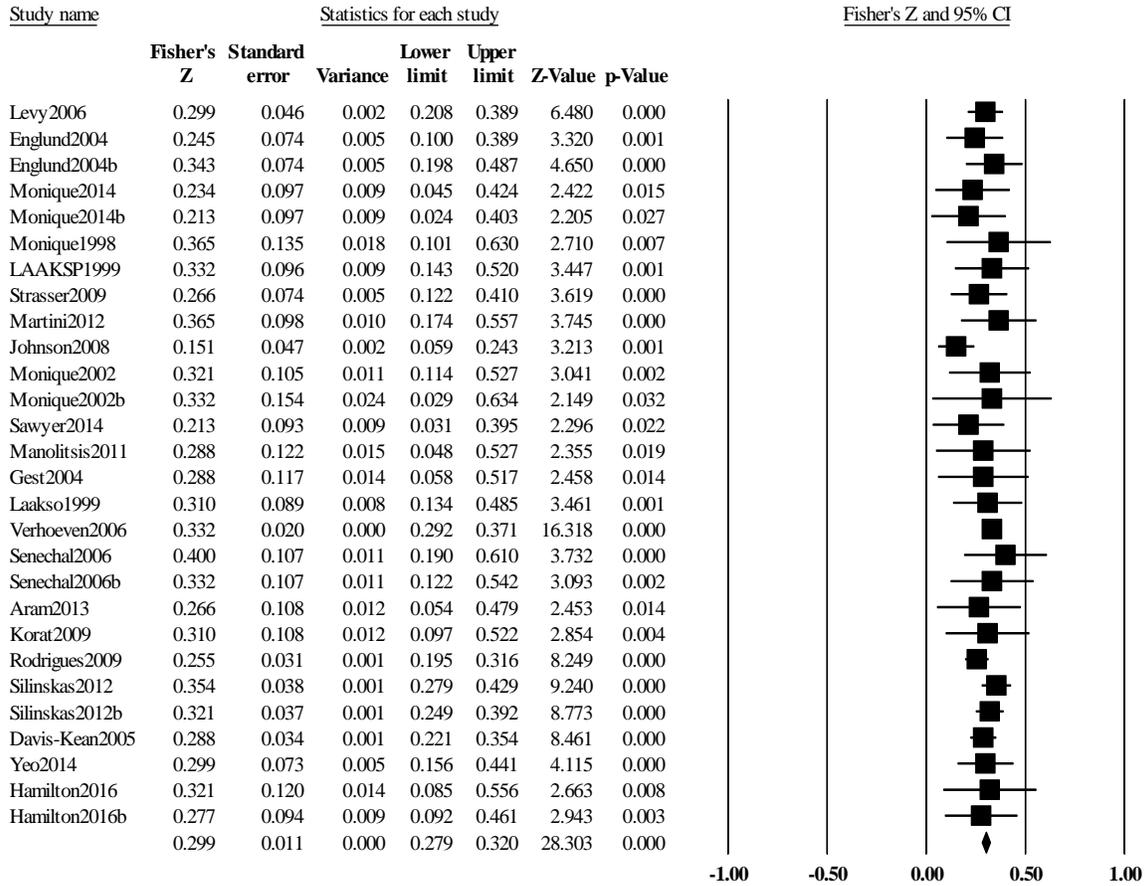


Figure 4. Forest plot of parental literacy involvement

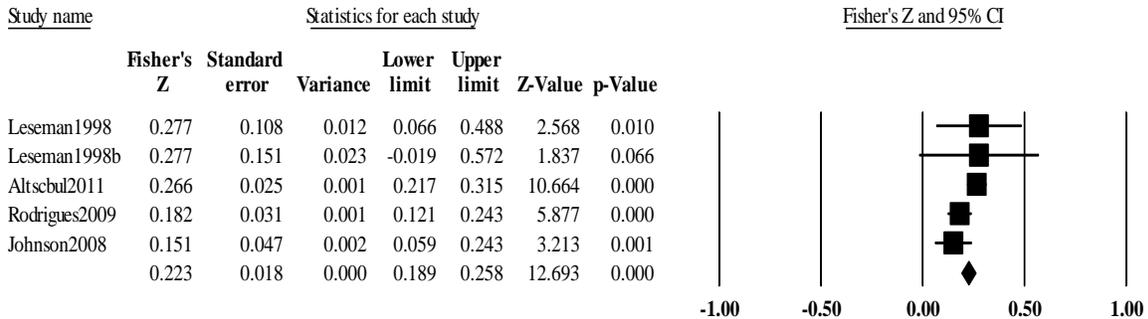


Figure 5. Forest plot of home literacy resources

Table 1 shows the detail information of our selected studies. Thirty studies ($N = 10,630$) reported the overall correlation between HLE and reading comprehension, 14 studies ($N = 2,329$) reported the correlation between PLB and reading comprehension, 24 studies ($N = 6,290$) reported the correlation between PEY and reading comprehension, 28 studies ($N = 9,030$) reported the correlation between PLI and reading comprehension, and five studies ($N = 3,246$) reported the correlation between HLR and reading comprehension.

Effects of Home Literacy Factors on Children's Reading Comprehension

Table 2 shows the effect size between HLE factors and children's reading comprehension. The effect size of overall HLE, PLB, PEY, PLI, and HLR were examined. The result showed that first, all HLE and HLE factors had positive correlations with children's reading comprehension, which means the higher HLE or HLE scores related to higher children's reading comprehension performance. Second, except for the HLR effect size which was small ($z = .21$), overall HLE ($z = .32$) and other HLE factors ($z_{PLB} = .32$; $z_{PEY} = .27$; $z_{PLI} = .30$) had moderate effect sizes with children's reading comprehension. From the results, each HLE factor's correlation was not significantly interacted by moderators ($I^2_{PLB} = 8.09$, $Q_{PLB} = 56.12$, $p_{PLB} > .05$; $I^2_{PEY} = 30.38$, $Q_{PEY} = 33.04$, $p_{PEY} > .05$; $I^2_{PLI} < .001$, $Q_{PLI} = 22.27$, $p_{PLI} > .10$; $I^2_{HLR} = 46.31$, $Q_{HLR} = 7.45$, $p_{HLR} > .05$). Moreover, all potential moderators played insignificant roles in moderating the correlation between HLE factor and children's reading comprehension (grade, sampling area, HLR type, parental literacy activities involvement approach). We further compared the correlation effect size between each HLE factor. The results showed significant differences between PLB and HLR (Diff = 2.35, $p < .05$), and between PLI and HLR (Diff = 2.54, $p < .05$).

Table 2. Meta-analysis on the correlations between home literacy environment and reading comprehension

HLE	k	N	Fisher's		Q	I ²	N fail safe	Diff
			z	95%CI				
Overall	59	19,230	.32	[.31, .33]	56.12	<.001	9,609	Diff (PLB & PEY) = 1.30,
PLB	14	2,339	.32	[.28, .37]	14.14	8.09	712	Diff (PLB & PLI) = 0.63,
PEY	24	6,290	.27	[.24, .31]	33.04	30.38	2,301	Diff (PLB & HLR) =
PLI	28	9,030	.30	[.28, .32]	22.27	<.001	4,005	2.35,
HLR	5	3,246	.21	[.16, .27]	7.45	46.31	147	Diff (PEY & PLI) = 1.31,
								Diff (PEY & HLR) = 1.61,
								Diff (PLI & HLR) = 2.54

Note. *** $p < .001$; PLB = parental beliefs on children's performance, PEY = parental received education years from school, PLI = parental involvement on literacy activities, HLR = home literacy resources.

Regarding publication bias examination, the Rosenthal's fail-safe number was 9,609. Figure 6 shows that selected materials had a symmetrical distribution, which means that the overall effect size between HLE and children's reading comprehension did not have a significant bias. The Rosenthal's fail-safe number was 712. Figure 7 shows that the selected materials had a symmetrical distribution, which means that the correlation effect size between PLB and children's reading comprehension did not have a significant bias. The Rosenthal's fail-safe number was 2,301.

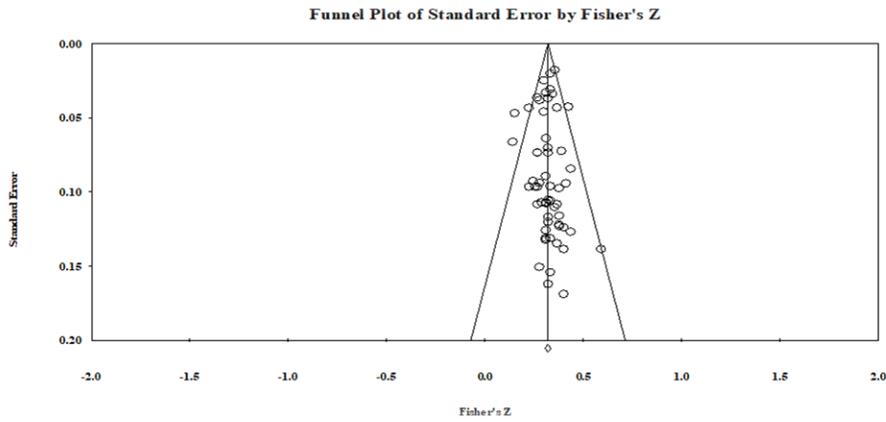


Figure 6. Overall effect size funnel plot

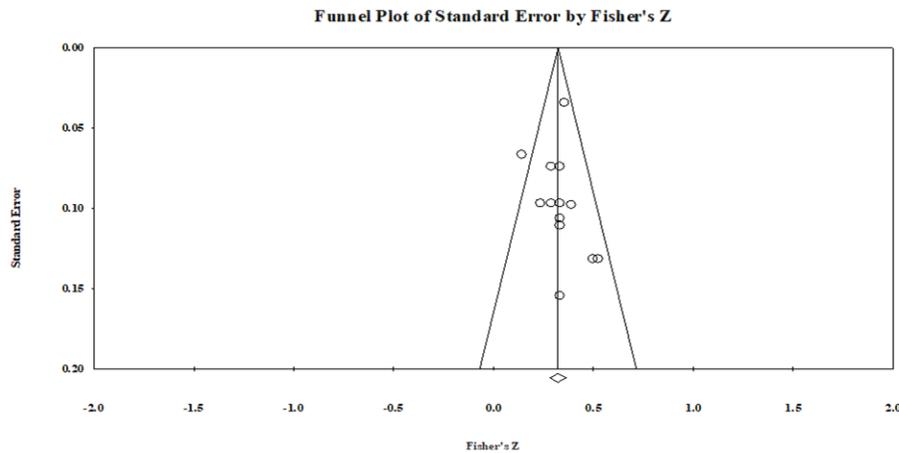


Figure 7. Parental literacy beliefs effect size funnel plot

Figure 8 shows that selected materials had a symmetrical distribution, which means that the correlation effect size between PEY and children's reading comprehension did not have a significant bias. The Rosenthal's fail-safe number was 4,005. Figure 9 shows that selected materials had a symmetrical distribution, which means that the correlation effect size between PLI and children's reading comprehension did not have a significant bias. The Rosenthal's fail-safe number was 147. Figure 10 shows that selected materials had a symmetrical distribution, which means that the correlation effect size between HLR and children's reading comprehension did not have a significant bias.

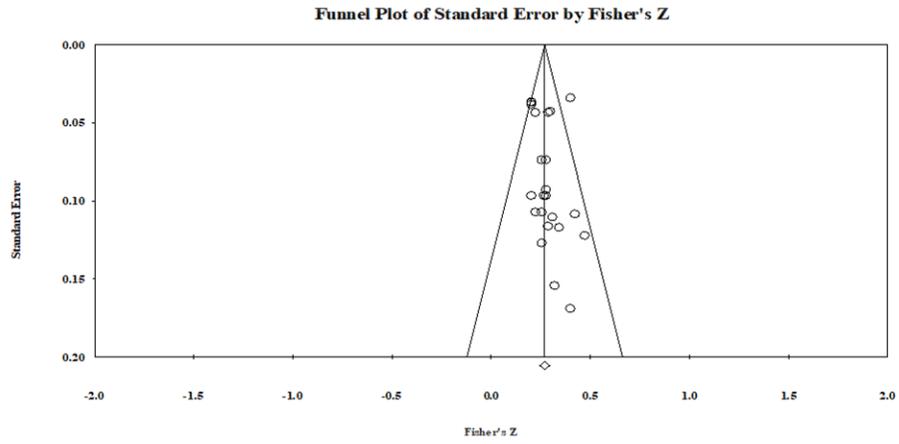


Figure 8. Parental education years effect size funnel plot

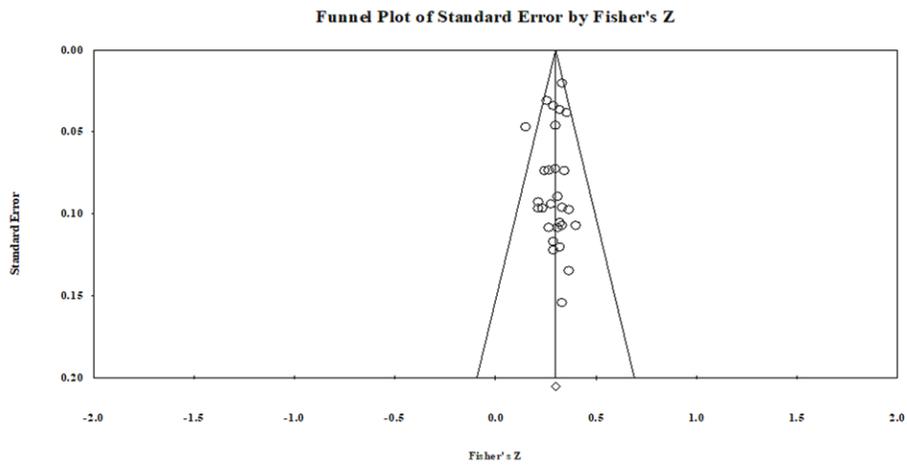


Figure 9. Parental literacy involvement effect size funnel plot

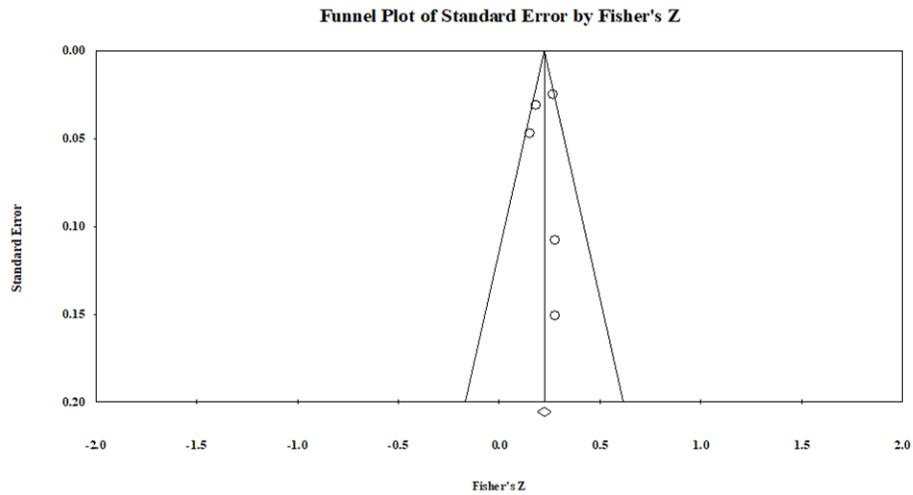


Figure 10. Home literacy resources effect size funnel plot

Discussion

This study examined the relative effects of HLE and HLE factors on children's reading comprehension. There were several major findings. First, the overall effect size was around .30, showing a positive moderate correlation between HLE factors and children's reading comprehension. Second, PEY and HLR showed similar effect sizes on children's reading comprehension, which means that PLY and HLR had a similar positive correlation with children's reading comprehension. Also, the effect size of PLB and PLI had a similar positive correlation with children's reading comprehension. However, PLI and PLB had significantly higher effect sizes than HLR did. Last, none of the potential moderators (grade, sampling area, HLR types, and parental activities involvement approach) showed significant effects in the relationships between HLE and reading comprehension. Consistent with the information transfer theory (Dearing, et al., 2006), our findings suggest that children's reading comprehension was impacted more by PLI than by HLR, which means that PLI had a significantly more positive relationship with children's reading comprehension than HLR had.

Differential Effect of Home Literacy Environment Factors on Children's Reading Comprehension

The effect of PLB on students' reading comprehension development found in this study is different from that in Castro et al. (2015) research. We found that the synthesis correlation was at a moderate level, and there is no strong positive association between students' reading performance and PLB. Conversely, Castro et al. found a strong relationship. The different results may be due to the different academic outcomes focused on. Castro et al. selected various academic achievement outcomes as dependent variables, while reading accounted for fewer than 2% of these achievement outcomes. PLB could impact the children's learning motivation. In the case of achievement in science subjects as selected by Castro et al. (more than 84% of the achievement indicators), higher motivation could secure higher grades for early schoolers. For reading comprehension, however, the determining factors are much more complex than for science subjects. For example, two key factors in reading - decoding ability and linguistic comprehension - had closer relations with reading comprehension than motivation had. Both decoding ability and linguistic comprehension knowledge acquisition require longer for foundation knowledge construction, which may not increase much through motivation training in a short time period. Therefore, those science subject outcome factors may result in a higher correlation between children's performance and parental expectations.

Nevertheless, we found that the PLB effect on children's reading comprehension is the same as those found in other reading studies (Jeynes, 2007; Thompson, Alexander & Entwisle, 1988; Yamamoto & Holloway, 2010). PLB contributed to the children's academic achievement through and within family social capital (Hao & Bonstead-Bruns, 1998). More specifically, parents can foster positive relationships on literacy knowledge acquisition with their children, providing more opportunities for literacy activities interaction, encouragement, or emotional support regarding children's literacy knowledge acquisition. This positive literacy relationship between parents and children is more likely to achieve agreement on literacy expectations, thereby enhancing children's academic achievement. In the case of reading comprehension, another explanation is that parental expectation enhances children's reading motivation and reading interest cultivation (Seyfried & Chung, 2002; Yamamoto & Holloway, 2010). Zhan's (2006) survey showed that parental expectation is closely correlated with parental supervision in students' learning performance. The reason for this could be that the parental effect is very similar to PLI.

PLI and PLB showed similar effect sizes. The results supported that the interaction between parents and children is an effective way for knowledge transfer (Hoover-Dempsey & Sandler, 2005). PLI could

construct a parental role in students' education and raise positive awareness among children in self-efficacy learning. PLI in response to children's different reading knowledge and comprehension task performance levels could take place through parental knowledge reinforcement (Griffith, 1996; Hoover-Dempsey & Sandler, 2005).

PEY has a moderate effect size on reading comprehension and the effect size was similar in each grade group. The result supported the hypothesis of the information transfer theory that parents obtaining more knowledge could achieve a better transfer effect on their children's knowledge learning (Sénéchal & Young, 2008; Van Steensel et al., 2011). Meanwhile, the effect of PEY on reading comprehension might be indirect. Its impact may be through other parental-children interaction activities (e.g., parental teaching behavior).

HLR had the similar effect size with PEY. We considered that the effect of HLR on children's reading comprehension might also be an indirect effect. We found that HLR only contributed effectively to reading comprehension when the available resources were properly applied for use with literacy activities.

There are several limitations of the current study. First, the limitation of different measurements/operationalization of variables across studies needs to be mentioned. Studies operationalized and measured variables differently, which can make interpretations from meta-analyses complicated. For example, some studies operationalized parental education as a high school graduation status, whereas other studies gave more nuanced information about specific grade-level attainment. Regarding measures of reading comprehension, some studies focused more on word decoding, while others focused more on fluency. Second, we did not include studies with participants with physical disabilities. Third, due to the limited number of total studies relating to each reading comprehension level's measurement (sentence level, paragraph level, and passage level), we only reported the average effect size to reflect the correlation between HLE factors and reading comprehension. Last, the current study only synthesized the relationships between HLE and reading comprehension. In future studies, researchers could examine the correlations of HLE and other reading skills in greater depth.

We derived our conclusions from the combined results of 59 studies which represented 19,230 participants. To summarize, this meta-analysis has confirmed a positive moderate correlation between HLE and children's reading comprehension. These results supported the information transfer theory on parental teaching effect, where all literacy knowledge could be transferred from parents to children through home literacy activities. In addition, we found an independent correlation between HLE factors and reading comprehension which means it was not significantly impacted by selected moderators (grade, sampling area, HLR type, and parental involvement styles). The comparison analysis showed that the effect sizes of PLB and PLI were significantly higher than that of HLR. Findings of this study suggest that parental literacy activities involvement and parental literacy expectations contribute more to children's literacy knowledge enhancement.

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