
**Title Registration for a Systematic Review:
Preschool Predictors of Later Reading
Comprehension Ability: A Systematic Review**
**Hanne Næss Hjetland, Ellen Brinchmann, Solveig-Alma
Halaas Lyster, Bente Eriksen Hagtvet, Monica Melby-Lervåg**

Submitted to the Coordinating Group of:

<input type="checkbox"/>	Crime and Justice
<input checked="" type="checkbox"/>	Education
	<input type="checkbox"/> Disability
<input type="checkbox"/>	International Development
	<input type="checkbox"/> Nutrition
<input type="checkbox"/>	Social Welfare
<input type="checkbox"/>	Other:

Plans to co-register:

<input checked="" type="checkbox"/>	No		
<input type="checkbox"/>	Yes	<input type="checkbox"/> Cochrane	<input type="checkbox"/> Other
<input type="checkbox"/>	Maybe		

Date Submitted: 19 November 2013

Date Revision Submitted: 01 February 2014

Approval Date: 09 March 2014

Publication Date: 02 May 2014

TITLE OF THE REVIEW

Preschool Predictors of Later Reading Comprehension Ability: A Systematic Review

BACKGROUND

In today's technical and knowledge driven society, it is paramount to be able to read well enough to acquire school-related knowledge and—later in life—to obtain and maintain a job. Longitudinal studies that follow typical children's language and reading skills over time can contribute to our knowledge about children's development. In addition, these studies may also tell us something about the correlation between language skills in preschool and later reading ability. Such findings are of practical significance, as they have direct implications for how to best prepare children for later reading instruction from an early age.

The purpose and goal of reading instruction in school is fluent reading with comprehension. Reading comprehension is a process whereby the child visually recognizes a specific combination of letters as a recognizable word and retrieves the name and meaning behind it from memory (Vellutino, 2003). To be able to understand a written text, the child must read with enough fluency, i.e., accuracy and speed, to allow the processing of words and sentences in the limited time the information is sustained in memory.

The simple view of reading

Gough and Tunmer (1986) describe a "simple view of reading" where there are two equally important abilities needed in order to comprehend what is read: decoding and linguistic comprehension. Comprehension and decoding are two distinct processes that are both necessary, simultaneously affect each other, and are dependent on each other in order for positive reading development (Bloom & Lahey, 1978). It is important to note that this "simple view" does not deny that abilities such as phonemic awareness, vocabulary knowledge, or orthographic awareness are important to reading; rather, it suggests that they are sub-skills of either decoding or language comprehension (Connors, 2009).

To be precise concerning the terminology we use, by decoding we mean accuracy and fluency of decoding of single words. The term linguistic comprehension refers broadly, in this context, to expressive and receptive vocabulary, listening comprehension, and oral cloze. We acknowledge that these are capabilities embodying slightly different skills, as well as measured by different tests, but still they all belong within term linguistic comprehension.

In order to comprehend what one reads, it is essential to know what the decoded words mean. Vocabulary is the one dimension of language that correlates the strongest with reading comprehension and has been the focus of much research (Biemiller, 2003; Dickinson & Tabors, 2001; Ouellette, 2006; Walley, Metsala, & Garlock, 2003). A child's early vocabulary predicts later reading development and especially reading comprehension

development (Biemiller, 2003, 2006; Lervåg & Aukrust, 2010; National Reading Panel, 2000). A child's vocabulary consists of the words the child is familiar with in the language. The large contribution of vocabulary to reading development emphasizes the need for studies with a special focus on vocabulary and reading comprehension development. While there is support for this strong connection, there is still uncertainty as to how decoding and vocabulary interrelate to reading comprehension (Ouellette, 2006).

Augmented simple view of reading

While there is support for the “the simple view of reading,” there are also researchers who argue the need for a third component in the equation (Chen & Vellutino, 1997; Conners, 2009; Hoover & Gough, 1990). Longitudinal studies provide support for an augmented model (Geva & Farnia, 2012; Johnston & Kirby, 2006; Oakhill & Cain, 2012). The argument derives from the remaining variation in reading ability that can't be explained within the simple model. There are a number of dimensions other than decoding and linguistic comprehension that may have a significant impact on one's reading ability. In general, the model is augmented by the inclusion of cognitive skills such as naming speed, working memory, and meta-cognitive strategies. These cognitive processes make significant contributions to reading comprehension beyond word reading and linguistic comprehension.

Text comprehension is a complex task that draws on many different cognitive skills and processes (Cain, Oakhill, & Bryant, 2004). Broad language skills are hence paramount to good reading comprehension (Carroll, 2011). The language and cognitive components that are considered to be of special importance for this—and thus also predictors of reading comprehension development—are for instance, grammar, working memory, use of background knowledge, processes that include inference making, and monitoring processes related to comprehension (Burgoyne, Burgoyne, Whiteley, & Hutchinson, 2011; Cain, Oakhill, & Bryant, 2000; Cain et al., 2004).

As previously noted, higher-level language and cognitive processes have also proven their contribution in explaining the variance and impact on reading comprehension. Cain and Oakhill (1998) report findings that suggest that good inference-making ability is not the product of reading comprehension; it is rather more likely that inference-making skills facilitate comprehension development. In a longitudinal study by Cain et al. (2004), working memory and component skills of comprehension predicted unique variance in reading comprehension.

The augmented view of reading suggests that there needs to be a wider perspective on reading development, whilst exploring the impact and longitudinal contribution that different language and cognitive processes have towards obtaining good reading comprehension. While there is a relatively well-documented understanding of the different language skills underlying children's ability to learn to read, there is still a need for further research to both support and challenge findings in other comparable studies.

Systematic reviews that explore the findings across an array of studies from different countries and hence also languages contribute to a broader picture of the coherence of this relationship. In the meta-analysis performed by the National Early Literacy Panel (2008), the early literacy or precursor literacy skills related to oral language measures of grammar, definitional vocabulary, and listening comprehension were generally significantly stronger predictors than were measures of vocabulary. The results from this meta-analysis must be interpreted with the knowledge that the outcome measure (reading comprehension) was measured in kindergarten and preschool. It is common to think that vocabulary plays a bigger influence in reading comprehension later after the initial alphabetical code is cracked, and the child reads with more fluency. This, together with the otherwise mentioned studies, supports the need for more research on the topic of what language and cognitive processing abilities that have a high correlation to later reading development.

OBJECTIVES

The objective for this systematic review is to summarize the best available research on the correlation between preschool predictors related to reading and later reading comprehension ability.

The review aims to answer the following questions:

- 1) What is the magnitude of the correlation between linguistic comprehension skills in preschool and later reading comprehension abilities?
- 2) To what extent do phonological awareness, rapid naming, and letter knowledge correlate with later decoding and reading comprehension skills? Do these variables contribute uniquely to reading comprehension after linguistic comprehension skills in preschool have been taken into account?
- 3) To what extent does working memory in preschool correlate with later reading comprehension abilities, and does this have an impact beyond linguistic comprehension skills?
- 4) To what degree do other possible influential variables (e.g., age, test types) contribute to explaining any observed differences between the included studies?

EXISTING REVIEWS

Our review will differ from the prior reviews on several important aspects:

While there are novel analyses planned for the current study, there are certain elements that will be comparable to the abovementioned reviews. The systematic reviews conducted by the National Early Literacy Panel (2008), and García and Cain (2013), included published studies retrieved from searches done in the two databases: PsycINFO and the Educational Resources Information Center (ERIC). Additionally, supplementary studies stemmed from, for instance, hand searches of relevant journals, and reference checks of past literature reviews were utilized in the NELP (2008) review. The same databases are expected to be used in this study. In keeping with the guidelines of a Campbell review, our review must also include a systematic search for unpublished reports (to avoid publication bias). This is a strength to this present study that isn't utilized in the other two reviews. They included only studies published in refereed journals.

In addition, the NELP (2008) review team coded the following early literacy skills or precursor literacy skills: alphabetic knowledge, phonological awareness, rapid automatized naming (letters or digits, as well as, objects or colors), writing or writing name, phonological memory, concepts about print, print knowledge, reading readiness, oral language, visual processing, performance IQ, and arithmetic. The outcome variables in that meta-analysis were decoding, reading comprehension, and spelling. In this current meta-analysis, we will have a special focus on linguistic comprehension, and the predictor variables will be: decoding, phonological awareness, letter knowledge, naming speed, inference skills, syntax, working memory, and nonverbal intelligence. The review by García and Cain (2013) has assessed the relationship between decoding and reading comprehension, and has restricted their review to include these measures.

One aspect in which our review will differ from the García and Cain (2013) review is that they studied the concurrent relationships between the included variables, i.e., the measures used to calculate the correlations were taken at the same time point. Our review will assess the longitudinal correlational relationships between the predictor variables in preschool and reading comprehension at school-age after reading instruction has begun.

Additionally, the NELP (2008) review only reported on reading comprehension in kindergarten and preschool, while our review will examine reading comprehension measured during formal schooling. If the included studies report on a number of reading comprehension timepoints in school, the last one will be preferred. Reading development measured during the early reading development is largely dependent on their decoding skills (Hoover & Gough, 1990; Lervåg & Aukrust, 2010). Later, after this process has become more automatized and fluent, there is more leeway to study other influential factors, for instance vocabulary.

If possible, the review team will also code number of years of reading instruction at the time of assessment of the outcome measure in the included studies. This can contribute to answering: to what degree do other assumed influential variables (e.g., age, test types) contribute to explain the difference between the included studies?

While the NELP (2008) review doesn't state that they restricted the included samples to only monolingual typical children, the García and Cain (2013) review excluded bilingual and learners of English as a second language. This is also a step that this present review will have as a criterion. García and Cain (2013) state that studies conducted with special populations were discarded if they did not include a typically developing control sample. The only exception from this criterion was if the studies included participants with reading disabilities. In the NELP (2008) review, the sample criterion was children who represented the normal range of abilities and disabilities that would be common to regular classrooms. In this regard, these reviews will differ from our review in that the planned review will only include typical children: i.e., not included because of a special group affiliation, for instance children with reading disabilities.

Furthermore, there are a number of years that have passed since the NELP (2008) review was undertaken, and this is the review that is most comparable to ours. The most recent study included in the NELP (2008) review was published in 2004. We suspect that there are a substantial number of new longitudinal studies that have been conducted and published since the last search was done.

Additionally, the planned review will conduct statistical modelling by using the program Mplus (Muthén & Muthén, 1998-2012). This will make it possible to analyse a correlation matrix in the meta-analysis, as opposed to just bivariate correlations and a moderator variable. In order to find the unique contributions, accounted for by a variable after the shared variance with other variables has been partitioned out, we will use a hierarchical regression-analysis on a meta-level (Melby-Lervåg, Lyster, & Hulme, 2012)

RESEARCH DESIGN & SETTINGS

The review will include longitudinal non-experimental studies that follow a cohort of children from preschool onwards in school and after reading instruction has begun. Since there are different traditions concerning the start of formal reading instruction, *preschool* refers to testing of predictor variables before reading instruction has begun, ranging from 3-6 years of age.

In addition, control or comparison groups from experimental studies can be included if they are non-treatment control groups.

Inclusion criteria

Studies will be included if they meet the following criteria:

- Report a measure of linguistic comprehension in preschool age
- Include a measure on reading comprehension after formal reading instruction has begun.
- A sample of unselected monolingual typical children, i.e., not included because of a special group affiliation (e.g., a special diagnosis).
- Report a Pearson r correlation between the linguistic comprehension measure in preschool and reading comprehension test in school.

Predictors and moderator coding

In addition to the above-mentioned criteria, these variables below will be coded but will not serve as exclusion criteria if they are not included in the study:

Predictors:

- Decoding (accuracy and fluency of single word reading or non-word reading)
- Phonological awareness (awareness of the phonological structure, or sound structure, of spoken words i.e. rhyme, phonemes and syllables)
- Letter knowledge (letter recognition – names and sounds)
- Naming speed (how quickly one can name objects, symbols (letters or digits) or colors)
- Inference skills (the ability to draw inferences)
- Syntax (knowledge about how words or other elements of sentence structure are combined to form grammatical sentences)
- Working memory (“a brain system that provides temporary storage and manipulation of the information necessary for . . . complex cognitive tasks” (Baddeley, 1992, p. 556)
- Nonverbal ability (tasks that are not based on language skills i.e. task with figures)

Moderators:

- Sample size
- Age at testing (both age at testing for predictors and outcome reading comprehension)
- Test types
- Country of study
- Socio economic Status

POPULATION

The review will include studies conducted with samples of unselected monolingual typical children, i.e., not included because of a special group affiliation (e.g., a special diagnosis)

PREDICTORS AND OUTCOMES

Standardized tests of linguistic comprehension and reading comprehension. The two mandatory outcomes for the included studies are reading comprehension and linguistic comprehension measured by standardized tests. Regarding outcome measures on reading comprehension, tests that tap content comprehension by asking control questions will be prioritized. Preschool linguistic comprehension can include standardized measures of either receptive or expressive vocabulary, listening comprehension or oral cloze. Measures assessing receptive word knowledge will be preferred in favour of expressive vocabulary measures, listening comprehension and oral cloze. If the included studies have several assessment time points, the first time point in preschool will be coded, regarding the vocabulary measure, whilst the last reading comprehension assessment in school will be coded.

Predictor coding: As previously noted, a selection of predictor variables related to other influential language abilities, cognitive related processes, and a decoding measure will be coded in order to estimate their respective contributions. The number of studies that report on planned predictor variables will determine if there is sufficient statistical power needed to perform the respective analysis. In the protocol, the procedure for these variables will be further elaborated.

Moderator coding: In order to examine variables that could contribute to explaining the potential disparity between different studies, we will perform a series of moderator analyses. Divergent correlations from the different studies may be influenced by systematic differences related to participants, settings, number of years of reading instruction, and age between the different outcomes assessments. Moderator variables will therefore attempt to account for these types of differences. Furthermore, we will code variables related to study quality as a moderator variable, e.g., the sample size.

REFERENCES

- Baddeley, A. (1992). Working memory. *Science*, 255, 556–559. doi:10.1126/science.1736359
- Biemiller, A. (2003). Vocabulary: Needed if more children are to read well. *Reading Psychology*, 24(3-4), 323-335. doi: 10.1080/02702710390227297
- Biemiller, A. (2006). Vocabulary development and instruction: A prerequisite for school learning. In S. Neuman & D. K. Dickinson (Eds.), *Handbook of Early Literacy Research* (Vol. 2, pp. 41-52). New York: Guilford Publications, Inc.
- Bloom, L., & Lahey, M. (1978). *Language development and language disorders*. New York: John Wiley & Sons.
- Burgoyne, K., Burgoyne, H. E., Whiteley, J. M., & Hutchinson. (2011). The development of comprehension and reading-related skills in children learning English as an additional language and their monolingual, English-speaking peers. *British Journal of Educational Psychology*, 81(2), 344-354. doi: 10.1348/000709910X504122
- Cain, K. & Oakhill, J. (1998). Comprehension skill and inference making ability: Issues of causality. In C. Hulme & R.M. Joshi (eds.), *Reading and spelling: Development and disorder* (pp. 329–342). Mahwah, NJ: Erlbaum.
- Cain, K., Oakhill, J., & Bryant, P. (2000). Investigating the causes of reading comprehension failure: The comprehension-age match design. *Reading and Writing*, 12(1-2), 31-40. doi: 10.1023/A:1008051414854
- Cain, K., Oakhill, J., & Bryant, P. (2004). Children's reading comprehension ability: Concurrent prediction by working memory, verbal ability, and component skills. *Journal of educational psychology*, 96(1), 31. doi: 10.1037/0022-0663.96.1.31
- Carroll, J. M. (2011). *Developing language and literacy: effective intervention in the early years*. Chichester, West Sussex: Wiley-Blackwell.
- Chen, R. S, & Vellutino, F. R. (1997). Prediction of reading ability: A cross-validation study of the simple view of reading. *Journal of Literacy Research*, 29(1), 1-24. doi: 10.1080/10862969709547947
- Conners, F. A. (2009). Attentional control and the simple view of reading. *Reading and Writing*, 22(5), 591-613. doi:10.1007/s11145-008-9126-x
- Dickinson, D. K., & Tabors, P. O. (2001). *Beginning literacy with language: young children learning at home and school*. Baltimore, Md.: P.H. Brookes Pub. Co.
- García, J. R., & Cain, K. (2013). Decoding and Reading Comprehension A Meta-Analysis to Identify Which Reader and Assessment Characteristics Influence the Strength of the Relationship in English. *Review of Educational Research*, online first. doi: 10.3102/0034654313499616.
- Geva, E., & Farnia, F. (2012). Developmental changes in the nature of language proficiency and reading fluency paint a more complex view of reading comprehension in ELL and EL1. *Reading and Writing*, 25(8), 1819-1845. doi: 10.1007/s11145-011-9333-
- Gough, P. B., & Tunmer, W. E. (1986). Decoding, reading, and reading disability. *Remedial and special education*, 7(1), 6-10. doi: 10.1177/074193258600700104

- Hoover, W. A., & Gough, P. B. (1990). The simple view of reading. *Reading and Writing*, 2(2), 127-160. doi:10.1007/BF00401799
- Johnston, T. C., & Kirby, J. R. (2006). The contribution of naming speed to the simple view of reading. *Reading and Writing*, 19(4), 339-361. doi: 10.1007/s11145-005-4644-2
- Lervåg, A., & Aukrust, V. G. (2010). Vocabulary knowledge is a critical determinant of the difference in reading comprehension growth between first and second language learners. *Journal of Child Psychology and Psychiatry*, 51(5), 612-620. doi: 10.1111/j.1469-7610.2009.02185.x
- Melby-Lervåg, M., Lyster, S.-A. H., & Hulme, C. (2012). Phonological skills and their role in learning to read: a meta-analytic review. *Psychological bulletin*, 138(2), 322. doi: 10.1037/a0026744
- Muthén, L. K., & Muthén, B. O. (1998-2012). Mplus user's guide. Seventh Edition. Los Angeles, CA: Muthén & Muthén.
- National Early Literacy Panel (NELP). (2008). Developing early literacy: Report of the National Early Literacy Panel. Washington, DC: National Institute for literacy. Retrieved from <https://www.nichd.nih.gov/publications/pubs/documents/NELPReport09.pdf>
- National Reading Panel. (2000). Report of the National Reading Panel: Reports of the subgroups. Washington, DC: National Institute of Child Health and Human Development Clearing House.
- Oakhill, J. V., & Cain, K. (2012). The precursors of reading ability in young readers: Evidence from a four-year longitudinal study. *Scientific Studies of Reading*, 16(2), 91-121. doi: 10.1080/10888438.2010.529219
- Ouellette, G. P. (2006). What's meaning got to do with it: The role of vocabulary in word reading and reading comprehension. *Journal of educational psychology*, 98(3), 554. doi: 10.1037/0022-0663.98.3.554
- Vellutino, F. R. (2003). Individual differences as sources of variability in reading comprehension in elementary school children. In A. P. Sweet & C. E. Snow (Eds.), *Rethinking reading comprehension* (pp. 51–81). New York: Guilford.
- Walley, A. C., Metsala, J. L., & Garlock, V. M. (2003). Spoken vocabulary growth: Its role in the development of phoneme awareness and early reading ability. *Reading and Writing*, 16(1-2), 5-20. doi: 10.1023/A:1021789804977

REVIEW AUTHORS

Lead review author:

Name:	Hanne Næss Hjetland
Title:	PhD candidate
Affiliation:	University of Oslo, Department of Special Needs Educational
Address:	P.O Box 1140 Blindern
City, State, Province or County:	Oslo
Postal Code:	N-0318
Country:	Norway
Phone:	+47-22858044
Email:	h.n.hjetland@isp.uio.no

Co-author:

Name:	Ellen Iren Brinchmann
Title:	PhD student
Affiliation:	University of Oslo, Department of Special Needs Education
Address:	P.O. Box 1140 Blindern
City, State, Province or County:	Oslo
Postal Code:	0318
Country:	Norway
Phone:	+47-22854877
Email:	e.i.brinchmann@isp.uio.no

Name:	Solveig-Alma Halaas Lyster
Title:	Professor
Affiliation:	University of Oslo, Department of Special Needs Education
Address:	P.O. Box 1140 Blindern
City, State, Province or County:	Oslo
Postal Code:	0318
Country:	Norway
Phone:	+47-22858049
Email:	s.a.h.lyster@isp.uio.no

Name:	Bente Eriksen Hagtvet
Title:	Professor
Affiliation:	University of Oslo, Department of Special Needs Education
Address:	P.O. Box 1140 Blindern
City, State, Province or County:	Oslo
Postal Code:	0318
Country:	Norway
Phone:	+47-22858009
Email:	b.e.hagtvet@isp.uio.no

Name:	Monica Melby-Lervåg
Title:	Professor
Affiliation:	University of Oslo, Department of Special Needs Education
Address:	P.O. Box 1140 Blindern
City, State, Province or County:	Oslo
Postal Code:	0318
Country:	Norway
Phone:	+47-22858138
Email:	monica.melby-lervag@isp.uio.no

ROLES AND RESPONSIBILITIES

There is substantial expertise within the review team both in regards to content and methodology. The contributors in this review are all working within the field of language and reading comprehension. Professor Monica Melby-Lervåg has extensive experience with conducting meta-analysis and the statistical analysis competence required. The first and last authors have also completed a two-day course on Meta-analysis with Michael Borenstein (October, 2013) using “Comprehensive Meta-Analysis version 3”. In addition, the review team have experience with electronic database retrieval and coding, and have access to library support staff when needed.

- Content: H. N. Hjetland, E. Brinchmann, S.-A. H. Lyster, B. E. Hagtvet & M. Melby-Lervåg.
- Systematic review methods: H. N. Hjetland, E. Brinchmann & M. Melby-Lervåg,
- Statistical analysis: H. N. Hjetland, E. Brinchmann, M. Melby-Lervåg & A. Lervåg (statistical advisor)
- Information retrieval: H. N. Hjetland & M. Melby-Lervåg

POTENTIAL CONFLICTS OF INTEREST

The review team foresee no conflict of interest.

FUNDING

The review team have not received extra funding to conduct this review.

PRELIMINARY TIMEFRAME

- Date you plan to submit a draft protocol: 15 April 2014
- Date you plan to submit a draft review: 15 September 2014

DECLARATION

Authors' responsibilities

By completing this form, you accept responsibility for preparing, maintaining, and updating the review in accordance with Campbell Collaboration policy. The Coordinating Group will provide as much support as possible to assist with the preparation of the review.

A draft protocol must be submitted to the Coordinating Group within one year of title acceptance. If drafts are not submitted before the agreed deadlines, or if we are unable to contact you for an extended period, the Coordinating Group has the right to de-register the title or transfer the title to alternative authors. The Coordinating Group also has the right to de-register or transfer the title if it does not meet the standards of the Coordinating Group and/or the Campbell Collaboration.

You accept responsibility for maintaining the review in light of new evidence, comments and criticisms, and other developments, and updating the review every five years, when substantial new evidence becomes available, or, if requested, transferring responsibility for maintaining the review to others as agreed with the Coordinating Group.

Publication in the Campbell Library

The support of the Coordinating Group in preparing your review is conditional upon your agreement to publish the protocol, finished review, and subsequent updates in the Campbell Library. The Campbell Collaboration places no restrictions on publication of the findings of a Campbell systematic review in a more abbreviated form as a journal article either before or after the publication of the monograph version in *Campbell Systematic Reviews*. Some journals, however, have restrictions that preclude publication of findings that have been, or will be, reported elsewhere and authors considering publication in such a journal should be aware of possible conflict with publication of the monograph version in *Campbell Systematic Reviews*. Publication in a journal after publication or in press status in *Campbell Systematic Reviews* should acknowledge the Campbell version and include a citation to it. Note that systematic reviews published in *Campbell Systematic Reviews* and co-registered with the Cochrane Collaboration may have additional requirements or restrictions for co-publication. Review authors accept responsibility for meeting any co-publication requirements.

I understand the commitment required to undertake a Campbell review, and agree to publish in the Campbell Library. Signed on behalf of the authors:

Form completed by:

Hanne Næss Hjetland

Date:

24 February 2014