Literacy Studies: Perspectives from Cognitive Neurosciences, Linguistics, Psychology and Education

Rui A. Alves
Teresa Limpo
R. Malatesha Joshi *Editors*

Reading-Writing Connections

Towards Integrative Literacy Science

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Literacy Studies

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While language defines humanity, literacy defines civilization. Understandably, illiteracy or difficulties in acquiring literacy skills have become a major concern of our technological society. A conservative estimate of the prevalence of literacy problems would put the figure at more than a billion people in the world. Because of the seriousness of the problem, research in literacy acquisition and its breakdown is pursued with enormous vigor and persistence by experts from diverse backgrounds such as cognitive psychology, neuroscience, linguistics and education. This, of course, has resulted in a plethora of data, and consequently it has become difficult to integrate this abundance of information into a coherent body because of the artificial barriers that exist among different professional specialties.

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Rui A. Alves • Teresa Limpo
R. Malatesha Joshi
Editors

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Editors
Rui A. Alves
Department of Psychology
University of Porto
Porto, Portugal

Teresa Limpo
Department of Psychology
University of Porto
Porto, Portugal

R. Malatesha Joshi
College of Education
Texas A&M University
College Station, TX, USA

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Foreword

Reading and writing are so visibly connected – they rely upon the same system of written language and cognitive skills – that it is stupefying that the implications of their relationship so slowly dawned upon the research community.

During the first hundred years of psychological research on literacy (starting with Javal (1878) and Cattell (1886)), treatments of the reading-writing connections were not especially theoretical, empirically ambitious, or vigorous. Perhaps the earliest of these efforts focused on the relationships between spelling and word reading (e.g., Horn, 1919), and rarely did any study explore more than a single correlation between two measures, one of reading and one of writing.

The scant attention paid to reading-writing relations by theorists and empirical researchers was mirrored by the pedagogy. A number of educators asserted that reading and writing reinforced each other (e.g., Burrows, 1939), but this speculation was superficial and in practice more honored in the breach. Few American teachers, particularly in the elementary grades, taught writing, and the basal readers of the twentieth century did not usually include lessons on either composition or spelling. The spelling books of the time were equally disconnected from reading objectives or lessons.

That began to change in the 1980s – less than 40 years ago!

I was a doctoral student at the time and decided I wanted to conduct a more complicated investigation of the connections between reading and writing. I had read all those correlational studies and ungrounded pedagogical claims about the value of teaching reading and writing together and thought a more complex analysis would make sense. Although multivariate statistics had been invented a half century earlier, they had rarely been used to explore learning and processing problems because of the amount of calculating that was needed to realize such an analysis. That changed with the emergence of the mainframe computer and the availability of multivariate statistics programs, both of which had barely become available at the time of my matriculation.

But the barriers to such a study were not all technical. My dissertation advisor said that I could do such a study but warned "no one will be interested." And, another dissertation committee member when told of my aspirations opined dryly that I was going on a "fishing expedition."

Those responses might sound mean or snarky in 2019, but they were on the mark at the time. The fact was that no one was likely to be especially interested in that problem; it wasn't an accident that no one else was doing such work. Also, it really was a kind of a fishing expedition since my plan – at that nascent point – was embarrassingly atheoretical. I had a plethora of measures (of decoding, vocabulary, reading comprehension, spelling, grammar, and text structure), but no articulate hypotheses of the psychological and pedagogical implications of these interconnections that I expected to find.

I completed that work, received my degree, and went off to be a professor while I tried to whip my fishing expedition into shape for publication. During that interregnum, P. David Pearson and Robert J. Tierney published their 1983 paper, "Toward a Composing Model of Reading." The paper explored a constructivist notion of reading comprehension that used composition as a metaphor. Essentially, they claimed that the best readers approached a text in the same fashion that writers composed their texts.

That metaphor – the reader as composer – captured the *zeitgeist* of the times, and educators, psychologists, and linguists suddenly were curious about the connections between reading and writing. Several weeks later, my dissertation study was published in the *Journal of Educational Psychology* and met an audience that was hungry for data on the actual, as opposed to the metaphorical, connections between reading and writing (Shanahan, 1984). When everyone wants hot tamales and you're the only vendor who has any, your work is going to get noticed. The field that wouldn't be interested in my dissertation became interested days before its publication.

Soon after, I had opportunities to work with an expert on statistical modeling (Richard Lomax) which allowed me to explore these relationships in more theoretical ways, considering issues such as directionality and asymmetry of relations (Shanahan & Lomax, 1986). And Judith Langer published a complex qualitative analysis of the process connections between reading and writing (Langer, 1986), too.

The practical results of all of this? By the late 1980s, commercial reading programs started to include writing and spelling components, an innovation that continues today.

Later, researchers like Virginia Berninger (Berninger et al., 1992) picked up on my original models but improved and enhanced them to better understand how reading and writing connected for struggling readers. She and her colleagues also reinvigorated what had lapsed into a moribund research line, thus bringing this volume into fruition.

The editors have done a remarkable job of assembling this collection of chapters. If 1980 was an awakening or a turning point in the conceptualization of reading-writing relations, then the 2019 publication of these chapters is a sign that such research has reached maturity. Here, you will find theoretical rigor, empirical sophistication, and a practical pedagogical grasp that was unimaginable only four decades ago.

One thing that particularly stands out to me in these chapters is their international character. In the 1980s, reading-writing relations were about learning to read and write in the English language. The investigations in Spanish, Greek, Hebrew, Polish, Lithuanian, Turkish, and so on described here suggest a cognitive universality of some of what we have learned about reading-writing relations and the consistency of these patterns across scripts and languages.

The job of a foreword is not to explain each of the chapters to follow, but I think there are some statements about what we have learned in 40 years that would be a good introduction to this book, since the chapters collectively reiterate, extend, and complicate these basic ideas. What is that we have learned so far?

- Reading and writing are related. What we learn from reading can be used in writing and in learning to write, and vice versa.
- Reading and writing are developmental. This means that the relations between reading and writing change in character across that development – from word reading and production to discourse interpretation and composition. This progression is evident with the youngest readers and writers and with adult learners as well.
- Teaching reading or writing can have a cross-modal impact on each other because reading and writing depend on much the same knowledge.
- Because reading and writing are communication processes, being engaged as a reader or writer can provide insights about communicative needs that can enhance the opposite process.
- Reading and writing can be used in combination or unison to accomplish tasks that could not be accomplished with only reading or writing.
- Reading and writing about a topic or issue involve individuals in processes that increase understanding because they provide somewhat different perspectives.
- Oral language plays an important role in the development of reading and writing and in their relationship.

I've long believed that the importance of reading-writing relations goes far beyond literacy as it has the possibility of revealing how the human mind stores and uses knowledge or how "transfer" may occur. That someone can learn to use the orthographic-phonemic properties of words to decode through direct explanation, demonstration, and guided practice is the basic paired-associate learning task. That learners can then use this information to spell words they have not yet seen or that engaging in such spelling tasks can further enrich the word reading ability itself is

magical. Answering questions about how this transfer works, what the range of individual differences in such knowledge sharing may be, what may facilitate or impede it, and why it might proceed more efficiently or powerfully in one direction or another should provide a revealing window into the workings of the human mind and how it learns; truly, a great adventure that is just beginning.

This volume provides a valuable collection of the international state of our knowledge of reading and writing relations in 2019. It will be a fine companion for those who are undertaking this great adventure.

University of Illinois at Chicago Timothy Shanahan
Chicago, IL, USA

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Contributors

Yusra Ahmed Department of Psychology and Texas Institute for Measurement, Evaluation and Statistics, University of Houston, Houston, TX, USA

Rui A. Alves Faculdade de Psicologia e de Ciências da Educação da Universidade do Porto, Porto, Portugal

Theodosia Apostolou Department of Psychology, University of Cyprus, Nicosia, Cyprus

Dorit Aram Department of School Counseling and Special Education, Constantiner School of Education, Tel Aviv University, Tel Aviv, Israel

Barbara Arfé University of Padova, Padua, Italy

Nalan Babür Boğaziçi University, Istanbul, Turkey

Otília Costa e Sousa Polytechnic Institute of Lisbon and Institute of Education, University of Lisbon, Lisbon, Portugal

Egidia Cumbo Psychological Sciences Research Institute, UCLouvain, Louvain-la-Neuve, Belgium

Robin L. Danzak Department of Communication Sciences & Disorders, Emerson College, Boston, MA, USA

Adi Elimelech The Department of Education, Shaanan Academic Teachers College, Haifa, Israel

Gülcan Erçetin Boğaziçi University, Istanbul, Turkey

Eduardo García Faculty of Psychology, Universidad de La Laguna, The Canary Islands, Spain

Reda Gedutienė Department of Psychology, Klaipėda University, Klaipėda, Lithuania

George K. Georgiou Department of Educational Psychology, University of Alberta, Edmonton, Canada

Claire Gosse Psychological Sciences Research Institute, UCLouvain, Louvain-la-Neuve, Belgium

Steve Graham Warner Professor in the Mary Lou Fulton Teachers College, Arizona State University, Tempe, AZ, USA

Belma Haznedar Boğaziçi University, Istanbul, Turkey

Juan A. Hernández-Cabrera Faculty of Psychology, Universidad de La Laguna, The Canary Islands, Spain

Juan E. Jiménez Faculty of Psychology, Universidad de La Laguna, The Canary Islands, Spain

Susan Jones Graduate School of Education, University of Exeter, Exeter, UK

R. Malatesha Joshi Department of Teaching, Learning, and Culture, College of Education and Human Development, Texas A&M University, College Station, TX, USA

Young-Suk Grace Kim School of Education, University of California at Irvine, Irvine, CA, USA

Sara C. de León Faculty of Psychology, Universidad de La Laguna, The Canary Islands, Spain

Iris Levin Department of School Counseling and Special Education, Constantiner School of Education, Tel Aviv University, Tel Aviv, Israel

Teresa Limpo Faculdade de Psicologia e de Ciências da Educação da Universidade do Porto, Porto, Portugal

Helen Lines Graduate School of Education, University of Exeter, Exeter, UK

Marta Łockiewicz Division of Psychology and Psychopathology of Development, Institute of Psychology, Faculty of Social Sciences, University of Gdansk, Gdańsk, Poland

Debra Myhill Graduate School of Education, University of Exeter, Exeter, UK
University of Wollongong, Wollongong, Australia

Francisco Naranjo Faculty of Psychology, Universidad de La Laguna, The Canary Islands, Spain

Timothy C. Papadopoulos Department of Psychology and Center for Applied Neuroscience, University of Cyprus, Nicosia, Cyprus

Izabela Pietras Division of Methodology and Psychological Diagnosis, Institute of Psychology, Faculty of Education and Psychology, Maria Curie-Skłodowska University, Lublin, Poland

Marie Van Reybroeck Psychological Sciences Research Institute, UCLouvain, Louvain-la-Neuve, Belgium

Amihai Rigbi School of Education, Beit Berl College, Kfar Saba, Israel

Angélica Sepúlveda Education Laboratory, São Paulo, Brazil

Batia Seroussi School of Education, Levinsky College, Tel Aviv, Israel

Timothy Shanahan College of Education, University of Illinois at Chicago, Chicago, IL, USA

Atle Skaftun Norwegian Reading Centre, University of Stavanger, Stavanger, Norway

Oddny Judith Solheim Norwegian Reading Centre, University of Stavanger, Stavanger, Norway

Ecehan Candan Boğaziçi University, Istanbul, Turkey

Anat Stavans Faculty of Culture and Society, Beit Berl College, Kfar Saba, Israel

Ana Teberosky University of Barcelona, Barcelona, Spain

Liliana Tolchinsky University of Barcelona, Barcelona, Spain

Per Henning Uppstad Norwegian Reading Centre, University of Stavanger, Stavanger, Norway

Richard K. Wagner Department of Psychology and Florida Center for Reading Research, Florida State University, Tallahassee, FL, USA

Sara Zadunaisky-Ehrlich School of Education, Beit Berl College, Kfar Saba, Israel

Chapter 1
Introduction to Reading-Writing Connections: The Integration Roads Ahead

Rui A. Alves, Teresa Limpo, and R. Malatesha Joshi

Abstract Reading and writing connections are likely the best soil to grow an integrative view of literacy, which, in this chapter we call literacy science. Five major workings seem crucial to establish literacy science. The contributions to this volume align quite well with those five integration lines. The field needs at least to (i) redefine literacy, (ii) to model the evolving relations between reading and writing throughout development, (iii) to develop a comprehensive view of literacy development, (iv) to account for diversity across a multitude of orthographies, and (v) to provide practitioners with integrated evidence-based literacy interventions.

Keywords Literacy · Reading-writing connections · ELN

Introduction to Reading-Writing Connections: The Integration Road Ahead

Reading-Writing Connections is a two-way street that is burgeoning with research activity. The current volume aims to present the state-of-the-art of this scientific field, which, as argued by its champion (Shanahan, foreword; see also, Shanahan 1984, 2006, 2016), is reaching maturity. Maturity means that drawing on well-established traditions of empirical inquiry (viz., reading research and writing research), relying on expertise from multiple disciplines, and using interdisciplinary

Preparation of this chapter benefitted from networking at COST Action IS1401 European Literacy Network (www.eln.eu).

R. A. Alves (✉) · T. Limpo
Faculty of Psychology and Education Sciences, University of Porto, Porto, Portugal
e-mail: ralves@fpce.up.pt; tlimpo@fpce.up.pt

R. M. Joshi
College of Education and Human Development, Texas A&M University, College Station, TX, USA
e-mail: mjoshi@tamu.edu

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frameworks (such as cognitive science) to make sense of piecemeal findings, the researchers in the field are paying attention to the broader literacy picture, and contributing to establish a literacy science, which we think of as the integration of available research findings concerning reading, writing, and more broadly the study of the literate mind.

Efforts to this integration can be seen in the increasing exchanges between reading and writing research communities as well as in the interdisciplinary nature of literacy studies. One current example of community building around the idea of a unified literacy science can be seen in the establishment of the European Literacy Network, ELN, a network funded by the European Union program for Cooperation in Science and Technology (COST), between the years 2014–19 (for the network's website see, www.eln.eu). ELN is at the inception of the present volume as, early on, it was evident that reading-writing connections is arguably the best ground to nurture an integrative framework for literacy science. The contributions to this volume thus came from members of the ELN, who have responded to a call for papers and have also contributed to three symposia organized for the International Conferences of the Society for the Scientific Studies in Reading (in Porto and in Brighton) and the Special Interest Group on Writing of the European Association for Learning and Instruction (in Liverpool).

Establishing a framework for literacy science is a manifold endeavor, some of these elements are already apparent in the structure of the present volume. As a priority the field needs to map its terrain, in other words, it needs to define what is literacy and its evolving nature. The field also needs competing theoretical frameworks, which can provide coherent syntheses of available findings, and fuel the debate about what to test further and where to look for. Furthermore, the field needs comprehensive accounts of literacy development; including how contextual characteristics such as the myriad of existing human languages might change learning and literacy development. At the same time, on an evidence-based note, the field needs to strengthen its partnership with education to further improve literacy instruction and remediation. These aforementioned elements are covered next as introduction and overview of the current volume.

What Is Literacy?

Literacy is a capability, it is a sort of endowment, a freedom that individuals can acquire from cultures to inhabit literate worlds (Alves 2019; Olson 2016; Sen 1999). Literate worlds are virtual worlds created by written records, which are enacted whenever someone reads, writes and manipulates documents. The diversity of these worlds is enormous and can span from law to literature, from religion to science. While the specializations of the literate mind seem open-ended, its core seems fairly confined.

The core of literacy rests on a competence with a script (Olson 1999), which as an external and permanent representation of a language requires the operations of decoding and encoding written language, or more broadly, the back and forth exchanges between written and spoken languages. Inherent to this capability view

of literacy is the idea that literacy can vary in proficiency. Indeed, one commonly distinguishes between basic and high literate feats, for instance, a story written by a child or a master short-story by a laureate author. Recently, Alves (2019) has elaborated this proficiency notion by proposing a threshold view of literacy development, which distinguishes two thresholds in literacy (viz., participation and change thresholds). Acquiring automaticity in basic decoding and encoding operations, that is in reading and writing, seems necessary to allow individuals to participate effectively in literate and bureaucratic societies. Deliberate practice in a literate domain seems further necessary to attain expertise in that domain, which opens possibilities for change in literate and bureaucratic societies. Providing conditions for threshold crossing is frequently an explicit goal of education systems, respectively in its basic and higher education branches.

What Are Reading-Writing Connections?

Reading and writing look alike Siamese twins. They patently share common foundations (viz., written language and cognitive skills), but do develop distinct personalities (particularly through its uses and consequences), and do definitely keep a relationship with each other. The opening chapter in this volume by Kim is perhaps the most comprehensive attempt to date on establishing a framework about what is shared, distinct and the evolving relationship between reading and writing.

Theoretically, one can expect the relationship between reading and writing to be driven by reading, by writing or to be interactive. In the third chapter, Jimenez, García, Naranjo, León, and Hernández tested these three models using structural equation modeling in a large cross-sectional sample of Spanish speaking children in elementary grades, in Chile, Guatemala, Mexico and Spain.

Of similar theoretical depth and analytical sophistication to the previous chapters in the first part, in the fourth chapter, Ahmed and Wagner used meta-analytic structural equation modeling to test and summarize the expected connections between the simple view of reading and the not-so-simple view of writing. This novel approach to modeling is remarkable for the amount of empirical evidence it relies upon. Part I ends with a clarifying discussion of the three chapters by Richard Wagner, who sheds considerable light towards forthcoming studies that will likely provide even more fine-grained accounts of reading and writing co-development.

Literacy Development

Literacy is a life long journey and Part II of this volume exemplifies its wide span, ranging from preschool children to immigrant adults. Normally, literacy plays many and diverse functions across development, but one that is central is the one that the part's discussant, Liliana Tolchinsky, tags under the label of "a pedagogy of integration". Integration is indeed crucial for a social species as our own, and more so for

creatures that create worlds on paper (to borrow the title from Olson's 1994 book), thus literacy and its teaching play a key role promoting the adaptation to the literate virtual worlds created by documents, at the same time that it builds cohesion among literate minds by means of shared reality.

In Chap. 6, Teberosky, Sepulveda, Costa, and Sousa show how seeking and teaching relations between orality, reading and writing is a successful avenue for, early on, implementing a pedagogy of integration.

In Chap. 7, Myhill, Lines, and Jones argue that, in a sense, reader and writer are creations of writing, or more precisely that it takes time and literate experiences to build accurate representations of readers' needs and of writers' intentions. It is quite telling that gaining consciousness of readers and writers is a difficult metacognitive feat, and one that once again benefits from a pedagogy of integration.

Stavans, Seroussi, Rigbi, and Zadunaisky-Ehrlich, in Chap. 8, report on a cross-sectional study in which children from Grades 2–5 were assessed on a range of reading tasks and wrote argumentative and informative texts. Across grades, Stavans and colleagues used path analysis to test predictive effects of reading measures on writing outcomes, their findings are a reminder of the complex and evolving relations among reading, writing and teaching.

In Chap. 9, Danzak reminds us that integration of adult immigrants in human communities is not only a matter of material, economic survival, but also and critically a matter of integrating a linguistic community. In this latter form of integration, literacy tutoring can play a decisive role in allowing for participation, and constructing identity. Part II ends with a scholarly discussion by Tolchinsky, who skillfully wrap-ups the preceding chapters in the core theme of "a pedagogy of integration" and convincingly claims that writing can be the most effective core of that pedagogy.

Reading and Spelling Across Orthographies

Part III contains four chapters relating to literacy acquisition in different orthographies: Greek, Turkish, Polish and Lithuanian. Greek has a long history as it is considered one of the oldest Indo-European languages and the written language has not changed since fifth century B. C. E. Greek language is credited with introducing vowels to the Phoenician alphabet. Turkish orthography, on the other hand, may be considered one of the newest ones as the script was changed from Arabic to Latin script in 1928 to make it more transparent. Polish is a Slavic language and is morphologically rich transparent orthography. Lithuanian is a Baltic language and is written in an adapted version of Roman script. So, we have a good blend of different orthographies in this part.

In Chap. 11, Papadopoulos, Georgiou, and Apostolou present the results of factors influencing literacy development among Greek speaking students from Cyprus in a longitudinal study from Grades 1–2. The authors labelled the factors as proximal and distal referring to the specific and general elements that can impact literacy

acquisition; proximal factors included Rapid Automatized Naming (RAN) and phonological awareness while distal factors included successive and simultaneous processing. In this longitudinal study, it was found that both simultaneous and successive processing influenced RAN and phonological awareness in predicting reading and spelling in grade 1, while in grade 2, simultaneous processing contributed directly to reading and spelling skills.

In Chap. 12, Candan, Nalan, Haznedar and Erçetin extended the role of RAN and phonological encoding (PE), measured through a non-word spelling test, on reading and spelling in Turkish among third and fourth grade children. Interestingly, it was found that both RAN and PE were significant predictors of reading and spelling even after controlling for grade level.

Compared to Greek and Turkish literacy studies, there are fewer published reports on Polish – a Slavic language. In Chap. 13, Pietras and Łockiewicz outline the nature of Polish orthography and summarize the studies conducted in the literacy acquisition, many of the studies not available to the outside world. It is interesting to note the similarities in Polish language also the influence of phonological and morphological aspects to master reading and spelling.

Similar to Polish, there are very few empirical studies on the literacy acquisition of Lithuanian – a Baltic language. In Chap. 14, Gedutienė provides an historical perspective with the Soviet occupation to the post-independence situation since 1990. After providing a framework of the Lithuanian orthography, including its phonological, morphological, and orthographic the author outlines the lack of research in literacy acquisition and development in Lithuania.

Part III ends with a wise discussion by Barbara Arfé, who forcefully points to the necessary integration of reading and spelling international research agendas, and the need to overcome the valuable (but far from universal) anglocentric bias that dominates literacy research and instruction. As further noted by Arfé, literacy science needs to integrate both what is universal in literacy development with what is language, educational and culture specific. May the recent establishment of the ELN be a fertile ground to surpass the ill consequences of too narrow and parochial approaches to literacy research and education.

Integrative Approaches to Literacy Instruction and Remediation

Part IV contains three chapters exemplifying how reading and writing can be successfully integrated in literacy assessments and interventions. Patently there are many recipes to carry these successful integrations, as long as they can rely on well-established reading-writing connections. The three empirical studies reported on Chaps. 16, 17 and 18 are prime evidence of some reading-writing connections at play.

Uppstad, Solheim, and Skaftun (Chap. 16) studied the relation between writing and reading comprehension in a sample of 209 Norwegian fifth graders. Specifically,

they were interested in showing if writing skill predicted reading comprehension, over and above word reading and listening comprehension, it did.

Elimelech, Aram, and Levin (Chap. 17) conducted two home literacy intervention studies, in which mothers were trained to engage their preschoolers in Hebrew-relevant phonological games and joint-writing tasks. They found the interventions had a positive impact on children's reading and spelling abilities as compared to control children.

Reybroeck, Cumbo, and Gosse (Chap. 18) conducted a word building intervention with adolescents, who after many years learning to read, still struggled with decoding. As compared to a business as usual control group, the adolescent benefitted from the eight training hours (spread over 9 weeks) and improved their reading and spelling scores, and also importantly, their sense of self-efficacy in reading.

The last part of this book ends with an enlightened discussion of reading and writing connections by Steve Graham. Graham judiciously discusses the field, the three studies, and urges researchers to use broad and diverse measures of both reading and writing.

The Roads Ahead

The current volume chose reading-writing connections as the primeval ground where to lay the foundations of a science of literacy. This ground is covered along four main roads here denoted by the parts I, II, III, IV, each discussed by a lucid and acknowledged scholar in the field. We believe that these roads, with its cross-roads and ongoing works can become important avenues to establish a clearer view of literacy and to maximize the power that literacy can bring to all humans and to a better world. Humbly enough, we expect this volume to become a useful step in the direction towards integrative literacy science.

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Part I
Modeling Approaches to Reading-Writing Relations

Chapter 2
Interactive Dynamic Literacy Model: An Integrative Theoretical Framework for Reading-Writing Relations

Young-Suk Grace Kim

Abstract I propose an integrative theoretical framework for reading and writing acquisition, called the interactive dynamic literacy model, after reviewing theoretical models of reading and writing, and recent efforts in integrating theoretical models within reading and writing, respectively. The central idea of the interactive dynamic literacy model is that reading and writing are inter-related, developing together, largely due to a shared constellation of skills and knowledge. Four core hypotheses of the interactive dynamic literacy model include (1) hierarchical structure of component skills with direct and indirect relations; (2) interactive relations between component skills, and between reading and writing; (3) co-morbidity of reading and writing difficulties; and (4) dynamic relations (relations change as a function of development, learner characteristics, and reading and writing measurement). Implications and future work are discussed.

Keywords Interactive dynamic literacy model · Reading · Writing · Integration · Shared knowledge

Introduction

Research on reading and writing as well as reading-writing relations has been highly active and productive in the past four decades. In a comprehensive review, Fitzgerald and Shanahan (2000) and Shanahan (2006) summarized work on reading-writing relations into three views/approaches: shared knowledge, functional view, and rhetorical relations. In this chapter, I primarily draw on the shared knowledge approach (reading-writing relations exist because they share or draw on the same or similar knowledge and cognitive systems) while also considering the functional view and

Y.-S. G. Kim (✉)
School of Education, University of California at Irvine, Irvine, CA, USA
e-mail: Youngsk7@uci.edu

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rhetorical relations. My goals are (1) to delve deeper and expand our understanding about what is shared between reading and writing development from a component skills perspective (skills and knowledge that are involved in reading and writing processes, and contribute to reading and writing development); (2) to develop an integrative theoretical framework of literacy acquisition; and (3) to discuss implications and future work. To this end, theoretical models of reading and those of writing, and associated evidence are briefly reviewed. This is followed by a review of component skills of oral language and their relations to reading and writing. Then, the interactive dynamic literacy model is proposed to establish a single integrative framework that can explain causal chain of relations among component skills as well as reading-writing relations by consolidating evidence from multiple lines of work.

Theoretical Models of Developmental Reading

One prominent view of reading comprehension that has received substantial attention is the simple view of reading. The central idea of this view is that reading comprehension can be essentially described as two parts, decoding (or word reading) and linguistic comprehension (or listening comprehension; Gough and Tunmer 1986; Hoover and Gough 1990). In other words, reading comprehension depends on one's ability to decode words and to comprehend oral language. Empirical evidence for the simple view of reading is robust across languages with varying depths of transparency (e.g., Adlof et al. 2006; Florit and Cain 2011; Joshi et al. 2012; Kim et al. 2011a, b). Furthermore, when employing a latent variable approach, word reading and listening comprehension explained almost all the variance in reading comprehension (Adlof et al. 2006; Foorman et al. 2015; Kim 2015a, 2016, 2017a; Kim and Wagner 2015). Despite mounting evidence, the simple view has been widely criticized to be too simple to explain complex processes involved in reading comprehension (e.g., Kirby and Savage 2008; Pressley et al. 2009). As illustrated below, this is partly due to the simple view's lack of specificity and clarity about component skills and nature of their relations, particularly about linguistic comprehension.

Complementing the simple view of reading, another important line of work has shown that multiple cognitive skills and knowledge (not just word reading and linguistic comprehension) contribute to reading comprehension, including working memory, attention, vocabulary, inference, background knowledge, and comprehension monitoring (Cain et al. 2004; Nation et al. 2010; Oakhill et al. 2003; Oullette 2006). Although a formal theoretical model was not proposed, this line of work was described as a multi-component view of reading (Cain 2009; also see The Reading Systems Framework by Perfetti and Stafura 2014). This work was further extended to the nature of relations among component skills. Cromley and her colleagues in their Direct Inferential Mediation model hypothesized that background knowledge, vocabulary, reading strategies, word reading, and inference have direct and indirect

relations to reading comprehension (Cromley and Azevedo 2007; Cromley et al. 2010; also see Ahmed et al. 2016). More recently, integrating these theoretical models and evidence, the direct and indirect effects model of reading (DIER) has been proposed and validated (Kim 2017a, 2020a). In this model, word reading and listening comprehension, the two component skills of simple view of reading, are hypothesized to be two proximal skills; and the language and cognitive component skills identified by the multi-component view of reading (e.g., working memory, vocabulary, inference) are component skills of listening comprehension (see below for further details) and have direct and indirect relations to reading comprehension. Furthermore, background knowledge (topic or content knowledge and discourse knowledge), text reading fluency, and socio-emotions toward reading are also included as component skills of reading comprehension (see Kim 2020a for details). DIER fit data very well for Korean-speaking children (Kim 2015a) and English-speaking children (Kim 2017a, 2020a).

Theoretical Models of Developmental Writing

One of the influential models of writing was the Flower and Hayes' model (1981) and their subsequent revisions (Hayes 1996, 2012). These models focused on cognitive processes involved in writing such as planning, translating, and reviewing, and their interactions with the task environment and the writer's long-term memory. While these were models of proficient writing, subsequent work focused on developing writers. One such a model is the simple view of writing (Berninger et al. 2002; Juel et al. 1986). Parallel to the simple view of reading, Juel et al. (1986) proposed that writing can be described as processes involved in two skills: ideation and spelling. Writing requires generation of written texts, and therefore, one's skill to generate and organize ideas (i.e., ideation) and to encode sounds to written symbols (i.e., spelling) are two minimum necessary skills for writing. Spelling was hypothesized to draw on cipher knowledge, which is primarily determined by phonological awareness and experience with print. In contrast, details about processes involved in ideation were not offered, but instead, the Hayes and Flower (1980) model of planning, translating, and reviewing processes were referenced.

The simple view of writing was further modified and expanded to the not-so-simple view of writing (Berninger and Winn 2006), which, in addition to skills identified by the simple view of writing, includes handwriting fluency as part of transcription skills, executive function, and working memory. Executive function includes a range of skills and processes such as attentional control, planning, reviewing, revising, and self-regulation strategies; and working memory plays a central role in coordinating these component skills and accessing long-term memory.

Component skills identified in the simple view and not-so-simple view of writing have been supported by empirical studies, including transcription skills such as spelling and handwriting fluency (e.g., Abbott and Berninger 1993; Alves et al. 2016; Berninger et al. 1997; Graham et al. 1997; Kim et al. 2011a, b, 2014; Limpo and

Alves 2013), oral language (e.g., Coker 2006; Kim et al. 2011a, b, 2014, 2015a; Olinghouse 2008), self-regulation (Limpo and Alves 2013; Graham and Harris 2000; Graham et al. 2012), and working memory (e.g., Berninger et al. 1997; Bourdin and Fayol 1994; Hayes and Chenoweth 2007; Kellogg 1996; Kim 2017a; Kim and Schatschneider 2017). Although the role of oral language in writing may not be immediately obvious in these theoretical models of writing, at the core of ideation (in the simple view of writing) or text[1] generation (in the not-so-simple view of writing) is oral language skills because generated ideas necessarily have to go through translation into oral language before being transcribed.

Another theoretical framework, the knowledge-telling model specifically focuses on text generation process – how knowledge is represented into the writing process and "what happens to writing in that process" (p. 143) for mature and immature writers (Bereiter and Scardamalia 1987). For immature or developing writers, text generation primarily takes the process of representing or reproducing what they know in terms of content and discourse features – that is, writing is the "think-say" (p. 145) or memory retrieval, linear process until accessible ideas are depleted; and writing does not alter knowledge. In contrast, for mature writers, writing is a strategic goal-oriented and complex problem-solving process, taking a recursive process and drawing on, refining, and transforming knowledge (knowledge-transforming).

Extending and integrating these models, we recently proposed the Direct Indirect Effects model of Writing (DIEW; Kim 2020b; Kim and Park 2019; Kim and Schatschneider 2017). Unlike process-focused models, DIEW is a component model of writing, focusing on and specifying skills and knowledge that are involved in the writing processes and that contribute to writing development. DIEW builds on the component skills identified by the simple view and not-so-simple view of writing, and further specifies additional component skills, including higher order cognitive skills and regulation such as reasoning, inferencing, and perspective taking, background knowledge (content knowledge and discourse knowledge – knowledge about genres, knowledge about procedures and strategies in carrying out specific writing tasks, see Olinghouse and Graham 2009), and socio-emotions. Moreover, DIEW specifies the nature of relations among component skills (see Kim and Park 2019 for details) such that the two component skills by the simple view of writing, transcription and discourse oral language skills (i.e., ideation) are proximal skills that capture the other skills specified in the not-so-simple view of writing (e.g., working memory, attention, self-regulation such as monitoring). DIEW fit data well for English-speaking children (Kim 2020b; Kim and Schatschneider 2017) as well as Korean-speaking children (Kim and Park 2019).

[1] The term, text, is often mistaken to mean only 'written' text. However, text includes both oral and written texts. This clarification is relevant to the discussion of theoretical models of writing because, for instance, in the not-so-simple view of writing, text generation refers to generating ideas and representing those in oral language. If it referred to written texts, the transcription component skill would be redundant or unnecessary.

Unpacking Oral Language Skills

One central component skill included in the theoretical models of reading and writing is oral language. Yet, its precise roles and mechanisms were underspecified in these models. This is a crucial issue because the main idea of the simple view of reading and writing is that reading and writing essentially involve processes for oral language plus those for print (reading/decoding for reading comprehension and spelling/encoding for written composition). Oral language is widely classified into different aspects such as phonology, morphology, syntax, semantics, and pragmatics. Another useful way of classifying oral language skills is in terms of grain sizes: sublexical-, lexical-, sentence-, and discourse-level skills. Sublexical-level oral language skills include units smaller than the word such as phonemes or morphemes. Lexical-level oral language includes vocabulary; sentence-level language includes comprehension and production of sentences; and discourse-level oral language includes listening comprehension and oral discourse production (comprehending and producing oral texts such as multi-utterances, conversations, stories, informational texts; Kim and Pilcher 2016). Recognizing and considering grain size of oral language skills is critical because the complexity of abilities and processes differ as a function of the grain sizes or linguistic hierarchy. For example, a lexical-level oral language skill, vocabulary, requires mapping sound sequences to meaning, and thus, one's phonological memory (also called verbal working memory) is essential (Gathercole and Baddeley 1990; Kim 2017b). In contrast, discourse-level oral language skills are higher-order skills, requiring a complex set of cognitive skills such as working memory, inhibitory control, attentional control, inference, perspective taking, and comprehension monitoring (Florit et al. 2011, 2014; Kim 2015a, 2016; Kim and Phillips 2014; Kim and Schatschneider 2017; Lepola et al. 2012; Strasser and del Rio 2014; Tompkins et al. 2013), lower-level language skills such as vocabulary and grammatical knowledge, and background knowledge (Florit et al. 2011; Kendeou et al. 2008; Kim 2015a, 2016, 2017a).

Another recent advance in our understanding about oral language is the *structural* relations among the language and cognitive component skills of discourse-level oral language skills. According to the direct and indirect effects model of text comprehension (DIET, Kim 2016), the language and cognitive component skills can be classified into domain-general cognitive skills or executive function (e.g., working memory, inhibitory control, attentional control), foundational oral language skills (vocabulary and grammatical knowledge), and higher-order cognition and regulation skills (e.g., reasoning, inference, perspective taking, and monitoring, goal setting, self-assessment or self-evaluation, and self-enforcement). These classes of skills map onto different levels of mental representations constructed during discourse comprehension and production (i.e., surface code, text base, and situation model) and have hierarchical relations (see Kim 2015a, 2016, 2017a, 2020a, b; Kim and Schatschneider 2017). Specifically, foundational cognitive skills are necessary for foundational oral language skills, which, in turn, are necessary for higher-order cognition and regulation skills. All these skills are also needed for

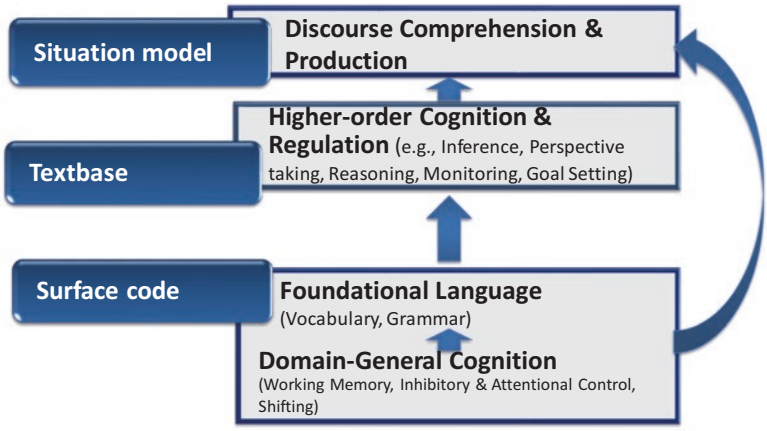

Fig. 2.1 Direct and indirect effect model of text comprehension. (DIET; modified from Kim 2016, reprint with permission)

discourse-level language and literacy skills such as listening comprehension, oral production, reading comprehension, and written composition (see Fig. 2.1).

One important observation to note here is that the language and cognitive component skills of discourse-level oral language skills (e.g., listening comprehension) overlap with those for reading comprehension (e.g., working memory, vocabulary, inference; see above). Theoretically, this is not surprising because discourse processes do not differentiate oral texts from written texts (Graesser et al. 1994; Kintsch 1988). However, discourse comprehension and production have been predominantly studied in the context of *written texts* (i.e., reading; McNamara and Magliano 2009); and has not been integrated with the literature on other theoretical models such as the simple view of reading. The observation about overlapping language and cognitive component skills for discourse-level *oral* language skills and discourse-level *literacy* skills is the key to integrating multiple lines of work in reading and writing. In reading, for instance, by integrating evidence from simple view of reading, discourse theory, and component skills of listening comprehension, it was demonstrated that the component skills of listening comprehension and reading comprehension are essentially the same; word reading and listening comprehension are proximal skills that are supported by language and cognitive component skills identified by the multi-component view; and word reading and listening comprehension completely mediate the relations of language and cognitive component skills to reading comprehension (DIER, Kim 2015a, 2017a, 2020a). Similarly, in writing, discourse-level oral language and transcription skills, the two component skills of the simple view of writing, completely mediated the relations of component skills such as working memory, foundational oral language (vocabulary and grammatical knowledge), and higher-order cognitive skills (inference and perspective taking) to writing (DIEW; Kim 2020b; Kim and Park 2019; Kim and Schatschneider 2017).

Reading-Writing Relations

Although the models reviewed above primarily focused on either reading or writing, there is a long history of research investigating the relation between reading and writing (see Fitzgerald and Shanahan 2000; Langer and Flihan 2000; Shanahan 2006). The sources of reading-writing relations have been investigated from different perspectives, but the most prominent explanation has been shared knowledge – reading and writing are related because they draw on shared knowledge (see Fitzgerald and Shanahan 2000; also see Langer and Flihan 2000). Fitzgerald and Shanahan (2000) summarized shared knowledge into the following four broad categories: metaknowledge (e.g., purposes and functions of reading and writing), domain knowledge (e.g., vocabulary and content knowledge), knowledge about universal text attributes (e.g., graphophonics), and procedural knowledge (e.g., accessing and using knowledge).

In this chapter, I approach shared knowledge from a component skills perspective drawing on the previously reviewed theoretical models of reading and writing. First, lexical-level literacy skills such as word reading and spelling draw on essentially the same component skills such as phonological awareness, orthographic knowledge and awareness, and morphological awareness (Carlisle and Katz 2006; Kim 2010; Kim et al. 2013a, b; Schatschneider et al. 2004; Treiman 1993). This is in line with theoretical models of word reading and spelling (e.g., triangle model; Adams 1990; Treiman 1993) which specify that for lexical-level literacy skills, the child needs to develop accurate representations in three interrelated forms or aspects: phonology, orthography, and semantics. Second, discourse-level literacy skills (i.e., reading comprehension and written composition) also rely on a similar set of skills, including lexical-level literacy skills (word reading and spelling) and discourse-level oral language skills (listening comprehension & oral production), and their component skills – foundational, domain-general cognitive skills (e.g., working memory, attention), foundational oral language skills (vocabulary and grammatical knowledge), higher-order cognitive skills (reasoning, inference, perspective taking, monitoring), background knowledge (domain and discourse knowledge), and socio-emotions (e.g., Ahmed et al. 2016; Berninger and Abbott 2010; Cain et al. 2004; Cromley and Azevedo 2007; Juel et al. 1986; Kim et al., 2011a, b, 2014, 2015a; Kim and Schatschneider 2017).

If reading and writing are related to each other due to shared knowledge, what is the nature of their relations? Shanahan and Lomax (1986) hypothesized interactive relations where different aspects and levels of reading and writing skills are interactively related to each other such that phonetic skills in reading influence spelling, and spelling influences vocabulary in reading, which, then, influences vocabulary diversity in writing. Berninger and colleagues also hypothesized bidirectional relations, conceptualizing reading-writing relations as part of a language-in-four-functional-system: aural (language by ear), oral (language by mouth), reading (language by eye), and writing (language by hand; Berninger and Abbott 2010; Berninger et al. 1997). Berninger and Abbott (2010) found that listening

comprehension, oral language production, reading comprehension, and written composition predicted each other.

Interactive Dynamic Literacy Model

Review of theoretical models and associated empirical evidence suggests largely similar, albeit not identical, processes in reading and writing development. Integrating these insightful theoretical models and associated evidence, I propose an integrative theoretical model of reading and writing development, called the interactive dynamic literacy model (see Kim and Graham 2020 for empirical evidence). This model is informed and influenced by several lines of prior work reviewed here, and directly builds on DIER (Kim 2015a, 2017a, 2020a) and DIEW (Kim 2020b; Kim and Graham 2020; Kim and Park 2019; Kim and Schatschneider 2017).

The central idea of the interactive dynamic literacy model is that reading and writing emerge from multiple shared knowledge cognitive processes in visual, phonological, and semantic systems and memory such that reading and writing are not modular or unidirectional systems, but instead interact, influence, mutually reinforce, and develop together. Figure 2.2 illustrates this, showing that reading and writing are related but different skills, and they are products of underlying common language and cognitive skills. On the surface is manifestations of reading (decoding or comprehension of written texts) and writing (spelling or production of written texts). Under the surface or underlying the manifestations are shared language and cognitive systems that enable and support reading and writing skills.

Figure 2.3 shows details of the component skills and structure of the component skills according to the interactive dynamic literacy model. What is apparent in

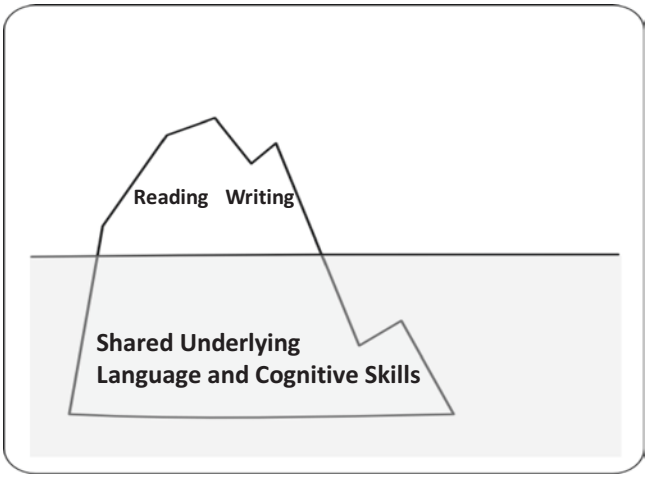

Fig. 2.2 Heuristic illustration of the interactive and dynamic literacy model

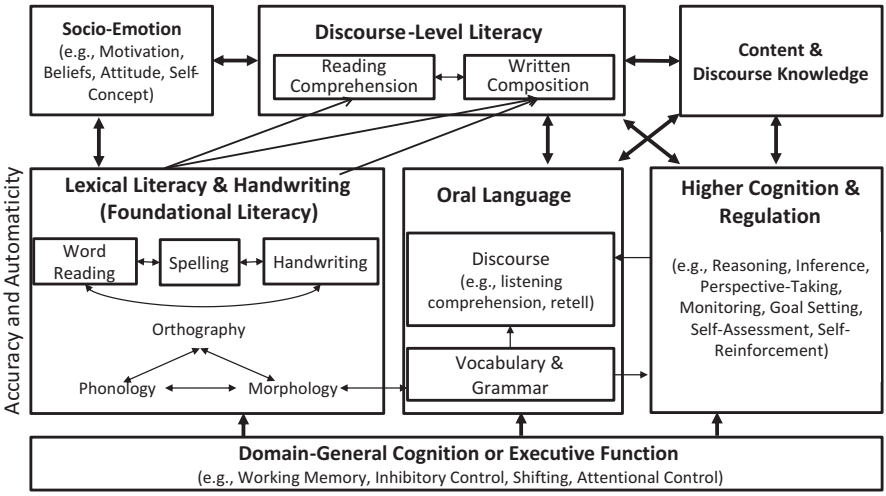

Fig. 2.3 Interactive dynamic literacy model

Fig. 2.3 is similarities or overlaps in the component skills and knowledge for reading and writing. Both reading comprehension and written comprehension draw on lexical-level literacy skills, oral language skills at various levels (vocabulary, grammatical knowledge and discourse oral language), higher order cognitions and regulations, domain-general cognitions, content and discourse knowledge, and socio-emotions. These component skills are activated and employed involving long-term memory system with constraint of limited processing resources, during the various processes of reading comprehension (decoding, constructing, and integrating propositions) and written composition (generating ideas, translating, transcribing, revising, and editing). Also important in the skill development is accuracy *and* automaticity. Accuracy (e.g., accurate identification of letters, accurate word reading or spelling, accurate use of vocabulary words) is necessary but not sufficient for literacy acquisition. In tasks involving complex processes such as reading and writing, automaticity (effortless and lack of conscious awareness) in component skills is needed to allow cognitive resources to be available for higher order processes and to access and retrieve relevant information efficiently to support the goal of meaning processing and production (e.g., Kim 2015b; LaBerge and Samuels 1974).

The shared nature of components skills for reading and writing does not entail that reading and writing are identical skills (also see Fitzgerald and Shanahan 2000). Reading is a receptive task where stimuli is given to the reader and thus decoding and comprehension processing is delimited by the given materials. In contrast, writing is a productive/expressive task that requires generating and encoding texts, and managing greater degree of options (e.g., expressing ideas using linguistic and rhetorical choices, structural organization depending on goals and genres). Therefore, although both reading and writing draw on a highly similar set of skills and knowledge, the extent to which skills and knowledge contribute to reading versus writing is likely different, resulting in dissociation between reading and writing.

Working Hypotheses of Interactive Dynamic Literacy Model

Based on the central ideas described above, below are four working hypotheses of the interactive dynamic literacy model. These hypotheses are not expected to vary across languages and writing systems. However, the relative contributions of component skills and developmental timing are expected to vary as a function of orthographic depth. For instance, in transparent orthographies, with appropriate instruction, lexical-level literacy skills develop at a faster rate (Seymour et al. 2003s), and thus, its constraining role will be short-lived compared to that in deep orthographies (e.g., Babayiğit and Stainthorp 2010; Kim 2015b), and oral language and higher order cognitions may exert their influences earlier than in deep orthographies (Kim 2020a; Kim and Park 2019).

Hypothesis 1. Hierarchical Structure with Direct and Indirect Relations As shown in Fig. 2.3 (also see Fig. 2.5), the interactive dynamic model hypothesizes hierarchical relations among component skills where discourse-level literacy skills (reading comprehension and written composition) are built upon lexical-level literacy skills and discourse-level oral language skills, which, in turn, are dependent on language and cognitive component skills. Lexical-level literacy skills (word reading and transcription skills) rely on emergent literacy skills, including orthography (print awareness, orthographic knowledge and awareness), phonology (phonological awareness), and semantics (e.g., morphological awareness). Discourse-level oral language skills (listening comprehension or oral production) draw on higher-order cognitions and regulation such as inference, perspective taking, reasoning, and self-regulation and monitoring as well as foundational oral language skills such as vocabulary and grammatical knowledge. All these rely on domain-general cognitive skills or executive function such as working memory, inhibitory control, shifting, and attentional control. Knowledge including content/topic knowledge and discourse knowledge as well as socio-emotions toward literacy interact with reading and writing development. The hierarchical relations indicate that lower-level skills are necessary for higher-level skills. That is, development of lower-level skills is required for higher-order skills, or lower-level skills feed forward high-level skills. This does not, however, indicate that mastery of lower-level skills is necessary for the development of higher-order skills. Instead, the lower-level and higher-level skills develop in an emergent, overlapping, parallel manner, co-developing with one another.

Hierarchical relations specify mechanisms and pathways by which component skills influence reading and writing development. For instance, emergent literacy skills are important for reading development but their influence on reading comprehension is *indirect* via word reading (Juel et al. 1986; Kim and Petscher 2016; Vellutino et al. 2007). Furthermore, language and cognitive component skills such as working memory, vocabulary, and inference have direct and indirect relations to listening comprehension (Kim 2015a, 2016, 2017a, 2020a; Kim and Phillips 2014), and indirect relations to reading comprehension (Kim 2015a, 2017a) and written composition (Kim 2020b; Kim and Park 2019; Kim and Schatschneider 2017) via lexical-level literacy and discourse oral language skills. For example, the role of

working memory in reading comprehension (see Peng et al. 2018) and writing (Bourdin and Fayol 1994; Hayes and Chenoweth 2007; Kellogg 1996) is well-established. Also well-established is its role for the other component skills of reading comprehension and writing such as vocabulary and grammatical knowledge (see Kim 2017b for a review). Then, the influence of working memory on reading comprehension and writing would be largely indirect via the component skills. Indeed, working memory was not directly related to reading comprehension (Kim 2017a, 2020a) or written composition (Kim 2020b; Kim and Graham 2020; Kim and Park 2019; Kim and Schatschneider 2017) once other higher order skills (e.g., discourse oral language skills) were accounted for and when discourse oral language skills were measured in an equivalent manner as discourse literacy skills. Despite lack of a direct effect, the indirect effect of working memory via other component skills were substantial (Kim 2017a; Kim and Park 2019; Kim and Schatschneider 2017).

Hypothesis 2. Interactive Relations This hypothesis states that component skills of reading and writing are dynamically inter-related, developing together (see double headed arrows in Fig. 2.3). For instance, evidence indicates the relation of morphological awareness to vocabulary (Kieffer and Lesaux 2012); and vocabulary to morphological awareness (Wysocki and Jenkins 1987), and the relation of vocabulary to inference (Kim 2015a, 2017a) and inference to vocabulary (Kim 2017b; Lepola et al. 2012). Discourse-level literacy skills also interact with discourse-level oral skills and content/domain knowledge. Reading comprehension draws on content knowledge while it also builds content knowledge via reading experience. Reading comprehension relies on oral language skills, but reading experiences also likely facilitate the development of oral language (Quinn et al. 2019). Experiences with discourse oral and written texts can also increase higher order cognitions and regulations (e.g., Mar et al. 2010). Writing also draws on content knowledge, and also builds knowledge, particularly at an advanced level (see Bereiter and Scardamalia 1987). Socio-emotional aspects (e.g., motivation, engagement, attitude, self-efficacy, and anxiety in reading and writing; Graham et al. 2007; Katzir et al. 2009) also likely develop interacting with literacy acquisition (e.g., see Katzir et al. 2018).

Reading and writing are also hypothesized to have an interactive relation, stemming from two sources: shared knowledge and processes reviewed above as well as rhetorical relations between reading and writing. As shown above, if reading and writing largely rely on highly similar sets of skills, then their development is likely mutually supportive and interdependent. From the rhetorical viewpoint, the processes of reading and writing acquisition themselves might result in interactive relations (Fitzgerald and Shanahan 2000). For instance, reading experiences (i.e., reading texts) might provide readers the opportunity to understand the meaning-construction process in writing. Writing experience, on the other hand, is likely to afford one to reflect on how information is presented in written texts, promoting awareness of text structure and text meaning.

Note that the interactive relations hypothesis is flexible about bidirectional relations across grain sizes. For example, morphological awareness (sublexical skill) would

predict vocabulary (lexical skill) and vice versa; or vocabulary and inference might have bidirectional relations (Kim 2017a, b; Lepola et al. 2012). Of the same grain size, word reading and spelling may have a bidirectional relation. Furthermore, the interactive hypothesis does not imply symmetric contributions – it is likely that one skill (e.g., reading) may be more important contributor to development of the other skill (e.g., writing) or relative contributions may change as children develop reading and writing skills. For example, Hayes' (1996) model for proficient writers and DIEW (Kim 2020b) include reading as a component skill of writing whereas theoretical models of reading comprehension do not include writing as a component skill. However, this does not indicate that writing development does not play a facilitative role in reading development (e.g., Graham and Hebert 2010). However, this might indicate that reading contributes to writing to a greater extent than writing does to reading.

Extant literature provides some evidence about interactive and bidirectional relations between reading and writing. As for correlational evidence, word reading predicted transcription skills (spelling and handwriting fluency) (Kim et al. 2018a, b) and transcription skills predicted word reading (Berninger et al. 2002); and reading comprehension predicted quality of written composition (Berninger and Abbott 2010; Kim et al. 2015a, 2018a, b) and vice versa (Berninger and Abbott 2010). However, a study which explicitly investigated bidirectional relations reported mixed findings. Ahmed et al. (2014) investigated bidirectional reading-writing relations at the lexical-, sentence-, and discourse-level using longitudinal data from Grades 1 to 4. A bidirectional relation was found at the sentence level, but a unidirectional relation from reading to writing was found at the lexical- and discourse-level literacy skills. Similar results of reading to writing relations, but not the other way around, at the lexical and discourse level literacy skills were found for students in Grades 3 to 6 (Kim et al. 2018a, b).

Causal evidence from intervention studies also supports the interactive and bidirectional relations. For the lexical-level literacy skills, a recent meta-analysis concluded that spelling instruction improved word reading (effect size = .40) and reading comprehension (effect size = .66) (Graham and Santangelo 2014). Instruction on word reading, via phonics instruction, also enhanced spelling (effect size = .35) (see a review by Ehri et al. 2001). At the discourse level, writing (i.e., written composition) intervention improved reading comprehension (effect sizes = .22–.27; Graham and Hebert 2010) and reading instruction improves writing (Graham et al. 2018).

These studies reveal one important pattern regarding the nature of reading-writing relations: different magnitudes of reading-writing relations as a function of grain size – the relation at the lexical level literacy skills is stronger than that at the discourse level literacy skills. Correlations between lexical-level literacy skills such as word reading and spelling are moderate to strong ($.50 \leq rs \leq .84$; Ahmed et al. 2014; Berninger and Swanson 1994; Ehri 2000; Juel et al. 1986; Kim 2010; Kim et al. 2015a, b, c). In contrast, the relation between discourse-level skills (reading comprehension and written composition) tends to be weaker. Reading comprehension and writing 'productivity' (e.g., number of words and phrases) have weak relations ($.01 \leq rs \leq .34$; e.g., Abbott and Berninger 1993; Berninger et al. 1997)

whereas reading comprehension and writing 'quality' have more consistent and relatively weak to moderate correlations, ranging from .26 to .39 (Juel et al. 1986); .24 to .54 (Abbott and Berninger 1993); .47 to .59 (Ahmed et al. 2014); .35 to .37, Berninger and Abbott 2010); .38–.43 (Berninger et al. 2002); and .33 to .50 (Kim et al. 2015a). The differences in the magnitude of the relations might be attributed to the fact that lexical-level literacy skills rely on a limited number of sources (i.e., emergent literacy skills) whereas discourse-level skills (reading comprehension and written comprehension) rely on a wide array of skills and knowledge.

Hypothesis 3. Co-morbidity of Reading and Writing Difficulties If reading and writing develop based on many shared many language and cognitive component skills and knowledge, an important corollary hypothesis is that students with reading difficulties are likely to have writing difficulties and vice versa. As depicted in Fig. 2.4, according to the interactive dynamic literacy view, most common student profiles will be found in the 'low-low' and 'high-high' regions with some in the 'low-high' or 'high-low' regions. This, of course, would depend on the strengths of the relations between reading and writing such that the stronger the relation, the greater concentration of students in the high-high, and low-low quadrants compared to the low-high and high-low quadrants. An example is the case for the lexical-level literacy skills, given a strong correlation between word reading and spelling. In contrast, when the relations are moderate or weak, the number of children in the low-high and high-low profiles would increase. Profiles would also depend on the nature of reading-writing relations. If writing relies on reading to a greater extent than vice versa, the likelihood of having low reading and high writing would be lower. Limited but extant evidence does indicate co-morbidity of reading and writing difficulties. For example, children with dyslexia had impaired transcription skills and written

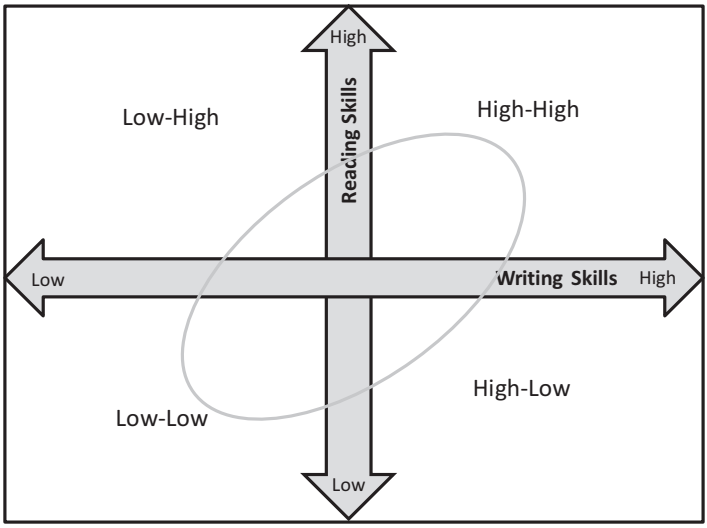

Fig. 2.4 Four quadrants of reading-writing skill profiles

composition. In addition, these children's emergent literacy skills were related to their reading skills as well as written composition (Berninger et al. 2008a, b).

Hypothesis 4. Dynamic Relations Another key hypothesis of the interactive dynamic literacy model is dynamic relations among component skills as a function of (a) development; (b) learner characteristics, and (c) reading and writing measurement. For the differential relations as a function of development, the strengths of relations between component skills and literacy skills are expected to vary, depending on the one's developmental phase because lexical-level literacy skills place greater constraints on discourse-level literacy skills during the beginning phase whereas language and higher order cognitive skills would play greater roles at a more advanced phase because the influence of lexical-level literacy skills would reach plateau with development. Furthermore, linguistic complexity of texts to comprehend and produce increases as children develop literacy skills (i.e., upper grades), placing greater demands on language and higher order cognitive skills. In reading, texts in upper grades contain complex ideas and language structure (e.g., vocabulary and syntactic structure). In writing, according to the knowledge-telling framework, at a more advanced phase, writing shifts to knowledge-transforming where students write to expand upon their knowledge with new ideas (Bereiter and Scardamalia 1987).

Relations may also vary as a function of individual characteristics such as students' language learner status and learning disability status. For example, for students who learn to read and write in a second language and have limited proficiency in the target L2 oral language, L2 oral language skills might play greater constraining roles in writing (Silverman et al. 2015). Similarly, students with learning disabilities (e.g., language impairment, dyslexia) might be differentially impacted on their writing skills. For instance, we found that students with language impairment, but not those with speech impairment, had consistently lower writing scores across the year although their rate of growth did not differ from that for typically developing children (Kim et al. 2015a, b, c).

Finally, the contributions of component skills to reading and writing would vary, to some extent, depending on how reading comprehension and written comprehension are measured and evaluated. In reading comprehension, the extent of contributions of component skills has been found to vary as a function of measurement or assessment of comprehension (e.g., cloze tasks, retell, open-ended or multiple choice questions after reading passages; Cutting and Scarborough 2006; Keenan et al. 2008) and text features (e.g., texts vary in the demands of language and cognitive skills, Kim 2020a). Written composition is also evaluated in multiple ways for developing writers, including writing quality (quality and clarity of ideas and organization), writing productivity (amount of written text), and writing fluency ("efficiency and automaticity in writing connected texts"; Kim et al. 2018a, b, p. 322); and these different aspects are related but dissociable dimensions (Kim et al., 2014, 2015a; Kim and Graham 2020; Puranik et al. 2006; Wagner et al. 2011). These different aspects of written composition rely on component skills differentially such that oral language and higher order cognitions make greater contributions to writing quality than to writing productivity (Kim et al. 2014, 2015a; Kim

and Graham 2020). Similarly, reading comprehension is primarily related to writing quality, not productivity (Kim and Graham 2020).

Implications, Future Directions, and Further Considerations

Figure 2.5[2] is a simplified, heuristic representation of the interactive dynamic literacy model to help illustrate practical implications. Discourse literacy skills (reading comprehension and written composition) are supported by two necessary pillars, lexical-level literacy skills and discourse oral language skills. The building founda-

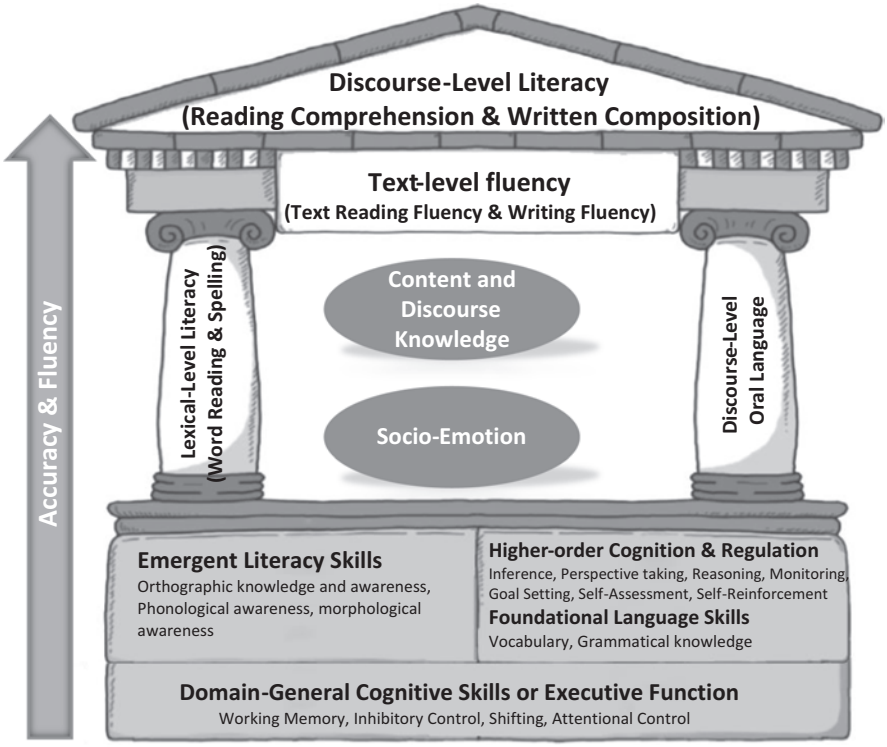

Fig. 2.5 Heuristic representation of the interactive dynamic model of literacy development. Adapted from Kim (2017b). Note: The boundaries do not indicate lack of relations among component skills

[2] Figure 2.5 includes text level fluency (text/oral reading fluency and text writing fluency) as a partial bridge between the pillars and discourse literacy skills. Theoretical and empirical details of text level fluency is beyond the scope of this chapter, but see Kim et al. (2018a, b) for text writing fluency and Kuhn et al. (2010) and Kim and Wagner (2015) for oral/text reading fluency.

tion for the lexical level literacy skill pillar is emergent literacy skills; the foundations for discourse oral language skills are higher order cognitions and regulation, and foundational language skills; and all these are built upon domain general cognitive skills (executive function). Without either pillar (lexical level literacy skills or discourse oral language skills), the structure does not hold or successful reading comprehension or written comprehension cannot be achieved; and without foundational blocks (emergent literacy skills and language and cognitive skills), the two pillar skills are not supported. Knowledge (content and discourse knowledge) and socio-emotions also contribute to reading and writing skills.

There are several practical implications of the interactive dynamic literacy model. First, the shared knowledge and processes imply that to improve reading and writing, explicit and systematic instruction is needed on the shared underlying skills. This is important to promote successful development and to prevent difficulties in reading and writing skills (see the co-morbidity hypothesis). Second, the shared knowledge and interactive nature imply that teaching reading and writing in an integrative manner would promote synergistic development. Recommendations include incorporating spelling in phonics instruction (e.g., see Ehri et al. 2001), having students write about texts they read, and increasing opportunities to write as part of reading instruction (Graham and Hebert 2010). Third, the hierarchical structure offer implications for assessment and instruction: to develop discourse literacy skills (reading comprehension and written composition), assessment should include the two pillars, lexical-level literacy skills and discourse oral language skills, and their component skills, depending on the student's developmental phase. This is represented in Fig. 2.6 where children's profiles are classified into four categories.

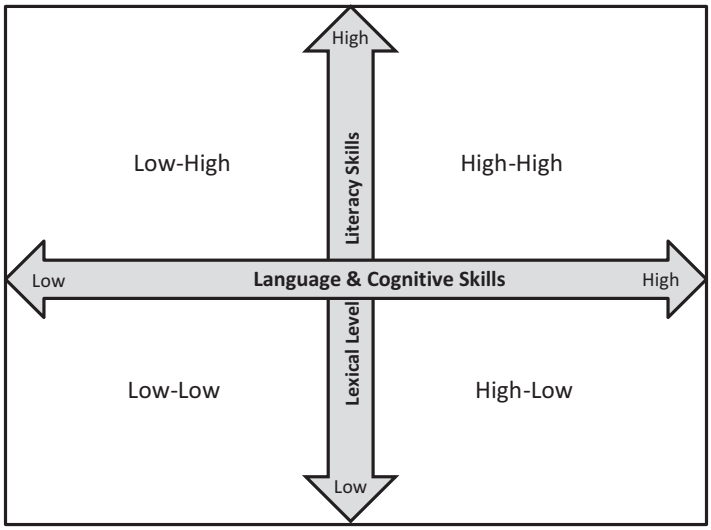

Fig. 2.6 Four profiles of skills to inform development of reading and writing

If a student struggles with reading comprehension and/or written composition, the student's lexical-level literacy skills and discourse oral language skills should be assessed as a starting point, followed by a systematic diagnostic assessment to identify sources of difficulties by evaluating the student's performance on the component skills of lexical-level literacy skills and discourse oral language skills. That is, for lexical-level literacy skills emergent literacy skills need to be assessed. For discourse-level oral language skills, not only foundational oral language skills such as vocabulary and grammatical knowledge, but also higher-order cognitive skills need to be assessed. The profiles and sources of difficulties are then used as a basis to make instructional decisions in order to meet the student's needs. Finally, the hierarchical structure also implies that instruction to promote development of reading and writing skills and prevention of difficulties can and should start early before children can read and write by addressing the foundational skills – emergent literacy skills, language skills, and higher order cognitive and regulation skills. This is particularly critical for children from disadvantaged backgrounds who often have weaknesses in these skills (Hart and Risley 1995; National Research Council 1998).

Although the interactive dynamic literacy model is informed by extant theoretical models and associated empirical evidence, future work is necessary to test the specification shown in Fig. 2.3 by including the component skills for reading and writing simultaneously (see e.g., Kim and Graham 2020). Furthermore, studies should examine the core hypotheses using data from different languages and writing systems to examine its validity. For example, the interactive hypothesis and dynamic hypothesis should be further investigated using longitudinal data, and experimental studies where both reading and writing skills are measured regardless of their focal instructional target skill (either reading or writing) – a review of the literature revealed many missed opportunities to examine the bidirectional relations because many prior experimental studies measured either reading or writing, but not both. Also warranted is systematic research on the co-morbidity of reading and writing difficulties. While some important work has been conducted in this area (e.g., Berninger et al. 2008a, b; Puranik et al. 2006), much of previous work has focused on difficulties in one domain, but not co-morbidity.

The theoretical models and frameworks presented above, including the interactive dynamic literacy model, focused on the processes and skills within the individual reader or writer. An individual's skill, of course, is an outcome of characteristics of the individual and his or her interactions with the environment. Development of reading and writing, and their component skills involves interactions with and is influenced by multiple layers of environmental factors (Bronfenbrenner 1979). For reading development, the reader, text, and activity elements were recognized (Snow 2002). In writing, Hayes (1996) laid out the task environment (i.e., audience, collaborators, text so far, composing medium) that interacts with the individual during the writing process. Graham (2018) also expanded this to include the community in which writing occurs. Beyond these immediate task and text environments surrounding reading and writing, development of the component skills and knowledge is embedded within larger sociocultural contexts such as homes, classrooms (instruction), schools, neighborhoods,

and districts. The list can go on, but the point is that although beyond the scope of this chapter, these larger socio-cultural contexts should be recognized for reading and writing development.

Conclusion

Tremendous progress has been made in our understanding of acquisition and instruction of literacy skills in the last four decades. However, although literacy skills include both reading and writing, they have been largely studied separately. Thorough and careful look into reading and writing, respectively, is necessary and insightful, but it is also imperative to consider and study reading and writing as a co-developing system rather than as isolated systems. As an extension of previous efforts in this line of work, in this chapter, I reviewed prominent theoretical models and evidence in reading and writing, and proposed an integrative framework, the interactive dynamic literacy model. The core of this view is that reading and writing draw on a highly similar set of shared language and cognitive. Central hypotheses about structural relations include hierarchical relations, interactive relations, co-morbidity of reading and writing difficulties, and dynamic relations. Future work is needed to examine, refine, and further enhance ideas elaborated in the interactive dynamic literacy model.

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Chapter 3
An Analysis and Comparison of Three Theoretical Models of the Reading-Writing Relationships in Spanish-Speaking Children

Juan E. Jiménez, Eduardo García, Francisco Naranjo, Sara C. de León, and Juan A. Hernández-Cabrera

Abstract In this chapter we present a comparison and evaluation of three alternative theoretical models of the reading-writing relationship through structural equation modeling of a Spanish-speaking school population: (a) a reading-writing model which postulates that reading has a direct influence on writing); (b) a writing-reading model which postulates that reading is influenced by writing and; (c) an interactive model which postulates that both skills are influenced reciprocally. Previous studies have been conducted in a language with opaque orthography as English. English, being an opaque language, has many inconsistencies in the grapheme-phoneme correspondences and vice versa; however, the Spanish is a language more regular and consistent. Therefore, the explanatory models on the relationship between reading and writing in languages with opaque orthography should not be extrapolated directly to languages with transparent orthography. So far, we have no studies of this nature in our language. Taking into account our findings, the chapter concludes by suggesting that the flow of information between reading and writing may be of a more universal nature based in the alphabetic systems.

Keywords Reading-writing models · Transparent orthography · Spanish language · Learning to read · Learning to write

J. E. Jiménez (✉) · E. García · F. Naranjo · S. de León · J. A. Hernández-Cabrera
Faculty of Psychology, Universidad de La Laguna, The Canary Islands, Spain
e-mail: ejimenez@ull.edu.es; egarciam@ull.edu.es; sleonper@ull.edu.es; jhernand@ull.edu.es

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Introduction

Learning to read and learning to write are often presented as being two sides of the same coin, and to a degree this is true, as the two constitute inverse processes of using the same code: reading is the decoding of a message that arises from spoken language, and writing is the encoding of a message from that same language (Ehri 2000). However, it is possible to identify different typologies, based on the degree of competence in each of these skills (e.g., good readers – good writers, poor readers – poor writers, good readers – poor writers, and good writers – poor readers) (Stotsky 1983; Tierney 1983). For the Spanish language, we have found the most common pattern to be that of children with appropriate reading skills who have difficulties writing, and the least common pattern to be the reverse case (Jiménez et al. 2009b).

An overall consensus has yet to be reached among those who analyze reading and writing as to whether these skills are dissociated over the course of their development. One key question in this regard is whether the ability to read words precedes the ability to spell them or whether, on the contrary, certain children can apply the alphabetic principle in writing before they are able to do so in reading (Shankweiler and Lundquist 1993). There are currently two different views on this: (1) that the acquisition of reading and writing skills is promoted through a single cognitive processing system (Frith 1985; Perfetti 1991, 1992; Treiman 1998); and (2) that the two activities depend on independent cognitive processes or mechanisms (Stotsky 1983).

In the following, we provide evidence of three possible types of influence between reading and writing: an influence of reading upon writing, an influence of writing upon reading, and finally, a reciprocal process of influence between the two skills.

Influence of Reading Upon Writing

Nobody questions the idea that there is a certain degree of transfer between reading and writing; some authors even claim that correct reading is an essential step towards correct writing (Oster 1984). Treiman (1993) found that first-grade pupils who had been taught using a global method tended to avoid using *ck* at the start of a word, even though they had never been taught that this was not permitted. Rather, they had learned this orthographical pattern through reading. These findings show how frequent exposure to written texts helps a child learn to write and spell words correctly. In the same vein, it has been found that pupils exposed to high levels of reading experiences obtain higher scores in writing tasks (Cunningham and Stanovich 1993; Sénéchal et al. 1996; Stanovich 2000). Also, it has been demonstrated that pupils increase their knowledge when they read, and use the information thus learned when they write. In other words, as children become more able to evaluate a text, they increase their ability to use the knowledge obtained by means of this activity in tasks related to written composition (Grabe 2003).

Influence of Writing Upon Reading

Notwithstanding the above, the ability to read a word, derived from the frequency of exposure to its printed form, does not always ensure that a child will write that word correctly. Some theories posit that the development of writing precedes that of reading (Graves 1978). In the initial stages of learning, children tend to read logographically, i.e., by means of visual cues, without establishing a direct link between graphemes and phonemes, or linking some letters with their pronunciation but ignoring others (Ehri 1997; Frith 1985). Treiman (1993) suggests that the alphabetic level required for learning to read is acquired, and reaches its peak development, through the acquisition of writing skills. Thus, as children learn to write, they develop the ability to recognize the sounds and phonemes of words produced orally.

In this sense, Frith (1985) shows that the order of transference from writing to reading is real, as the methodical order used in writing is co-opted for use in reading. This author proposed that alphabetic reading involves decoding of a word from left to right and that the shift to this kind of processing is brought about through spelling experience. A child learning to spell a word can later assimilate the idea that the temporal order is more important than the salient graphical features (which are important in the logographic stage).

In recent years, it has been shown that practicing writing develops reading speed, increases reading vocabulary, and improves skills related to reading comprehension (Mahurt et al. 2007). It also promotes awareness of the organization and structure of materials used in reading (Clay 2004). In sum, writing helps readers internalize language skills, thus promoting the quality of their reading.

Reciprocal Processes Between Reading and Writing

In addition to the studies cited above, there are others that claim that reading ability precedes writing ability, but that the latter is also able to influence reading (Goodman and Goodman 1983; Shanahan 1984; Shanahan and Lomax 1986, 1988). Chall and Jacobs (1983) conducted a study of the development of the relationship between reading and writing, based on scores obtained in tests run on primary schoolchildren. This study consisted of thirty low socio-economic status (SES) students in grades two, four, and six (who were retested a year later in grades three, five, and seven). The tasks of assessing reading and writing were quite different. For reading, an individually administered test was selected that gave separate scores on six reading and language-related components – word recognition, phonics, oral reading, word meaning (administered orally, without print), silent reading comprehension, and spelling. With regard to writing assessment consisted of 10 min of writing on a narrative and 10 min on an expository stimulus taken from the National Assessment of Educational Progress (NAEP). The results showed a strong link between reading and writing, and suggested that the two skills influenced each other. In the same vein, other authors also argued that reading and writing words are similar skills,

since they both depend on the same source of knowledge in one's memory: knowledge of the alphabetic system, knowledge of how words are written in general, and knowledge of how specific words are to be written (Frith 1985; Treiman 1998). Fitzgerald and Shanahan (2000) have argued that reading and writing are connected due to shared knowledge and cognitive processes required in both domains.

More recently, Kim et al. (2018) have pointed that from the perspective of the interactive and dynamic literacy model, reading and writing are hypothesized to co-develop and influence each other during development (interactive), but the relations change as a function of grain size and developmental phase (dynamic). If the grain size is relatively small (i.e., word reading and spelling), reading-writing relations are expected to be stronger because these draw on a more or less confined set of skills such as orthography, phonology, and semantics. However, when the grain size is larger (i.e., discourse-level skills such as reading comprehension and written composition), the relation is hypothesized to be weaker because discourse literacy skills draw on a more highly complex set of components skills, which entails more ways to be divergent.

Comparison of Theoretical Models of the Reading-Writing Relationship Across Languages

Shanahan and Lomax (1986) conducted a study of English-speaking children comparing and evaluating three models of the relationship between reading and writing as a function of school grade. For the reading-to-writing model, it was suggested that reading could have considerable influence on writing, and for the writing-to-reading model it was expected that writing would affect reading, but not vice versa. A third model, the interactive model, is the most complex model. It postulates that reading knowledge directly effects writing skills within each level of discourse (i.e., word analysis directly influences spelling; comprehension influences story structure) while knowledge of writing can influence reading across levels of discourse. The models were compared at two grade levels (second and fifth grade) to see whether the nature of the relationships changed over the learning process. The results showed that the interactive model had the highest goodness of fit of the three. However, the analysis by grade showed that the interactive model was superior to the reading-to-writing model in second grade; the interactive model was superior to the writing-to-reading model in both second and fifth grades; and the reading-to-writing model was superior to the writing-to-reading model in both grades. Finally, whilst the interactive model was superior to the reading-to-writing model in second grade, there was no difference between the reading-to-writing and interactive models in fifth grade. The authors suggested that the reading-to-writing model was superior to the writing-to-reading model because children used information from reading more in writing than vice versa. One possible explanation provided by the authors for this result might be that the children were not given as many opportuni-

ties to write. It is possible that there might be different results in an instructional context with more emphasis on writing. The fact that the influence of writing on reading begins to decrease in older grades would explain the lack of a difference between the interactive and reading-to-writing models in fifth grade. Some years later, Shanahan and Lomax (1988) tested the same models in groups classified by reading level. They wanted to determine whether the degree of competence in reading and writing could modulate the relationships between these two skills. They found that the interactive model fit the data better than the other models at both performance levels. These results thus replicated their previous findings. Later, Ahmed et al. (2014) applied latent change score modeling to investigate longitudinal relations between reading and writing skills at the word, sentence, and text levels in Grades 1 through 4. They found that a reading-to-writing model better described the data for the word and text levels of language, but a bidirectional model best fit the data at the sentence level.

To our knowledge, a model that account for relationships between reading and writing in the Spanish language has not yet been provided. Previous studies have been conducted in languages with opaque orthographies, such as English (Ahmed et al. 2014; Berninger et al. 2002; Eisterhold 1991; Juel et al. 1986; Shanahan and Lomax 1986, 1988). English, being an opaque language, has many inconsistencies in the grapheme-phoneme correspondences; Spanish, on the other hand, is a more regular and consistent language. Therefore, the explanatory models for the relationship between reading and writing in languages with opaque orthographies should not be extrapolated directly to languages with transparent orthographies. So far, we have not encountered any studies of this nature in the Spanish language, making the present study the first of its kind. Here, we analyze the relationships between several reading and writing variables on the basis of the following models: (a) a reading-to-writing model (R-W) which postulates that reading has a direct influence on writing; (b) a writing-to-reading model (W-R) which postulates that writing influences reading; and (c) an interactive model (R<>W) which postulates that both skills are influenced reciprocally. The models differ in the ordering or sequencing of the relationships between the variables.

Overall, we analyzed separate components of reading and writing on the basis of a levels-of-language approach that differentiates the levels of the word, sentence, and passage (Abbott et al. 2010; Berninger et al. 2002). In addition to the reading and writing variables, each model also includes language, cognitive, and metacognitive variables that are extremely important and influential for both reading and writing: these are alphabetic knowledge, speech perception and phonological awareness. The importance of these three components, among others, has been demonstrated for both opaque and transparent languages. With respect to cognitive and language skills, it has been shown that perceptual processing has a huge influence on the optimum development of phonological skills. Problems with phonetic discrimination affect the quality of phonological representations in the lexicon, which in turn determine the efficiency of the phonological processing system (Elbro 1996, 1998; Fowler 1991; Ortiz and Guzmán 2003). The important role played by phonological awareness in reading and writing languages with both transparent and

opaque orthographies has also been recognized in a number of studies (Berninger et al. 2001; Bradley and Bryant 1985; Cunningham 1990; Domínguez 1996; Ecalle and Magnan 2004; Goikoetxea 2005; Jiménez and Artiles 1990; Mann and Liberman 1984; Ramos and Cuadrado 2004; Shankweiler and Fowler 2004; Stanovich et al. 1984; Tunmer and Nesdale 1985; Yopp 1988). The same link has been found between phonological awareness and writing (Bruck and Waters 1988; Wimmer and Hummer 1990). Also, Mann and Foy (2003) found that phonological awareness is associated with both alphabetic knowledge and speech perception. With regard to reading and writing variables, correlations have been found between reading and writing at the sub-word, word, sentence, and text levels (see for a review, Wong 2018).

The first of the proposed models (R-W) postulates that reading exerts an influence on the development of writing. According to this model, reading competence includes four latent variables: word naming, pseudoword naming, sentence-level reading, and reading comprehension. Writing, for its part, also includes four latent variables: word spelling, pseudoword spelling, sentence-level writing, and narrative writing (which was assessed by rating the story components included in the composition). In addition, the model includes the additional language, cognitive, and metacognitive abilities of speech perception, phonological awareness, and alphabetic knowledge.

The second model (W-R) posits an influence of writing on reading development. The components used are the same as those presented above for the R-W model. This model proposes, in general, that writing influences the development of reading, without allowing for the opposite to be true in any case.

The third of the proposed models (R<>W) is the interactive model. The components of the model are the same as in the two models proposed above. This model proposes, in general, that there is an interaction between reading and writing.

In studies with English, the R-W model was found to be superior to the W-R model (Shanahan and Lomax 1986). One possible explanation for these results is that in a language with opaque orthography, one would expect a greater transfer of reading to writing, since the learning process relies more on this visual-orthographic process than on phonological processes. In other words, knowledge of spelling patterns that are acquired through reading can be a source of knowledge in which learners are supported to advance the orthographic representation of words through writing. Both reading and writing involve greater participation of visual-orthographic processes in an opaque orthography, because there is no regularity between orthographic patterns and phonological patterns. The findings from opaque orthographies should not be directly extrapolated to other languages, however. In this sense, it is proposed that in a language with a transparent orthography such as Spanish, the opposite pattern might be found, i.e., one might predict that the W-R model would fit better than the proposed R-W model. When there is greater regularity, it is to be expected that the learning process demands greater participation of phonological processes than of visual-orthographic processes. In fact, there is empirical evidence that English-speaking children acquire full operation of the phonological route by the age of nine (Backman et al. 1984; Siegel and Ryan 1989), while in a transparent orthography as in Spanish, they begin to consolidate this from 6 years of age (Cuetos

1989). In addition, findings from studies of dyslexic subtypes showed that in opaque orthographies, there is a higher prevalence of the subtype of phonological dyslexia compared to the subtype of surface dyslexia (e.g., Castles and Coltheart 1993; Manis et al. 1996; Stanovich et al. 1997); the opposite pattern was found in the Spanish language (Jiménez et al. 2009c). However, the R<>W model is presented as the model that best describes the relationship between reading and writing, and this regardless of the orthographic system of a language, since it postulates that these relationships flow in both directions (from reading to writing and from writing to reading).

In this chapter we present a comparison and evaluation of three alternative theoretical models of the reading-writing relationship through structural equation modeling of a Spanish-speaking school population from the Canary Islands (Spain), Mexico, Chile, and Guatemala.

Study

The Reading-To-Writing Model

The first model (R-W) posits that reading exerts an influence on the development of writing. This model has four latent variables for reading: word naming, pseudoword naming, sentence-level reading, and reading comprehension. There are also four latent variables for writing: word spelling, pseudoword spelling, sentence-level writing, and story structure. The model also includes language, cognitive, and metacognitive variables that are extremely important and influential for both reading and writing: these are alphabetic knowledge, speech perception, and phonological awareness.

In this model, alphabetic knowledge is influenced by phonological awareness, which in turn is influenced by speech perception, and both phonological awareness and alphabetic knowledge influence the ability to read and write words and pseudowords (Backman et al. 1984; Cuetos 1989; Defior 1990; Ecalle and Magnan 2004; Elbro 1996, 1998; Fowler 1991; Goikoetxea 2005; Mann and Foy 2003; Ortiz and Guzmán 2003; Ramos and Cuadrado 2004; Shankweiler and Fowler 2004). The present model also provides for a direct influence of word and pseudoword reading ability on the development of sentence-level reading. Sentence-level reading, for its part, also directly influences reading comprehension. With respect to the influence of reading on writing, it is posited that the ability to recognize words influences one's ability to write words and pseudowords, which favors sentence-level writing, which in turn favors narrative writing. In this sense, some authors have shown that optimum reading performance affects the development of the ability to write words and pseudowords (Cunningham 1990; Cunningham and Stanovich 1993; Sénéchal et al. 1996; Stanovich 2000). This is largely due to the fact that we can learn orthographic patterns through reading, thus favoring the correct writing of words and

orthographic accuracy (Treiman 1993). Finally, this model shows, in keeping with the claims of Shanahan and Lomax (1986), how reading comprehension directly influences the ability to express ideas in writing, through the writing of sentences and narrative texts.

The Writing-To-Reading Model

The second model presented is the W-R model, which posits that writing influences reading development. It uses the same components as the R-W model described above. Generally speaking, this model proposes that writing influences reading only, and that the reverse is never true. In this model, alphabetic knowledge is influenced by phonological awareness, which in turn is influenced by speech perception, and both phonological awareness and alphabetic knowledge influence the ability to read and write words and pseudowords. Here, the idea is that sufficient word and pseudoword reading skills will help the reader construct a syntactic structure or framework, which will make it possible to ultimately extract meaning (Cuetos 1996). This explains the direct influence exerted by the ability to read words and pseudowords on sentence-level reading. Once the syntactic framework has been constructed, a semantic analysis is carried out to help us understand what we are reading (Bransford 1979). This semantic analysis will not be possible if the preceding syntactic analysis contains errors (Cuetos 1996). With respect to the influence of writing on reading, it is posited that the ability to write words and pseudowords favors performance in word and pseudoword naming tasks (Mahurt et al. 2007; Mommers 1987). Finally, this W-R model shows how the syntactic construction of sentences, which is influenced by lexical processes, affects both reading comprehension and the organization of narrative writing (Shanahan and Lomax 1986, 1988).

The Interactive Model

The third model presented is the R<>W model, which uses the same components as the above two models. Generally speaking, this model posits the existence of a reciprocal influence between reading and writing. Alphabetic knowledge is influenced by phonological awareness, which in turn is influenced by speech perception, and both phonological awareness and alphabetic knowledge influence the ability to read and write words and pseudowords. This model posits a direct influence of word and pseudoword naming skills on the development of sentence-level reading. Also, sentence-level reading directly influences reading comprehension. This R<>W model also shows that word spelling skills favor sentence-level writing when it receives an influence from word naming skills, and that these processes of sentence-level writing influence processes involved in narrative writing and reading comprehension. Finally, it shows that reading comprehension directly influences the ability

to express ideas in writing, through the writing of sentences and narrative texts (Shanahan and Lomax 1986, 1988).

Method

Participants The sample used in this study consisted of 2450 Spanish-speaking pupils (1349 boys and 1101 girls) in the second to sixth grades of primary education, ranging in age from 7 to 12 and attending either public or private schools (12 public and 4 private schools). Of the total sample, 911 pupils (543 boys, 368 girls) were attending school in Spain; 335 pupils (182 boys, 153 girls) were in Guatemala; 472 pupils (258 boys, 214 girls) were in Chile, and 732 pupils (366 boys, 366 girls) were in Mexico. No significant differences were found by sex and school grade, χ^2 (4) = 4842, p = .304, i.e., the same proportion of boys and girls was present at each grade level. The selection criterion of IQ ≥ 75 was applied to exclude intellectually challenged children from the sample (Siegel and Ryan 1989). Children presenting any of the criteria involved in the diagnosis of learning disabilities were also excluded from the sample, with due consideration given at all times for the insights of the pupils' own teachers.

Measures To measure non-verbal intelligence, we used the Factor G test by Cattell & Cattell (1989). Scale 1 (Form A) was used for pupils aged 6 to 8 and Scale 2 (Form A) was used for pupils aged 9 to 14. To evaluate cognitive and reading processes, the SICOLE-R-Primary Multimedia Battery (Jiménez et al. 2007, 2009a) was used. This multimedia battery involves a series of tasks for evaluating cognitive and reading processes. For this study, we used the following tasks: *a) Speech perception:* this section has three tasks that assess the participant's ability to differentiate between consonants in the context of direct consonant-vowel (CV) syllable pairs which differ in terms of voicing (e.g., /na/–/ra/), manner of articulation (e.g., /ta/–/ga/), and place of articulation (e.g., /pa/–/ka/). Overall reliability for this test was α = .94; b) *Phonological awareness*: this is a computer-based adaptation of the Phonemic Awareness Test by Jiménez (1996), which involves isolation, synthesis, omission, and segmentation tasks. For each subtask, 15 words were presented, 5 from each type of syllabic structure (e.g., CV, CVC, and CCV). Reliability for this test was α = .87; *c) Alphabetic knowledge:* this task tests children's knowledge of the phonemes that correspond to each letter of the alphabet. Reliability for this test was α = .82; d) *Word and pseudoword naming:* this task consists of reading words and pseudowords out loud while recording latency times (LT), i.e., the time between when the word or pseudoword appears on the screen and when the pupil begins to read it out. Reliability for this test was α = .93; e) *Sentence-level reading*: in this task, sentences are presented with the functional words missing, and the participant must select a word from a menu to complete the sentence. Reliability for this test was α = .87; f) *Reading comprehension*: this involves reading a narrative text type (entitled "Tino's adventure") and an expository text type (entitled "Fruit"). After

reading each text, the child is asked questions and instructed to select the correct answer from three possible responses. Reliability for this test was α = .63. To assess writing, the PROESCRI Battery (*Batería PROESCRI*, Artiles and Jiménez 2007) was used. For this study, the following tasks were used: a) Dictation of words with arbitrary orthography (i.e., non-consistent words): this is a dictation task involving words that are written differently from how they are pronounced. To spell them correctly, the child must use the orthographical route. Reliability for this test was α = .86; *b) Writing from dictation pseudowords that are both long and with low syllabic positional frequency:* this is a dictation of pseudowords. To spell them correctly, the child must use the phonological route. Reliability for this test was α = .93; c) *Morphosyntactic structuring processes*: the aim of this test is to determine whether the pupil is able to order simply-structured sentences. This test was used here as a measure of sentence-level writing. In this task, the child is shown eight sentences out of order (e.g., "girl-pretty-is-The") and is asked to place the segments in the correct order (e.g., "The girl is pretty"). Reliability for this test was α = .70; *d) Writing a story:* here, the child is asked to write a story based on an image prompt. The measure involves recording whether the child uses the story components included in the composition (i.e., narrative categories of setting, character, theme, and solution). For another study (Jiménez and Hernández-Cabrera 2019), the same protocol was used and the average ICC was superior to .90.

Procedure Cattell's Factor G test was administered to each class as a group. Administering Scale 2 (Form A) took two sessions of 15 min each, and Scale 1 was administered in a single session of 30 min. The SICOLE-R-Primary software tasks were administered individually. There were two sessions, one on each day, over 4 months, in the different schools making up the sample. A total of 32 expert examiners (eight per school) were required in order to cover all of the schools selected for testing (three public schools and one private school in each country). As a rule, the children performed half of the tasks from the SICOLE-R-Primary battery in one session, and they themselves decided which door to open and which tasks to complete in each round. Each session lasted approximately 50–60 min. In the first session, the person running the experiment explained the procedure to be followed, and ensured that all participants had understood the instructions. The children were told that for the test, they would be in an amusement park with five doors, and that they could choose which doors to open and then work through the tasks behind each one until they had completed all the tasks behind all the doors. In the first session, the examiner also filled out the pupil registration forms and calibrated the microphones, as they would be needed for some of the tasks selected at random by the children. The microphone was recalibrated at the start of each session. For the writing tests, the PROESCRI Battery was administered to all children in a given class together; this took two or three sessions of 45 min each.

Results

Analyses of covariance structure were performed, using lavaan 0.5–16 (Rosseel 2012) in R Core Team (2013). In order to assess the adjustment of each estimated model, we used adjustment indexes with low sensitivity to the abnormality of observable variables that overcome χ^2 difficulties; in other words, these were incremental indexes that assessed the improvement of the estimated model compared with a base model. These indexes are the Normed Fit Index (NFI), Non-Normed Fit Index (NNFI), Bentler's Comparative Fit Index (CFI), the Root-Mean-Square Error of Approximation (RMSEA), and the Standardized Root Mean Square Residual (SRMR). Good adjustments between the postulated model and the data observed are those that generate values equal to or greater than 0.9 for the incremental indexes. Where the RMSEA is concerned, Hu and Bentler (1999) point out that an acceptable model must produce RMSEA values lower than or equal to 0.07. Before model evaluation, latent variables were scaled by imposing unit of loading identification constraints (Bollen 1989). The unstandardized coefficients of all the first observable indicators of each latent variable in each of the models tested (i.e., R-W, W-R, R<>W model) were fixed to 1.0. Pupils were dropped from the analyses if any of the variables had missing values.

Model 1: The Reading-to-Writing Model

The R-W model fit well, χ^2 (763, N = 2212) = 2663.90, $p < .001$, NFI = .930, NNFI = .945, CFI = .949, RMSEA = .033 (90% CI .032–.035), SRMR = .071 for the whole group. Also, it explained 30%, 03%, 69%, 01%, 40%, 13%, 22%, 55%, 67%, and 20% of the alphabetic knowledge, phonological awareness, word naming, pseudoword naming, word spelling, pseudoword spelling, sentence-level reading, reading comprehension, sentence-level writing, and story structure factor variance, respectively (Fig. 3.1).

Model 2: The Writing-to-Reading Model

The W-R model fit well, χ^2 (765, N = 2212) = 2871.22, $p < .001$, NFI = .924, NNFI = .939, CFI = .943, RMSEA = .035 (90% CI .034–.037), SRMR = .081 for the whole group. Also, it explained 30%, 03%, 72%, 01%, 32%, 15%, 21%, 60%, 63%, and 18% of the alphabetic knowledge, phonological awareness, word naming, pseudoword naming, word spelling, pseudoword spelling, sentence-level reading, reading comprehension, sentence-level writing, and story structure factor variance, respectively (Fig. 3.2).

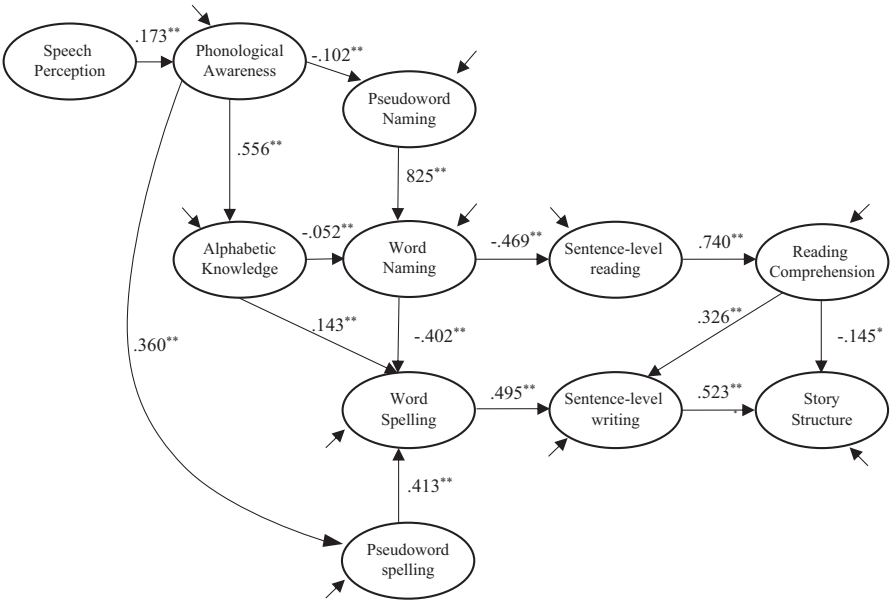

Fig. 3.1 The Reading-to-Writing Model

Model 3: The Interactive Model

The R<>W model fit well, χ^2 (763, N = 2212) = 2573.63, p < .001, NFI = .932, NNFI = .947, CFI = .951, RMSEA = .033 (90% CI .031–.034), SRMR = .063 for the whole group. Also, it explained 31%, 03%, 69%, 01%, 42%, 13%, 20%, 65%, 65%, and 22% of the alphabetic knowledge, phonological awareness, word naming, pseudoword naming, word spelling, pseudoword spelling, sentence-level reading, reading comprehension, sentence-level writing, and story structure factor variance, respectively (Fig. 3.3).

Overall, the structural equation modeling revealed that all models appear to fit the data well. However, because the three models are non-nested (Bentler and Satorra 2010) we carried out BIC, AIC, and RMSEA indexes comparisons following recommendations suggested by Po-Hsien Huang (2017). All these indexes are often suggested for non-nested model selection, and SEM analysis revealed a minor value for the three indexes mentioned above for the R<>W model.

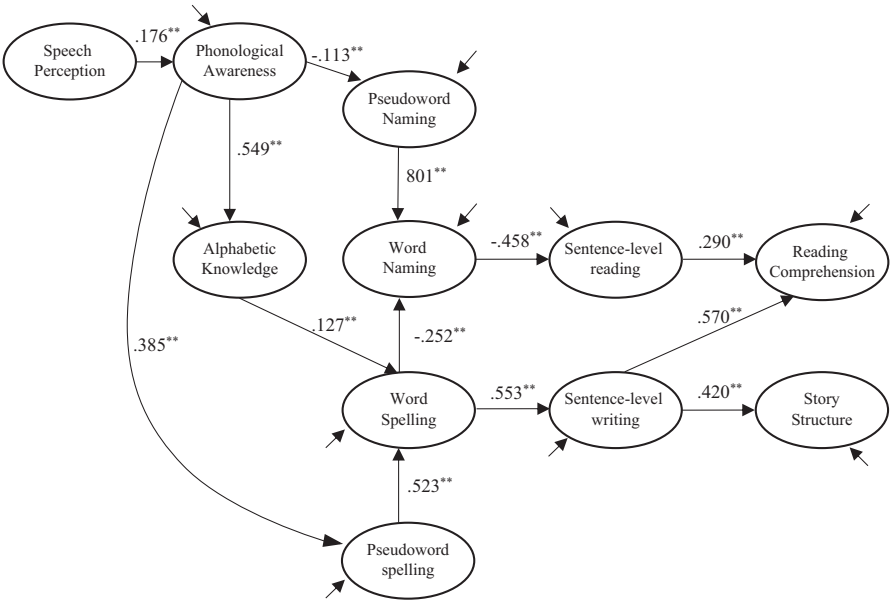

Fig. 3.2 The Writing-to-Reading Model

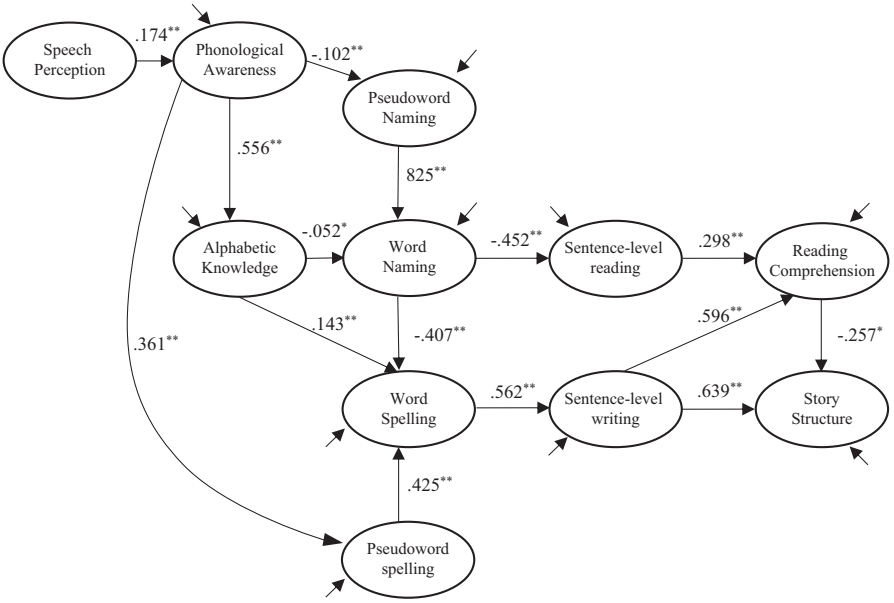

Fig. 3.3 Model 3: The Interactive Model

Concluding Discussion

The main aim of this study was to test three different models of the relationship between reading and writing in a population of Spanish-speaking schoolchildren. There are no currently any models for Spanish such as those presented here, which show the relationships between reading and writing in primary schoolchildren. Previous studies have been carried out with languages with opaque orthographies, such as English (Ahmed et al. 2014; Berninger et al. 2002; Eisterhold 1991; Juel et al. 1986; Shanahan and Lomax 1986, 1988). This is why the models presented here are so relevant: they have allowed us to explore the relationships between reading and writing in a language with a transparent orthography, i.e., Spanish. The results show that the three conceptual models are appropriate for explaining the relationships between reading and writing.

The R-W model, upon evaluation, revealed the following unidirectional interrelations between the various components of reading and writing: Speech perception influences phonological awareness, and both phonological awareness and alphabetic knowledge influence the lexical processes of reading and writing, whereby the contribution of phonological awareness to pseudoword spelling is of particular note. Word naming influences sentence-level reading, which in turn influences reading comprehension. Word naming also influences the ability to spell words. These lexical processes of writing, influenced by the lexical processes of reading, exert in turn an influence on sentence-level reading, which favors narrative writing. We also observed that reading comprehension affects sentence-level writing considerably, but that the contribution that it makes to narrative writing is weak—indeed, this direction came out as negative in the model.

The W-R model, upon evaluation, revealed the following unidirectional interrelations between the various components of reading and writing: Speech perception influences phonological awareness, and both phonological awareness and alphabetic knowledge influence the lexical processes of reading (albeit only in pseudoword naming) and writing, whereby the contribution of phonological awareness to pseudoword spelling is of particular note. Word spelling, for its part, influences word recognition, which contributes to sentence-level reading and reading comprehension, and also influences sentence-level writing, which influences reading comprehension and narrative writing.

Finally, the R<>W model, upon evaluation, revealed the following unidirectional interrelations between the various components of reading and writing: Speech perception influences phonological awareness, and both phonological awareness and alphabetic knowledge influence the lexical processes of reading and writing, whereby the contribution of phonological awareness to pseudoword spelling is of particular note. Word naming influences sentence-level reading, which in turn influences reading comprehension. Word spelling, for its part, is influenced by the ability to name words ($\beta = -.407$), and itself influences sentence-level writing. Moderate to strong correlations have been reported for lexical-level literacy skills (Ahmed et al. 2014). Sentence-level writing influences reading comprehension and narrative writing. We also observed that word spelling indirectly affects reading comprehen-

sion and narrative writing through sentence-level writing. Previous research has shown that syntactic knowledge and awareness are related to reading comprehension, and instruction in sentence construction skills improves reading fluency, grammatical knowledge plays a role in children's writing performance, and interventions in sentence construction skills improve the sentence writing of students with learning disabilities (see for a review, Wong 2018). The contribution made by reading comprehension to narrative writing is weak, however, and even came out as negative in this model ($\beta = -.257$). Nevertheless, a weaker relation has been reported for reading comprehension and written composition (Ahmed et al. 2014).

In the present study, of the three models, the R<>W model seems to fit better than the R-W and the W-R models. These findings are very similar to those found for English. However, one must proceed with caution when drawing conclusions, as our analysis does not take into account any possible differences that may be identified between school grade and reading level. We did not analyze here whether the interactive nature and the total magnitude of the reading-writing relationship is consistent at different levels of literacy proficiency, nor the grade-level differences. On the other hand, although findings from the present study suggest that reading and writing are related, an important limitation of this study is that we cannot conclude about the developmental nature of relations. The cross-sectional design limits our ability to examine growth trajectories and developmental relations of reading and writing at the lexical and discourse-levels. To this end, longitudinal research need to clarify how growth trajectories in reading and writing interrelated over time from Grades 2 to 6.

In any case, our findings would suggest that the differences between the orthographic systems would not appear to modulate the relationships between reading and writing, and that the flow of information between reading and writing may be of a more universal nature based in the alphabetic systems.

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Chapter 4
A "Simple" Illustration of a Joint Model of Reading and Writing Using Meta-analytic Structural Equation Modeling (MASEM)

Yusra Ahmed and Richard K. Wagner

Abstract This chapter introduces a novel approach to modeling reading/writing relations. We conducted an exploratory meta-analysis of the reading and writing literature to identify academic skills related to both domains. Using the Simple View of Reading and Writing as theoretical frameworks, we then fit structural equation models to evaluate the direct contributions of (1) decoding/orthography, (2) language (operationalized as listening comprehension, oral expression and vocabulary), (3) transcription (operationalized as handwriting and spelling) and (4) working memory, on reading and writing. We further evaluated indirect effects of these four academic skills on writing through the mediating effect of reading. We use MASEM to conduct a meta-analysis and fit a structural equation model to meta-analytic data. While this method is complex, our illustration uses broad strokes to focus on the main aspects of the MASEM approach. Thus, both the illustration of MASEM and the theoretical frameworks are "simple", although complex frameworks underlie each.

Keywords Writing · Reading · Spelling · Language · Decoding

Research shows that literacy skills develop and interrelate in complex ways because students have varying experiences and expertise in reading and writing, and schools have varying curricula for reading and writing instruction. The multilayered

Y. Ahmed (✉)
Department of Psychology and Texas Institute for Measurement, Evaluation and Statistics, University of Houston, Houston, TX, USA
e-mail: yusra.ahmed@times.uh.edu

R. K. Wagner
Department of Psychology and Florida Center for Reading Research, Florida State University, Tallahassee, FL, USA
e-mail: rkwagner@psy.fsu.edu

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complexity of the interrelation of literacy skills presents a challenge for comparative analyses. Experimental studies which target at-risks students and employ the use of well-designed assessments and interventions are often small because of resource and time limitations. However, along with correlational studies, the literature has established links between key malleable skills related to reading and writing, often considering the multi-dimensional nature of each process, longitudinal development of reading and/or writing, and variability in student ability, age, and grade. Although informative, differences across previous studies may lead to heterogeneous conclusions about interrelations among component skills due to (a) differences in the unit of analysis at the sub-word, word, sentence or text levels, and (b) differences in the number and types of component skills included (e.g., linguistic variables such as vocabulary versus cognitive functioning variables such as working memory), (c) differences in qualitative versus quantitative aspects of writing, and (d) differences in modality of measures (for example, picture vs. verbal tests of vocabulary). Meta-analysis provides one way to widen the scope of research by combining measures and constructs from different studies while addressing the variability in the results due to differences between study and sample characteristics.

A novel approach for analyzing correlational data, called meta-analytic structural equation model (MASEM), provides an important new tool for analyzing relations between reading and writing across studies. MASEM has been applied to various areas of research, including educational psychology, to model linear relations among processes. MASEM combines the strengths of meta-analysis, on one hand, and path analysis and structural equation models (SEM), on the other hand, two kinds of models that are commonly applied to reading and writing research. This chapters aims to illustrate the use of correlational data using univariate MASEM. For purposes of illustration, we present a preliminary version of the joint model of reading and writing. Readers should refer to Ahmed (2014) for further details of the meta-analysis, alternative SEM model specifications, and moderator analyses. Readers should also refer to Cheung (2013) for an in-depth description of the mathematical models along with step-by-step descriptions of how to fit MASEM models under the univariate and multivariate approaches (see also Cheung 2013; Jak 2015).

The Simple and Not-so-Simple Views of Reading and Writing

The Simple View of Reading

The simple view of reading (SVR) and not-so-simple view of writing (NSVW) are well-established frameworks of reading and writing, respectively. Both frameworks rest on the assumption that the sum and/or interaction of component skills results in adequate reading comprehension or written expression, respectively. For example, the SVR holds that mathematically D × LC = RC (Decoding × Listening

Comprehension = Reading Comprehension), which are each necessary but not sufficient for reading comprehension. The original SVR model included word reading proficiency under the construct of decoding, although additional specifications of the model have included word reading accuracy and fluency (e.g., Florit and Cain 2011). It was also suggested by Tunmer and Chapman (2012) that a composite of non-word decoding, word-decoding and word reading fluency would be the best strategy for modeling the decoding component of the SVR. Listening comprehension is the ability to understand spoken language; mainly spoken words as well as sentences and passage-level oral language (Gough and Tunmer 1986). Under this framework, deficits in reading comprehension are due to failure to achieve word decoding skills only, listening comprehension skills only (specific reading comprehension disability) or both (garden variety poor readers). More recently, Ouellette and Beers (2010) showed that in addition to decoding and listening comprehension, oral vocabulary predicted reading comprehension in older students, but not beginning readers. They called this model the not-so-simple view of reading, not only because of the addition of oral vocabulary but also because of the complexity underlying relations of the "simple" model.

The Simple and Not-so-Simple Views of Writing

The Simple View of Writing (SVW) was modeled after the SVR and the Hayes and Flower (1980) and Hayes (1996) cognitive processing theories of writing. The Hayes and Flower (1980) model includes three main cognitive processes: planning, translating and reviewing, which later were revised to reflection, text production and text interpretation (Hayes 1996). Hayes' model also included working memory, long-term memory as well as motivation for writing. The model is process-based, as it assumes a sequence of events with a temporal distribution that occur for the end goal of writing. Furthermore, the model focuses on adult expert writing, and can serve as a framework for developmental models of writing in younger children (Berninger and Winn 2006). For example, the sub-components of the cognitive process section of the 1996 model included reading and listening comprehension (text interpretation), as well as problem solving and reasoning (reflection). Building on the ideation component of the Hayes and Flower (1980) and Hayes (1996) model, the SVW posits that lower level transcription skills such as handwriting (Berninger et al. 2002) and spelling (Juel et al. 1986; Berninger et al. 2002) as well as higher level skills such as ideation (which includes planning, revision and translating), account for most of the variation in writing skills (Juel 1988; Juel et al. 1986; Berninger et al. 2002). This model was later updated to the NSVW to incorporate working memory, long-term memory and executive functioning, including attention and strategies for self-monitoring and regulation (Berninger and Winn 2006).

The SVW and NSVW proposed by Berninger and colleagues are testable models that are less specific than the SVR in terms of directional relations among components of writing skills. On the surface the models are equally parsimonious:

individual differences in writing skills can be explained by transcription (spelling and handwriting), executive functions, working memory, and text generation (which can be operationalized as oral language, given that ideas must be translated to oral language; Kim and Schatschneider 2017; Berninger et al. 2002), but the model does not show mechanisms through which these components interact. Empirically testing the nature of these relations has been employed via path-analytic models and structural equation models differentially. For example, Limpo and Alves (2013) specified direct as well as mediational paths among transcription, planning, revision, self-efficacy and text-generation, and found that planning and self-efficacy made direct contributions to writing quality for older students and transcription made direct-, and indirect contributions through revision and self-efficacy, for younger students. Childress (2011) attempted to fit an SEM model with fine-motor skills, language, and attention/executive functions making direct contributions to quality of writing (and mediated through working memory), but this model did not converge. Kim and Schatschneider (2017) modeled the relations among transcription, oral language and cognitive components and writing quality, and found that working memory made indirect contributions to writing through transcription skills as well as oral language (see Chap. 1). The empirical models evoke the complexity of the interrelations among cognitive processes related to writing, but the NSVW paradigm suggests that key measurable components such as transcription, oral language and working memory can be used to specify a model of written composition.

In the present meta-analysis (see also Ahmed 2014) we identified a large range of variables related to writing, including decoding/orthography (D/O), text reading (TR), vocabulary/morphology (V/M), listening comprehension (LC), oral expression (OE), working memory (WM), spelling (SP), and handwriting (HW). In addition, several criterion variables of writing quality (WQ), and Curriculum-based measures of writing (CBM), or writing productivity, were identified. For example, writing fluency indices include CBM of writing such as total number of words written (Gansle et al. 2004) and correct minus incorrect word sequences (Espin et al. 2001), whereas writing quality indices range on several characteristics, including type of rating (e.g., ideas and macro-organization; Graham et al. 2002; Olinghouse 2008). Subsequently, we evaluated the effect of transcription skills as well as working memory on several aspects of written expression such as writing quality, total number of words written, and a combined construct of CBM including total number of words written and several other CBM measures (e.g. total number of sentences, clauses, t-units, etc.). Executive functioning, except for working memory, was excluded from models presented here because the construct of executive functions is operationally defined in different ways (e.g., verbal, non-verbal and full-scale IQ, code switching/fluency, working memory, attention, inhibition, self–regulation, and writing specific processes such as planning, reviewing and revising) depending on the field of study (Abbott and Berninger 1993; Altemeier 2006; Babayiğit and Stainthorp 2011; Berninger and Winn 2006; Caravolas et al. 2005; Cragg and Nation 2006; Hoskyn and Tzoneva 2008; Juel et al. 1986; McBride-Chang et al. 2011; Nathan 2009; Olinghouse 2008). Because of the complexity and multi-faceted nature of the executive functions construct, it was difficult to combine measures

from different studies under a single umbrella without fitting both *general* and *specific* aspects of executive functions (Cirino et al. 2018), which this meta-analysis was not designed to do. Thus, three components of the NSVW were evaluated (transcription, language and working memory).

Joint Models of Reading and Writing

The first proponents of the SVW, proposed a "Simple View of Reading and Writing" (Juel et al. 1986), which could be teased apart to make predictions about individual differences in reading or writing. The model was a path analysis with the following relations among variables: (a) spelling and ideas predicted writing, (b) word recognition and listening comprehension predicted reading comprehension, (c) lexical knowledge and cipher knowledge (spelling-sound knowledge) predicted spelling as well as word recognition, (d) exposure to print predicted lexical knowledge and cipher knowledge, and e) IQ and oral language predicted phonemic awareness. Paths in (a) and (b) are representative of the simple views of writing and reading, respectively, and the additional factors were predictors of word level or sub-word level reading and writing (i.e., spelling). The results provided support for the simple views of writing and reading and indicated that word level literacy skills are dependent on the same sources of knowledge.

An experimental question that is often explored in reading/writing studies, as well as the present study, concerns the nature of the contributions of linguistic and cognitive factors to reading/writing independently (Babayiğit and Stainthorp 2011; Berninger et al. 2001) or to both outcomes simultaneously (Aarnoutse et al. 2005; Caravolas et al. 2001; Cataldo and Ellis 1988; Juel et al. 1986; Kim et al. 2014; Parodi 2007). Given that reading is a precursor of unassisted writing development at the word, sentence and text levels of written language (Ahmed 2014), Guan et al. (2014) tested whether the relations among component skills (morphological awareness, syntactic processing and working memory) and Chinese writing quality are mediated by reading comprehension. The results favored mediated effects, rather than direct effects of the component skills. The rationale of a mediated model is also in line with cognitive theories of writing (e.g., Hayes 1996), which suggest that the cognitive processes associated with written expression rely on reading and listening comprehension. Thus, it's possible that some components are directly related to reading and writing, whereas other components are related to writing via their effects on text-level reading. Apart from Juel et al. (1986), none of the previous studies have empirically modeled the Simple View of Reading and Writing (SVRW).

Figure 4.1 presents the joint model evaluated in the present study. The SVR (top portion of Fig. 4.1) was replicated by including language comprehension as a latent variable comprised of listening comprehension, vocabulary and oral expression. For the NSVW portion of the model, we expected that working memory and transcription would make independent contributions to text level writing. Finally, we expected that text reading would mediate the relations of oral language and word

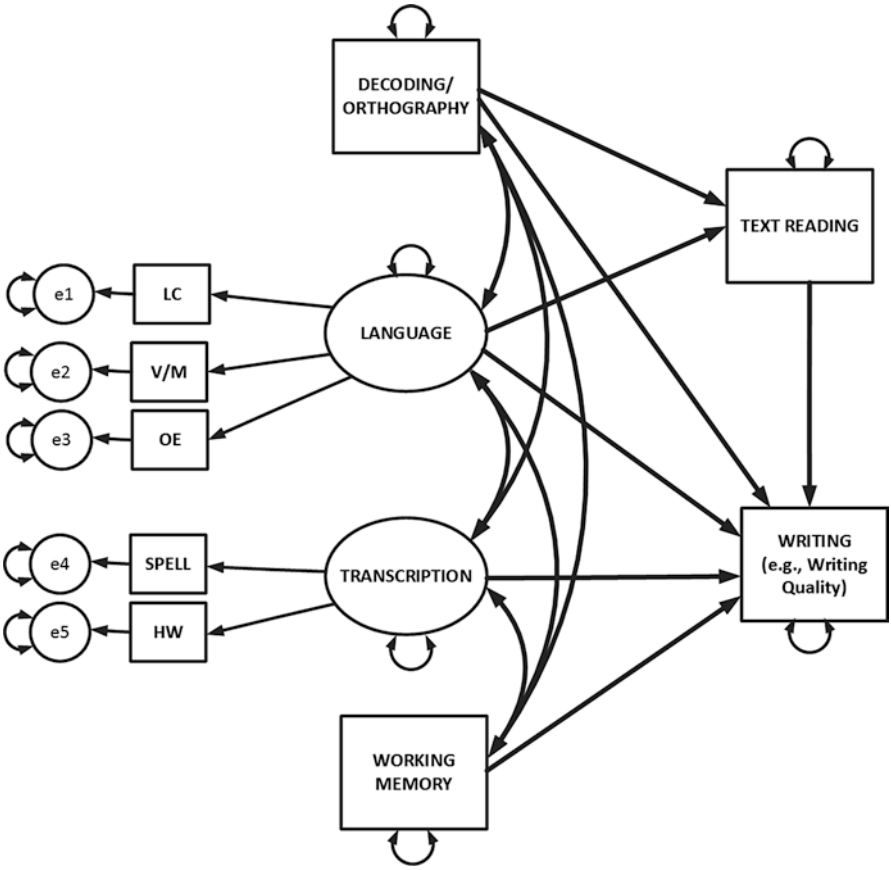


Fig. 4.1 Joint model of reading and writing with reading as a mediator of the effects of decoding and language on writing
Note. e error, *HW* Handwriting, *LC* listening comprehension, *OE* oral expression, *SPELL* spelling, *V/M* vocabulary/morphology

reading to writing. To model both reading and writing processes, the component skills of the SVR were specified as predictors of reading and writing. The mediation of component skills through text reading was also tested, to test direct and indirect relations among component skills and writing, and the extent to which text reading accounts for the relationship between language comprehension and writing, as well as decoding and writing. Because working memory did not make contributions to reading or writing in preliminary models, this variable was not included in the final model.

Meta-analytic Structural Equation MODELING (MASEM)

Step 1: Univariate Meta-analytic Procedures

When both predictor and criterion variables are continuous, the correlation coefficient represents the estimate of effect size, and because correlation coefficients are standardized it is possible to compare them across studies. We searched the literature for studies containing correlations among reading- and writing-related variables. Effect sizes (correlations) were obtained from correlation matrices or from text within studies. The seventy-six studies listed in Table 4.1 were identified and a total of 104 samples were included as several studies provided independent samples for different grade levels or for sub-populations (for example, typically developing children vs. children with a learning disability). We corrected for restriction of range in order to include sub-populations. Other variables coded are presented in Table 4.2.

As a first step, random effects meta-analyses were conducted for each bivariate pair of variables (e.g., spelling-handwriting, spelling-writing quality, spelling-decoding/orthography, handwriting- writing quality, handwriting-decoding/orthography, decoding/orthography-writing quality, etc.; see Ahmed (2014), for further details about the estimation of effect sizes). This procedure resulted in a "synthesized" correlation matrix among all variables coded. The meta-analyses showed that text reading, decoding, CBM, and spelling had the highest correlations with writing quality (range = .56–.60). Moderate correlations were found between listening comprehension, handwriting and writing quality (range = .38–.39). Finally, low correlations were found between vocabulary/morphology, oral expression and working memory and writing quality (range = .27–.28). Table 4.3 presents the effect sizes (correlations) along with indices of heterogeneity. Differences in correlations that are attributable to sampling variance alone are characteristic of homogeneous effect sizes, whereas heterogeneous effect sizes comprise additional sources of unexplained variability and are less representative of the population effect. In the presence of heterogeneity, we consider the dispersion of effect sizes from study to study. The effect sizes were mostly homogeneous, with the following exceptions: decoding/orthography-text reading, and writing quality-text reading.

The first index of heterogeneity is Cochran's Q, which provides a test of significance for heterogeneity and is distributed as a chi-square statistic with $k - 1$ degrees of freedom (Shadish and Haddock 1994). Because Q has low power as a comprehensive test of heterogeneity, especially when the number of studies is small, it's important to consider other indices that measure heterogeneity. The I^2 statistic describes the percentage of variation across studies that is due to heterogeneity rather than chance, and unlike Q, it does not inherently depend on the number of

Table 4.1 Studies included in the meta-analysis

1. Abbott and Berninger (1993)	39. Green et al. (2003)
2. Abbott et al. (2010)	40. Hanley and Bissonnette (2003)
3. Aitken (2011)	41. Hooper et al. (2010)
4. Albuquerque (2012)	42. Hoskyn and Tzoneva (2008)
5. Altemeier (2006)	43. Jenkins et al. (2004)
6. Apel et al. (2010)	44. Jeong (2009)
7. Apel (2010)	45. Jewell and Malecki (2005)
8. Aram and Levin (2004)	46. Jones (2008)
9. Babayiğit and Stainthorp (2010)	47. Juel et al. (1986)
10. Babayiğit and Stainthorp (2011)	48. Kim et al. (2011)
11. Bae (2007)	49. Lerkkanen et al. (2004)
12. Balioussis (2010)	50. McBride-Chang et al. (2011)
13. Ball (2003)	51. Molfese et al. (2006)
14. Berninger and Abbott (2010)	52. Mulligan (2002)
15. Berninger et al. (1992)	53. Nathan (2009)
16. Berninger et al. (2006)	54. Nelson (2003)
17. Berninger et al. (2011)	55. Nikolopoulus et al. (2006)
18. Bird et al. (2008)	56. Olinghouse and Graham (2009)
19. Bishop and Clarkson (2003)	57. Olinghouse and Leaird (2009)
20. Bloodgood (1999)	58. Olinghouse (2008)
21. Cabell et al. (2011)	59. Ollila et al. (1986)
22. Caravolas et al. (2001)	60. Packard et al. (2006)
23. Caravolas et al. (2005)	61. Patel and Soper (1987)
24. Chan et al. (2006)	62. Pinto et al. (2009)
25. Cheng et al. (2011)	63. Puranik and Apel (2010)
26. Cheng (2006)	64. Puranik and Lonigan (2011)
27. Chiappe et al. (2002)	65. Puranik (2006)
28. Cragg and Nation (2006)	66. Reynolds and Perin (2009)
29. Diamond et al. (2008)	67. Ritchey et al. (2010)
30. Dixon (2011)	68. Ritchey (2008)
31. Dunsmuir and Blatchford (2004)	69. Shanahan (1984)
32. Erford et al. (2001)	70. Shatil et al. (2000)
33. Espin et al. (2001)	71. Taylor (1986)
34. Fea (1953)	72. Terenzi (2009)
35. Fogo (2008)	73. Traughber (2007)
36. Furness and Samuelson (2011)	74. Vellutino et al. (2004)
37. Gansle et al. (2004)	75. Wagner et al. (2010)
38. Graham et al. (1997)	76. Welsch et al. (2003)

Note. See Ahmed (2014) for study characteristics and references

Table 4.2 Description of variables coded

Moderators	
Participant Characteristics	Normal (typically developing) vs. Special Populations (reading disability, dyslexia, down syndrome, hearing loss, English Language Learners, twins, low income, bilinguals/multilingual)
Grade/age	Pre-K – grade 12. Ages were converted to grade equivalents.
Language of tests	L1 (primary language) or L2 (secondary language) was indicated if it was not a match with the language of the tests
Design	Correlational vs. randomized controlled trial (RCT)
Type of publication	Peer reviewed journal vs. dissertation
Predictors	
Alphabet knowledge	Alphabet and letter knowledge
RAN	Letters, digits, words
Phonological awareness	Manipulation of phonemes
Decoding/ orthography	Word and non-word reading and reading fluency, orthography
Text Reading	Reading comprehension, oral reading fluency, reading speed
Vocabulary/ morphology	Defining or recognizing words based on print or pictures
Listening comprehension	Understanding spoken language, articulation and repetition of oral language
Oral expression	Oral expression of thoughts and ideas
Working memory	Listening, verbal or visual working memory
IQ	Verbal and non-verbal IQ
Spelling	Word and non-word spelling from dictation
Handwriting	Copying, letter writing, name writing, handwriting fluency, word writing fluency, number writing
Writing knowledge	Knowledge of written language pragmatics (e.g., grammar) tested at the sentence level
Writing quality assessment characteristics	
Writing assessment	Standardized test, writing sample, teacher ratings of writing ability, district test
Holistic score	Overall score of writing sample
Component score	e.g., content/ideas/development/coherence/consistency (of ideas), structure/ organization, mechanics/conventions, vocabulary/word choice, purpose/ tone/voice, cohesion/sentence similarity/sentence structure similarity
Composite score	Sum of component scores or sum of sub-tests in a standardized test
Curriculum based measures (CBM)	e.g., Number of words (NW), Number of different words (NDW), Number of ideas (NI), Number of sentences (NS), Number of t-units (NTU), Words spelled correctly (WSC), Percent words spelled correctly (%WSC), Correct word sequence (CWS), Percent correct word sequence (%CWS), Incorrect word sequence (IWS), Correct minus incorrect word sequence (CIWS), etc.
Readability	e.g., Flesh Reading score and flesh-Kincaid reading score

(continued)

Table 4.2 (continued)

Computational indices	e.g., Coh-Metrix based lexical diversity, causal verb incidence, sentence syntax similarity, etc.
Scoring scale	3–12 point scale (for holistic and componential scores), 10–20 point scale for composite scores
Time	3–50 mins, or untimed
Genre	Narrative, expository, and persuasive
Raters	Researchers, teachers, state staff (numbers indicated)
Task/topic	Topic, story starters, summary, choose topic, picture prompt, scenario, standardized test
Data	
Effect sizes	Significant and non-significant correlations provided in a correlation matrix or in the text. For longitudinal studies, the correlation for the middle range was coded (e.g., grade 3 for a study including grades 1–5) and for cross-sectional studies correlations were coded for each sample.
Reliability	Reliabilities for specific samples and reliabilities reported in test manuals. For written expression, inter-rater reliability was coded.
Descriptive statistics	Standardized means and standard deviations.

studies considered. I^2 of 50% is interpreted as moderate heterogeneity and 75% is interpreted as high heterogeneity, suggesting that the same two effects that had significant heterogeneity also had over 50% heterogeneity that was due to variability among studies rather than chance. Finally, the Tau-squared statistic (T^2) is defined as an estimate of the variance of the true effect sizes (τ^2) and it takes into account if studies are different from each other (Q), the number of subjects (n) and number of studies (k). T^2 has the advantage of being in the same metric as the effect size. As shown in Table 4.3, none of the effects had sizeable variance. The non-significant homogeneity test statistics indicate that most effects were normally distributed around the true correlation. The heterogeneous effects were further examined using a mixed effects model to evaluate the following moderators: grade/age, language (English vs. other), special population (typically developing vs. other), publication type (peer reviewed journal vs. dissertation) and writing assessment rubric (holistic, composite and componential). The moderators did not significantly contribute to between-studies variance.

Step 2: Structural Equation Models

As a second step, the pooled correlation matrix was fit to structural equation models to evaluate relations among component skills. Because working memory did not make contributions to reading or writing in preliminary models, this variable was not included in the joint model of literacy skills (see Fig. 4.2). Initially, all variables were regressed on writing and paths to reading were fixed to zero. Only text reading

Table 4.3 Summary of results for the univariate meta-analyses

	k	Q	I^2	T^2	ES ($\hat{r}$)
Writing quality					
CBM writing	29	12.85	0.00	0.25	0.51
Decoding/orthography	22	24.18	13.15	0.07	0.51
Text reading	27	80.28**	67.61	0.18	0.60
Vocabulary/morphology	23	35.95	38.81	0.02	0.27
Listening comprehension	23	23.25	5.39	0.03	0.39
Oral expression	14	12.29	0.00	0.01	0.28
Working memory	13	12.02	0.19	0.00	0.27
Spelling	12	10.45	0.00	0.11	0.56
Handwriting	12	12.36	11.04	0.03	0.38
CBM writing					
Decoding/orthography	23	24.08	8.63	0.12	0.33
Text reading	18	25.47	33.25	0.09	0.31
Vocabulary/morphology	12	11.70	5.99	0.03	0.12
Listening comprehension	13	11.56	0.00	0.02	0.18
Oral expression	8	5.46	0.00	0.04	0.15
Working memory	11	10.28	2.70	0.00	0.14
Spelling	24	33.84	32.03	0.07	0.37
Handwriting	16	18.72	19.86	0.09	0.41
Decoding/orthography					
Text reading	27	72.83**	64.30	0.12	0.74
Vocabulary/morphology	23	19.32	0.00	0.03	0.37
Listening comprehension	22	28.75	26.95	0.02	0.36
Oral expression	11	12.45	19.66	0.05	0.22
Working memory	23	23.22	5.26	0.02	0.25
Spelling	44	50.53	5.00	0.12	0.64
Handwriting	29	30.90	9.39	0.00	0.31
Text Reading					
Vocabulary/morphology	28	20.50	0.00	0.07	0.57
Listening comprehension	23	23.77	7.43	0.06	0.51
Oral expression	14	11.89	0.00	0.02	0.35
Working memory	16	13.06	0.00	0.02	0.36
Spelling	24	29.80	22.83	0.05	0.67
Handwriting	15	10.12	0.00	0.01	0.31
Vocabulary/morphology					
Listening comprehension	15	10.37	0.00	0.06	0.61
Oral expression	14	11.74	0.00	0.01	0.34
Working memory	16	19.73	23.97	0.01	0.34
Spelling	26	22.15	0.00	0.04	0.44
Handwriting	16	12.84	0.00	0.02	0.21

(continued)

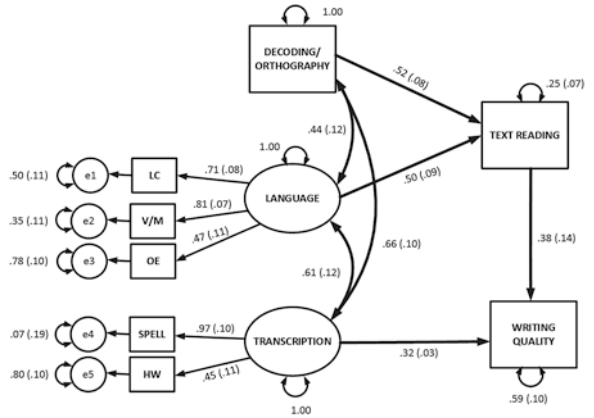
Table 4.3 (continued)

	k	Q	I^2	T^2	ES ($\hat{r}$)
Listening comprehension					
Oral expression	16	14.99	0.00	0.02	0.32
Working memory	12	9.94	0.00	0.00	0.33
Spelling	14	15.04	13.57	0.02	0.36
Handwriting	8	5.03	0.00	0.01	0.24
Oral expression					
Working memory	11	9.33	0.00	0.02	0.29
Spelling	4	3.55	15.55	0.15	0.40
Handwriting	4	2.63	0.00	0.01	0.24
Working memory					
Spelling	15	10.99	0.00	0.01	0.32
Handwriting	7	6.25	3.95	0.01	0.22
Spelling					
Handwriting	19	21.82	17.51	0.04	0.43

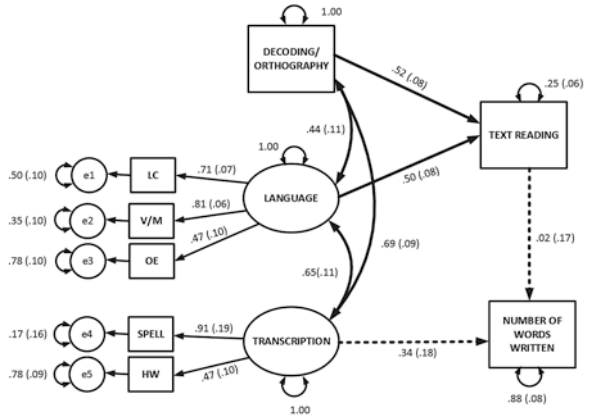
Note. $**p < 0.05$; *k* number of studies, *df* degrees of freedom, *ES* Effect Size

(ß = .45, $p < 0.001$) made significant contribution to writing quality in this model, whereas the effect of language (ß = −0.07, $p > 0.05$), decoding (ß = −.03, $p > 0.05$) and transcription (ß = .38, $p > 0.05$) were not significant. Because of the lack of a significant effect between language comprehension and writing, and decoding and writing, subsequent models did not include mediation. The final model (Fig. 4.2a) provided an excellent fit to the data ($\chi 2 = 15.77$, $df = 16$, AIC = 1330.58, BIC = 1374.67, RMSEA = 0.00, SRMR = 0.05, CFI = 1.00, TLI = 1.00). Decoding (ß = .52, $p < 0.001$) and language comprehension (ß = .50, $p < 0.001$) made significant contributions to text reading, which in turn made a significant contribution to writing quality (ß = .38, $p < 0.001$). In addition, the effect of transcription on writing quality was significant (ß = .32, $p > 0.05$). The model accounted for 75% of the variance in text reading and 41% percent of the variance in writing quality. Subsequent models included number of words written (Fig. 4.2b) and CBM measures of writing (Fig. 4.2c) as the outcome variables, with adequate fit indices across models. The models explained 42% of the variance in CBM writing and 12% of the variance in total number of words written. The effect of transcription (ß = .34, $p < 0.001$) was significant for CBM writing, but the effect of text reading was not (ß = .12, $p > 0.05$).

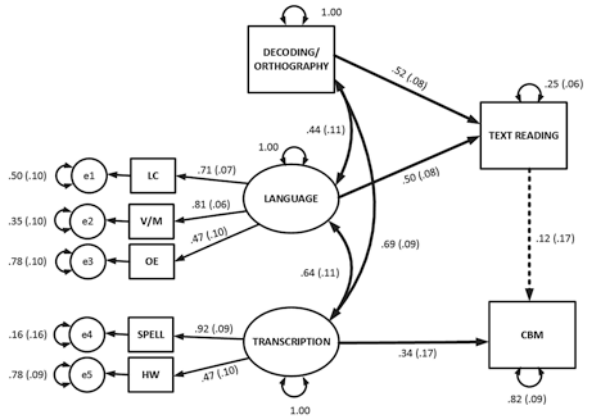
Fig. 4.2 (continued) *Note*. CBM included total number of words written and other CBM measures of writing. The total number of words written was obtained by excluding all other variables involving CBM measures of writing. Thus, an alternative correlation matrix was fit to the data which included the effect sizes for total number of words instead of curriculum based measures of writing. Dashed lines = non-significant paths, solid lines = significant paths. *e* error, *CBM* curriculum based measures of writing, *HW* Handwriting, *LC* listening comprehension, *OE* oral expression, *SPELL* spelling, *V/M* vocabulary/morphology



a) Joint model of reading and writing with writing quality as the outcome variable.



b) Joint model of reading and writing with total number of words written as the outcome variable.



c) Joint model of reading and writing with curriculum based measures of writing as the outcome variable

Fig. 4.2 Joint models of reading and writing, with writing quality (**a**), total number of words written (**b**) and CBM writing (**c**) as outcome variables

Neither transcription (ß = .34, $p > 0.05$), nor text reading (ß = .02, $p > 0.05$) made significant contributions to total number of words written.

Implications for Modeling the Connections Between Reading and Writing

To model component skills of the SVR and NSVW, we conducted a meta-analysis of 76 studies and included several measures of reading as well as writing, evaluated the direct and mediational effects of common predictors on literacy skills, and explored quantitative and qualitative aspects of writing. The results of the univariate MASEM approach indicated that text reading was an important predictor of writing along with transcriptions skills. However, the exploratory meta-analysis did not include the original Gough and Tunmer (1986), and Hoover and Gough (1990) SVR studies, but did include the Juel et al. (1986) study, because the purpose of the meta-analysis was to identify studies reporting data on constructs related to both reading and writing. It is thus possible that results would vary if studies which explicitly test the SVR are included in the analysis and if specific aspects of the constructs are contrasted (e.g., word reading accuracy and fluency). However, Florit and Cain (2011) conducted a meta-analysis of 33 studies (including Hoover and Gough 1990) which examined the components of the SVR in English as well as transparent orthographies, and reported the correlations based on schooling years (i.e., students having spent more, or less time in school), as well as age. The results indicated that decoding was more influential than linguistic comprehension in younger students who spoke English, and for transparent orthographies linguistic comprehension was a stronger predictor of reading comprehension. Specifically, the correlations for the younger cohort were .79, .84 and .89 for English reading comprehension and non-word reading accuracy, word reading accuracy, and word reading fluency, respectively, whereas in the present meta-analysis the correlation between text reading and decoding/orthography (word and non-word reading accuracy and fluency) was .74. Similarly, they reported correlations ranging from .38 to .71 for linguistic comprehension and reading comprehension, whereas the present meta-analysis found a correlation of .51. The similarity in results of the meta-analyses is reassuring, given the small overlap in the studies included in both meta-analyses, as the present analysis focused on and was limited to, studies including component skills of reading as well as writing. Similarly, Kent and Wanzek (2016) conducted a meta-analysis of 38 studies to evaluate the relationship between component skills (handwriting fluency, spelling, reading and oral language) and writing quality and production across different grade levels (K-3 vs. 4–12) and types of learners (typically developing vs. academic difficulty). The results revealed higher correlations among component skill and writing quality than writing productivity, and overall higher correlations between handwriting fluency, spelling and reading with writing quality. While there were several differences in the inclusionary and exclusionary criteria, granularity of

constructs, and analytic procedures, the present meta-analysis included approximately 30% of the studies in Kent and Wanzek (2016), and was mostly consistent with their results (differences in effect sizes ranged from 0.02 to 0.12).

Building on previous research, we have briefly illustrated a new approach for synthesizing bivariate correlations which is better suited for making conclusions about direct and indirect effects component skills of reading and writing. The models provided support for the transcription component of the NSVW as a latent factor comprised of handwriting and spelling (Berninger et al. 2002; Graham et al. 1997; Limpo and Alves 2013), with unique contributions to quality of writing and productivity. Additionally, language was modeled as a latent variable comprising of listening comprehension, vocabulary/morphology and oral expression, but the effect of language on writing was not significant. It is likely that the inclusion of higher-order components specified by the NSVW in future research (i.e., executive functions such as switching and inhibition, and attention) would provide important insights about the connections between transcription and language and written expression. As the model posits, these higher-order skills draw upon working memory capacity, but the present study showed that working memory was not directly related to writing when transcription and text reading were also in the model. Working memory is an essential component of the writing process as outlined in multiple theoretical models of writing, including the NSVW (Berninger and Winn 2006; Hayes 1996, 2000; Hayes and Flower 1980; McCutchen 1996). The central role of working memory is that coordinates lower- and higher-order processes during text generation. Yet, research shows that domain-general cognitive processes like working memory and attention do not make unique contributions or predict response to intervention after controlling for domain-specific higher-order components, such as planning (e.g., Hooper et al. 2006). Thus, it is possible that rather than working memory *capacity* alone, the writer's text representations and development in working memory play an important role in text generation (Kellogg 2008).

The joint SEM models of literacy showed that text reading exerts an influence on writing, over and above oral language, and word decoding. Although it was hypothesized that decoding and language would be implicated in writing because of their relation with text reading, the components of the SVR were not directly related to writing. This finding is contrary to research which shows that language plays an important role in written expression, even after controlling for reading comprehension (Berninger and Abbott 2010). The finding that text reading, not language, is directly related to writing is important because it suggests that factors that are specific to a reader's interaction with written text might be implicated in text generation.

Of note, we defined the construct of text reading as reading comprehension and passage-level reading fluency. Although these variables are highly correlated, they represent distinct aspects of reading. Similarly, most of the studies included in the meta-analysis defined oral expression as telling or retelling a story, but some studies also defined this construct at the word and sentence levels. Future studies are required to determine the role of oral expression at different levels of language (Santoro 2012), as well as more extensive future work that specifically incorporates all components of the NSVW.

Conclusions

The studies and meta-analytic models reviewed here clarify current understanding of the relations among reading and writing. For example, word level reading was not related to text generation, but text-level reading was related to text generation quality, and not quantity (as defined by CMB-writing measures). Within the domain of writing, transcription was related to text generation quality and quantity when the outcome was CBM-writing (defined as multiple measures such as correct word sequences written and total number of words written), but not when the outcome was total number of words written only. Within the domain of reading, findings provided additional support for the SVR as word-level reading and language predicted text-level reading. However, the results also pose some interesting new questions: a) *are the relations among language and working memory and writing context dependent*? b) *are working memory and language related to different parts of the process of writing (e.g., revision) rather than the quality and quantity of text generation?* Such questions require additional research integrating cognitive and linguistic processes involved in the processing vs. production of text (e.g., Parodi 2007).

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Chapter 5
Modeling Relations Between Reading and Writing

Richard K. Wagner

Abstract The three chapters take different approaches to model relations between reading and writing: Synthesizing existing models of reading and writing and key empirical findings (Kim); using structural equation modeling (SEM) to test alternative models of relations between reading and writing (Jimenez et al.); and using meta-analytic structural equation modeling (Ahmed &Wagner). Each of the models can be used to generate testable predictions. Examples of how this can be done using latent change score modeling of longitudinal data are described. Latent change score modeling is a new approach to modeling longitudinal data that combines the strengths of SEM causal modeling and latent growth curve modeling.

Keywords Reading · Writing · Models of development · Latent change score modeling

Modeling Relations Between Reading and Writing

The chapters by Kim, Jimenez et al., and Ahmed and Wagner illustrate the value of applying different kinds of models to the study of relations between reading and writing. I will discuss each chapter in turn with an emphasis on the alternative modeling approaches they have used, and then describe a method that appears fruitful for following up on implications of their work by modeling possible influences between reading and writing as they co-develop.

R. K. Wagner (✉)
Florida State University, Tallahassee, FL, USA
e-mail: rkwagner@psy.fsu.edu

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Interactive Dynamic Literacy Model: Theoretical Framework for Integrative Science of Reading-Writing Relations by Young-Suk Grace Kim

Kim presents an interactive dynamic literacy model that represents a synthesis of the major models of reading and writing, guided by key findings in the empirical literature. There are a number of strengths of the model. The first is its comprehensiveness. Perhaps not surprisingly given that it was created as a synthesis of existing theory and data, it provides a very useful and informative depiction of the many constructs that are involved in understanding reading, writing, and their connections. A second strength is that it is not merely a description but a framework but that includes assertions that ultimately could be supported or refuted by empirical research. An example is the assertion that reading and writing are connected primarily because of their shared skills and knowledge. Although this might seem to be an obvious assertion, there are other reasonable competing assertions. For example, it is possible that in addition to shared knowledge and skill, reading might affect the development of writing or writing might affect the development of reading. I will return to this topic in the final section. A second example of assertions that could be tested is provided by the four core hypotheses that are proposed. The first hypothesis is that influences between reading and writing are interactive and bi-directional. It is possible to test competing models that specify main effect but not interactive influences or unidirectional rather than bi-directional influences. A second hypothesis is that relations between reading and writing are dynamic rather than static. This again can be tested by comparing models that allow changing relations between reading and math across development to models that constrain the influences to be the same across development. The third hypothesis is that reading and writing difficulties are co-morbid or co-occurring. An important area for future research is to examine whether asymmetric patterns exist in co-occurrence (whether having writing difficulties but not reading difficulties is as common as having reading difficulties but not writing difficulties) and if so, what accounts for them. The fourth hypothesis is the hierarchical structure of component skills, with some components influencing reading or writing only indirectly through mediating by higher order skills. Kim reports studies that test this hypothesis directly. For example, the influence of working memory on reading comprehension and on writing is mediated rather than direct.

An Analysis and Comparison of Three Theoretical Models of the Reading-Writing Relationships in Spanish-Speaking Children

Juan E. Jiménez, Eduardo García, Francisco Naranjo and Juan A. Hernández

Turning to the chapter by Jimenez et al., they provide an excellent example of using structural equation modeling (SEM) to test three alternative models of relations between reading and writing. A reading to writing model proposes that reading influences the development of writing. Conversely, a writing to reading model proposes that writing influences the development of reading. Finally, an interactive model proposes that both reading influences the development of writing and writing influences the development of reading.

An important strength of this chapter is that the three models of relations between reading and writing are implemented as competing structural equation models. As implemented, the primary difference between the reading-to-writing and writing-to-reading models is that for the reading-to-writing model, word reading influences word spelling and reading comprehension influences sentence-level writing and story structure. In contrast, for the writing-to-reading model, the arrows go the other way with word spelling influencing word reading and sentence level writing influences reading comprehension. The interactive model had influences going in both directions. So consistent with the reading-to-writing model, word reading influenced word spelling and reading comprehension influenced story structure. Consistent with the writing-to-reading model, sentence level writing influenced reading comprehension. However, it wasn't clear why the interactive model did not include arrows going both ways between constructs such as word reading and word spelling, thereby fully combining the effects posited by the reading-to-writing and writing-to-reading models. Including paths in both directions would make the model no longer be recursive, but it is possible to fit non-recursive models. It also wasn't clear why a path between reading comprehension and story structure was included in the reading-to-writing and interactive models but omitted from the writing-to-reading model. Sometimes paths are omitted to solve problems with models that do not converge, and this may have been the case here. As the authors acknowledge, the data are cross-sectional rather than longitudinal, and it would be great to test these competing models on longitudinal data that could show the posited influences on development.

A "Simple" Illustration of a Joint Model of Reading and Writing Using Meta-analytic Structural Equation Modeling (MASEM)

Yusra Ahmed and Richard K. Wagner

The third chapter by Ahmed and Wagner also used structural equation modeling to test models of relations between reading and writing but rather than using data from a single study for analysis, they did a meta-analysis of the literature. The meta-analysis differed from the typical meta-analysis in that the goal was not to produce an estimated effect size but rather a composite correlation matrix. The composite correlation matrix then served as the data to be used in the structural equation models.

The model to be tested represented a combination of the simple view of reading and the not-so-simple view of writing. Regarding relations between reading and writing, the model allowed for direct effects of word reading and language on both text reading and writing, as well as indirect effects of word reading and language on writing that were mediated by text reading. Spelling and handwriting formed a transcription factor that also was a potential cause of the writing variables. Three writing variables were modeled: writing quality, number of words written, and CBM writing. The models fit the data very well. However, the results varied somewhat for the three writing variables. The effects of word reading and language were mediated by text reading for the writing quality outcome, but there were no direct or indirect effects of word reading and language on number of words written or CBM writing when the transcription factor was included in the model. It makes sense that text reading might have more of an effect on writing quality that was independent of transcription compared to the lower level variables of number of words written and CBM writing.

Using Latent Change Score Modeling to Test Alternative Models of How Reading and Writing Are Related

Longitudinal studies can be helpful in studying whether (a) reading affects the development of writing, (b) writing affects the development of reading, (c) both effects occur, or (d) neither effect occurs. Longitudinal studies have typically used one of two methods for modeling results. The first method is represented by structural equation causal models and cross-lag panel models. They can be used to determine whether individual differences in a construct at time one account for individual differences in a second construct at time two, often including the autoregressive effect of the second construct at time one in the model. The second commonly used method for analyzing longitudinal data is latent growth curve modeling. Growth in a construct is modeled in terms of an intercept (typically but not necessarily where people start at the beginning of the longitudinal study) and a slope (how fast people grow). Each individual has values for the intercept and slope parameters, and distri-

bution of parameter values across individuals in the sample can be used to characterize the group mean and standard deviation for intercept and slope parameters.

An advantage of SEM causal models and cross-lag panel models is the facilitation of causal inference provided by time precedence. Because the developmental period is broken into discrete time intervals, one can determine whether a construct at time one accounts for variance in a second construct at time 2, controlling for the autoregressive effect of the second construct at time 1. A disadvantage of these models is that only covariances are modeled. Whether performance increases, decreases, or stays the same over time is not modeled and identical results are obtained.

An advantage of latent growth-curve models is that growth is modeled explicitly with a developmental function. Unlike SEM causal models and cross-lag panel models that ignore means, all of the data are modeled including means and covariances. However, because the developmental period is not broken into discrete time intervals, the absence of time precedence limits the ability to make causal inferences from the results of latent growth curve modeling.

Latent-change score models combine the strengths of SEM causal models and latent growth curve models. Because the developmental period is divided into discrete time intervals, time-precedence is available to be used for making causal inferences. Development is modeled explicitly by analyzing both mean and covariance structures. The most important advantage of latent-change score models is that they can be used to determine whether one construct influences the development of a second construct. Coupling parameters in latent change score models are used to represent these influences by determining whether performance on one construct can account for subsequent change in performance on a second construct.

A latent change score model for two constructs (x, y) measured at 4 time points is presented in Fig. 5.1. Beginning at the top of the figure, the rectangles labelled X1 through X4 represent four measurements over time for construct X. The variance in these observed variables is divided into measurement error (the small circles labelled ε_{X1} through ε_{X4}) and true scores (the ovals labelled X1 through X4). Change in true scores from one time point to the next is represented the circles labelled Δx21 through Δx43. The same interpretations apply for the construct Y at the bottom of the figure. Moving to the left, the intercepts or where people start are represented by η_{0x} and η_{0y}. The slopes or rates of growth are represented by η_{1x} and η_{1y}. For constructs like reading and writing, if you are good at one you tend to be good at the other. The correlation between where people start on the two constructs is represented by the double-headed arrow connecting η_{0x} and η_{0y}. If you grow fast in reading, you are likely to grow fast in writing. The correlation between how fast you grow on both constructs is represented by the double-headed arrow connecting η_{1x} and η_{01}. A direct influence of one construct on the subsequent development of a second construct is represented cross-lags or arrows going from a true score on one construct to change in the other (e.g., the arrow from X1 to Δy21).

Four competing models of possible developmental influences between reading and writing are available to be tested. The first is that there are likely correlations between where people start (intercepts) and how fast they grow (slopes) in reading and writing, there are no direct influences of one construct on the development of the other. The second model posits that reading influences the subsequent develop-

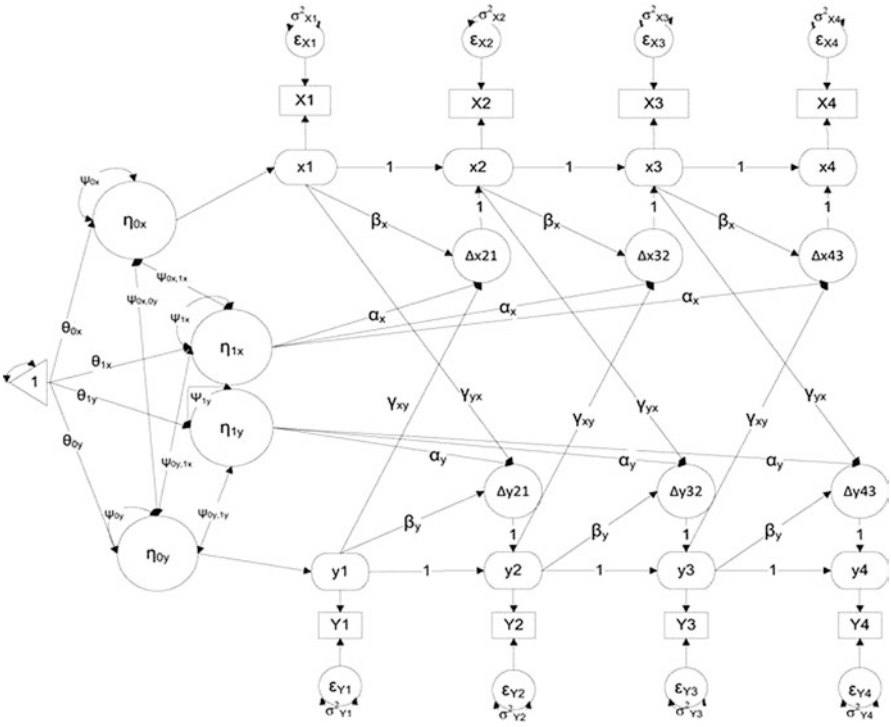

Fig. 5.1 A latent change score model of co-development

ment of writing, independently of potentially correlated intercepts and slopes. The third model posits that writing influences the subsequent development of reading, independently of potentially correlated intercepts and slopes. The fourth and final model posits bi-directional influences of reading on the subsequent growth in writing and of writing on the subsequent growth in reading, independently of potentially correlated intercepts and slopes.

These models can be applied to address developmental implications of the models and results presented in the three chapters. For example, a strong form of Kim's the interactive dynamic literacy model would account for relations between reading and writing solely by their shared components and knowledge. This model applied to longitudinal data would be the first of the four latent change score models described above: Correlated intercepts and slopes because of the shared components and knowledge but not additional direct developmental influences of reading on writing or writing on reading. The three models outlined by Jimenez et al., reading-to-writing, writing-to-reading, and interactive models, would be represented by the remaining three latent change score models. Finally, meta-analysis could be used to create composite correlation matrices and mean structures and then apply latent change score models to the data the way Ahmed and Wagner did but using structural equation models rather than latent change score models.

Part II
Literacy Development

Chapter 6
Orality, Reading and Writing in Early Literacy

Ana Teberosky, Angélica Sepúlveda, and Otília Costa e Sousa

Abstract An experience of intervention in literacy classes in Early Childhood and Primary Education is presented in this chapter from a perspective that conceives language as a process of co-construction of meanings and associates orality, reading and writing in that process. This perspective discusses the implicit definitions of the most widespread teaching proposals and argues that there is a conceptualization of written language as an object of learning in the initial period. This conceptualization is evident in the activities and interactions entailed by that process, as well as a description of the learner at the starting point.

Introduction

In spite of a relative consensus on the final objectives of teaching early literacy, there is much debate about how to begin. In this debate, controversy still exists between supporters of a global, from top-down approach, and proposers of a phonetic, bottom-up approach. This discussion is applied mainly to reading, but not to writing, which is rather associated with an analytical strategy (bottom-up). In this confrontation, the writing system shows a restricted view of the code and its learning as an association between letters and phonemes. However, several authors have reflected on the need to differentiate between written signs and written language, and on the difference between producing signs and producing and interpreting texts (Blanche-Benveniste 2002; Linell 2005; Olson 1994).

Additionally, and regarding initial learning, both proposals, global and analytical, deal with reading and writing either as a unitary process or as separate processes

A. Teberosky (✉)
University of Barcelona, Barcelona, Spain
e-mail: ateberosky@ub.edu

A. Sepúlveda
Education Laboratory, São Paulo, Brazil

O. Costa e Sousa
Polytechnic Institute of Lisbon and Institute of Education, University of Lisbon, Lisbon, Portugal

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in which learning to read comes first and comprehension and production of texts comes later. Both proposals also neglect the diversity of situations in which linguistic activities are carried out (oral or written, including the different textual genres), as well as the technological objectives and means of production and perception of those achievements. Finally, in this discussion there is a poorly adjusted description of the learner, who is treated as if he/she had no knowledge of language or writing, or as if he/she shared the adult's representations about language.

Unlike the previous debate, in this chapter we propose that a global as well as an analytical strategy is necessary to understand the early learning of written language, especially if the objective is to help children understand the structure of the text (macrostructure) and the language units within different structures. According to Ann Peters' statement (Peters 1983, p. 5) on the acquisition of oral language, we also believe that both visions global and analytical help understand the linguistic structure of texts and describe the learning of language. But first we should dismiss the idea that, in the case of smaller units, words or phrases, children share the same representation as literate adults.

In our perspective, literacy is not a unique process, but rather composed and interactive, with relationships between orality, reading and writing. Additionally, writing should be considered as a visual and graphic system of language, although there should be a distinction between the graphic system, the discursive mode of writing and the material and spatial display of texts. Accordingly, we believe that the activity of teaching is guided by the diversity of usage of oral communication, reading, dictation, writing, commentary, etc., along with their demands and interactions, as we will argue later. This guide operates in two directions: in guaranteeing and promoting a linguistic flow of texts at the start point of the activities (input condition) and, from there onwards, in programming cycles of activities which we have named *chained tasks*, aimed at a production in response to the conditions of the initial input (Teberosky 2016, p. 24).

The activity of reading is also considered not equivalent to decoding or writing - those activities are different depending on whether they consist of writing, verbalizing, dictating, reading literally, interpreting, commenting on words, texts, etc. And the learner is described as a speaker of the language, who may have participated in various cultural learning situations and who has developed important cognitive abilities by the age of four or five (Tomasello 1999). Consequently, we proposed not to separate the learning and teaching of writing from oral language but to consider that there is a continuity between both, each one with its own unique features. In this sense, we share this view with the broadest spectrum of Cognitive Linguistics on usage as one of the main factors in the shaping of language (Bybee 2006; Langacker 1987; Tomasello 2003). We adopt here a perspective from a usage-based theory in which the learning of language is based directly on experience with language (oral and written). Rather than being an abstract set of rules or structures, children learn language as a network built up from the instances of language use (Beckner et al. 2009, p. 3).

In our proposal, learning activities are prepared according to their diversity, and we consider the need to activate the possibilities of participants, teachers and

students. Firstly, reading aloud children's stories by the teacher, which gives place to interactive cultural learning where children participate *with* and *through* the adult's activity (Tomasello 1999). This adult reading aloud activity is a global strategy that involves a whole series of other activities chained between the connection of orality with reading and writing.

Since the objective of reading aloud is to generate other activities such as retelling or rewriting stories, the teacher helps the child to understand the macrostructure of the text in order to understand the relationship between the coherence of the subject and the ideas with the words and expressions they have heard in the oral text. A series of activities is then developed, such as oral reproduction of the text they have heard (or retelling the text, and this may be recorded in audio or video), dictation by children to the adult as a reconstitution after having heard the stories, or rewriting the text that has been heard. Children's ability for reformulation has been shown in several studies on the acquisition of oral language, where repetition and imitation are of paramount importance (Clark 2006; Martinot 2003; Küntay and Senay 2003; Veneziano 2014).

The global strategy (reading aloud) is followed by a more analytical one that ensures the specific understanding of how writing works as a graphic system, related to the writing of words. Since, regardless of the type of teaching strategy, the child must develop a process of unit conceptualization (texts, paragraphs, phrases, words or letters), the educational strategy should include activities that make this process easier. In any case, the child has to build the units from the writing phase, since the units do not occur similarly in oral language (Peters 1983; Veldhuis and Kurvers 2012).

While conceptualization of the text takes place during reading aloud and the subsequent comments, conceptualization of units from the graphic system takes place when writing, particularly when an adult "writing aloud" (and then reading aloud what they are writing) accompanies it. Data collected from studies regarding the construction of writing allowed us to know the specific evolutionary perspective of the child's thought on the units of the writing process: knowing, for instance, that initially the written text represents to the child the name of the object, or a specific type of word as a "word-name" (Ferreiro and Teberosky 1982; Ferreiro 2002).

We had already argued that, from the point of view of the child, oral reading does not correspond to his representation of what is written. At the initial level children expect only the names (or referential content) to be represented by writing (Ferreiro and Teberosky 1982, p. 148). In the activities presented herein we are taking into account these representations, of the relationship between orality, reading and writing from children point of view and the purpose of transforming the product into a process. At the same time, we treat the writing or the texts according to their use, and not independently of what we do with them. The learner is a pre-school child who has access to books through adults who read to him/her aloud; who can grasp the properties of writing because he/she has seen materials written in different environments; who has asked "who does what" (in the text); who has heard explanations; and who has been encouraged to scribble on paper (draw, write). This means that the child has participated in interactions with others who have read children's

stories (oralised); who have answered questions (in conversation); who have been able to imitate graphic arrangements on paper. In this description, we emphasize the interactions between the oral reading, and writing that occur in every learning situation.

To understand these interactions, we need a theory about the learning of writing that takes into account the aspects involved and how they cooperate with each other. The theory adopted here takes into account the interaction of linguistic, cognitive and socio-cultural processes. A first aspect of the learning process relates to the *symbolic dimension* of language (oral or written), which is used in contexts of either interpersonal or distant communication (Tomasello 2003, p. 6). When the learning process of writing begins, children have already participated in symbolic situations of communication that enable them to flexibly understand symbols according to the context of use, while preparing them for interactions in networks of those symbols. This makes learning a more complex process than simple correspondence (or association) between letters and sounds.

Beyond the perception or recognition of the series of spellings, the second aspect of learning the writing process conceives it as *a conceptualization* (Tomasello 2003, p. 62), in the same sense as it has been studied in other fields. That is to say, in order to learn how to write, the child develops different hypotheses about its function and nature, which influence the reading and writing perspective from his/her point of view (Ferreiro and Teberosky 1982). This second aspect guides the learning process and is involved in the description of the learner, and his/her previous skills and knowledge.

A third aspect is explained by the fact that pre-school children already know about routines and social and cultural patterns of interaction, for which they have scripts on how to participate. In addition, they are prepared as speakers in their language communities. That preparation of *cultural learning* (Tomasello et al. 1993, p. 495) occurs in activities of joint attention and understanding of the intention of others, which also allows them to participate in book reading carried out by adults.

The fourth aspect is related to the *diversity of situations* (Blanche-Benveniste 2008, p. 354) in which different linguistic activities are carried out (oral or written, including the different textual genres), as well as the demands, objectives and technological means of production and perception of those activities. Reading is therefore considered not equivalent to decoding, neither is writing considered equivalent to coding; and that learning differs, depending on whether it is reading, silent or oral reading, literally reading, interpreting or commenting on words or texts, verbalizing, writing, dictation, rewrite, creative writing.

In our experience, considering each of these aspects has guided our specific orientations on teaching according to pedagogical objectives, to the students' age, to the role attributed to the teacher, and to the different linguistic levels. With the objective of sharing with the teachers these principles we chose the design-based methodology conceived for the intervention in classroom, which would allow us to influence the selection, sequencing and preparation of classes. This methodology designed for education research was aimed at transferring and translating research

in improving educational practice, and at the same time involving teachers in this process (Reinking and Bradley 2008).

Intervention Methodology

The design-based research is a methodology that could bridge the gap between research and practice in formal education. From this approach the question is *How can it be implemented to accomplish that goal?* (*What could be?).* As expressed by Bradley and Reinking (2011, p. 193), this question is different from a naturalistic research, which intends to describe: *When implementing intervention X (or Y), what happens?* (*What is?),* or from an experimental research, which establishes *Which intervention is better on average, X or Y?* (*What is best?*). In order to develop the intervention, the first step is the training and on-site counselling of teachers, in an advice-practice-analysis-evaluation cycle. This counselling guides the organization of tasks, also as a cycle, or chained tasks.

Other design experiments (Cobb et al. 2003; Reinking and Bradley 2008) define general principles that we share, to which we have added some from our perspective.

1. They are performed in the classroom, in real educational environments.
2. Theory plays a central role in the implementation of the intervention, as it is its foundation. In our experience, one starts with a theory that describes written language and that conceives learning as a symbolic and conceptualizing process from the perspective of students, which gives an account of the social and cultural aspects and of the diversity of situations involved in the process.
3. An important theoretical aspect is the idea of learning as a process of knowledge construction. This principle has enabled us to make many aspects of the learning process observable, such as the segmentation of text units, the consideration of all graphic aspects of the text and its "graphic reason" (Goody, Goody 1977; Kress 1994). As well as the early memory of children's stories, the adjustment between retelling and dictating for another person to write, the distinction between literal and non-literal, and so on.
4. Another principle is the link oral-written language, and the ways of continuity between the acquisition of oral language and literacy, each in its specific modality.
5. The teachers involved in our classroom intervention are trained not only to teach concepts, but also to model the reading, writing and text commenting procedures. Such modelling is fundamental because teachers not only have to speak, read or write, but they also have to show how to speak, how to read, and how to write.
6. The teachers involved accept the data collection and the process registration, and the researchers are committed to give training and information to the teachers.

Decisions Regarding the Intervention

The decisions shared with the teachers in this intervention on teaching to read and write are related to all the variables that participate in the process: to the pedagogical objectives, to the components of the written language, to the teachers' roles, to the description of the students who learn, and to the different situations related to the linguistic activities. The pedagogical decisions were affected by the conceptualization of the relationships between the oral and written language and between reading and writing, as well as the complementarity between the global discursive dimension of texts and a more analytical dimension when considering units. For example, if a pedagogical goal were to increase the vocabulary of children aged 4 and 5, then decisions about increasing vocabulary would affect the type of text, the materials, the presentation medium, the text recording, as well as the teacher's role and the student's description of age, activity and accessibility of the task. If the pedagogical objective were to stimulate comments on the text, the decisions would depend on the definition of the relationships between the oral and written processes and the role of writing (in relation to literal and interpretation) and of the student's participation, and so on.

The chained tasks around children books, presented below, illustrate the integrated work done at classrooms on teaching written and oral language. Reading aloud is the leitmotiv for listening, speaking, writing, rewriting, reading and rereading, allowing to pay attention simultaneously to the meaning and to the material nature of oral and written language. Language play and dictation emphasize the raw material out of which language is made of.

What Have We Observed from the Intervention?

This approximation to the practice the theoretical and developmental principles of previous research has allowed us to bring to light some learning aspects that remain hidden in other classroom situations, where the standard rules and exercises prevail. On the other hand, from the teacher's reading of various types of texts as part of the language curriculum, children develop a series of tasks such as retelling, dictating to the adult or rewriting, relying on the memorization of the children's stories, poems or fables heard.

Reading aloud was intended to give voice to the text, accompanied by multimode resources, such as visualization of the story, gestures, teacher's glances and intonation, to facilitate access to the content. Afterwards, the teacher continues with oral comments not only to help remembering the content, but also to clarify the macrostructure of the text. This task is important for the subsequent activities of text retrieval, that require a certain level of distance and also the teacher's help. The children then recount the text and, as we will see, they are able to memorize long texts from the age of 4.

However an issue that was raised was what kind of knowledge and strategies are required for these tasks? In particular, children need to have memorizing capacity to keep these long texts in mind. In fact, there is evidence that young children can be very good at remembering and reproducing rather long fragments of speech, as Rubin has shown (Rubin 1995, p. 84). Children can master the language of texts and reproduce them in a reformulation. We give this reformulation a functional value: in our experience: to remember the whole story, to summarize a certain part of it, to locate expressions used in the text, to identify the characters or to describe the events of the story, etc. In addition, the statements memorized and used are more easily analyzed and segmented than those heard for the first time (Peters 1983; Wong Fillmore 1979).

The other two activities of retelling the memorized text and dictating to the adult who does scribe are feasible because the lines of separation between orality, reading and writing are blurred. The reformulation of children's stories favors the learning of long texts, although children continue to have problems of coherence and cohesion, connection and segmentation of the text and its graphic layout. Dictated to the adult, for example, facilitates the relationship between speaking and writing "what has been said" in an adjustment between the two activities as well as in the literal reproduction of the "same words" that writing retains.

The activities of language play and "writing aloud" (write and say) of words enable to focus phonographic correspondence, and the morphological and lexical aspects, and so on, thus facilitating explicit reflection on language and alphabetic writing (or metalinguistic component). This means that each activity maintains a specific relationship with each of the variables that affect the learning process.

In the following sections, we present examples of the activities developed by children whose educational conditions have been previously discussed. Some examples derive from de data of interventions programs we developed in public schools in Barcelona from preschool to second grade (children ages from 4 to 7 years old) and in Lisbon public schools in first grade (6 years old). Although an exhaustive description is not possible, we will justify decisions for this type of situations as well as the criteria used in order to provide some clues.

Why Begin with Reading Aloud, Re-rweading and Teacher's Comments?

The justification of this activity is well expressed in Bus et al. (1995, p. 2): read aloud "may make a unique contribution to these early linguistic developments" by exposition young children at written language register. Indeed, when the focus is reading a text, we see that the teacher's and students' oral comments show a focus on language (Canut and Vertalier 2011), both on the content and on the formal and material aspects of the text. In the perspective described here, we pay particular attention to these aspects among 4–6-years-old. The participating children went to

public schools in Barcelona (in the case of the 4 and 5 years) and public schools in Lisbon (in the case of 6 years). The ages correspond to the pre-school courses of 4 years, pre-school courses of 5 years and first grade to 6 years.

In the following examples of interaction in a classroom of the first grade, we can see that the teacher and the children talk about the text and reflect on the function of some specific words and expressions.

Passage 1. Paying attention to the beginning of history.
Teacher: "One day" (reading), **pay attention to how this story begins**, "One day".
Student: **It does not start with "Once upon a time"...**
Teacher: No, it does not. However, it can also start like this: "One day…" (Teacher continues reading).

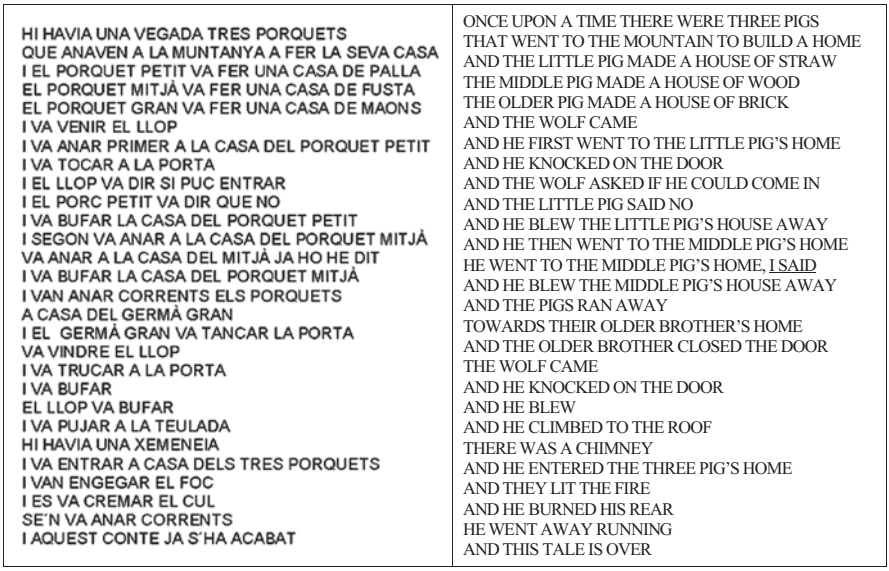
Passage 2. Re-reading and paraphrasing with attention to specific vocabulary.
Teacher: What are these animals talking about?
Student: They are talking about the stranger.
Teacher: Are they speaking of the stranger? Yes... And, what do they say about the stranger? Of the strange rat...
Student: That... That it is vile... That the rat steals a lot.
Teacher: Oh, they are saying that the rat is vile and that it steals a lot. **What word in the story says that the stranger steals?**
Student: The word *rob.*
Teacher: Very well, it says: *robs things*. **However, there is a word for it. Do you remember which?** Someone who steals is a...?
Student: Burglar.
Teacher: *Burglar*, very well! Well! Very good!

During re-reading, children can pay attention and talk about meanings, but also about specific words in the text itself. In our approach, this is enhanced by focusing on the oral and written (re)production of texts that have been read through the recount and the reformulation in rewriting. When starting a new book, the children remember these connections, as shown in the following dialogue:

Passage 3. Paying attention to the connection between reading and writing activities.
Teacher: It is a very nice story, as you will see.
Child: **Which we will also write one day?**
Teacher: Yes, we will also write it. But first we need to read it so we can then write it. And we have to speak, don't we? Let us look at the title. Cesar, would you please read it?
Cesar: "The frog and the stranger".

What Are the Oral Productions Made by Children?

After the reading aloud activities in the series of "chained tasks", children produce an oral recount or dictate to the adult the children's story they have heard. When dictating to the teacher with the purpose of writing the story, the focus is on the interaction between reading, orality and writing processes. In the following passages, a preschool teacher presents and guides this activity to a group of 4-year-olds (Fig. 6.1).



HI HAVIA UNA VEGADA TRES PORQUETS	ONCE UPON A TIME THERE WERE THREE PIGS
QUE ANAVEN A LA MUNTANYA A FER LA SEVA CASA	THAT WENT TO THE MOUNTAIN TO BUILD A HOME
I EL PORQUET PETIT VA FER UNA CASA DE PALLA	AND THE LITTLE PIG MADE A HOUSE OF STRAW
EL PORQUET MITJÀ VA FER UNA CASA DE FUSTA	THE MIDDLE PIG MADE A HOUSE OF WOOD
EL PORQUET GRAN VA FER UNA CASA DE MAONS	THE OLDER PIG MADE A HOUSE OF BRICK
I VA VENIR EL LLOP	AND THE WOLF CAME
I VA ANAR PRIMER A LA CASA DEL PORQUET PETIT	AND HE FIRST WENT TO THE LITTLE PIG'S HOME
I VA TOCAR A LA PORTA	AND HE KNOCKED ON THE DOOR
I EL LLOP VA DIR SI PUC ENTRAR	AND THE WOLF ASKED IF HE COULD COME IN
I EL PORC PETIT VA DIR QUE NO	AND THE LITTLE PIG SAID NO
I VA BUFAR LA CASA DEL PORQUET PETIT	AND HE BLEW THE LITTLE PIG'S HOUSE AWAY
I SEGON VA ANAR A LA CASA DEL PORQUET MITJÀ	AND HE THEN WENT TO THE MIDDLE PIG'S HOME
VA ANAR A LA CASA DEL MITJÀ JA HO HE DIT	HE WENT TO THE MIDDLE PIG'S HOME, I SAID
I VA BUFAR LA CASA DEL PORQUET MITJÀ	AND HE BLEW THE MIDDLE PIG'S HOUSE AWAY
I VAN ANAR CORRENTS ELS PORQUETS	AND THE PIGS RAN AWAY
A CASA DEL GERMÀ GRAN	TOWARDS THEIR OLDER BROTHER'S HOME
I EL GERMÀ GRAN VA TANCAR LA PORTA	AND THE OLDER BROTHER CLOSED THE DOOR
VA VINDRE EL LLOP	THE WOLF CAME
I VA TRUCAR A LA PORTA	AND HE KNOCKED ON THE DOOR
I VA BUFAR	AND HE BLEW
EL LLOP VA BUFAR	AND HE CLIMBED TO THE ROOF
I VA PUJAR A LA TEULADA	THERE WAS A CHIMNEY
HI HAVIA UNA XEMENEIA	AND HE ENTERED THE THREE PIG'S HOME
I VA ENTRAR A CASA DELS TRES PORQUETS	AND THEY LIT THE FIRE
I VAN ENGEGAR EL FOC	AND HE BURNED HIS REAR
I ES VA CREMAR EL CUL	HE WENT AWAY RUNNING
SE'N VA ANAR CORRENTS	AND THIS TALE IS OVER
I AQUEST CONTE JA S'HA ACABAT	

Fig. 6.1 Dictation to the teacher of the children's story *Els tres porquets* (Three Little Pigs). Preschool (4-year-olds)
Note: Reproduced from Teberosky and Sepúlveda (2009)

Passage 4. Dictation to the adult: interactions between reading, orality and writing processes.

Teacher: [...] **I will write everything you tell me**, I will keep on writing and we will keep on saving it, agreed.

[…]

Teacher: […] try **not to go too fast, go bit by bit**. **It will be on screen.**

[…]

Teacher: […] wait a second. Oscar, I am at "and he climbed to the roof".

In this activity, we see an extended speech production made by children from the age of 4. This speech is displayed on screen in written form. To establish the relationship between dictation, writing and text, the teacher stops at times to read or reread the text, sometimes asking for a repetition of what has been said. The result offers us evidence of the children's ability to produce a connected and extensive speech.

It can also be seen that the learning process of differentiating the simple process of speaking and the process of dictating the text which will be written, as well as the children's ability to respect turns, maintain the idea of the text and contribute to its development. When it comes to more than one child, we can observe that there is an ability to adapt themselves to what one speaker says and what the next one adds.

How to Get to Write a Text?

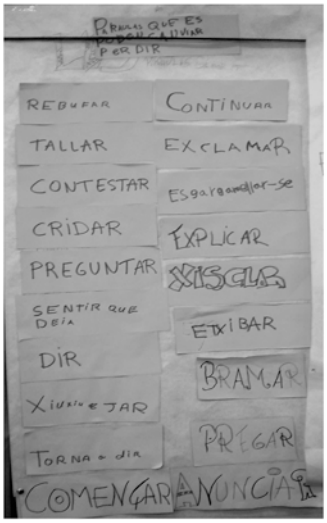
Adult reading aloud, retelling and dictating for the adult to write are learning processes that lead to the rewriting of texts. In addition, the production of intermediate texts, in particular through the writing of lists, helps children in rewriting. The preparation of lists helps children in two of the greatest challenges of mastering the language within the text. On the one hand, it offers them a material support for the activity of identifying and envisioning units of written language. On the other hand, it accompanies them in the process of organizing the text as a coherent whole.

Producing lists from texts involves identifying *listable* items, according to the characteristics of the text and the objectives of teaching and learning (Sepúlveda and Teberosky 2008). The *list* can contain the names of the characters, places or objects. The verbs that are listed serve to narrate the events (*jumped, went, drank*) or describe the verbal and nonverbal behavior of the characters (*argued, asked, said, murmured, shouted*). The adjectives that are listed serve to describe or specify the qualities of characters, places, or objects; the type of words and expressions used by the narrator to move from one event to another (time markers); the expressions used, among others.

The list's layout, with an arrangement in vertical columns of discontinuous elements, presents the language in a disconnected and abstract form (Goody 1977). For this reason, it is particularly appropriate for cognitive work of the paradigmatic type of language analysis and conceptualization. In this work, it is necessary to extract or retrieve outputs – expressions, words, parts of words – from their context and immediate use to turn them into objects of reflection, and to make comparisons that give room to their categorization. In our data, we have observed that the activity of extracting examples from a text, or several texts, stimulates the permanent search (inter and extra textual during the school year) of examples of a particular type of language unit that helps children to build a solid conceptualization of the linguistics units and of paradigmatic and syntagmatic relationships (Fig. 6.2).

On the other hand, we have also observed that the enumerative structure of the list serves the process of retrieval and organization of the text as a coherent whole. The teacher often lists the episodes in the children's story and the 5-year-olds who still devote effort to the graphical representation of language often produce lists to rewrite the narratives (Figs. 6.3 and 6.4). This way, their writings can consist of a collection of statements that retrieve key elements of the episodes: the characters and the actions.

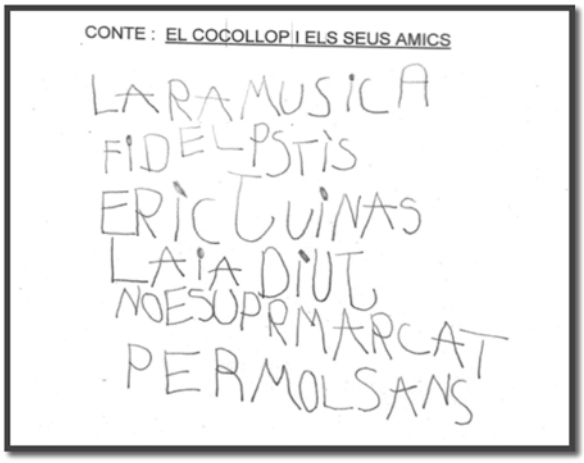
In fact, lists have been described as a form of extended discourse that can serve to recount past events (Küntay 2004). Unlike narratives, lists do not incorporate connective expressions that indicate temporal succession or establish causal relationships between listed events. However, the teacher who knows the represented text can identify in the children's production, the text that has been read aloud and that has been commented and recounted orally with the students.



Translation
Words that can be replaced by SAY

TO MURMUR	TO CONTINUE
TO INTERRUPT	TO EXCLAIM
TO REPLY	TO SCREAM
TO SHOUT	TO EXPLAIN
TO ASK	TO SHRIEK
TO HEAR WHAT WAS SAID	TO SCREAM
TO TELL	TO SPIT
TO WHISPER	TO BURST
TO REPEAT	TO PLEAD
TO START	TO ANNOUNCE

Fig. 6.2 List of discursive verbs, useful when writing dialogues – Second grade, collective mural list



Standardization and Translation

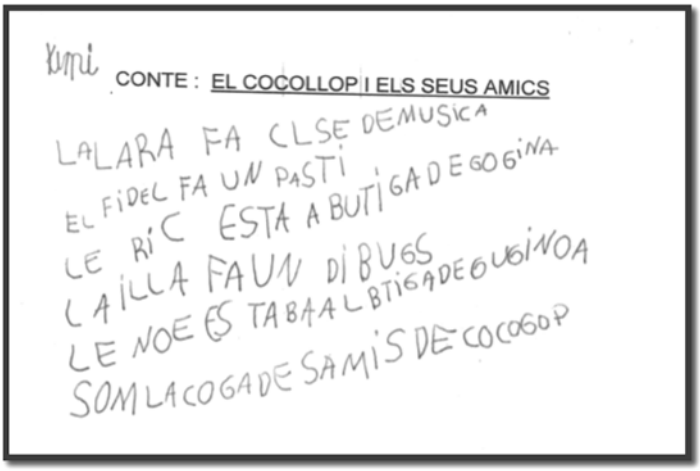
STORY: CROCOWOLF AND FRIENDS

LARA MUSIC
FIDEL CAKE
ERIC TOYS
LAIA DRAW
NOE SUPERMARKET
FOR MANY YEARS

Fig. 6.3 Rewriting of the story *Cocollop i els seus amics* (Crocowolf and friends)– Preschool, Miquel, 5 years old

Why Writing Through the Process of Rewriting Texts?

By using from top-down perspective, from reading aloud to reformulation, and before conventional learning exists, we have been able to observe children's construction of text units. Figures 6.5 and 6.6 show examples of 5-years-old children with a certain command over writing, who, when trying to produce texts, face



Standardization and Translation

STORY: CROCOWOLF AND FRIENDS

LARA HAS MUSIC LESSONS
FIDEL MAKES A CAKE
ERIC IS IN THE TOY STORE
LAIA IS DRAWING
NOE IS IN THE TOY STORE
WE ARE CROCOWOLF'S COMPANIONS

Fig. 6.4 Rewriting of the story *Cocollop i els seus amics* (Crocowolf and friends) – Preschool, Kimi, 5 years old

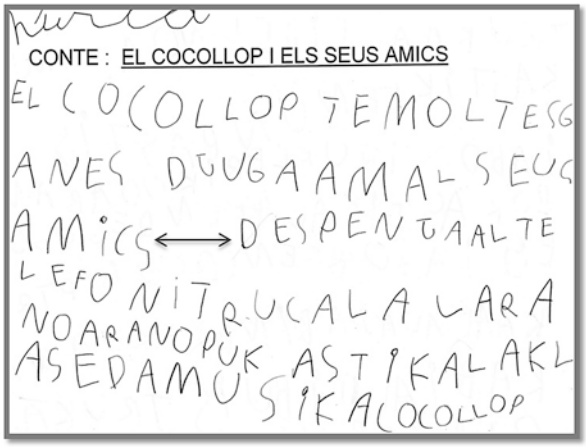


Fig. 6.5 Rewriting of the story *Cocollop i els seus amics* (Crocowolf and friends) – Preschool, Núria, 5 years old

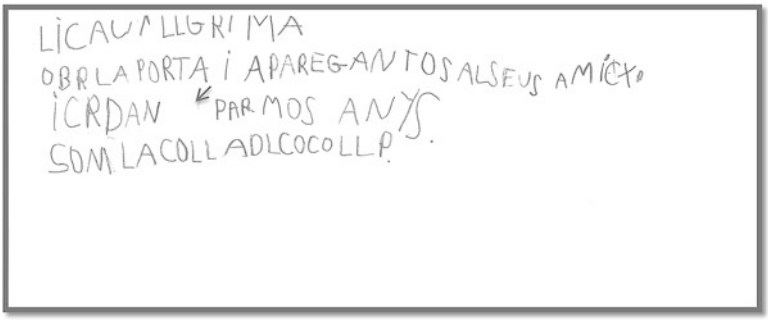


Fig. 6.6 Rewriting of the story *Cocollop I els seus amics* (Crocowolf and friends) (part taken from the 2nd page) – Preschool, Alait, 5 years old

segmentation and connection challenges between different types of linguistic units. These are children who are still working on the recognition and segmentation of words, which can be seen in the segments of continuous writing or hypo-segmentation. Since these children do not use punctuation conventions to delimit parts of speech, they resort to other solutions.

For instance, to establish the boundary between one episode and another (one statement and the next) or between the narrator's voice and the characters' speech, some children choose to leave a blank line in the text (see Fig. 6.5), while others go to another line (see Fig. 6.6). In any of the cases, these are valid mechanisms for delimiting discursive units, with the blank line functioning as a punctuation mark (Catach 1994).

In Núria's writing (Fig. 6.5), we see the usage of a blank to mark the boundary between the beginning of the children's story and the first episode:

CROCOWOLF REALLY WANTS
TO PLAY WITH HIS
FRIENDS HE PICKS UP THE TE
LEPHONE AND CALLS LARA
I CAN'T RIGHT NOW I'M HAVING
MUSIC LESSONS CROCOWOLF

In Alait's writing (Fig. 6.6), we see the usage of the change of line to delimit episodes and the usage of the blank to differentiate direct speeches:

A TEAR FALLS
HE OPENS THE DOOR AND ALL IS FRIENDS SHOW UP.
AND THEY SHOUT FOR MANY YEARS.
WE ARE CROCOWOLF'S COMPANIONS.

In these texts, we also find evidence of mechanisms of discursive connection being added. The conjunction "and" is the means by which many children try to create a consolidated discourse. Such evidence can be found in Núria's and Alait's texts.

In our corpus, texts written by 6 years old show progress in understanding the process of writing a text, as can be seen in Figs. 6.7 and 6.8. These texts show that children understand and incorporate the graphic resources of writing to establish distinctions between the parts of the discourse. Children differentiate the title of the text using typographic variations (capital and larger letters) and add punctuation marks that allow the reader to recognize the different episodes, usually with a final stop and a change of line. In addition, in direct speech they use different strategies to differentiate statements in the text and to point out who says what, how and to whom.

In Luna's text (Fig. 6.7), we see the preference for punctuation to delimit the character's speech:

another partner gives him
his last candy:- do you want it?

In Steven's text (Fig. 6.8), the preference for establishing boundaries is discursive speech, writing marks that explicitly state who is speaking:

the other day the pig was distracted
and a fire started help said the pig.

We also see improvement in the connection mechanisms. In the examples (Figs. 6.7 and 6.8), children added literary expressions to delimit their texts (*one day; in a village*), various connective elements (cumulative, adversative, cause, coordinating conjunctions: *because, but, and*) even a time marker (*the other day*).

How Language Play Contributes to Children Understanding of Language and Alphabetic Writing?

Language play offers valuable support to the literacy process. In language learning and alphabetic writing, children need to identify segment units (grammatical, lexical, syllables, and phonemes) and notice their characteristics. Language play is helpful because it generally implies distancing and focusing on language (Crystal 1996).

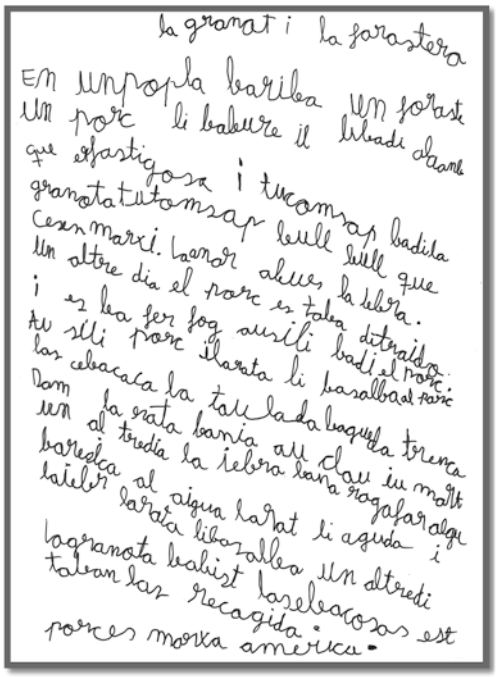
In the activities with language play children have an appropriate context to reflect on sound aspects, such as rhyme and alliteration or tongue twisters, on morphological aspects in many sets of opposites, or on semantic aspects in oppositions and similarities, as well as in games of nonsense.

It has been argued that versification focused on linguistic form and helps children to identify and segment words and syllables, as well as to memorize (Cook 1997, p. 229; Domínguez et al. 2013, p. 503). Rhythm is also at the heart of rhyme, and sensitivity to both is related to literacy (Bradley and Bryant 1983; Goswami and Bryant 1992). On the other hand, repetition, in general, also guides the procedures of identification, extraction and segmentation of units. Additionally, by focusing on

Standardization and translation

NO, NO and NO!
Once a bear that did not
want to go to school because
he had never gone.
another partner gives him
his last candy:- do you want it? and he
said no but actually
he wanted it.

Fig. 6.7 Rewriting of the story *No, no i no* – First grade, Luna, 6 years old



Standardization and translation

the frog and the stranger

In a town came a stranger
a pig saw it and told the animas
that it was disgusting and how do you
know said
the frog everybody knows I want want
that
him to leave. they went to see the hare.
The other day the pig was distracted.
and a fire started help said the pig.
Help pig and the rat saved the pig
the roof of his house was damaged
the rat came with hammer and nails
another day the hare went to get water
slipped into the water the rat helps him
and
the hare the rat saved him **the other day**
frog saw his things were
collected.
because he leaves to America.

Fig. 6.8 Rewriting of the story *La granota i la forastera* (Frog and the Stranger)– First grade, Steven, 6 years old

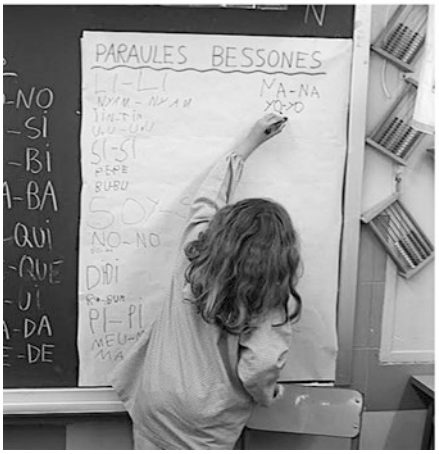
the sound aspect, the meaning is left in suspense. These procedures are favored because they are part of the own resources of playing with the language.

In our study, we have documented mainly activities related to sound and morphological aspects of the language. Thus, we have seen activities related to the repetition of syllables, onomatopoeia, rhymes and alliteration, with repetition and rhymes, univocal words, opposites and compositions (morphological ones), enumerations, nonsense, charades, etc.

The supporting material that accompanies the metalinguistic reflection in language activities is frequently the creation of lists dictated to the teacher. Either these are created collectively, in large or small groups, or they can be created individually. Figure 6.9 presents some examples of lists created for the analysis and research of "twin words" (words with reduplication of syllables, for example Ton ton, Cus cus, Tin tin, Lili, and some onomatopoeia).

Creation of a collective list on a board

Creation of individual lists



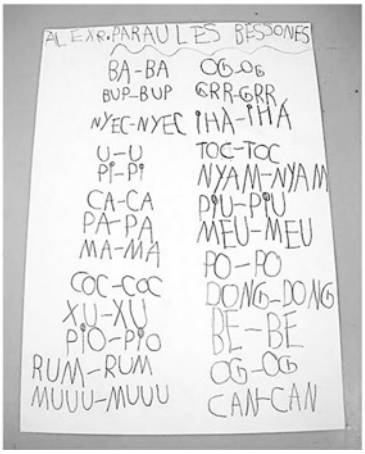


Fig. 6.9 Sequence of activities on "twin words" – Preschool, 5 years old
Note: Reproduced from Teberosky (2012)

Why Dictation, Discussion and Manipulation of Language?

Going further on the linguistic analysis and the relationship among orality, writing and reading, the dictation strategy was implemented on 1st and 2nd grades. The metalinguistic dictation (Nadeau and Fisher 2013; Sousa et al. 2015) has allowed us to observe the children's process of metalinguistic reflection on the conventions of word writing. Unlike traditional dictation of words to children in order to evaluate their spelling knowledge, in this exercise the teacher dictates a word or a short phrase to promote a debate regarding the conventions of word writing. The dictation is integrated in a chained sequence, starting with book reading and comment. The dictation is taken out of the observation of the children's writing difficulties and is focused on identified hindrances on the Portuguese written system.

We have observed that when children work together in pairs and discuss how to write the dictated words, they use previously acquired knowledge, resort to linguistic reasoning, and establish analogies to propose, justify, argue or negotiate their ideas. Furthermore, the process includes a presentation of the written solution to the group, as well as the justification of the options made. Thus, collectively, the teacher guides the debate and solves the problem, resorting which of the solutions are correct and explaining why (Sousa 2015).

In the first grade, the documented difficulties are mostly related to linguistic aspects: misunderstanding voiced and voiceless consonants (e.g. /f///v/), complex syllabic structures – complex onset and rime (coda) (e.g. go*s*to (like), t*r*epa*r* (to climb)), flexional morphology (e.g. gost*ou* (liked – 3th person sing.), gostaram (liked 3th person plural), gost*ei* (liked – 1st person sing), comeu (ate – 3th person sing.), sorriu (smiled – 3th person sing.)). Initially, when the child's only writing strategy is a phonetic analysis, a usual method is showing written texts in the classroom or presenting memorized texts in order to expose them to the written form. On the other hand, focusing reflection the discussion of the lists, as described above. It allows working around word families, organizing morfossyntactic paradigms aiming the search of similarities, highlighting linguistic and orthographic relationships and regularities both on writing and reading,

In the example presented in Fig. 6.10, we see the different solutions found by five pairs for the writing of the word "*saltou*" (*jumped*):

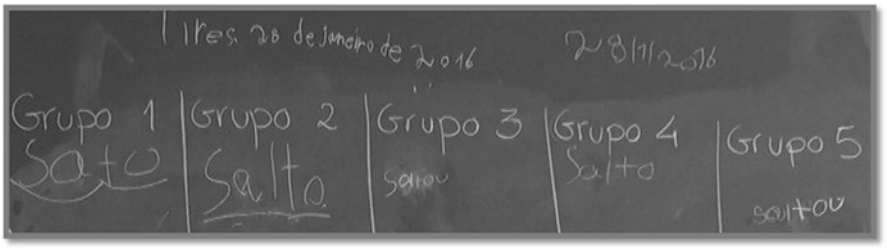


Fig. 6.10 Written solution for the dictation of the word "*saltou*". First grade

As can be seen, the /s/ at the beginning of the word presents no difficulties, but /s/ is a difficult phoneme to represent when located in the middle of a word due to the diversity of graphemes with which it can be written in Portuguese: *s, ss, x, ç,* or *c* (before *i* or *e*). There is also no difficulty in writing the *t*, as there is an unambiguous relationship between spelling and phonemic. On the other hand, the representation of /l/ and /ou/ proved arduous. In this example, we find that one of the groups did not write /l/ in position coda; those who made the conventional writing justified their answer by analogy: with the name *Salvador*, thus, they resorted to writing the syllabic segment of *Sal*vador to write this other word that begins with the same syllable. Another group remembered the writing of the word *sal* that had been presented previously, but no one identified the /l/ in coda position by itself, they relied on the orthographic representation of the syllable.

As for writing the final -*ou,* only two groups wrote it conventionally and the child justification shows a morphosyntactic knowledge, *when "action words" have the sound /o/ in the termination, they are written with "ou"*. In the dictation of a similar word in the second grade, *gostou (liked)*, half the children wrote the final segment in a conventional way.

These dictation activities started from an oral production (the adult) and moved to the written representation (children), and the reading gave place to the comparison and the discussion of conventions:

Teacher:	When I read /o/, how do we write it? (at the end of the word).
Children:	letters *o* and *u*.
Teacher:	And how about when we write words that end in *o* and *u*? Which kind of words are these?
Children:	In words such as *cortou* (cut), *gostou* (liked), *criou* (created), *jogou brincou* (played), *andou* (walked), *estragou* (damaged).
Children:	the past tense.
Teacher:	That's right. These are words in the past tense.

As we see, the enumeration helps establish the flexible paradigm that emphasizes the class of words in which the morpheme *ou* occurs: verbs. In verbal conjugations, *ou* refers to the verbal tense (simple past perfect), in addition to the person (3th) and the number (singular); this characteristic is what stands out when children organize the linguistic paradigm.

The activities presented in this chapter are learning centered and highlight the importance of input and exposure to the written language to learn language and written language. Learning is accepted as participation in literate activities with the adult in order to model and direct the attention of the child. Teaching focuses on the cultural artefacts to be learned - language and written language - in multiple dimensions: as meaning, as interaction, discussion and adjustment, as text, as space for the inscription of letters and groups of letters that represent sounds and convey meanings. Assuming that language is a meaningful representational activity only accessible through texts (Culioli 1990, p. 72), meaning and texts are target within tasks that start from the text, which is accessed and commented on by the oral. From the oral, writing and rewriting are targeted and framed by written language and culture.

Moreover, language play and metalinguistic dictation are structured tasks, which enable children to construct and co-construct language and language awareness capitalized on reading, writing and orality.

Conclusion

We have argued that in literacy we need teaching practices that resort to both global and analytical strategies and that understand the relationships between orality, reading, and writing processes. In our intervention, adult reading aloud activities allow children to have contact with texts, discursive and graphic units with recognizable limits, to which children can respond in different ways. These responses are explored in a number of activities included in the reading aloud exercises.

In adult dictation, the child's ability to memorize extensive texts is stimulated, which is the basis of the reformulation and the establishment of relations between prior and present knowledge, as well as understanding the necessary adjustment between enunciation according to the speed at which the adult writes, and the differentiation between speaking and strictly dictating the memorized text.

In the analysis of word writing under language activities (i.e. the creation of lists), the negotiated writing of words dictated for the teacher to write puts into play a series of activities related to the metalinguistic reflection and the usage of metalanguage. Additionally, the activity of rewriting in the initial steps of the learning process stimulated the process of text construction segmentation and connections in the text, conceptualization of textual units. In addition, it helps develop the "graphic reason" in all your forms of usage of the page, layout, and construction of the graphic line as a unit with syntactic and textual meaning. It is the exploitation of blank spaces and line-breaks to make graphically units of language, like words in sentences or using indentations in lists (blank spaces), or line breaks in clauses and phrases to help children see how the different parts relate to each other in the text.

In this chapter, children written language learning is highlighted. Teaching practices have a leading role, affecting the children's linguistic and literate development. One point to be made here is the wide range of knowledge needed for encourage children to reach their full potential and strive to extend their understanding, skills and knowledge. Another point to be made is that teachers are given the opportunity to be involved with research, and they pointed out the high-quality professional development that comes from participating in these projects.

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Chapter 7
Writing Like a Reader: Developing Metalinguistic Understanding to Support Reading-Writing Connections

Debra Myhill, Helen Lines, and Susan Jones

Abstract Becoming a writer is a challenging task, and one of the few tasks where the cognitive demands do not decrease with maturity because '*as writers mature and gain expertise, they invest more effort and reflective thought in the task'* (Kellogg R, The psychology of writing. Oxford University Press, Oxford, 1994, p. 204). Part of this reflective effort relates to an increased awareness of the implied reader of the text and a more goal-oriented sense of what the writing should achieve. Arguably, this requires the writer to hold in mind both his/her writerly intentions and the imagined response of the reader to the emerging text. Barrs and Cork (The reader in the writer. CLPE, London, 2001) conceive of the notion of '*the reader in the writer'*; however, our interest is in the symbiotic relationship between reading and writing, not simply 'reading like a writer' but also 'writing like a reader'. Drawing on data from writing conversation interviews with students aged 9–14 over 3 years, this chapter will explore these young writers' developing metalinguistic understanding of how to shape and craft their written texts to satisfy both their own authorial intentions and the needs of the reader.

Keywords Writing · Reading · Reader-writer relationship · Authorship · Metalinguistic understanding

D. Myhill (✉)
Graduate School of Education, University of Exeter, Exeter, UK

University of Wollongong, Wollongong, Australia
e-mail: d.a.myhill@ex.ac.uk

H. Lines · S. Jones
Graduate School of Education, University of Exeter, Exeter, UK
e-mail: h.e.lines@ex.ac.uk; susan.m.jones@ex.ac.uk

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Introduction

Becoming a writer is a challenging task, and one of the few tasks where the cognitive demands do not decrease with maturity because '*as writers mature and gain expertise, they invest more effort and reflective thought in the task'* (Kellogg 1994, p. 204). Part of this reflective effort relates to an increased awareness of the implied reader of the text and a more goal-oriented sense of what the writing should achieve. Arguably, this requires the writer to hold in mind both his/her writerly intentions and the imagined response of the reader to the emerging text. There is, of course, a substantive body of research examining the relationships between reading and writing (Langer and Flihan 2000; Shanahan 1987, 2006) but this has predominantly addressed how reading and writing share common cognitive processes and knowledge, arguing that there is a common cognitive system for understanding written language and a bidirectional relationship between reading and writing (Parodi 2007). A more modest body of research has considered, from a socio-cultural perspective, that the experience of being a reader and being a writer can be reciprocally supportive (Butler and Turbill 1984; Blatt and Rosen 1987; Barrs and Cork 2001).

However, the emphasis in empirical and theoretical studies on this reciprocality between reading and writing has tended to focus upon developing readers' awareness of the writer's purpose and intentions. Smith (1983) argued that children '*must read like a writer, in order to learn how to write like a writer. There is no other way in which the intricate complexity of a writer's knowledge can be acquired'* (1983, p. 562), and he maintains that through this reading like a writer '*we engage with the author in what the author is writing'* (1983, p. 563). Bruner (1986) considers how the reader subjectively constructs meaning from the written text, in effect, taking the written text and 'writing' their own version, filling the '*gaps that call upon the reader to become a writer, a composer of a virtual [prosthetic] text in response to the actual one'* (1986, p. 24). More recently, Bazerman puts the same stress upon readers becoming more aware of the writer and their purposes:

> *Being aware of the writer's purpose when you read helps you evaluate how well the writer has achieved the purpose and decide whether you want to follow where the writer is trying to lead you. The active reader reads more than the words and more than even the ideas: the active reader reads what the writer is doing. The active reader reconstructs the overall design, both the writer's purpose and the techniques used to realize that purpose*. (Bazerman 2010, p. 104)

To an extent, one could argue that this framing of reading like a writer is more about higher level comprehension than it is about becoming a writer, developing understanding of authorial intention, and recognition that it is the reader who makes the meaning from the text. In contrast, Barrs and Cork's (2001) study does look more closely at how reading experiences can support writing and being a writer. They worked with primary aged children and considered how writing might improve when children have the opportunity to engaging with rich and challenging literature. Significantly, they also looked at the pedagogical practices which accompanied this approach, particularly examining the nature of the classroom interventions the

teachers made in relation both to the published text and to children's own emerging texts. At the heart of the study was a deep and rich engagement with high-quality texts that spoke to children's own experiences, but it also included '*sustained discussion of particular aspects of the author's way of writing and of the literary features of the text*' (Barrs and Cork 2001, p. 80), thus explicitly drawing attention to how the writer shaped the text as well as what the text was communicating. Our own interest, however, is very much in the symbiotic relationship between reading and writing, not simply 'reading like a writer' but also 'writing like a reader': we are concerned not only in how rich texts can support writing development through developing awareness of the author's choices and intentions, but also how writing development can be enriched through encouraging young writers' to articulate their own choices and intentions in relation to their imagined readers. This chapter will explore young writers' developing metalinguistic understanding of how to shape and craft their written texts to satisfy both their own authorial intentions as writers and the (imagined) needs of the reader, drawing on a study which uniquely considers the bidirectionality between reading and writing through attention to writers' choices in published texts and young writers' choices in their own texts.

Metalinguistic Understanding and Meaning-Making in Writing

Conceptually, this chapter draws on a cumulative series of empirical studies, investigating how explicit teaching of the relationship between grammar and making meaning in writing can improve student outcomes in writing through increased metalinguistic understanding (Myhill et al. 2013, Jones et al. 2013). Theoretically, the sequence of studies are underpinned by a Hallidayan view of '*grammar as a meaning-making resource'* (Halliday and Matthiessen 2004, p. 10). This stands in contrast to traditional views of grammar as concerned principally with correct use of forms, adherence to rules, and a heavy focus on the 'parts' of a clause or sentence. Halliday's theorisation of grammar is systemic, requiring us to '*understand the nature and the dynamic of a semiotic system as a whole*' (2004, p. 20) and the inter-related nature of grammatical choices in creating text. In this way, grammatical choices are part of the repertoire through which writers shape meanings in text – grammatical forms shape meaning in as potent a way as do lexical or figurative choices. So, for example, George Orwell's opening of *1984* – '*It was a bright cold day in April and the clocks were striking thirteen*' – foreshadows the dystopian focus of the novel, not simply through semantic choices, but also through the grammatical choices. The paralleling of two simple clauses through a co-ordinating conjunction juxtaposes the everyday idea of a bright cold day in April with the extraordinary idea of clocks striking 13, positioning both as statements of truth. Moreover, the choice of a plural for 'clocks' suggests this is a not a single occurrence with one clock but involves all clocks: in this world it is normal for clocks to

strike 13 and the dystopian thrust is established. Our research has adopted this view of grammar as a way of making-meaning to support young writers in developing understanding that grammatical choices are part of the repertoire through which writers shape meanings in text.

Central to this conceptual framing is metalinguistic understanding (Gombert 1992), specifically *'the ability to take language as the object of observation and the referent of discourse'* (Camps and Milian 1999, p. 6). Although metalinguistic understanding is by definition explicit, the act of writing is also governed by implicit knowledge and automated processes. We know that there is a strong relationship between reading and writing, and that students who are keen readers often draw on their reading experiences in the shaping of written texts. We acknowledge the powerful significance of this implicit knowledge in writing, and the way reading develops 'writerly knowledge' which enthusiastic readers can draw on in their writing without conscious or explicit decision-making. At the same time, many school learners are not keen readers, and moreover, not all keen readers seem able to draw on this implicit knowledge in their own writing. Fitzgerald and Shanahan (2000) note that one knowledge base which connects reading is metaknowledge, defined as '*knowing about the functions and purposes of reading and writing; knowing that readers and writers interact; monitoring one's own meaning-making'* (2000, p. 175). With this in mind, our interest has been in how developing metalinguistic knowledge of the choices available to writers can be fostered through explicit teaching of linguistic structures and their meaning-making effects in authentic texts, developing writers' metaknowledge of the inter-relationship of reading and writing, and their capacity to monitor their own creation of meanings.

Methodology

The data for this chapter draw on a 4 year Economic and Social Research Council -funded study which addressed the research question: what is the relationship between metalinguistic knowledge and understanding, and development in writing? The research design was an in-depth longitudinal cross-phase qualitative study, comprising the tracking of 2 primary classes (age 9–11: $n = 57$) and 2 secondary classes (age 12–14: $n = 52$), each in four different comprehensive schools, over 3 years, tracing the development of their metalinguistic understanding and their development in writing. From each of these classes, nine children (3 high-attaining in writing; 3 average-attaining; and 3 lower-attaining) were selected to form case study samples, using teacher assessment against national standards for the primary cohort, and externally-assessed national assessment data for the secondary cohort.

The teachers involved received professional development workshops, supporting their capability in making explicit connections between writers' linguistic choices in authentic texts and students' own choices as writers, adopting the Hallidayan conceptualisation outlined above. The pedagogical framework used in these

workshops has been developed through cumulative studies, and is founded upon four pedagogical principles (see Table 7.1).

In the professional development workshops, the teachers worked with the research team to co-create teaching units, and the research team supported the teachers' grammatical knowledge, where necessary. As it was a longitudinal study following two cohorts of students, the teachers changed each year: thus the workshops were repeated each year with new teachers, but did also use data from the previous year's study to illustrate both successful and less successful practice.

A rich set of qualitative data was collected, including samples of student writing taken from each teaching unit observed and one piece of writing which was

Table 7.1 The four pedagogical principles with their theoretical rationales and examples of practice

Pedagogical Principle	Theoretical Rationale
1. **Make a link** between the grammar being introduced and how it works in the writing being taught.	To make explicit the connection between grammatical form and how it creates meaning in context.
Example of practice: Share the reading of the episode in Michael Morpurgo's story, *Arthur, High King of Britain* where the sword, Excalibur, rises from the lake, and look at how the use of clauses where the subject comes after the verb shapes the portrayal of a dramatic moment in the plot.	
2. Explain the **grammar through examples**, not lengthy explanations.	To focus learner attention on the form as used in context, not on grammatical naming and identification.
Example of practice: Explain the subject-verb inversion through showing the text examples, highlighting in colour the position of the subject after the verb.	
3. Build in **high-quality discussion** about grammar and its effects.	To support both thinking and verbalisation of metalinguistic understanding about the relationship between grammatical choices and meaning-making.
Example of practice: Stimulate discussion of Morpurgo's choice to invert the subject and verb by inviting students to consider how structuring the clauses differently in the more standard S-V order creates a different effect, particularly how the subject-verb inversion alters how we visualise this moment in the plot. Later invite children to articulate how they have structured clauses in their own story to influence how the reader sees that plot moment.	
4. Use examples from **authentic texts**	To link developing writers to the broader community of writers, drawing attention to the grammatical choices that published writers make.
Example of practice: The use of an authentic children's narrative text – *Arthur, High King of Britain* by Michael Morpurgo.	

undertaken by the whole sample at the beginning and the end of the study; and teacher lesson plans, lesson observations and video. This chapter, however, draws on the 'writing conversation' interview, developed for the study, in which students' metalinguistic understanding was probed through talking about their own writing, or those of peers. Methodologically, this avoided questions which invited generalised responses and focused the conversation on what the student could discuss in relation to his or her own metalinguistic understanding about their own, or peers', authorial intentions and writerly choices. The writing conversations were conducted with the case study students twice a year, after each of the observed teaching units had been completed: in total, there were 94 primary writing conversations and 96 secondary writing conversations, as not all of the nine case study students selected in year 1 remained in the school, or the project classes.

The writing conversations were analysed inductively using Nvivo, resulting in a set of thematic clusters: *Grammar-writing Relationship; Grammatical Reasoning; Pedagogical Practices; Metacognition; Metalinguistic Understanding;* and *Handling the Reader-Writer Relationship*. It is the analysis located in this last cluster which this chapter will address.

Findings

The coding under the thematic heading of *Handling the Reader-Writer Relationship* was categorised under three sub-themes: *Awareness of Reader Needs; Choice of Effects;* and *Content Focus*. Table 7.2 below sets out the definition of each of these codes with examples from the data.

Table 7.2 The sub-codes for the theme, Handling the Reader-Writer Relationship

Sub-code	Definition	Example
Awareness of reader needs	Comments which suggest that the student has anticipated the reader's response and/or made writing decisions with the reader in mind	*I realised that if I described the statue first then the reader would hopefully have the idea of what the statue actually looked like…it creates a clearer picture in the reader's head so the reader can actually understand what's actually going on rather than jumping to what is happening.*
Choice of effects	Comments which show awareness of effectiveness of language choices made as a writer	*I felt that it's good to use a short sentence because then people that can stick into their minds for when they do have a choice of taking alcohol or not taking drugs…* 'alcohol can cause accidents'.
Content focus	Comments which focus on the message or the ideas in the writing	*Well my finishing paragraph, I said* 'blue cross are always open and with your support they always will be.' *So it's saying that you're helping with your support it will continue and it won't stop it will continue to save animals.*

Table 7.3 below shows how many interview comments were coded to each of the sub-codes in each year of the study. They do reveal a pattern of a growing number of comments which relate to language choices and to the communicative content of the writing, which is almost certainly a response to the study's interventions, but a more static outcome in responses reflecting reader awareness.

This growth in volume of comments is represented graphically in Fig. 7.1, suggesting that developmentally this growing awareness is linked to age. It is important to note, of course, that this statistical data simply reflect the number of comments, not the quality of thinking which they represent. This is explored more critically in the qualitative analysis further below.

Awareness of Reader Needs

One aspect of authorial intention is the capacity to anticipate or envision how a real or imagined reader of your writing will interpret what you have written. The writer has to 'de-centre' from his or her own understanding of what is being written and project an interpretation from the reader's perspective. In England, there has for a long time been a considerable emphasis on the notion of 'audience' for a text, including its inclusion in examination assessment criteria. Ironically, the word 'audience' points to a listening community not a readership and although young writers know that audience is important, genuine understanding of the needs of a imagined reader or consideration of how as a writer we might choose to position our reader is less strongly developed. The writing conversations revealed that students do have reader awareness but that it is a developing awareness, as might be expected of young writers of this age, rather than a secure and rounded understanding of how they can shape their writing to fulfil their authorial intentions.

One cluster of comments in this theme indicated that some children conceive of their reader principally in terms of *what* is communicated, not *how* they might influence their reader's response. Sometimes these were very literal communications of facts and information to the reader, such as the 9 year-old who believed his description of Komodo dragon habitats could be used by '*the keepers of the Komodo dragon or something like that in zoos'* or the 13 year-old who wanted to be sure that her narrative plot was clearly communicated and argued that her intention was to

Table 7.3 The frequency of responses coded in the theme, Handling the Reader-Writer Relationship

	Primary				Secondary			
Year	*1*	*2*	*3*	*ALL*	*1*	*2*	*3*	*ALL*
Reader awareness	13	14	14	**41**	22	21	13	**56**
Choice of effects	8	16	27	**51**	16	31	26	**73**
Content focus	12	27	33	**72**	12	40	30	**82**
Total no of interviews	35	31	28	**94**	36	31	29	**96**

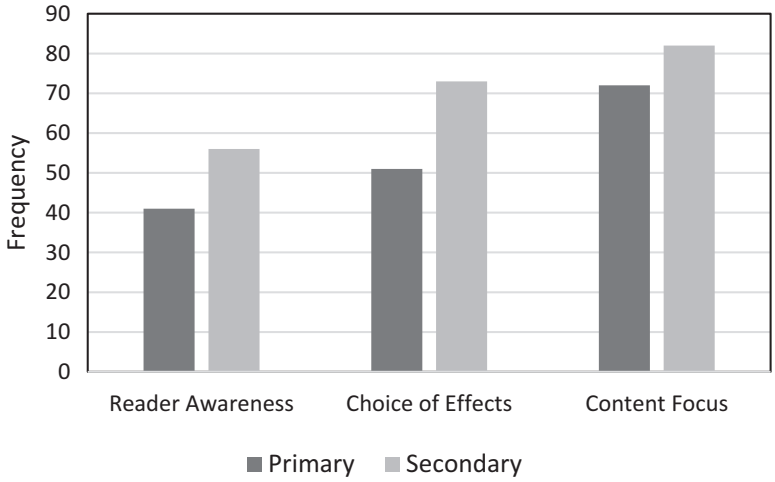

Fig. 7.1 Comparing sub-code frequencies across primary and secondary age cohorts

'*just basically tell people what happened and describe what happened*'. For others, there was a little more nuance to the desire to communicate clearly, going beyond the transfer of facts to include a perspective on those facts. For example, a 10 year-old, writing a persuasive speech in the context of a cross-curricular study of the Ancient Greeks, wanted not only to inform his reader about the lives of ancient Greek fisherman, but to help them realise that '*it's hard, fishing, hard work'*.

However, there were many students in both primary and secondary age ranges who had a more secure awareness that as writers they could influence or affect how their reader responds to their writing. For some, this was a recognition that different implied readers required different kinds of writing, such as the 9 year-old, tasked with writing a letter to Dahl's character, Willy Wonka, who noted that her formal address to '*Mr Willy Wonka'* was important because '*it's not just an ordinary chat, it's like if you were working and you send a letter to your boss you wouldn't just go like 'Oh hello Mr Wonka*'. A common awareness was that writing could create an emotional response and many of the young writers commented on an emotion which they hoped to stir in their readers:

- '*we wanted them to feel sorry for Noah because he's lost his dad'* (11 year-old)
- '*I'm trying to make them feel scared'* (9 year-old)
- '*if you were reading it and you heard that story … it would make you very emotional and you probably wouldn't want to, like, try not to be peer pressured into drinking'*. (13 year-old)
- '*the past tense one, I wanted people to feel sorry for the soldier but also like it's like happened and you can't really do anything about it and like we don't want it to happen again'*. (13 year-old)
- '*I want them to feel like they're in the story… alongside it*.' (11 year-old)

For a smaller number of writers, there was an awareness of how they could manage the telling of a story or the communication of information in particular ways. One 11 year-old wanted to manage the mood of a narrative so that the reader would '*feel that it's really calm and then all of a sudden it gets really, it's peaceful, and then all of a sudden it gets really tense… and it goes back to being calm again*'. Another 10 year-old used sub-headings in an information text to manage the information on behalf of their reader: '*you have a section on weather, a section on houses, a section on food so they can go onto the different sections and they know that it's not just all together, it's in sections that you can just read about*'.

There was also a cluster of responses in which students echoed advice frequently given by teachers relating to reader awareness, particularly concerning the use of descriptive detail to '*make a picture in its head'* (9 year-old) or a '*picture in their mind'* (12 year-old). Students also referred to the need to try and draw their reader in so '*people feel like they're more part of it'* (12 year-old), or to create suspense so that readers *'feel they don't know what will happen next*' (12 year-old). There was also a sense in some writers that their readers might be less than motivated, making writers attend to keeping them reading, '*otherwise readers can get really bored and kind of stop reading*' (12 year-old). There were multiple references to making '*them want to read on*' and to keeping their readers interested. These do reflect the efforts of teachers to develop greater reader awareness, although the repertoire of implied reader responses is rather narrow.

It was also evident, particularly for older students, that the most important reader was the teacher, not any task-specified imaginary reader, and students were conscious of trying to impress their teacher-reader with the kinds of choices in writing they felt would secure success. This was either by using arguments they thought would appeal to their teacher or by setting out to demonstrate language choices they believed were important:

- *I think Mr B wanted like bossy verbs because it's like telling them to do it exactly* (10 year-old)
- *I wanted to show my teacher that I can do what he was trying to get us to do so like the similes and the description and all* of that (10 year-old)
- *Since Year 7 you're always writing for the teacher, you're writing to show your understanding within lessons* (14 year-old)
- *I did two rhetorical questions next to each other to make the reader really think because Miss said that rhetorical questions make sure the reader thinks* (14 year-old)

One 14 year-old able writer explicitly articulates this awareness of the teacher as reader, but retains her own authorial view. She explains why she has used a particular relative clause and says '*I know you're supposed to say like, it adds more detail, when it's like that but I just think varying sentence types is always more interesting for someone to assess or read it'*. Overall, the students' responses in this sub-code indicate that young writers appear to have a developing reader awareness over time but that there is also considerable scope for considering how writing instruction might support a stronger and more mature understanding of the reader. The data also

highlight the existence of tensions for these school writers between an imaginary 'real' audience and the 'real' audience of the teacher.

Choice of Effects

The student responses in this sub-code related to their ability to verbalise and explain the language choices they had made. Some of these responses show that students were able to explicitly comment on their choices. Often these young writers referred to using description in the writing, such as the 10 year-old who explained that she *'was trying to get good descriptive words telling you exactly what it's about and what it does*' or the 12 year-old who noted that her writing was '*really descriptive'* and cited as evidence her sentence '*The trees were covered with green leaves, the grass was growing in rhythm with the wind, bluebells decorated the ditches, fallen trees and fences'*. Comments like this reflected an articulation of a choice but with no direct discussion of how it might shape a reader's response (although the use of 'you' in the first quotation was common across the dataset as a rather generalised way of referring to an implied reader). But students were also able to make more direct links between a choice and its possible effect on a reader. An 11 year-old maintained that the sentence '*her heart hammered and her soul got sucked up like in a tornado*' was a description '*so the reader actually knows like what it felt like*'. Another writer felt that the choice of direct address through the use of the pronoun 'you' was '*like you're bringing them into it… You're engaging them'* (13 year-old). Many of the responses focused on the effect of particular word choices, as in this example from a 10 year-old talking about a piece of persuasive writing:

> *When I did the last, 'it's a dream deeply rooted in every designer's dream', I put 'deeply rooted' because like some people just put 'planted into' … but I thought well if you put 'planted' it can be easily pulled out and if you put 'deeply rooted' it will be like a tree stump, it would be harder to come off.'*

One older writer reflected that her vocabulary choices had matured over the 3 years to become more deliberate although there is no explicit discussion of why these choices are more effective than those in earlier years:

> *' 'my heart beats rhythmically', 'my breathing is steady': I think that's a little more, I think my vocabulary is, I'm more aware of like where I'm putting it in whereas in Year 7 I think I was just trying to cram in like a load of fancy words and just took time to describe things and I think in Year 9 I knew what I was doing more and I was intentionally trying to use better vocabulary, so it's a bit more composed than my Year 7 one'*. (14 year-old)

Students were less likely to comment on syntactical choices, but there were those who were aware that syntactic choices could alter how the information in a sentence was communicated. In one writing task, stimulated by the novel they had been reading as a class, students composed a letter in role to two sisters trying to persuade them to allow their young brother to leave home to attend a boarding school. One

writer discussed why his choice of the active voice '*You have raised him extremely well*' was better than the passive version which did not make clear who had raised the boy – '*it could have been anybody'*. Another student explained why her choice to put '*Closer and closer I go*' at the start of her sentence creates a sense of build-up which is not achieved by a standard subject verb sentence:

> *'If you say 'I went closer and closer' that's sort of like you know what happened but if you're saying 'closer and closer' it's sort of like you're building up to something that is going to happen'*. (14 year-old)

It was also evident, however, that many students struggled to verbalise precisely the effect of their choices on their real or imagined reader. Sometimes students correctly identified a link between a choice and effect but could not explain why that choice had that effect. One 9 year-old writing a narrative explained that she wanted her description of a dragon make the reader '*feel scared'* and felt that her simile '*like a scorched vampire'* made the dragon more scary because '*it's like a vampire and its scorching*' . Similarly, one writer indirectly identifies her verb choices in '*He barged into the room and pushed the doors open*' as helping the reader infer character, but she does not articulate this directly, instead suggesting these choices show '*he must be annoyed or something'* (11 year-old). Another writer tries to explain the choice of first person perspective in a narrative as '*it's more personal and it's more around one person and what they've experienced rather than a lot of other people'* (13 year-old). There were many examples like this where students were choosing features of their writing which did appear to be explicit choices but where the challenge of verbalising how the choice achieves a particular effect was clear. There is a sense, nonetheless, in these comments of young writers on the brink of a higher level of metalinguistic understanding.

Elsewhere, however, students' articulation of the effect of their choices revealed substantial reliance on the teachers' explanations of choices and effects, leading to some echoing of teachers' verbalisations which may not represent full understanding. Some of these responses also reflect the current emphases of the national assessment of writing for 11 year-olds in England, including the need to use varied punctuation such as brackets, dashes and ellipsis. One 11 year-old noted an ellipsis in his writing and claimed he used it '*because it adds tension'*, mirroring the teacher's explanation. Other responses suggest the students are repeating back things teachers have encouraged them to do, such as the writer who explains that his use of alliteration '*gives it a really good picture'* (10 year-old); or the writer who feels their modal verbs '*make the reader feel involved'* (12 year-old). In one example, the student tries to explain the effect of sentence length variety but in fact echoes teacher comments relating to adding detail, building tension, hooking readers in and keeping the reader interested without any coherent explanation of how this relates to length:

> *'Some sentences make you add more detail into your writing instead of just using simple sentences and shorter ones and longer ones. Sometimes shorter sentences help build climax but then you can give a load of detail about what's actually happening. Then you can hook them in with like the long sentences, like at the beginning there's an average sized one*

which hooks them in and then you can use different types from then on. Because then they're interested'. (12 year-old)

Content Focus

A substantial set of student responses ($n = 72$ for primary and $n = 82$ for secondary) were coded as *Content-Focused,* where students tended to focus more on *what* they were writing, than *how* they were writing it. Fig. 7.1 indicates that both primary and secondary students made more responses categorised as content-focused than they did for the other sub-codes. In part, this relates to the questions they were asked: questions intended to prompt discussion of linguistic choices and their effects were often answered with reference to the content of the writing. This may be because they did not understand the intended focus of the question:

Interviewer: What have you learnt about doing this kind of writing?
Student: That frogs are very energetic and they hibernate in mud which I never knew before. (9 year-old)

***

Interviewer: What were you learning in this piece of writing?
Student: We were learning about Charlie and the Chocolate Factory and Mr. Willy Wonka and we were pretending to be his chief taste managers. (9 year-old)

***

Interviewer: Are there any of your sentences that you think 'Oh I like the way I've shaped that sentence' or 'Oh I like the way I've written that sentence?'
Student: Vesuvius the great town protector.
Interviewer: And why do you like that one?
Student: Because it tells us how Vesuvius is protecting the world. (9 year-old)

Just as in the *Awareness of Reader Needs* comments, there were students whose concern was principally with the message they wished to communicate to the reader, so too here some students were more conscious of the topic of their writing than how that topic was shaped. So one student, when asked what advice she would give someone else who was writing an information text, responds with safety advice related to the content of her information text: '*Like the equipment you're getting out and all of that, because some of it might be sharp some of it might be soft but you need to tell them what it feels like because they cut themselves or something*' (10 year-old). This emphasis on the literal content of the writing is also evident in these examples:

Interviewer: Just pick me out one or two best bits of your description.
Student: '*They jumped down off the stand. I jumped back in horror'*…because you would get like get horrified if something jumps down towards you, so you would jump back. (9 year-old)

***

Interviewer: So can you find the bit that you think sounds just right?
Student: I think the beginning bit
Interviewer: '*Time for work is in school and not at home, home time is <u>our</u> time'* and you've underlined 'our' twice haven't you. So can you just attempt to explain to me why you like the sound of that?
Student: Because it's like saying we work but we still need time for ourselves. 9 year-old

These comments with a strong content focus may indicate that students provide a literal account of events or ideas in their writing because these are more tangible and easier to describe than are their linguistic choices and how they shape intended meanings in the text. However, the emphasis on content is in line with Langer's (1986) findings that the students principal concern was with the meanings they were developing, reflecting the primacy of the communicative content in young writers' thinking, rather than a concern with the 'how' of communication.

Discussion

This analysis of how explicit metalinguistic teaching can draw upon the affordances of both reading and writing to strengthen writers' understanding of the authorial choices provides evidence both of children's capacity to understand how to write with their reader in mind, and of the challenges that that this poses. Because the nature of the intervention focused strongly on developing metalinguistic understanding of the choices writers make in texts and thus of the choices developing writers can make in their own texts, it is not surprising that over time their metalinguistic understanding grows and their writerly decision-making develops. Unlike many previous studies (e.g. Langer 1986; MacArthur 2008) these students did not foreground surface features, such as spelling, in their writing conversations but were genuinely engaged in considering how their writing was creating meaning. The data also indicate, however, that reader awareness (which was not an explicit focus of the interventions) may need stronger pedagogical guidance to make the language choices a writer makes more robustly linked to imagined reader responses.

One clear strand of evidence in the data relates to some students' struggle to verbalise the meaning-making effect of a particular language choice. It's important to recognise here that verbalisation makes metalinguistic understanding tangibly evident and available for consideration, but the inability to verbalise may not reflect

an absence of metalinguistic understanding. Camps and Milian (1999) distinguish between verbalisable and non-verbalisable metalinguistic knowledge, arguing that there are students who are making deliberate choices but who may be unable to verbalise them. Roehr (2008, p. 179) described metalinguistic understanding as '*declarative knowledge that can be brought into awareness and that is potentially available for verbal report'*. Our interest has been in this 'potential availability' of verbalisation and how teachers can support the development from potential to actual availability, drawing on theoretical thinking about metatalk and the power of talk for learning (Myhill and Newman 2016). The struggle that students face in verbalising the rationale for their choices may simply reflect development in metalinguistic understanding – as young writers they may be able to make appropriate and effective choices in writing *before* they are able to articulate this clearly. Certainly the evidence in the writing samples supports the idea that explicit teaching about choices results in students who use those patterns in their writing but not all are consciously aware that they have done so. However, the writing conversation data also suggest that verbalising may be hard because students are genuinely searching to find the right words to voice their choices – an emergent understanding on the brink of verbalisation. Thus, how teachers support these moments of emergent understanding is important, and teachers' own capacity to model verbalisation of writerly choices may itself need further development (see Myhill and Newman 2016) as this is an unfamiliar way of working, certainly in the educational context of the UK.

Additionally, this paper draws particular attention to a pedagogy which makes explicit connections between reading and writing, particularly writers' choices in authentic texts as models for supporting students' understanding of the repertoire of choices available to them as writers. One critical aspect of pedagogy which the writing conversations highlight is how teachers enable the development of metalinguistic understanding in these young writers. The Barrs and Cork study (2001) used '*orchestrated discussion'* and '*texts as models or writing'* (2001, p. 72) as part of their pedagogical approach, and this included explicit attention to how the writer used language, for example, how '*a writer used language to convey atmosphere or build up suspense' or how a writer 'used dialogue as part of characterisation'* (2001, p. 72). However, they conclude that *'the direct teaching of particular features of prose…is less likely to produce good writing than is a close focus on the meanings that children want to express*' (2001, p. 203). We would argue that it is the integration of the direct teaching *with* the discussion of meaning that is critical, bringing reading and writing together. At the same time, our data suggest that teachers need to broaden the repertoire of ways to discuss the relationship between language choices and meaning-making from a rather routinised focus on adding visual detail, creating suspense, hooking the reader in, and making the reader want to read on, which are echoed back in the writing conversations, to a richer and more nuanced repertoire of language and meaning-making relationships.

The data does also highlight the tension for students between school writing and real writing, particularly in terms of their awareness of the dual audience of teacher and imaginary reader, but also in terms of their awareness of the assessment

expectations for writing. Andrews and Smith (2011) argue that school writing can over-emphasise form, leading to '*a static and formulaic conception of what language can do'*, and that there is '*too limited a sense of audience and function so that writing becomes an activity that supports assessment requirements'* (2011, p. 9), arguments which our data appear to support.

Conclusion

This chapter has considered young writers' metalinguistic understanding of how to make language choices to shape meaning in their own written texts, drawing on the models provided by authentic texts. The pedagogical approach adopted encourages writers to recognise the language choices writers make and to be more explicitly aware of the choices they make in their own writing. Through the voices of the writing conversations with these young writers, we have drawn attention to the particular affordances of a pedagogy which integrates reading and writing within a Hallidayan conceptualisation of grammar as a meaning-making resource, but we have also drawn attention to the challenges that some students face in verbalising their metalinguistic understanding and the constraints that 'schooled writing' can impose upon their learning. It is evident that the role of the teacher in supporting a bidirectional learning relationship between reading and writing is a critical one, and there is a clear need for more empirical research which investigates pedagogical aspects of the integration of reading and writing in instructional settings.

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Chapter 8
The Contribution of Reading Abilities to the Writing Quality of Expository Text Structure in Hebrew Speaking Elementary School Children

Anat Stavans, Batia Seroussi, Amihai Rigbi, and Sara Zadunaisky-Ehrlich

Let us pick up our books and our pens. They are our most powerful weapons. One child, one teacher, one book, and one pen can change the world.

Malala Yousafzai, the United Nations, 12.6.2013.

Abstract Three decades of inquiry have explored the nature of the relationship between writing and reading, yielding at least three theoretical models (interactive, socio-cognitive, and separate processing), numerous perspectives within each model, and a wide range of research methodologies to support or refute these theories. Texts in general and written texts in particular, must have content (i.e., the information depicted in the text) and structure (i.e., the way this information is organized), both constructs are interrelated and essential in the construction of a good expository text. For example, reading research has shown that awareness of text structure contributes to reading fluency, and assists the construction of a coherent mental representation of the text structure improving (Williams JP, Journal of Special Education 39:6–18, 2005) or hampering (Williams, Literacy in the curriculum: integrating text structure and content area instruction. In: McNamara DS (ed) Reading comprehension strategies theories, interventions, and technologies. Lawrence Erlbaum Associates, Hoboken, pp 199–220, 2007) comprehension. Drawing on different aspects of each of these theories, this study explores the relations between reading and writing abilities in elementary school children, in middle class integrative schools in central Israel. Our assumption that a high-quality written

A. Stavans (✉)
Faculty of Culture and Society, Beit Berl College, Kfar Saba, Israel
e-mail: stavansa@beitberl.ac.il

B. Seroussi
School of Education, Levinsky College, Tel Aviv, Israel

A. Rigbi · S. Zadunaisky-Ehrlich
School of Education, Beit Berl College, Kfar Saba, Israel

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text contains the various structural components in accordance with the genre requirements was corroborated. We conclude that the indicators that relate to text-structure-quality of different text genres is dynamic and its development is age-dependent.

Introduction

Reading and writing, two domains of literacy, share the same medium, but differ in its developmental path and in a dense network of factors related to it (Ahmed et al. 2014). Over three decades of research on the nature of the relationship between writing and reading have been grounded in at least three basically diverse theoretical models, numerous perspectives within each model, and a wide range of research methodologies to support or refute these theories. What runs as a backbone to these theoretical models is that the connections between reading and writing are obvious to naive observers since both share language, a writing notational system, real world knowledge, textual knowledge and cognitive abilities (Shanahan 2006). The present study further examines whether and what kinds of relationships exist between reading and writing throughout the school years when focusing on text structure of expository texts as a feature of text quality in children's construction of written texts.

Reading-Writing Connections

Reading and writing processes rely on four types of shared knowledge (Fitzgerald and Shanahan 2000): (a) domain or content knowledge of the specific modality in use (Flower and Hayes 1984; Spivey 1997); (b) meta-knowledge concerned with rhetorical relations in a communicative context (Boscolo et al. 2011); (c) textual knowledge involving text organization and language appropriate forms and functions unique to written language; and (d) procedural knowledge that includes knowing how to access, use and construct information by predicting, questioning and summarizing (Boscolo and Ascorti 2004; Hebert et al. 2013). The nature and directionality of these types of shared knowledge is captured in three theoretical models proposed by Shanahan (2015): (a) the interactive model – both reading and writing are analogous processes with shared activated cognitive abilities (Fitzgerald 1990; Just and Carpenter 1992; McCutchen 2000; Swanson and Berninger 1996) and skills to access information), (b) the socio-cognitive model – where reading and writing are communicative transactions between reader-writer-text (Rubin 1984), and (c) separate processes for reading and writing – which combine to achieve a goal (Langer and Applebee 1987). This study espouses aspects of all

three models in the search for the developing relationship between children's reading skills and the quality of the written text structure produced in argumentative and informative texts.

Studies have investigated the relationships between particular skills that affect children's reading abilities such as phonological awareness, accuracy and fluency in reading and reading comprehension, are differentially related to each other throughout development (Joshi and Aaron 2000). There is substantial evidence on the relationship between phonological awareness and word-level decoding skills in early reading development (Anthony and Francis 2005; see for a review McCardle et al. 2001). However, upon mastery of reading, there is reciprocity between phonological awareness and word reading (Nation and Hulme 2011; Vernon and Ferreiro 1999; Wagner et al. 1994).

Less research has dealt with the contribution of phonological awareness to writing. Some studies show that phonological awareness in preschool children is a predictor of writing achievement (Abbott and Berninger 1993; Mäkı et al. 2001) but it affects specifically spelling and not letter-writing or name-writing ability (Puranik et al. 2011). Factors such as syntactic and semantic processing (Klauda and Guthrie 2008), short-term memory, and rapid naming also correlate with literacy achievements. For instance, phonological awareness relates to reading accuracy (e.g., Wimmer et al. 2000), and rapid naming was more closely related to reading fluency (Savage and Frederickson 2005). Automaticity (which involves both fluency and accuracy (Breznitz 2006) advances the development of literacy by mastering the reading and writing of words with little conscious attention or mental effort (Perfetti 1994).

Writing Development

Writing is a complex activity involving the integration of cognitive and linguistic resources as well as motor skills, constrained by the topic-content knowledge (Scardamalia and Bereiter 1986; Hayes 1996; MacArthur et al. 2006). It is a social activity in which the writers-readers dialogue is constrained culturally, socially or institutionally (Nystrand 2006; Prior 2006). Text writing is an academic ability developed through formal instruction across school years (Graham et al. 2012). It involves continuity (i.e., the progression of writing ability on a continuum), complexity (i.e., the gradual improving text quality) and sociality (i.e., writing as a tool to become a member of the literate community) (Boscolo 2008) that builds academic literacy (i.e., the gradual development of linguistic competences, content-dependent knowledge and the understanding of oral and written differences) at school (Ravid and Tolchinsky 2002; Tolchinsky 2003). Text writing is text-type dependent (Christie 2005; Wing Jan 2009), as children learn to order their experiences and knowledge to express and communicate thoughts and feelings in different ways.

Expository Writing Development

Expository texts are central in school-academic literacy development and their comprehension and production pose distinctive linguistic, textual and cognitive demands on the individual propounding a challenge for school children because expository texts: (a) are less frequent in early childhood compared to narrative texts (Duke 2000); (b) require prior knowledge of the topic (Best et al. 2008); and (c) constitute a structure with distinct linguistic form and function (Coté et al. 1998). For instance, argumentative texts must have a well-built claim that is reinforced or refuted by justifications (van Eemeren and Grootendorst 2004) that follow a certain logical progression and have an explicit marking of different points of view. Informative texts provide information on a selected subject or extended definitions of a concept. While information regarding text knowledge structure and its contribution to reading comprehension has been documented, little research conducted on this topic has dealt with the connections between children's knowledge of text structure and organization and text quality (e.g., Ferretti et al. 2009). As stated before, several factors are known as influential on literacy achievements in general and on writing in particular. One of the prominent factors, text structure, is at the center of the present study.

Text Structure

Text structure refers to the organization of information for particular purposes (Kress 1994) weaving coherently relationships among textual ideas in one's cognitive representation to facilitate text comprehension (Kintsch 2004). Text structure helps remember ideas from a text (Meyer et al. 1980), and consequently construct a coherent mental representation of the text. Awareness to the structure of an expository text facilitates comprehension and recall (Taylor 1982), in part by invoking relevant background information and schemas to aid the construction of a meaningful representation. Though awareness of text structure facilitates text comprehension, it varies as a function of text type: some texts are less structured (such as descriptions), while others are more structured (like argumentative texts). It appears that the more the text has a marked structure the better is the performance in comprehension. Intervention studies with schoolchildren aimed at teaching text structure have shown advantages of structure knowledge among older readers (Armbruster et al. 1987; Weaver and Kintsch 1991). However, text structure knowledge in younger children is under-researched (Hall et al. 2005). Text structure characteristics (Yochum 1991), readers' age (Garner and Gillingham 1987) and overall comprehension skill (Englert and Hiebert 1984) are some of the explanatory bases for text structure awareness. The present study addresses text structure knowledge together with text organization and reading comprehension as pivotal in primary school, not only for procedural text processing knowledge but also for conceptual knowledge increments as expected in school literacy development.

Text Quality in the Present Context

The notion of text quality has been mostly studied in scholastic activities, achievements and responsibility of teachers and students. Little attention has been given to the concept of text quality as an amalgamated outcome of different processes, concepts, skills and abilities that are enlisted to the production of a good text. The research literature alludes to the different linguistic, transcriptional, cognitive, oral, and written knowledge that is required to produce a good text, looking at each in isolation and distinctive manner. In the present study text quality is addressed both by local/ particular measures related to reading abilities such as phonological awareness, reading accuracy, comprehension and text genre recognition, as related to global examination of the structure of elicited informative and argumentative texts produced by schoolchildren.

The issues presented here are part of a large-scale study aimed at delineating the development of expository text quality in Hebrew-speaking elementary schoolchildren in Israel. In this chapter, we limit the scope of text quality by a close analysis on the contribution of different reading-related abilities as preambles to the production of canonical expository text structure – argumentative and informative texts. Our study's approach is twofold: first to establish which reading abilities affect production of a well-structured argumentative or informative text; and second to trace the developmental evolution of these effects. To this end, we pose the following questions: (a) What relationships exist between the skills involved in reading measures (phonemic awareness, reading accuracy, genre recognition and comprehension) for schoolchildren across 2nd, 3rd, 4th,and 5th grades? (b) Do these reading skills (separately and as a cluster) predict the quality text structure of children's informative and argumentative in 2nd, 3rd, 4th and 5th grade? and (c) what is the developmental path in the contribution of reading skills to the quality of text structure across the ages?

The Study

Participants

The participants in this study were 293 schoolchildren (151 boys and 142 girls) from 3 different elementary schools in central Israel as shown in Table 8.1:

Table 8.1 Participants' grade and gender

Grade	Boys n (%)	Girls n (%)	Total n
2nd	35 (49%)	36 (51%)	71
3rd	33 (47%)	36 (53%)	69
4th	40 (58%)	28 (42%)	68
5th	43 (50%)	42 (50%)	85
Total	151 (51%)	142 (49%)	293

Participants were children attending one of the three public schools in middle-high SES residence areas in central Israel. Participants' ages was defined by their grade level. Seven participants were not included because they were newcomers with less than 2 years of schooling in Israel and six participants dropped from the sample as they left the school in mid-year. All participants included in the sample had a signed parental permission to take part in the study.

Materials and Procedure

This chapter deals with the relations between different reading skills measures as predictors of the quality of expository written text structure. The tasks were:

Reading Tasks Both low-level and high-level reading skills were examined, the former by phonemic awareness and reading fluency, and the latter by genre recognition and reading comprehension, as follows. (i) Phonemic awareness task – phoneme deletion administered individually. Each child was asked to omit a certain phoneme of the test word. The list of words was taken from the "Alef-Tav" (Shany et al. 2005) tool for reading assessment. Scores were calculated for each correct answer. (ii) Reading fluency and accuracy- reading aloud to an experimenter an age appropriate text (one for 2nd and 3rd grades and another for 4th and 5th grade) administered individually. The texts were taken from the "Alef-Tav" (Shany et al. 2005) tool for reading assessment. Scores included number of correct words read per minute. (iii) Reading Comprehension- administered collectively in class. This task was designed especially for the purposes of the present study. The texts were selected from general/popular sources such as magazines, books and children's journals and piloted beforehand on children who did not participate in the current study. There were two texts for each grade level, one informative and the second argumentative, each containing fifteen questions targeting different reading comprehension skills. Scores were calculated as the total number of correct answers out of the 15 questions for each text. Reliability analysis of the items revealed the following Cronbach α coefficients: Informative texts- 0.81, 0.85, 0.90, 0.76 – grades 2nd to 5th, respectively; Argumentative texts- 0.79, 0.75, 0.90, 0.64 – grades 2nd to 5th, respectively. (vi) Genre recognition task- three short texts on the same topic but in different genres: two texts were narratives and the third was a text (Hayes and Flower 1980; Rosado et al. 2014) administered collectively in class. Participants were asked to identify the "odd text" out and to explain their choice. Scores on this task were issued as 1 or 0 values in one of 4 possible answers (i.e. correct identification of outlier text and correct explanation, incorrect identification of outlier text and correct explanation, correct identification of outlier text and incorrect explanation, and incorrect identification of outlier text and incorrect explanation).

Writing Tasks (i) Writing an argumentative text- administered collectively. Participants asked to write an argumentative text relevant to their interests, shorten-

ing the school week in exchange of longer study days. (ii) Writing an informative text- administered collectively. Participants wrote an informative text on their favorite hero. Texts were analyzed for: length (consisting of number of clauses produced for each text); general component structure (proportion of component within the text calculated as number of clauses in the component divided by text length); and genre-specific component (proportion of sub-component within the body component in each type of text calculated as number of clauses in the sub-component divided by the length of the body component).

Data Analysis

The scores of the different tasks across grades are described by mean and standard deviations. Pearson correlation was used for as a measure of bivariate association between variables. Path analysis was used in order to estimate the presumed casual relationship among the observed variables. All analyses were performed using SPSS21 and AMOS23 software.

Results

To address the research questions, the results presented will constitute descriptive statistics per group performance, correlations between reading variables and effects' magnitude of the relations between reading variables and text structure production.

Descriptive Developmental Patterns in Reading and Writing Measures

Table 8.2 presents a general descriptive age-group statistic (mean and SD) of the reading measures.

The low-order reading skill of phonological awareness and reading accuracy increases with age: Phonological Awareness: $F(3,297) = 28.0$; $p < 0.001$, main difference between 2nd graders and the other grades; Reading Accuracy: $F(3,297) = 2.9$; $p < 0.04$ main difference between 2nd graders and the other grades. The high-order reading skills of comprehension and genre recognition increases with age: Reading comprehension-informative: $F(3,297) = 5.6$, $p = 0.001$, main difference is between 5th graders and the other grades; Reading comprehension-argumentative:: $F(3,297) = 5.5$, $p = 0.001$, main difference is between 3rd and 4th graders and 2nd and 5th graders; Genre Recognition: $X2\ (3) = 18.0$, $p < 0.001$, main difference is between 4th and 5th graders and 2nd and 3rd graders).

Table 8.2 Descriptive statistics of reading measures

Task	Whole sample M (SD)	2nd Grade M (SD)	3rd Grade M (SD)	4th Grade M (SD)	5th Grade M (SD)
Phonological awareness	74 (25)	53 (24)	78 (22)	77 (23)	85 (20)
Reading accuracy of text	97 (4)	96 (6)	97 (3)	97 (2)	97 (2)
Reading comprehension – informative	73 (22)	68 (23)	69 (25)	72 (21)	80 (15)
Reading comprehension – argumentative	71 (19)	67 (21)	74 (18)	77 (18)	66 (18)
Genre recognition	60 (49)	55 (50)	43 (50)	74 (44)	70 (46)

Table 8.3 presents a general age-group descriptive statistic (mean and SD) of the writing measures.

The length of both types of expository texts increases significantly with age (Arg. $F(3,293) = 31.3$, $p < 0.001$, main difference between 5th graders and the other grades; Inf. $F(3,289) = 13.5$, $p < 0.001$, performance increases linearly with grade). The general text structure components proportion of introduction, body and end, increases significantly, but with fluctuations from 2nd to 5th grade (Arg. Intro. $F(3,293) = 4.7$, $p = 0.003$; Inf. Intro. $F(3,289) = 3.5$, $p = 0.02$; Arg. Body $F(3,291) = 11.6$, $p < 0.001$; Inf. Body $F(3,289) = 3.2$, $p = 0.03$; Arg. End $F(3,293) = 8.4$, $p < 0.001$; Inf. End $F(3,289) = 1.6$, $p = 0.19$). The largest part of the text is the body in all ages and texts; the introduction is the second largest component while the end is the smallest component in the text. The body component constituency defines the genre in argumentative texts the claim component proportion is 1/3 while the support to the claim component makes 2/3 of the body of the text. The overall proportion of claims and support decreases with age (Claim $F(3,292) = 4.7$, $p = 0.003$; Support $F(3,292) = 4.7$, $p = 0.003$) but the variability between the children increases. In informative texts the use of explanations predominates (60%), whereas the use of narrative (11%) and illustration (3%) are used less. The use of explanation and narrative styles for presenting information increases with age while the use of illustration decreases with age (Illustration $F(3,289) = 3.9$, $p = 0.01$; Explanation $F(3,289) = 2.5$, $p = 0.06$; Narrative $F(3,289) = 2.4$, $p = 0.06$) .

Relations Among Reading Variables

To better understand these trends, reading variables were categorized in line with Bell and Perfetti (1994) and Landi (2010) as low-level skills (phonological awareness and reading accuracy) as predominantly aiding decoding, and high-level skills (genre recognition and reading comprehension tasks) as closely associated with language, content and textual abilities. Table 8.4 presents the bivariate correlations among the reading variables.

Table 8.3 Descriptive statistics of writing measures

Task			Whole Sample M (SD)	2nd Grade M (SD)	3rd Grade M (SD)	4th Grade M (SD)	5th Grade M (SD)
Argumentative text	Length (# of clauses)		9.3 (5.0)	6.8 (4.0)	7.7 (3.8)	8.6 (3.9)	12.9 (5.4)
	General component proportion	Introduction	2. 3 (7.5)	0. 4 (2.1)	2.9 (8.9)	0.9 (4.7)	4.2 (9.8)
		Body	90.1 (14.2)	97.4 (5.9)	89.8 (15.3)	92.8 (12.1)	85.3 (16.9)
		End	7.5 (14.5)	2.3 (5.6)	7. 3 (12.0)	6.2 (11.4)	12.6 (20.4)
	Genre-specific body component	CLAIM proportion	30.6 (20.7)	29.8 (16.5)	36.6 (23.3)	32.8 (23.0)	2.0 (18.4)
		Supports proportion	60.3 (22.8)	67.5 (16.7)	53.2 (24.8)	60.0 (25.0)	60.4 (22.1)
Informative text	Length (# of clauses)		11.8 (6.3)	8.6 (5.5)	10.8 (4.3)	12.1 (6.7)	14.5 (6.7)
	General component proportion	Introduction	23.7 (21.8)	30.1 (29.4)	19.5 (16.1)	25.2 (22.5)	20.8 (16.7)
		Body	73.6 (21.8)	67.7 (28.8)	78.6 (17.5)	72.2 (23.0)	75.3 (16.1)
		End	2.8 (6.1)	2.2 (5.9)	2.0 (4.9)	2.7 (6.0)	3.9 (7.0)
	Genre-specific body component	Illustration proportion	3.2 (12.4)	7.4 (19.0)	1.0 (4.2)	3.3 (14.2)	1.7 (7.2)
		Explanation proportion	59.7 (27.8)	55.0 (29.8)	67.4 (26.4)	58.4 (28.4)	58.5 (25.0)
		Narrative proportion	10.7 (22.9)	5.3 (14.1)	10.2 (23.3)	10.5 (22.5)	15.2 (27.1)

For low-level reading skills in the younger grades phonological awareness correlates with all high-level skills (2nd: genre recognition $r = 0.28$, $p < 0.05$; reading comprehension of argumentative text $r = 0.30$, $p < 0.05$ and informative text $r = 0.33$, $p < 0.001$; and in 3rd: reading comprehension of: argumentative text $r = 0.29$, $p < 0.05$ and informative text $r = 0.31$, $p < 0.05$). Similarly, in the older grades phonological awareness strongly correlates with all high-level skills (5th: reading comprehension of argumentative text $r = 0.40$, $p < 0.001$, and informative text $r = 0.52$, $p < 0.001$ and genre recognition $r = 0.48$, $p < 0.001$ and also with the low-level skill of reading accuracy $r = 0.53$, $p < 0.001$; however, no correlations were found in the 4th grade). Reading accuracy in the younger grades, correlates with all high level reading skills differentially (2nd: genre recognition $r = 0.30$, $p < 0.05$ and reading comprehension of informative text $r = 0.38$, $p < 0.01$; and in 3rd: reading comprehension of both alike argumentative text and informative text $r = 0.50$, $p < 0.001$). The older grades also show similar differential correlations between high-level reading skills and reading accuracy (4th: genre recognition $r = 0.44$, $p < 0.001$ and

Table 8.4 Correlations between reading variables by grade

	Grade	Phon. Awareness	Read. Accuracy	Genre Recognition	Read. Comp. Argumentative	Read. Comp. Informative
Phonological awareness	2nd					
	3rd					
	4th					
	5th					
Reading accuracy	2nd	0.20				
	3rd	0.19				
	4th	0.12				
	5th	0.53∗∗∗				
Genre recognition	2nd	0.28∗	0.30∗			
	3rd	0.13	0.02			
	4th	−0.03	0.44∗∗∗			
	5th	0.48∗∗∗	0.30∗∗			
Reading comprehension argumentative	2nd	0.30∗	0.21	0.39∗∗		
	3rd	0.29∗	0.50∗∗∗	0.21		
	4th	0.14	0.47∗∗∗	0.29∗		
	5th	0.40∗∗∗	0.19	0.26∗		
Reading comprehension informative	2nd	0.33∗∗	0.38∗∗	0.33∗∗	0.64∗∗∗	
	3rd	0.31∗	0.50∗∗∗	0.12	0.57∗∗∗	
	4th	0.15	0.15	0.23	0.64∗∗∗	
	5th	0.52∗∗∗	0.34∗∗	0.39∗∗∗	0.62∗∗∗	

$*p \leq 0.05; **p \leq 0.01; ***p \leq 0.001$

reading comprehension of argumentative text $r = 0.47$, $p < 0.001$; and in 5th: genre recognition $r = 0.30$, $p < 0.01$ reading comprehension informative text $r = 0.52$, $p < 0.001$ and also with the low-level skill of reading accuracy $r = 0.34$, $p < 0.01$).

Within the high-level reading skills, there are strong correlations between reading comprehension of argumentative texts and informative texts across all grade levels (2nd: $r = 0.64$, $p < 0.001$; 3rd: $r = 0.57$, $p < 0.001$; 4th: $r = 0.64$, $p < 0.001$; and 5th:$r = 0.52$, $p < 0.001$), yet the genre recognition task correlated with the reading comprehension task differentially across the young and older grades for argumentative texts (2nd: $r = 0.39$, $p < 0.01$; 3rd: none; 4th: $r = 0.29$, $p < 0.05$; and 5th:$r = 0.26$, $p < 0.05$) and for informative texts (2nd: $r = 0.33$, $p < 0.01$; 3rd: none; 4th: r = none; and 5th:$r = 0.39$, $p < 0.001$).

Written Text Structure Relations to Reading Variables

Length of Argumentative and Informative Texts

There is a weak but consistent decrease in the relation between reading variables and the length of argumentative texts with age (Fig. 8.1), yet the relation of the reading variables to the length of informative texts across the ages remains quite consistent (Fig. 8.2).

The effect of the reading variables on the length of the argumentative text is weak though seems to develop, as the reading and the writing seem to have different interactive roles. The 2nd graders reading ability are still developing and in rather incipient stages attention to writing lengthy texts is diverted both in terms of quantity and quality while in 3rd grade when the mastery of reading is more advanced and reading and writing are each at the 'service of the other', the effects of the reading variables become more intense resulting in lengthier texts. In 4th and 5th grades this relation fades. The higher skills of reading comprehension and genre recognition are related in a distinctive way to the length of the argumentative text produced by children at different stages of text quality development.

For the length of informative texts, lower reading skills are in a closer positive relation to the length only in the older grades, but the high-level reading skills are in strong relation with all grades except 5th, as illustrated in Fig. 8.2.

Reading comprehension of informative and argumentative texts relate positively with writing lengthier argumentative text. Among the youngest children, reading and understanding argumentative texts relates negatively to the ability to write a lengthier argumentative text, yet reading and understanding an informative text enhances the writing of an informative text. Genre recognition has a positive effect on the length of texts produced by the youngest groups but a negative and decreasing effect among the older groups.

Components of Argumentative and Informative Texts

The relation between the reading variables and text length is not sufficient to determine whether the quality of an argumentative and informative text is high. Analyzing the proportion of the body component that carries the genre distinction weight in both argumentative (Fig. 8.3) and informative (Fig. 8.4) texts.

The relation of reading variables to the proportion of the body component in the text is not the same across the ages and for the two types of texts. Only in 5th grade the low-level skills relate to the proportion of the body in argumentative (Phonological awareness: $\beta = -0.28$; Reading accuracy: $\beta = 0.34$) texts but no relations in any grade and with any reading variable to the body of the informative text (apart from Reading comprehension-argumentative in the 4th grade $\beta = -0.29$). However, what distinguishes the genres in the canonic scheme is the structure of the body of the text.

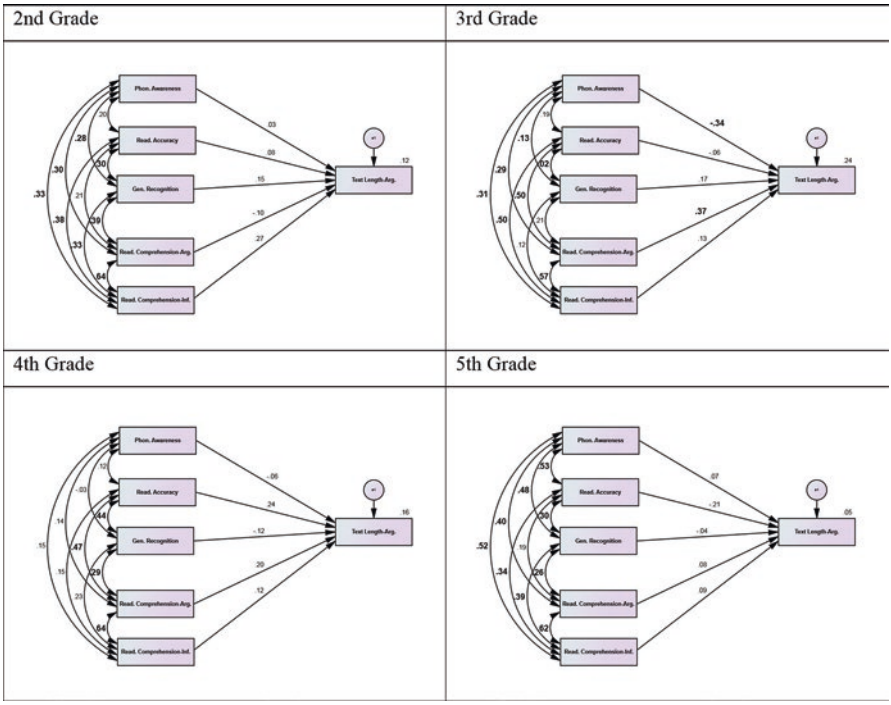

Fig. 8.1 Path models for text length – argumentative

Distinctive Argumentative Text Structure: Claims and Support

The typical constituency of the body of the argumentative genre is a clearly stated claim and support. Figure 8.5 illustrates the predictive effects of the reading variables on the proportion of claim and support within the body component.

Low-level reading variable of phonological awareness relates to the proportion of the claims and supports in the argumentative texts of 3rd ($\beta = 0.27$, $\beta = -0.29$, respectively). Among the 5th graders, low-level reading variables relates to the proportion of supports of the argumentative text provided by the writers (Phonological awareness: $\beta = -0.28$; Reading accuracy: $\beta = 0.32$).

Distinctive Informative Text Structure: Use of Illustration, Explanation and Narrative

The informative text body component was analyzed for genre type exposition of the information. The information organization constituted clauses that were explanatory, illustrative or narrative. Figure 8.6 illustrates the predictive effects of the read-

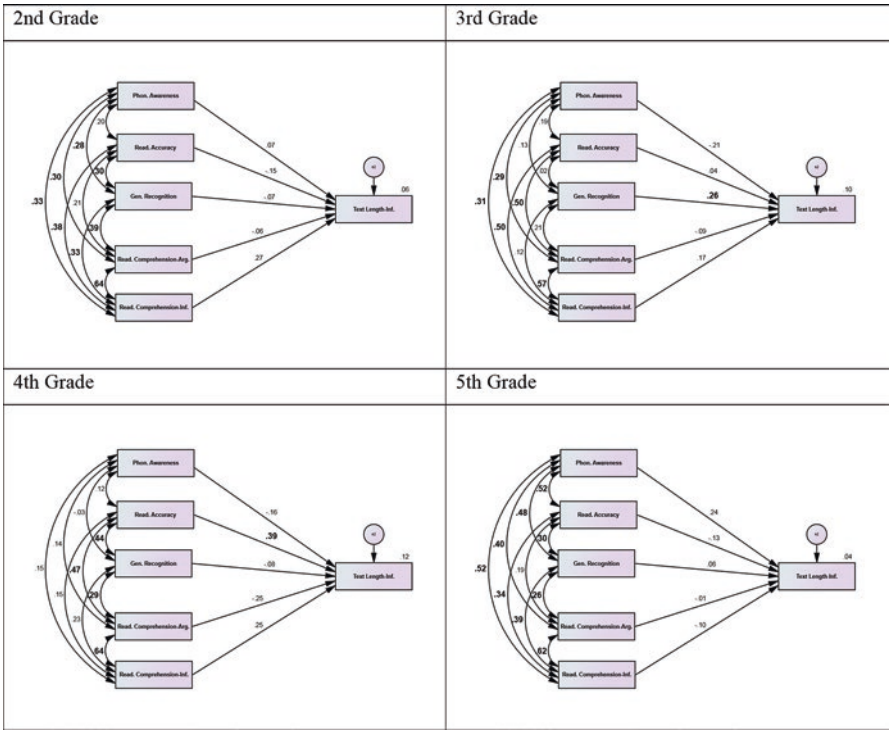

Fig. 8.2 Path models for text length – informative

ing variables on the proportion of style-genre used to present the information within the body component.

Figure 8.6 indicates that reading comprehension of informative texts is positively related to the use of illustrations in 2nd and 3rd grade (2nd grade: Genre recognition = > text body informative illustration β = −0.48, and Reading comprehension informative = > text body informative illustration β = 0.39; 3rd grade: Genre recognition = > text body informative illustration β = 0.25), but in 4th (Reading accuracy = > text body informative narrative β = 0.43) the same reading comprehension skill relates to the use of explanations.

Discussion

Texts in general and written texts in particular must have content and structure. Content refers to the information depicted in the text while structure refers to the way this information is organized. These aspects are interrelated and are essential in the construction of a good expository text. When it concerns reading, awareness of text structure contributes to reading fluency, and assists the construction of a coher-

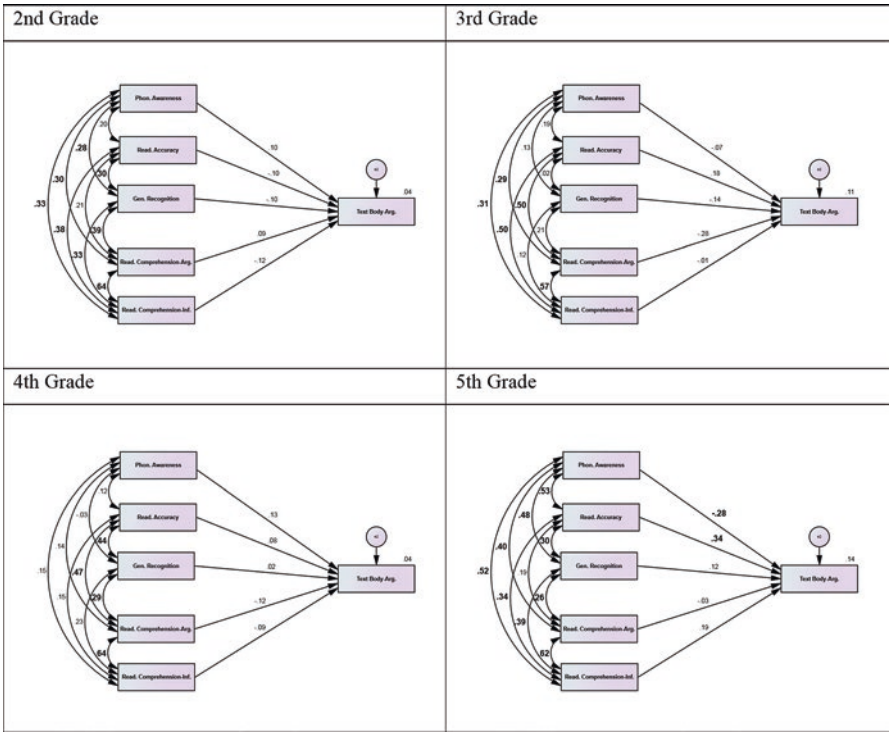

Fig. 8.3 Path models for proportion of BODY component in text – argumentative

ent mental representation of the text improving its comprehension (Williams 2005); yet, lack of sensitivity to structural information may result in comprehension difficulties (Williams 2007). To date, little is known about whether and in which ways, reading relates to producing written texts, in particular when writing is in full developmental stages in elementary school. This study explores the relations between reading and writing abilities in elementary school children in middle class integrative schools in central Israel. Our assumption is that high quality written text contains the various structural components in accordance with the genre requirements.

Phonological awareness and reading accuracy have been regarded as measures of low-level reading ability while text-genre recognition and reading comprehension are considered high-level reading skills. This study shows that in the low-level reading skill measured by a phonological awareness task, there is a developmental trend from 2nd to 5th grade, but in reading accuracy, the performance of all ages was rather high and consistent, suggesting that the 2nd grade children read accurately even though they cannot succeed at breaking the phonemes apart.

In the high-level reading ability, the younger compared to the older grades have a harder time recognizing the difference between text genres because they lack both experience and instruction, and they are still struggling with reading mastery. The genre recognition task requires greater metalinguistic ability – the ability to both

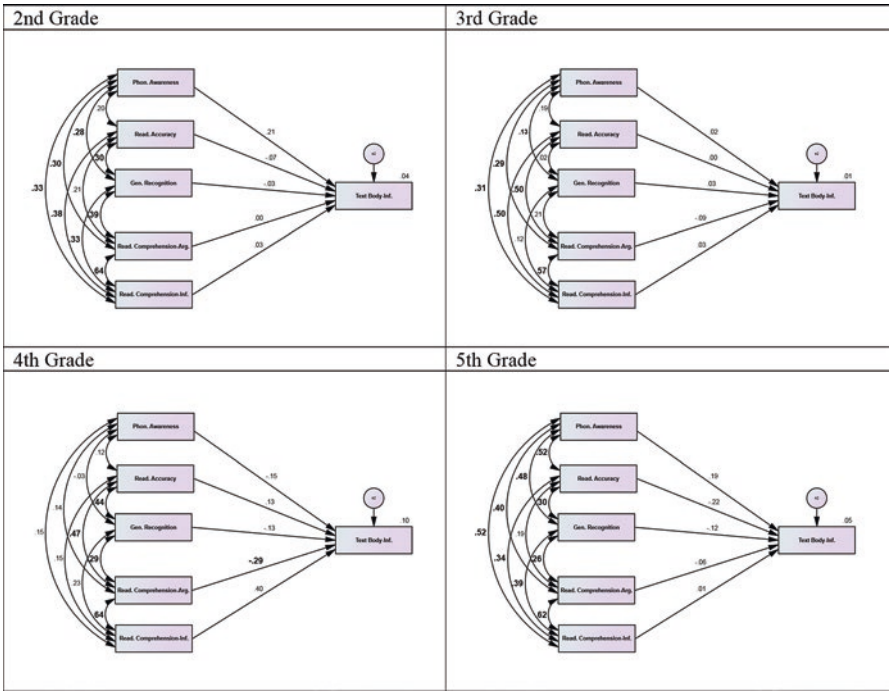

Fig. 8.4 Path models for proportion of BODY component in text – informative

single out the outstanding genre and to explain why it differs. Success rate on reading comprehension of the both types of texts is 65–80% with overall greater comprehension of informative compared to argumentative texts across all ages. The findings showed that while in both types of texts comprehension in older children is higher, the high-level reading measures show minor but stable developmental increments with age.

This study bears out three major issues. First, in both 5th and 2nd grades, high- and low-level reading variables are tightly related to each other compared to readers in 3rd and grades. Though the oldest and the youngest enlist high and low level-reading skills similarly, they seem to do so for different reasons. The young reader uses and builds the different reading skills in a mechanic and primitive manner and hence each skill serves as a scaffold to the next. The older reader recruits all these skills in an organic way so as to "bio-feed" each other. These interrelated abilities have been claimed to predict the quality of children's developing written productions.

Second, in what concerns reading abilities as predictors of quality text structure, the relationships between low level and high-level reading skills to writing quality text structure develops over time. While part of this study's findings showing that different reading predictors were found to explain unique variance in different text structure in the writing outcomes, other findings diverge from those reported in the

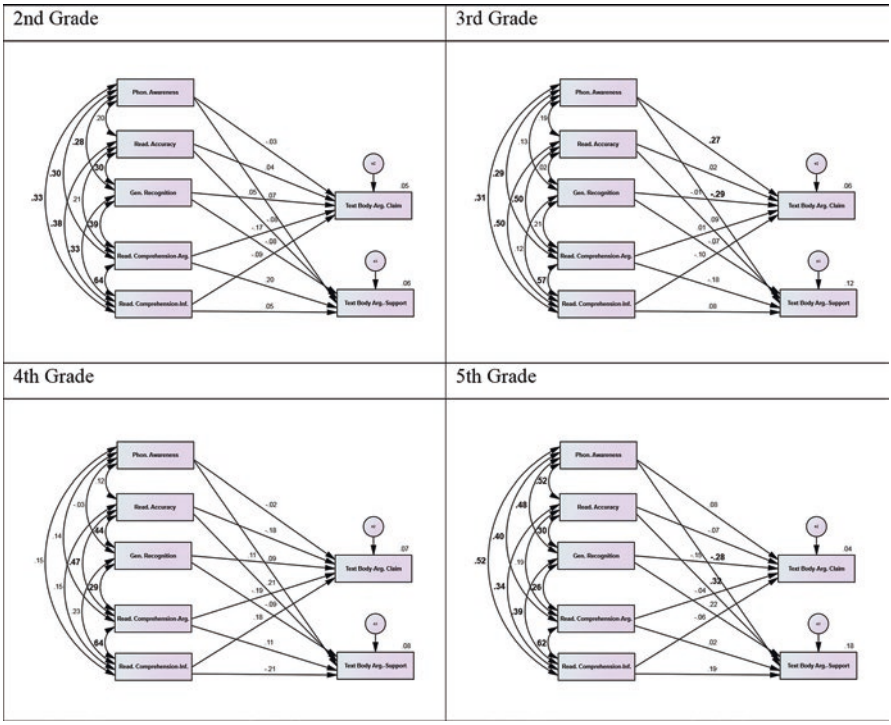

Fig. 8.5 Path models for proportion of sub-components Claim and Support within the BODY component in text – argumentative

literature (Landi 2010) because some reading variables have differential age group and genre dependent relations to text structure.

In general, the informative texts were lengthier across all age groups in comparison to the length of argumentative texts but the length difference is more pronounced in the younger ages. In line with Berninger et al. (2002), our findings show that reading comprehension of informative and argumentative texts, relate positively to writing lengthier argumentative texts, suggesting that children need to reach an intermediate level of compositional proficiency before their writing skills show reciprocal influences on reading comprehension. Our study showed that among the youngest children, reading and understanding argumentative texts results in a shorter argumentative text, yet reading and understanding an informative text results in a longer informative text. A possible explanation might be the structural differences between the genres. Informative texts are simpler in structure and richer in information – both features facilitate comprehension as compared to the argumentative text. An informative text also provides "content" knowledge taken as more factual and robust compared to the argument that is tainted with personal interpretation of facts. Thus, the content and structure of an argumentative text may be more

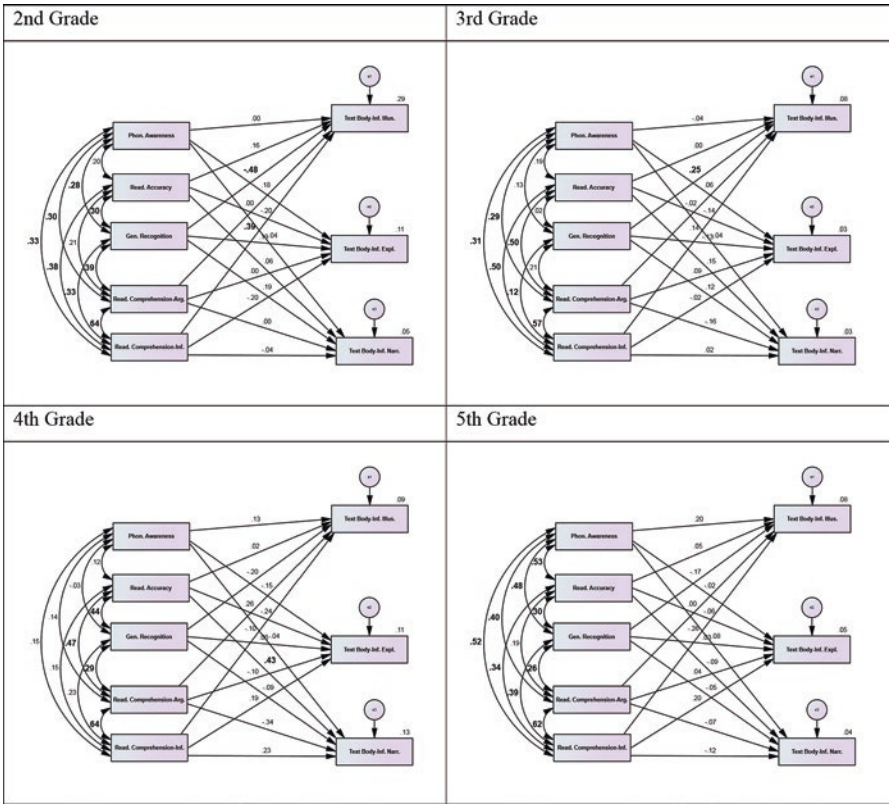

Fig. 8.6 Path models for proportion of sub-components Illustration, Explanation and Narrative within the BODY component in text– Informative

restrictive and cognitively demanding than that of an informative text that is more factual and concrete.

The low-level reading skills (primarily decoding skills) are the spotlight of the school literacy curriculum in 2nd and 3rd grade as scaffolds to writing. Phonological awareness does not seem to have a strong effect on the production of lengthy argumentative texts in all grades except in 3rd grade where it seems to be more of a hindrance than an asset. This and other findings of the relatively minor role of phonemic awareness across the board in the current study challenge the notion of phonemic awareness as a precursor of literacy achievements and calls into question the nature and the directionality of the relations between phonemic awareness, reading and writing in languages other than English (Share 2008 for a detailed review). Though reading is typically mastered by third grade, this age might be pivotal in the development of literacy because children are skilled and concerned with phonemic decoding (the mechanics of reading). When these children have to write, they are blocked by the concern of proper phoneme writing of the word and it's spelling at the price of writing (encoding) shorter texts. However, reading accuracy, which

improves with age, predicts positively lengthier texts among 4th grades but seems to hinder 5th grades' argumentative text length (similar to 3rd grade). It seems that once the hurdle of 'reading' has been overcome (2nd grade), the hurdle of 'writing' clings to the knowledge mastered in reading (3rd grade) until both reading and writing slowly find equilibrium to the extent that they do not necessarily predict the other (5th grade). Lengthier texts in 2nd grade are mostly related to reading comprehension of informative texts, in 3rd grade it relates to both reading comprehension of informative texts and also the genre recognition ability, in the 4th reading accuracy and reading comprehension of informative texts predict longer texts and in 5th grade phonological awareness is the strongest predictor of text length.

Third, looking closely at the relations between the reading ability and the proportion the introduction, body and end components in both informative and argumentative texts, there are strong relations between low or high level reading abilities the body component, where there are distinguishing structures for the argumentative (i.e., claim and support) and the informative texts (i.e., use of illustrations, explanations or narrations). Different reading abilities predict different writing outcome in the structure of the texts. Both low and high reading skills relate to the quality of support statements that is one of the more demanding tasks in the production of an argumentative text. A sustainable argument is robust if the claim is properly backed with convincingly good, factual, truthful and logical support. To build a proper support, one must have sufficient exposure and experience with reading, specifically reading texts of different types. The results show that older children's reading variables are related to the production of support statements in argumentative texts. Specifically, reading accuracy in both 4th and 5th graders indicates that the more accurate the reading is, the more elaborate and complex the support statements are. Hence, attentive and meticulous reading is aligned with attention to specifics and elaborate argument writing. By 5th grade, the production of support is related to both genre recognition and reading comprehension in particular of the informative text. The ability to distinguish the genres reflects a metalinguistic development that aids the construction of the argument. In the younger groups, comprehension of argumentative texts relate positively to the proportion of support statements provided (i.e., 2nd graders - the more the comprehension the more support statements are provided; 3rd graders - good 'comprehenders' are weak providers of good argumentation support), suggesting that at the early stages reading comprehension of argumentative texts, texts are regarded as a "template" for argumentative text writing. In 2nd grade the template functions as a full mold and in 3rd grade it constrains the thought-writing process.

The developmental path of the relation between reading variables and the text-structure quality is manifested across children's age in the production of longer texts in both genres. The length of the text is not arbitrary, but it is shaped in accordance to its structural components. In both genres, the body of the text was the dominant component, but it was evident that other elements that signal text quality – such as text opening and text closing become predominant in 5th grade. This was particularly salient in the argumentative genre and we assume that it is due to didactic reasons (in Israel, formal instruction of argumentative structure begins from 4th

grades onwards); yet, informative texts were longer than argumentative texts. This suggests that the structure quality of an argumentative text is affected by: (a) the highly "rigid" structure, which hampers children's writing until they have training and experience; once the structure is mastered, they are able to consolidate their positions as arguers producing texts with more supports, claims or counterclaims; and (b) the task of writing an argumentative text may have been interpreted as answering a question (i.e., agreement) instead of the argumentation your position. In contrast, the length of body component in informative texts where children could recruit different discourse genres (stories, explanations or examples) was facilitated by the variability of discourse stylistics with which the children had more experience both in oral and written form.

The relationships between low-level and high-level reading skills also changes with age. The idea that mastering low-order skills frees resources to engage in high-order skills becomes more complex, not entirely linear, and interpretation-dependent in terms of the need of these skills at various developmental stages. The relation of reading skills suggests that the differential gains the novice reader/writer makes build gradually in a mechanic and primal manner and hence each skill serves as a scaffold to another, until they become experienced readers/writers who recruit and automatize all these skills in an intrinsic way.

Text quality is also established by compliance with structural cannons of the genre. We found the text-structure quality of texts types to be dynamic and writing development dependent. With age and practice, texts became longer and contain all components (introduction, body and end), the proportion of each component changes in accordance to the genre conventions. Text quality of informative and argumentative texts has been documented in the literature as related to various reading abilities (Englert and Hiebert 1984), mostly in studies concerning English as a first language. In this study, high- and low-level reading skills have shown to relate to the structure of the texts in terms of text length, the presence and proportion of the components, and specifically the constituency of the body component, which is the genre-distinguishing component. The relations found between the reading skills and the structure of the texts varies across ages, genres, and text component. This variability and the strength of the relations is evidence that writing in elementary school evolves slowly, that informative texts are more accessible earlier compared to argumentative texts, and that some reading variables, which correlated with others, do not seem to be related to text structure production. Further studies on different languages and other aspects of text quality measures are needed to ratify or refute these findings.

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Chapter 9
(Re)Constructing Voices: Immigrant Women Read and Write for Social Justice and Themselves

Robin L. Danzak

Abstract Migration has reached crisis levels around the world, with communities struggling to resettle and support increasing numbers of newly-arrived individuals. Adult language and literacy education can empower immigrants to reclaim their voices as they acculturate to their new home. Using qualitative methods of narrative inquiry, this contribution demonstrates the value of an integrated reading-writing approach to English language and literacy tutoring with four, immigrant women attending an urban, adult education center in the northeastern United States. Based on in-depth interviews with each student and over 120 written texts they produced over 2 years, this chapter weaves together the women's voices –their journeys, aspirations, and reactions to global social justice issues addressed through reading and writing instruction. Their stories, organized around the themes of immigration, language, identity, education, and writing, reflect change and adaptation, resilience, and hope, as the women are empowered through their participation in a reading-writing community.

Keywords Adult education · Writing to learn · Immigration · Identity · Narrative research

The author is deeply grateful to the participants for their openness in sharing their stories and their dedication to learning and personal growth. Many thanks also to Stephanie Ridge for her assistance with interview transcription and data processing.

R. L. Danzak (✉)
Department of Communication Sciences & Disorders, Emerson College, Boston, MA, USA
e-mail: robin_danzak@emerson.edu

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(Re)Constructing Voices: Immigrant Women Read and Write for Social Justice and Themselves

Particularly during the last decade, migration has become a focal phenomenon across Europe, North America, and many other areas of the world. Indeed, what the media has termed "the migrant crisis" (e.g., BBC 2016) demands that governments and communities find solutions to resettle and support thousands of migrants in the process of integration and acculturation. One such initiative is adult education: language and literacy instruction can play a pivotal role in empowering individuals to reclaim their voices in a new cultural-linguistic context, allowing them to connect with others and participate productively in their new communities.

The purpose of this chapter is twofold. The first goal is to describe a social-justice oriented, integrated reading-writing approach to English language and literacy tutoring at an adult education center in the northeastern United States. The second is to relate the experiences of four, immigrant women attending the tutoring program for 2 years. The women, who grew up in Brazil, China, Guyana, and Libya, came to the U.S. with very diverse educational (from completing second grade through university), life, and migration experiences. At the time of data collection, they attended tutoring twice weekly for 2-h sessions to improve their English language and literacy skills. Using qualitative methods of narrative inquiry (Clandinin 2013), this chapter presents the participants' stories through their own voices, as captured in interviews and the numerous written texts they produced for the program.

Immigration, Language, and Identity

The life-changing experience of immigration and subsequent adaptation to a different sociocultural context often result in cultural and/or linguistic identity shifts (Pavlenko 2004; Rumbaut 1997). Indeed, acquiring another language in a new cultural context involves not only achieving the words and grammar necessary to communicate needs, but adjusting to the subtler, social and behavioral cues surrounding language use. Finally, there is the discovery –or perhaps, the construction or reconstruction- of one's own voice and identity (who am I in this new language?). This, often unrecognized aspect of second language acquisition is what, over time, leads to empowerment to express our personality, including, for example, humor, anger, and intimacy, in the new language (e.g., Kinginger 2004).

Based on this premise, the primary conceptual foundation of this study is that of a writer's discoursal identity, as presented by Ivanič (1998). Within this framework, discourse (here, writing) serves as the primary mediator in social construction of identity as, "the self… manifests itself in discourse" (p. 18). Additionally, "socially available resources for the construction of identity are multiple, and… an individual's identity is a complex of interweaving positionings" (p. 10). For Ivanič, the autobiographical self –which is both multiple and socially and discoursally constructed- is

present in all writing. Within the sociocultural context of text composition, a writer draws upon her/his autobiographical self, which consists of past and present experiences, interests, ideas, opinions, commitments, sense of self-worth, and literacy practices (e.g., Figure 7.1, p. 183). Thus, the act of writing itself encompasses a writer's "past experiences and encounters in all their richness and complexity, shaped as they are by their social opportunities and constraints" (p. 182).

Extending this model to the bilingual/immigrant writer, individuals using more than one language are bringing not only past experiences, but also aspects of "other" languages and cultures to their writing. Supporting the notion that bilingual competence is not the sum of two discrete systems but rather a single integrated one, Canagarajah (2006) suggested that, instead of drawing inferences from the first language and first culture, bilingual writers "shuttle between" (p. 589) their languages in the process of composing text. Thus, Canagarajah offered a negotiation model of bilingual writing that highlights the writer's: (1) agency in strategically managing multiple languages; (2) versatility in linguistic and cultural competence ("for example, life between multiple languages and cultures" (p. 591)); and (3) responsiveness to contextual changes that impact communication, discourse, and identity. In sum, for bilingual/immigrant writers, Ivanič's (1998) discoursal identity model could be extended to emphasize the writer's negotiation of multiple languages and cultures in writing and as part of the autobiographical self.

Writing to Learn

It is also important to discuss the notion of "writing to learn", which served as the pedagogical foundation for the tutoring curriculum and instruction. Writing to learn is the idea that writing can be used as a vehicle for reasoning and learning (Klein et al. 2014). In the language-literacy tutoring program, writing was used to develop English language proficiency (e.g., vocabulary, grammatical structures) as well as literacy skills (e.g., organization and structure of diverse types of text, experience with different genres, use of figurative language and rich description). Thus, for the students in this study, writing served as a dual-mediator: a means to (re)construct and express discoursal identity, and a means to learn and develop English language and literacy.

In tandem, in the participants' tutoring program, reading served as the impetus for discussion and writing about the students' own experiences and global, social justice issues, such as migration, poverty, racism and discrimination, child marriage, education of girls and women, environmental issues, and conflict and peace. In the tutoring sessions, reading and writing were integrated to promote increased understanding of the issues, related lexical, syntactic, and discourse structures, and reflection and self-expression. The co-construction of the participants' stories, from their interviews and writing, demonstrates the value of this tutoring approach by highlighting their journeys, challenges, and resilience built, in part, through their participation in a reading and writing community.

Method

In line with Ivanič's (1998) theoretical construct of a writer's autobiographical self, this qualitative research is based on narrative inquiry, defined simply as "the study of experience as story" (Clandinin 2013). Creswell (2013) suggested that good narrative research develops a chronology and tells a story based on themes and how the participant/s engaged or performed different phases/aspects of the story. Indeed, a key feature of narrative inquiry is maintaining the participants' voice in the story construction. Along these lines, Holley and Colyar (2012) emphasized that writing from the participants' point of view (in first person and present tense) authenticates the story and allows the reader to engage more directly with the participants.

Here, four women's stories are developed and integrated based on open-ended interviews and a corpus of their writing, composed both to share their experiences and to address social justice issues, during the language-literacy tutoring program over the course of 2 years. Organized around key themes, a collective narrative is constructed using the women's own words, ultimately expressing their (re)construction of discoursal identity through English language and literacy development.

Setting and Participants

Setting The study took place at an urban, adult education center (subsequently, "the Center") in the northeastern United States. At the time of data collection, The Center served approximately 900 students in full- and part-time programs for high school equivalency, English as a second language (ESL), and U.S. citizenship. The Center also provides students with access to childcare, a social worker, a vocational counselor, and a small foodbank for emergency aid.

The participants were students of the Center's part-time program, which consists of individual or small-group tutoring held twice weekly in 2-h sessions. Tutoring sessions are facilitated by trained volunteers and are tailored to suit students' abilities and needs in terms of English language proficiency and literacy skills. The author of this chapter served as the participants' ESL-literacy tutor for two academic years.

Participants The participants were four, immigrant women attending tutoring at the Center (see Table 9.1). Their ages ranged from 24–50 years, and their years of residence in the U.S. ranged from 2 to 27 years. Three of the four women completed university (Bachelor's) degrees in their home countries; however, one (Kavita) was taken out of school at age eight to help meet the basic needs of her family's household. Kavita, who has been in the U.S. the longest and whose mother tongue is English, attends the Center with the goal of earning a high school diploma equivalency. The other students' purpose was to improve their English language skills.

Table 9.1 Participant Information

Pseudonym, age	Home country and language	Arrival to U.S.	Education	Time attending the center
Pietra, 46	Brazil, Portuguese	2007	Bachelor's degree: Language & literature	2 years
Lien, 41	China, Mandarin	2014	Bachelor's degree: Business	1.5 years
Kavita, 50	Guyana, English	1989	2nd grade (age 8)	2 years
Salam, 24	Libya, Arabic	2012	Bachelor's degree: Dental technology	6 months

Although their backgrounds are diverse, the four students were grouped together for tutoring due to similar outcomes on the Comprehensive Adult Student Assessment Systems (CASAS 2016) Secondary Level Reading and Math assessments. The Center evaluates students with CASAS at the beginning and end of every semester to measure progress and assess readiness for focused preparation for the General Education Development (GED) or the National External Diploma Program (NEDP), the high school diploma equivalency options offered. The research was approved by the author's Institutional Review Board and all participants signed informed consent forms.

The Author: Both Tutor and Researcher In qualitative research, the researcher serves as a key instrument and thus, disclosure of researcher bias is important to validate the research (Creswell 2013). This is particularly the case in narrative inquiry, where the researcher and participants often find themselves "inhabiting a relational borderland space" (Clandinin 2013, p. 141); that is, the narrative researcher enters into the midst of the participants' ongoing lives, building relationships that may extend and continue beyond the research project itself. In this case, the author initially served as the participants' tutor, and eventually, simultaneously assumed the role of researcher to formally collect data and co-construct the student narratives.

The author is bilingual and holds a state Educator Certificate in World Languages (Spanish). She has over 10 years of combined experience as a teacher of Spanish and ESL, and several years as a university faculty member and researcher of bilingual language and literacy. Based on her own experiences living abroad, acquiring new languages, and teaching and researching with multilingual-multicultural students in public schools, she has a strong, personal connection to the immigrant experience and, thus, through her work, aims to support and advocate those who live it by sharing their stories.

Data and Procedures

Writing All student writing was collected in the context of the ESL-literacy tutoring, which took place in 2-h sessions, twice a week, over 2 years. Sessions were structured as collaborative workshops in which students critically examined social justice issues (e.g., migration, women's right to education, childhood marriage, racism, poverty, promoting peace, etc.) through reading and discussion, and responded to them in writing.

First, each issue was approached through careful interpretation of a reading (e.g., news article, interview, commentary) (reading session). This involved processing the text, sentence by sentence, with frequent comprehension checks and vocabulary study. Concurrent discussions of the reading allowed students to express their opinions and related experiences, as well as practice new vocabulary and syntactic structures. Following the reading session, the students composed written responses to the issue on their own, at home, to bring to the next session. Depending on the topic, genres included personal narrative, opinion/persuasive, and poetry.

In the following meeting (writing session), the students brought their writing and copies were made for all participants. Each woman read her work aloud in its entirety, and the group discussed the content and overall structure of the text, as well as new lexical items. The tutor-researcher then reread the text, sentence by sentence, allowing for a collaborative revision and further discussion of syntactic structures, spelling, and mechanics. Finally, the student reread her revised text completely for further practice.

This process resulted in 113 written texts produced over the 2-year period. Students' final, revised texts were entered into Microsoft Word for data processing and analysis. It should be mentioned that, for additional writing and language practice, the students also sporadically submitted open-topic, dialogue journals (Larrotta 2009; Kim 2005) that were read and responded to by the tutor-researcher only. Due to the irregularity of submission and diversity of topics and organization of the journals, they were not included in the present analysis.

Interviews During the second year, the tutor-researcher individually interviewed the four students. Interviews were semi-structured (Bernard 2011), using a guide that addressed the students' immigration and education experiences with a flexible approach, allowing for additional topics of conversation, depending on the participant. Thus, interview time varied from 32 to 62 min. Interviews took place at the Center (two students) or at the participant's home (two students), were audio-recorded, and transcribed. One participant, Kavita, was especially interested in telling her story. She contributed two, 1-h interviews and a 30-min follow-up. Kavita's story is presented as a single case, narrative inquiry in Danzak (2017).

Analysis: Guiding Themes

Narrative inquiry usually does not involve the traditional, thematic analysis applied in other types of qualitative research (Clandinin 2013). However, because what follows is a collective story developed from multiple texts of four participants, a thematic analysis (Corbin and Strauss 2008; Grbich 2007) was conducted to discover guiding themes from which to organize the narrative. All data were reviewed and coded using Dedoose (2016), a web application for qualitative data analysis. For the narrative construction, excerpts were selected and combined around key themes that emerged from the analysis.

Validation

Following Creswell (2013), the present qualitative study addressed issues of validation in several ways. Specifically, the following techniques were applied: triangulation (collection of interview data, formal writing, and journals); member-checking (reviewing interview transcripts with participants for feedback and additional information; Anfara, Brown and Mangione 2002); participant involvement (as both tutoring students and research informants); disclosure of researcher bias (see Author section above); and rich, thick description (based on the numerous writing samples collected).

Findings: The Narrative

The thematic analysis resulted in 13 main codes and 40 sub-codes. Figure 9.1 shows all codes, with larger text size indicating greater frequency of use.

Figure 9.1 Word cloud of codes shows all codes applied to the data in the process of thematic analysis. The size of the word in the cloud relates to the number of instances it was used.

The following main codes were selected to guide the presentation of findings into a cohesive narrative: Immigration (with 15 child codes), Language (6 child codes), Identity (4 child codes), Education (7 child codes) and the Center, and Writing. Additionally, all sections of the narrative are introduced by original excerpts from Pietra's poem, *Immigration*, which is included sequentially and in its entirety over the course of the presentation. The participants' collective narrative follows.

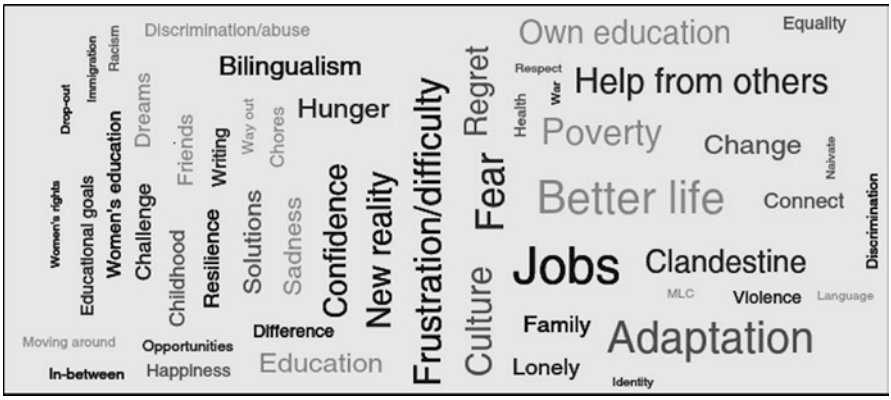

Fig. 9.1 Word cloud of codes

Motivation to Migrate

All my life in one suitcase
Cut roots and, one page turn
The chance to start again, change…
Uncertainties, goose bumps
Supernatural power
Pushes us into the unknown
Madness, courage, dreams
Better don't look back (Pietra).

I think that this country is totally different from Brazil so I was curious to know how is to live in another country, another culture, another experience. My mom always told me, "No, no Pietra! It's just a dream. Forget about. No, no, no, no. Are you crazy?" When I finished my college, there was a girl in the same college. I just saw her twice, and I know she is coming here, and I ask her all about it, her travel, and she told me. It's complicated because in Brazil I had my job in the school. So, I forgot about it. But then, this dream comes and, sometimes I feel more, "I have to go, I have to go, I have to go" (Pietra).

You know, one child policy in China. I find I was pregnant again. So my family, everybody wanted to find a good idea to deliver and protect the second baby. So, at last, we found a way for my husband continue his studying in America. I come with him to come to United States. So… we give up our jobs, our family, our friends, so we came here (Lien).

We came here to study for my husband PhD, computer engineering. My husband took his master degree from UK and he said, "I want to change the place," so that was his decision before the engagement. So that was the first purpose (Salam).

Growing up in Guyana, South America, I was poor, and hunger was facing my family every day. Since I was the oldest, I always would wonder where our next

meal was coming from: It is a frightening thought! … When I got my visa to come to America, I was happy and sad at the same time. The moment the plane took off was the most difficult. Tears welling up because I knew there was possibility waiting for me. But, I said the risk I will be taking will only help me and my family. I left my family home and came here for a better life (Kavita).

The Early Days: Fear and Regret

Fear…
Where am I? Who am I?
Lost identity, loneliness
Memory of a distance past, but so close,
It hurts the heart
Citizens of two worlds
Broken, incomplete.
Better don't look back (Pietra).

When I came here it was a cold day. The trees were bare, some standing so tall and big with no leaves. I wondered to myself, were those trees dying? (Kavita). A heavy snow day, I came to the United States (Lien). I took a plane to New York and I went to my friend house. I got a job, and then…. yeah it's hard time. I had hard, hard time, but I don't have regrets, no. No regrets. I'm happy (Pietra).

I want to go back home. I feel like a prisoner. I miss my family. I want to go back home (Kavita). I asked myself, "Do you regret it?" Yes, but I'm a woman who doesn't easily regret. So I'll work hard to earn a better and happy life (Lien). I wished to go back home as soon as possible. Because my mother, my sisters, my friends, my brothers, my family, my home, my air, and my place, you know, my childhood… everything is there! So, I can't easily forget everything there. So actually, I wish, but now the situation is very, very hard. I hope everything would be okay (Salam).

It's hard because, when we get here, we feel so lonely. Yeah, you miss everything: Your family, friends everything. And my mom. It's more hard for me because my mom pass away in February, and I came to here in May. Yeah, so it's so hard and I feel… so tired about everything. Sometimes I think, "I am going home", but something says, "Stay, stay". I use to say I am lucky because I knew a lot of people. I make some friends. Good friends (Pietra).

I feel here, it's my country. I don't know. I can't explain, but in Brazil, I feel like I was unhappy, like, sad. It's crazy because, here I don't have any chance for a good job, for a good college, for anything, but I feel happier here than there. Because in Brazil I *had* (italics indicate participant's emphasis) chance for a job, I had chance for a lot of things. Here no, but I don't know. I try to be, I try being different, because I know I don't belong here, but I try to do everything to- I'm trying maybe…

to fit in. … I would like the American people see me like, “Ah, she is different. She is not equal to another Brazilian people” (Pietra).

Language and Identity

Even though when I arrived in America I was able to speak English but not as good as the people who lived here. I had a very hard time adapt to the culture and the language. I didn’t know what to do and how to do things here. I had to pay very close attention and listen well. The culture here was very different than where I come from (Kavita).

When I came to the United States, I felt lost. Everything was new for me, because there is a big difference between Brazil and the U.S. I almost couldn’t understand the language, and I knew I would have a long way to proceed. … I think my English is terrible. It’s frustrating because I try and try and do my best. But I can see me, I can see myself after and before tutoring. Before, I can’t say something. I can’t understand. Now, after tutoring, I can speak it better and better. Like, last week, I went to the doctor, alone (smiling). I’m proud of me. When I was there, the nurse, she was rude with me. I think because I was nervous because I don’t like the hospital thing something like that. I was so nervous there, and my English was *phuf*. Oh, it’s so hard. The doctor was so polite with me. I told her, “I’m nervous,” and she talked slowly (Pietra).

Language is one of the important ways for people to communicate with each other and exchange feelings. But a different way of thinking leads to many interesting things. … My English is not good. If I want to find a job, I think the language is a base, like building a high building. If the base is not stone, yeah, someday the building will fall down. Because of my English not good to talk with strangers. Only the simple language: “Hi, how are you? Glad to meet you…” If we are going to talk with another deeply, I can’t. … I can’t do in-depth communication with others. For this reason, I felt very frustrated (Lien).

Actually, I feel the same Salam, but when you speak another language, you feel more confident… because useful, you speak two languages and you can connect to other people, not just your community. You can connect to others so that’s give me a lot of confidence and feel good about myself. So, the idea it’s that you can connect more than you think or more than… Not just your community. You can connect to others. Huge idea. The language is the first way to connect to others. So now I can do anything, I can say anything. I know my English is not perfect, but I *can* tell anybody what I want to say to him, or what I want to say about myself, or I can reply to anybody, say anything to me (Salam).

When one gets here to America life can be a challenge for them. Some of us do not speak any English because it is not spoken in our country. However, many people are willing to learn and speak and adapt to the culture. It can be very difficult, but most of them will try. For the older people, I think that some of them are scared.

For me even though I spoke English it was very scary to adapt in my new country. But I try very hard to fit in. It wasn't easy (Kavita).

Change and Adaptation

Time pass…
New roots grow, deep
Boat cutting calm waters
Safe, strong
Carried by the friendship
Hard life, long way
Move on is the only option
Better don't look back (Pietra).

It's very different American education and Chinese education. Every Chinese parent knows that they must not let their children lose at the starting line. So they push their children to begin to study English, painting, math, etc. when their children are very young. Although children don't like or aren't interested in learning, their parents still make them continue learning. On the other hand, American parents know it's very important to cultivate children's interest. There is plenty of time for children to play, to exercise, to travel. … If I can go back to China, I think I will still adapt very well. But I must get used to living here. (Lien).

I came here when I was 22, and was also very naïve. Here I had to learn the culture and try to adapt. For the first 10 years, I did not know how to act in front of people, or what to say and do. It was the most difficult time in my life. Living in a new country and learning their language. Since I lived here for so many years now, I can truly say that I am more Americanized. I am used to the culture and the people. Whenever I go back home, I feel different. I sometimes feel I don't understand the things that they do most of the time. For example, the way people talk, the way their system works, the way that they drive, and the list can go on (Kavita).

Actually, there is a lot of change in this last 4 years. I am now more responsible, stronger than before, and also more sensitive than before. When person is- missed the family and there's a lot of things happened with –with me, happened with me. And sometimes they have no idea what happened with me at all: if I'm sick, sad, need, help, or tired, because I don't want to tell them, make my mom worry about me. So, I hide what I feel and reply, "Yes Mom, I'm good, I'm happy, don't worry," to continue. I can do something by *myself*, without tell anybody else. Even I have pain, or even I am sensitive, but I can do anything. I delivered my two sons here, just by myself, and nobody helped me. Okay, Allah with me, and my husband, but there is things happen with me, I need my mom, I need my sisters. So, I changed. I think, I'm always say to myself, "Okay I'm changed to better." I trying to see a lot of people here in my same situation, without family, and they doing successfully. I can benefit from other things new here, and new culture so, I changed (Salam).

Education

However,
The top of the world
The view is wonderful
Diving in knowledge
Don't give up
Worth it! (Pietra)

There's friends told me about the Center, but the first thing was, I was feel bad and lonely and I can't talk to people around me, and I can't buy anything, or I can't talk to anybody to ask them about any stuff or anything. So, I was afraid. I was afraid around people and so, that makes me excited to go to the Center and learn more English to help me how I can live with these people and I can connect with them. So that's the first thing. I want to connect with people around me. Learn other language: that's another change. Now I look to learn something new, like driving, or like, positive things. Really, you, and the group and the Center changed me a lot. You can't imagine that, really. Even sometimes I was quiet in class, but really, I feel like sponge and absorb positive energy from you. The group, it's a change point, in my life. It was very small things, like, you can live good, and you can walk and see-you can smell fresh air and you can feel happy. So a lot of small things helps me to change to better (Salam).

Education is the solution to solve the world's problems. The role of education is to help people gain the knowledge and understanding of the world. Education is to teach people those who can do, those who cannot do, but also to educate people to distinguish between true and false, good or bad. This way, people will know that drugs, crime, girls' marriage, trafficking, etc., are wrong and bad, so that people would go to the creation of the world, make a more perfect world (Lien).

If there is something that can accelerate the reduction of inequality, it is education. I believe that, if education were available to all without exception of race and, especially of religion, the world's problems would, certainly, be much less than the statistics show us. The world needs education, more love to other people, and governments wishing to make a better world for everyone. With these changes, we might not solve problems like poverty, crime, inequality, girls' marriage, trafficking, drugs, etc., but we certainly would see a very insignificant number of these problems in our lives (Pietra).

Education means a lot to me. Being educated means you will get more respect from others. I believe that the lack of education can result in poverty and crime. In my village, I never had a role model who I could look up to. I never heard anyone talk about education and the importance of it. When I was a child growing up in Guyana, I did not go very far in school. I did not have the opportunities like many of the others who were allowed to go to school. My parents were very poor and did not have the resources to give to their children the right schooling. … I was taken out of school to help in the home while my mother went to work to bring home money to feed her family. When I was at home, I was so ashamed and embarrassed

to leave our house. I was so sad when I saw my classmates going to school. I would look through the windows until everyone went by, then I would cry for hours. If children don't go to school they become hurt (Kavita).

Empowerment Through Writing

The Center fills my time, and I feel the learning helps me to exchange the bad ideas for positive ideas…. For example, the word, Islam means 'peace', and the word, Muslim means 'a person who people feel safe to be around,' but the media has changed that. My friends have been exposed to many problems, and the reason was religion racism. I remember in last summer while I was at the park with my son and played with him on the swing sets. There was one boy waiting for us to play. Then he asked me, "What is that thing on your head?" I answered him lovely with smile, "It's a scarf." He laughed loudly, then pulled my scarf, then ran away. I fixed it quickly, but I was really surprised. So if the teacher or parents are racist, we don't blame the children at all. In addition, I am always asking myself, "a racist, does he think the others have no feelings, heart, and rights?" A different color or religion does not give you the right to hurt others' feelings (Salam).

I felt the writing about this topic, it's helped me to rid of all bad feelings about this topic or about this problem. When I meet with people at first, I feel a little bit scared, because they have no idea about my hijab or my religion, but when I start writing, or explain small things which I know, I felt good. And, I mean that's very helpful for me to feel good about myself, and about people, and about this problem, to share it with people (Salam).

I love write. So I would, I would like write more, but I can't some-sometimes it's hard for me to say something in in English, because I think my vocabulary is poor. … In Portuguese, my ideas go. But in English, I try put my ideas, organize my ideas, but ah! I don't know. It's hard. The immigration poem, when I was writing, I put my feelings. That poem, it's my life. Because it's hard, it's very hard. It's better don't look back (Pietra).

I feel very confident about my writing. I feel it has improved. I try very hard, you know, to find the correct wording to put there. Sometimes I have to write my story three or four times to just organize my thoughts. … When I write, I use my own personal stories in my writing, and it helps. I think it's a big help to express your yourself and your opinions in your writing because it tells, you know, "I'm speaking from my heart and this is who I am." I'm embarrassed at some times to say to everyone, you know, I'm going to the Center. But inside of me, I'm proud that I'm doing something to educate myself and help myself (Kavita).

Discussion

This chapter has described an integrated, reading-writing tutoring program, and illustrated its impact through the stories four, diverse, immigrant women who participated in the program over 2 years. Through narrative inquiry methods, the participants expressed their experiences related to the challenges of migration, language learning and acculturation, increasing ability to engage with others using English, the personal and societal importance of education, and growing confidence as writers and communicators. In this way, the participants' collective narrative demonstrates the value of the integrated reading-writing approach to the ESL/literacy tutoring in which they participated. Because, for tutoring, they were encouraged to write about their lives and respond to readings about social justice issues in writing, the participants were empowered to use their voices in personal and productive ways.

This investigation was based on the concept of discoursal identity, i.e., that the students developed and expressed identities through discourse (reading, discussion, and writing) mediated by the tutoring sessions. Their writing and interviews demonstrate that, although their cultural backgrounds and personal experiences vary, all four women shared a similar migration process: taking a risk by leaving home in search of something better, initial feelings of fear, loneliness, and regret, frustration in acquiring the language (a continuing challenge), and effortful attempts to adapt by learning new skills and/or changing behaviors. Finally, for all students, their decision to attend the Center was a positive turning point in that their participation and engagement supported their language and literacy learning, thus contributing to increased social integration and the ability to connect with others. The Center was not only a place to learn language and literacy, but the tutoring group –discussions and writing- became a place for the students to express themselves (identity) and connect with others facing similar challenges.

Regarding writing to learn, the integrated reading-writing approach implemented in the tutoring sessions engaged the students in critical inquiry and conversation about meaningful issues, while simultaneously building their English language (e.g., vocabulary, grammar) and literacy skills, as well as their confidence to speak out and engage others in dialogue. This is exemplified by Salam's comments about becoming comfortable educating others about Islam, and Kavita's statement about her writing, "I'm speaking from my heart and this is who I am." In fact, during the 2-year period, Kavita published a story in *The Change Agent* (a social justice-oriented magazine for adult learners), Pietra had an excerpt published in *Yes!* magazine (from an entry to a writing contest), and Salam sent an editorial deconstructing the link between terrorism and religion to local newspapers. Pietra, Kavita, and Salam also developed proposals for a hypothetical participatory budgeting initiative to improve their local community.

Overall, this contribution highlights the importance of reading-writing connections with an often-marginalized population (adult, migrant students), and illustrates the potential for an instructional approach. The issues presented in the readings served as a medium not only to develop English language and literacy skills, but

also to empower these women to speak out against injustice and advocate for their own and others' rights and quality of life. During this process, they examined and shaped their own identities in a new cultural-linguistic context. As Salam stated, "I feel the same Salam, but when you speak another language… you can connect to others. Huge idea. The language is the first way to connect to others."

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Chapter 10
Text Writing at the Core of Literacy Discourse

Liliana Tolchinsky

Abstract The chapters in this section share a common concern for individuals in the process of becoming literate and no matter how beginners the participants in the reported studies were, text production, is highlighted as the core of literacy discourse. Nevertheless, although the focus is on text-writing the authors clearly point at the benefits of an integrated approach both for teaching and for evaluating literacy attainments. This approach embraces not only different modalities of production (spoken/written) and distinct linguistic domains -from discourse organization to vocabulary and syntax but also suggest a concomitant work on low-level and high-level skills including intentions, mood reading and managing of emotions. Integrated approaches as the one advanced in this section may help to put an end to "the pendulum-like shifts" that have so long characterized literacy education.

Keywords Writing · Literacy · Education · Integrated approaches

Writing is a newcomer in human evolution. While the origins of Homo sapiens date from about 200.000 years ago, first writing systems are no older than 6000 years. A writing system is just a finite number of graphic elements that serves for representing language units of different levels: words, sentences and texts. Nevertheless, in a span of only six millennia this "artificial organ" (Vygotsky 1995/1931:31) transformed people's language development, ways of thinking, perception of forms (Duñabeitia et al. 2014), access to information and even the construction of own identity (Danzak, this section). Moreover, as societies became literate the functions of writing expanded and diversified (Biber 2009). Writing turned to be required in most spheres of social, political and economic activity and the content and style of written messages had to be adjusted to increasingly diverse functions and readers.

Thus, in order to become active members of society and achieve their personal purposes, individuals raised in current literate societies must learn to produce and understand a growing number of messages adapted to multiple ever-changing

L. Tolchinsky (✉)
University of Barcelona, Barcelona, Spain
e-mail: ltolchinsky@ub.edu

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purposes. Given this scenario, a crucial question is: how do individuals manage to dominate the extant diversity of writing purposes, messages and technology? What are the factors that facilitate this achievement? This means, essentially, how do people become literate? Undoubtedly, the term 'literacy' has long taken on a broader sense than its etymological meaning; it no longer entails the ability to read and write, but 'has instead come to be considered synonymous with its hoped-for consequences' (Aronoff 1994: 68). In present-day literate societies the hoped-for consequences of literacy are to enable production (and interpretation) of the texts in a "world on paper" (Olson 1994).

The chapters included in this section share a common concern for individuals in the process of becoming literate; some are in the early years of schooling, others in more advanced years and still others in the initial phases of learning a new language and writing system. Nevertheless, no matter how beginners their participants were, in none of the chapters the focus is on code-oriented, foundational skills, such as letter naming or word decoding. The authors are all committed to explain text production and interpretation. To be clear, children's knowledge of the written code is not neglected, however, it is targeted either in the context of text oriented activities (in the chapter authored by Teberosky, Sepulveda and Costa e Sossa) or for their contribution to text production in informative and argumentative texts (in the chapter by Stavans, Seroussi, Rigbi and Zadunaisky-Ehrlich).

Developing literacy is casted in terms of text-production in different text-genres and conceptualized as a complex activity that both orchestrates and impinges on linguistic, cognitive and socio-cultural knowledge. Teberosky et al focus on how to get to write a text, Stavans et al and Myhill, Lines, and Jones examined the text features that function as the best indicators of genre appropriateness and writing quality while pointing at the factors that enable to attain such features and Danzak elaborates on how immigrants' text writing in a new language contributes to reconstructing their identity.

However, writing not only enables fulfillment of multiple functions; it also warrants its own permanency. From its inception[1], writing created a new way of learning called teaching (Halliday 1989) and special institutions to carry out such learning. The four chapters in this section relate to the role of teaching in developing genre appropriate text- writing but in quite different degrees.

Teberosky et al and Danzak chapters are fully dedicated to teaching. Both chapters present a detailed description of the teaching principles and programmatic design that were applied to different populations. The first one (Teberosky et al.) was applied from preschool to second grade in Barcelona and in first grade in Lisbon with Catalan and Portuguese speaking children. The second one (Danzak) was carried out with immigrant women leaning English in the USA. In spite of the different

[1] "Mesopotamian peoples used writing primarily for record keeping, but cuneiform texts (3000 BC) were also used in school set up to teach the cuneiform system of writing. The primary goal of scribal education was to produce professionally trained scribes in the temples and palaces, the military and government service" (Duiker et al. 2010:15).

populations and participants' linguistic condition both programs implement a pedagogy of integration in which reading, writing, and speaking are connected.

Assuming that children must experience language in its different modalities of expression, Teberosky and associates propose a variety of reading, writing and oral activities (e.g., verbal definitions and explanations of words, dictation, literal and critical reading, telling and retelling) that are differently "concatenated" to favor text production. The authors elaborate on the ways in which the proposed activities may favor children's use and reflection on language. Of particular interest they point at the production of lists and language play activities as privileged contexts for young children to identify and denominate the units of language –syllables, letters, words and sentences.

In Danzak's chapter, we get a description of an EFL tutoring program for immigrant women. The program serves both to develop English vocabulary and grammatical structures and production of diverse types of text. Based on the idea of "writing to learn" (Klein et al. 2015). The program functions as a vehicle for reasoning and learning but also for expressing and discussing emotions, vital decisions or family conflicts. As explained by the author: writing served as a dual-mediator: a means to (re)construct and express discoursal identity, and a means to learn and develop English language and literacy.

Myhill's and associates chapter also relates to teaching but with a different purpose. In the author's view children must learn "how to write with their reader in mind" and teaching is considered fundamental for attaining this objective. For proper text writing writers must learn how to consider the reader's needs in their writing decisions. In the authors' view "explicit pedagogical work" is required in order to develop such ability. Students must reflect (and verbalize) not just on *what* to write but on *how* to write in order to respond to different needs, and to different readers. Pedagogical work should be particularly directed to how specific grammatical constructions (e.g., subject position before the verb) affect meaning for raising awareness on readers' needs and on the reason of their language choices and how these choices may shape reader's response. Student's metalinguistic work is directed to reflect on the syntactic features of constructions nor for grammatical reasons but for the function grammar fulfills in discourse.

For Stavans et al, children's ability to organize a text according to the genre constraints would be the key for evaluating the quality of children's writing. The study aims at probing the contribution of reading-related abilities (phonemic awareness, reading accuracy, genre recognition and comprehension) to the structure of argumentative and informative texts and the developmental path of the relation between reading variables and text-structure across 2nd, 3rd, 4th,and 5th grades in Hebrew speaking children. The study results show that both high and low level reading skills relate to text- structure, specifically to those components of the text that are genre-specific. This relation, however, varies across school-levels, genres, and text components. To account for this variation the authors drew mainly on the structural differences between the genres – argumentative texts have a more complex structure whereas informative texts are less constrained and enable combination of a variety of rhetorical devices. The author also appeal to "didactic reasons" for explaining

developmental differences. The educational curriculum serves to interpret and contextualize children's attainment across school-levels but teaching is not directly intervened.

A Pedagogy of Integration

Overall the chapters in this section show that writing, specifically text production, is at the core of literacy discourse. Although their declared topic is reading/writing relationships, text writing, and not reading is the observed output, the outcome variable. The predominance of writing over reading is reasonable since no reading is possible without something written, but beyond this obvious fact, putting writing at the center is justified for the role it plays both in early and later literacy development. Toddlers' graphic marking -simile writing – precedes their ability to read and serves for them to explore the features of form of all writing systems (Tolchinsky 2015). Later on, through their invented spelling preschoolers access the representation of the phonological system of their language (Olson 2016; Read 1971). For school age children writing activities serves for developing metalinguistic awareness of the units of language (Teberosky, this volume) as well as to probe the social "horizon of expectations" obeyed in the conventionalized forms of the different discourse genres (Bakthin 1986). An appropriate argumentative text, or any other text type for that matter, represents what the literate community expects at a defined historical moment. Learning the expected structure of the diverse text types is a definite step in the access to the written culture and seems to be enabled by a direct experience in writing different text types but facilitated or hindered by the specific structural features of each of these text types (Stavans et al.).

As part of the acculturation process –into the written culture- writers must also realize that the text they produce should take into account the reader they are addressing to. Taking into account the interlocutor needs to warrant effective communication is part of general cognitive development but deciding which linguistic resources, and more specifically which syntactic devices are the most adequate to respond to these need and shape the desired emotional responses seem to require quite an amount of metaknowledge that according to Myhill and associates only explicit pedagogical work in the context of writing activities can mobilize.

The role of writing as a tool for building and not only transmitting knowledge (Galbraith 1999), is far from limited to the early stages of literacy development or to the school years. This role increases with age/school level and writing experience. For adults, writing supports critical thinking, scientific reasoning and, obviously, literary creativity (Olson 2016). Moreover, for adults in the process of re acculturation it plays the fundamental role of reconstructing their own identity (Danzak, this volume).

In spite of the focus on text-writing the authors clearly point at the benefits of an integrated approach both for teaching and for evaluating literacy attainments. The suggested approach embraces not only different modalities (spoken/written) but also distinct linguistic domains from discourse organization to vocabulary and syntax and, consequently, suggest a concomitant work on low-level and high-level skills including intentions and mood reading and managing of emotions. Activities such as conversation, reflection on own writing choices, the form and function of grammatical constructions, verbal explanations, paraphrasing, literal and critical reading, retelling and many others proposed in the different chapters are marshaled for children and adolescents to create texts while a similar diversity of activities are proposed for adults in the process of learning a new language. Likewise, distinct reading-related activities such as phonemic awareness, reading accuracy, genre recognition and comprehension are examined in relation to the production of informative and argumentative texts.

Assuming the centrality of writing or suggesting writing as synonym of literacy (Alves 2019) constitutes a real turning point in the study of literacy even when writing is fully integrated with reading and oral skills. Interesting so, even researchers that truly appreciate the value of early writing in developing literacy refer to these productions as pre-literate (e.g., Levin and Bus 2003; Portex et al. 2018). No matter the amount of insights into the functioning of the writing system these productions reveal, their authors are considered preliterate because they are still unable to read.

There are still many open questions in relation to the contribution of the pedagogy of integration to literacy attainments and to the reciprocal influences between the different skills and domains of knowledge involved. Nevertheless, integrated approaches as the one advanced in this section may help to put an end to "the pendulum-like shifts" that have so long characterized literacy education (McKenna 1998). The pendulum metaphor was coined by Slavin (1989) to refer to the cyclical repetition of introduction and abandonment of opposite pedagogical ideas in swinging movement. To illustrate, for the domain of writing, moving from defending the central importance of handwriting and spelling for successful text production to defending the unique relevance of ideational and discourse processes or from the requisite of enhancing oral skills for learning how to write to the absolute need to concentrate on teaching writing skills. From the chapters in this section it appears that literacy learning (casted in text-writing) appears enhanced by concomitant work on different levels of skills, language domains and modalities of production with a large contribution of cultural knowledge; the challenge seems to be how to tackle integration of diverse factors more than to concentrate on any of them segregated from the others.

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Part III
Reading and Spelling Across Orthographies

Chapter 11
The Role of Distal and Proximal Cognitive Processes in Literacy Skills in Greek

Timothy C. Papadopoulos, George K. Georgiou, and Theodosia Apostolou

Abstract Phonological awareness (PA) and rapid automatized naming (RAN) are established proximal predictors of word reading fluency and spelling. Information processing skills, such as successive and simultaneous processing, are also known as distal predictors of word reading. Despite these findings, no studies have examined the joint contribution of these distal and proximal cognitive skills to literacy skills. The present study addresses this limitation by examining the respective relations in a reading-spelling integrated model with a group of young readers followed from Grade 1 to Grade 2. In this model, reading and spelling were specified as indicators of a latent variable, namely *literacy*, which, in turn, reflected the latent source of the variance shared between reading and spelling. The results of structural equation modeling showed that the literacy skills were predicted by both distal and proximal cognitive processes regardless of age. In Grade 1, distal cognitive processes predicted literacy skills through both RAN and phonological awareness. In Grade 2, only successive processing predicted literacy skills through RAN and phonological awareness. Simultaneous processing predicted literacy skills directly. These findings suggest that there is a higher demand for distal cognitive processes in the early phases of literacy development that allows the deployment of proximal processes and, subsequently of reading and spelling, and that the role of these processes changes as a result of literacy development.

Keywords Cognitive processes · Literacy · Rapid automatized naming · Phonological awareness · Greek

T. C. Papadopoulos (✉) · T. Apostolou
University of Cyprus, Nicosia, Cyprus
e-mail: papadopoulos.timothy@ucy.ac.cy; apostolou.theodosia@ucy.ac.cy

G. K. Georgiou
University of Alberta, Edmonton, Canada
e-mail: georgiou@ualberta.ca

R. A. Alves et al. (eds.), *Reading-Writing Connections*, Literacy Studies 19,
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The Role of Distal and Proximal Cognitive Processes in Literacy Skills in Greek

Literacy is essential in the modern world, both for personal satisfaction and for employment success in a knowledge-based economy. However, mastering literacy is one of the most critical challenges children face in their early school years. Research in the last two decades has revealed some key cognitive skills that contribute to reading and spelling (e.g., Caravolas 2004; Bowey 2005; Hulme and Snowling 2014). One of the most robust predictors is phonological awareness, the ability to perceive and manipulate the sound components of words. Many studies have shown that children with low levels of phonological awareness are at risk for reading failure, and that instruction in phonological awareness contributes to increased reading ability (e.g., Caravolas et al. 2005; National Reading Panel 2000). However, phonological awareness does not tell the complete story of learning to read and spell. Researchers have argued that naming speed (known in the literature as RAN), defined as the ability to name highly familiar symbols such as letters, digits, colors, and objects, makes an independent contribution to reading (particularly to reading fluency) and constitutes a second core deficit in dyslexia (e.g., Wolf and Bowers 1999). However, both phonological awareness and RAN are *proximal* predictors of reading/spelling and could themselves be a product of *distal* processes (more general and modality-unspecific cognitive processes). The purpose of this longitudinal study was to examine the unique and joint contribution of both distal and proximal cognitive skills to literacy skills in Greek in a group of children followed from Grade 1 to Grade 2.

Phonological information is derived by the reader from a phonic analysis of the printed stimulus, and is based upon the reader's prior development of oral language skills including rhyming, blending and phonological analysis (e.g., Adams 1990; Goswami and Bryant 1990). As phonological skills develop, the reader becomes abler to "attack" unfamiliar words. Likewise, RAN (and the factors underlying it, such as attention, conceptual and perceptual processing, and processing speed; see Papadopoulos et al. 2016) may affect reading development by interfering with the efficient recognition of letter patterns in words (thus slowing down and impairing word recognition; e.g., Sunseth and Bowers 2002), or more generally by disrupting fluency (e.g., Wolf and Katzir-Cohen 2001). According to the double deficit hypothesis (DDH), children with both RAN and phonological awareness deficits have the worse prognosis for reading development. In one of the first longitudinal studies on DDH, Kirby et al. (2003) showed that RAN and phonological awareness in Kindergarten predicted subsequent reading achievement up to Grade 5. They further found that phonological awareness was a stronger predictor of reading achievement in kindergarten and Grade 1 and that RAN's predictive power increased over time. This difference was primarily attributed to the positive effects of reading instruction on phonological awareness and to the increased role of orthographic processing (the hypothesized mediator of the RAN-reading relationship) to reading in later years. The detrimental effects of phonological awareness and RAN deficits on reading and

spelling development have now been documented in different languages (e.g., Greek: Papadopoulos et al. 2009b; Finnish: Torppa et al. 2013; Spanish: Jiménez et al. 2008) and in different developmental stages (e.g., childhood: Kirby et al. 2003; adolescence: Kairaluoma et al. 2013; adulthood: Cirino et al. 2005).

However, there is also evidence that distal cognitive processes, such as information processing skills, predict word reading through proximal cognitive skills, such as phonological awareness (e.g., Das et al. 2000, 2008; Wang et al. 2012). Successful word reading requires the participant to translate graphemes into phonemes one at a time, and then maintain both the identity and the position information of translated phonemes intact in verbal working memory while converting the remaining graphemes of the target word. This type of processing requires both phonological and successive processing (e.g., Papadopoulos 2001).

In the context of this study, we examine the role of two distal cognitive processing skills: simultaneous and successive processing. Dual-route theories of word recognition, for example, suggest that a word is recognized either through direct visual access or phonological coding of its sounds. The first should relate mainly to simultaneous processing via orthographic processing and the second primarily to successive processing via phonological awareness. Both cognitive processes are part of an information processing system (Luria 1973) and an integral component of the PASS (planning, attention, simultaneous and successive processing) theory of intelligence (Das et al. 1994b; see also Papadopoulos et al. 2015). The essential aspect of simultaneous processing is that each element is related to every other element. For example, recognition of whole words by sight involves this kind of processing, as does comprehension of the meaning of a sentence or a paragraph (e.g., Kendeou et al. 2015). In addition, simultaneous processing is necessary in performing tasks tapping orthographic knowledge (e.g., Wang et al. 2012). Successive processing, in turn, involves the integration of stimuli into a discrete, serial order where each component is related to the next. For example, it is used in skills such as word decoding where maintaining the exact sequence or succession of letters in the word is crucial for performing the task (for a review see Papadopoulos 2013).

A few studies have shown that both simultaneous and successive processes predict reading (e.g., Das et al. 2008; Deng et al. 2011; Georgiou et al. 2015; Joseph et al. 2003; Papadopoulos 2001; Wang et al. 2012). For example, Papadopoulos (2001) showed that Speech Rate, Sentence Repetition, and Word Series (indicators of successive processing) predicted reading accuracy (Word Identification and Word Attack) in Grade 1 in Greek. Studies in children with reading difficulties have also shown that they experience deficits in successive and simultaneous processing (e.g., Das et al. 2007, 1994a; Deng et al. 2011). For example, Das et al. (2007) conducted a study with Grade 3 and 4 English-speaking children and found that the probability of a child being a poor reader if his/her standard score on successive processing was below 80 was .75. The corresponding probability level for simultaneous processing of predicting a poor reader was .50.

However, the previous studies examining the role of distal and proximal cognitive processes in word reading and spelling have at least four important limitations: First, no previous studies have examined the effects of distal cognitive processes

through RAN and phonological awareness simultaneously. The available research to date has focused primarily on the relationship between distal cognitive processes, phonological awareness, and word reading (Das et al. 2000; Georgiou et al. 2015; Papadopoulos 2001). Second, no previous studies modeling the effects of distal and proximal cognitive processes on word reading have been longitudinal. Evidence, to date, is cross-sectional (e.g., Papadopoulos 2001; Wang et al. 2012). Third, given the importance of word reading fluency as an index of reading ability in languages with a transparent orthography (e.g., Georgiou et al. 2013; Landerl and Wimmer 2008), respective models ought to study these relationships with a focus on reading fluency. Previous studies on simultaneous and successive processing have focused exclusively on reading accuracy (e.g., Das et al. 2000, 2008). Finally, no study has examined the role distal cognitive processes may play in predicting spelling performance and, most importantly, in predicting reading and spelling concurrently in an integrated model.

The Present Study

The present study aimed to address these limitations by examining the respective relations in a reading-spelling integrated model, in a group of young readers in Greek followed from Grade 1 through Grade 2. In doing so, we first sought to examine if distal cognitive processes, such as successive and simultaneous processing, predict the proximal processes (RAN and phonological awareness), and subsequently reading and spelling.

Based on the findings of previous studies in Greek (e.g., Georgiou et al. 2008, 2010; Papadopoulos et al. 2009b), we first expected that phonological awareness and RAN would uniquely predict literacy. PA has been strongly implicated as a significant predictor of reading development (Papadopoulos 2001; Porpodas 1999), given the highly regular and transparent nature of Greek language[1] in which both syllable and phoneme level skills are equally important in predicting successful early reading (Papadopoulos et al. 2012). There is also evidence indicating that PA—along with RAN— not only contributes uniquely to reading ability in the first 2 years of schooling (e.g., Georgiou et al. 2008, 2010), but its effects may differ across languages varying in orthographic consistency (i.e., being more important for learning to read English than Greek).

Second, we expected successive processing to predict literacy through phonological awareness and RAN. The former part of this hypothesis has been confirmed in previous studies (e.g., Papadopoulos 2001; Wang et al. 2012). The latter part of this hypothesis emanates from relatively recent evidence suggesting that one of the reasons RAN is related to reading is its serial nature (serial RAN is more strongly

[1] Protopapas and Vlahou (2009) quantified the transparency of Greek language as being 95% consistent in the direction of reading and 82% consistent in the direction of spelling.

related to reading fluency than discrete naming; de Jong 2011; Georgiou et al. 2013). In fact, Georgiou et al. (2015), modeling the relationship between RAN and literacy across languages, have concluded that the relationship of RAN to reading fluency is sought in domain-general factors such as serial processing and articulation. Thus, if seriality is an important feature of RAN, then RAN should be predicted by successive processing. Finally, we expected simultaneous processing to predict literacy through phonological awareness and RAN, as phoneme blending requires the integration of separate phonemes (Papadopoulos et al. 2012) and has been found to depend on letter knowledge more than any other aspect of phonological awareness (Manolitsis and Tafa 2011).

Method

Participants

Two hundred eighty-nine Greek-speaking children (145 females and 144 males) from Cyprus participated in the study. The mean age of the group in the initial assessment (Grade 1) was 6 years and 6 months (*SD* = 0.30 years) and in the follow-up assessment (Grade 2), 7 years and 5 months (*SD* = 0.31 years). The group's verbal (Similarities and Vocabulary; WISC-III-R; Wechsler 1992; see Georgas et al. 1997, for the Greek adaptation) and non-verbal (Non-verbal Matrices; Cognitive Assessment System, CAS; Naglieri and Das 1997; see Papadopoulos et al. 2008 for the Greek adaptation) ability was assessed in Grade 1 and was found to be average. Approximately 62% of the sample was coming from urban communities and 38% from rural communities. School and parental consent for participation in the study was obtained prior to testing.

Measures

To assess simultaneous and successive processing we used the Das-Naglieri Cognitive Assessment System (D-N CAS; Naglieri and Das 1997; Greek standardization by Papadopoulos et al. 2009a). In turn, to assess reading fluency and spelling, we administered two reading (a real word and a pseudoword) and a 2-min spelling tasks from the Early Reading Skills Assessment Battery (ERS-AB; Papadopoulos et al. 2008).

Procedure

Participants were individually tested in a session lasting approximately 60 min in a quiet room in their schools between February and April in both grades by trained assistants. The order of the tasks was similar for all participants within each grade.

Results

The analysis was performed in two steps, using EQS. 6.1 (Bentler and Wu 2002). First, we evaluated the fit of the factor structure of the set of skills and their correlations in Grades 1 and 2. To do so, we conducted a confirmatory factor analysis examining the indicators of each latent factor and the correlations between the latent factors. The model included five latent factors: simultaneous processing, successive processing, phonological awareness, RAN, and literacy. Reading and spelling were specified as indicators of *literacy*, which, in turn, reflected the latent source of the variance shared between reading and spelling.

Indicators for simultaneous processing skills were Non-verbal Matrices and Figure Memory measures. Indicators for successive processing skills were Word Series and Sentence Repetition measures. Indicators for phonological awareness were Phoneme Elision and Phoneme Blending measures (Papadopoulos et al. 2009b). Indicators for RAN were the rapid naming of letters and digits measures (Papadopoulos et al. 2009b). Indicators for literacy skills were Word Reading and Phonemic Decoding Fluency and Two Minute Dictation measures (Papadopoulos et al. 2008). In evaluating the goodness of fit of this model to the data, we report the model chi-square statistic associated with the *p*-value, the comparative fit index (CFI), and the root mean square error of approximation (RMSEA). Specifically, we adhered to the following criteria for evaluating good model fit: Comparative Fit Indices (CFI) greater than .95 and Root Mean Square Error of Approximation (RMSEA) below .08 (Byrne 2006; Hu and Bentler 1999). Given the size of the present sample ($n > 200$) the ratio between chi-square and degrees of freedom (normed $\chi^2 < 5$) was also used to judge model fit (Schumacker and Lomax 2004). Measurement models results indicated a good fit, for Grade 1, χ^2 (22, $N = 287$) = 63.52, $p < .001$; CFI = .96; RMSEA = .07 (CI.90 = .05–.09), and Grade 2, χ^2 (24, $N = 287$) = 52.95, $p < .001$; CFI = .96; RMSEA = .06 (CI.90 = .04–.08) suggesting that the observed variables fitted the latent factor structure.

Second, we tested the fit of the theoretical model that has been discussed so far (Das et al. 1994b, 2000). Specifically, we examined whether successive and simultaneous processing exert their effects on literacy indirectly through phonological awareness and RAN (Fig. 11.1). In both grades, the two PASS latent variables were hypothesized to be interrelated. Likewise, PA and RAN were hypothesized to be interrelated. The fit indices suggested that the model fit was acceptable in Grade 1, χ^2 (3, $N = 287$) = 8.63, $p < .05$; CFI = .97; RMSEA = .08 (CI.90 = .02 to .10), but

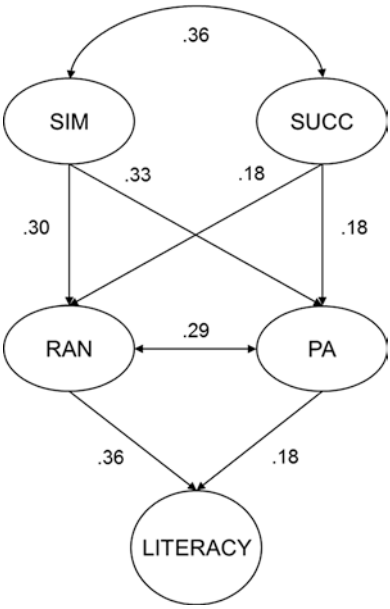

Fig. 11.1 Structural Equation Model for Latent Literacy factor, distal and proximal processes in Grade 1. The ellipses represent the latent cognitive variables of simultaneous (SIM) and successive (SUCC) processing, and the latent linguistic variables of rapid automatized naming (RAN), phonological awareness (PA), and Literacy (reflecting the underlying source of the variance shared between reading and spelling). All coefficients are significant at $p <$. 05 level; $n = 289$

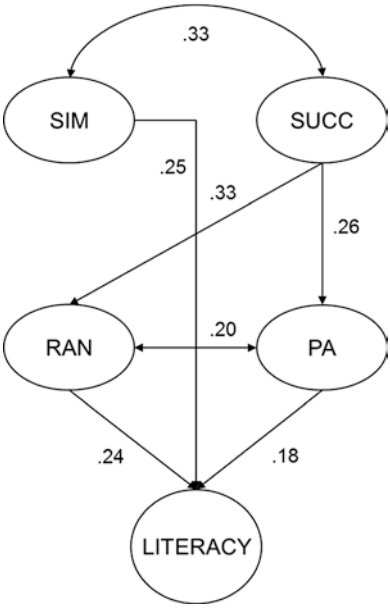

Fig. 11.2 Structural Equation Model for Latent Literacy factor, distal and proximal processes in Grade 2. The ellipses represent the latent cognitive variables of simultaneous (SIM) and successive (SUCC) processing, and the latent linguistic variables of rapid automatized naming (RAN), phonological awareness (PA), and Literacy (reflecting the underlying source of the variance shared between reading and spelling). All coefficients are significant at $p <$. 05 level; $n = 289$

not in Grade 2, χ^2 (3, $N = 287$) = 35.35, $p < .001$; CFI = .80; RMSEA < .08. EQS modification indices for model improvement suggested that we should add a direct path from simultaneous processing to literacy and eliminate the effects of simultaneous processing on PA and RAN (Fig. 11.2). After making these changes, the

model fit the data well, χ^2 (2, N = 287) = 4.58, p < .05; CFI = .99; RMSEA = .06. A careful look at the factor loadings suggested that, in Grade 1, PA accounted for 18% and RAN for 16% of the variance in literacy. In Grade 2, in the new parsimonious model, RAN accounted for 11% and PA for 6% of the variance in literacy, with simultaneous processing explaining another 8% of the variance.

The findings from this initial attempt to directly link the distal and proximal processes with *literacy* outcomes, confirms the main hypothesis we put forward based on the review of the literature: Literacy skills were predicted by both distal and proximal cognitive processes regardless of age. In Grade 1, both distal cognitive processes predicted literacy through phonological awareness and RAN. In Grade 2, successive processing predicted literacy through RAN and phonological awareness. Simultaneous processing also predicted the literacy skills directly.

Discussion

Over the last four decades, research on literacy has focused on the investigation of the cognitive skills that predict literacy with an emphasis on phonological awareness and RAN. However, when one considers *reading fluency* (also known as efficient decoding), perhaps the most necessary skill to be mastered in learning to read and spell in the early grades (National Reading Panel 2000), other more distal basic cognitive processes, such as information-processing skills, might be equally important. These processes may contribute to the efficient deployment of PA and RAN, and subsequently of reading and spelling. In this chapter, we have attempted to examine for the first time, to the best of our knowledge, the separable and joint effects of different proximal and distal cognitive correlates on reading and spelling, and thus, literacy. Here, we present three potential future challenges for literacy researchers. We believe that addressing these challenges will enhance our understanding of the role of the cognitive processes in learning to read not only in languages with a transparent orthography, but also across orthographies.

A first challenge is the identification of those cognitive mechanisms that are responsible for the development of reading fluency skills. We know that before formal literacy begins, children can become aware of regular patterns of sounds in spoken language, manipulate sounds in words, recognize words, and break them apart into smaller units, learn the relationship between sounds and letters, and build their oral language and vocabulary skills. These are all proximal skills that the National Reading Panel (2000) found to be precursors to children's later growth in the ability to decode and comprehend text, to write, and to spell. Add to these skills the potential importance of morphological awareness (e.g., Desrochers et al. 2018; Diamanti et al. 2014) and semantic understanding (e.g., Tsesmeli and Koutselaki 2013) for the development of spelling in later years, and the list of proximal cognitive skills could rapidly grow long. However, although there is evidence of a link between early and later developing literacy skills, some early literacy skills appear to be more important than others. The strongest and most consistent proximal pre-

dictors of later literacy development are phonological awareness, RAN, and letter knowledge (e.g., Puolakanaho et al. 2007; Schatschneider et al. 2004). For this reason, this set of skills consists the primary focus of reading remediation programs aiming to enhance reading fluency skills (e.g., *ABRACADABRA*: Savage et al. 2009; *Graphogame*: Lyytinen et al. 2009).

Nevertheless, as the present findings suggest, being able to manipulate the sounds of spoken language and rapidly name a sequence of letters and digits requires a set of distal processes that may be more general and modality-unspecific (see also Liu and Georgiou 2017; Wolff and Gustafsson 2015). When formal literacy begins, effective successive and simultaneous processing support the deployment of PA and RAN and, thus, of reading and spelling (Grade 1). In turn, as readers experience growth in reading and spelling (Grade 2) and start to activate letter representations in words quickly that help them induce sensitivity to commonly occurring orthographic patterns, simultaneous processing has a direct effect on literacy skills. Successive processing continues to predict literacy through RAN and PA. These findings are significant in at least two ways. First, from a developmental perspective, the changing concepts of reading fluency as an essential aspect of literacy development, rely on the same set of distal and proximal cognitive skills which, nevertheless, have different relationships with each other and, thus, with literacy in various phases of development. Consequently, identifying the cognitive processes that regulate such changes in reading fluency can lead to advances in the understanding of cognitive development and can significantly contribute to theories of word reading development. We believe that the two information processing skills employed here have the potential to help us understand such developmental changes in reading fluency and demonstrate a specific shift in the role of cognitive correlates of literacy, as well as developmental continuity. Second, the search for relevant cognitive processes can better inform instructional approaches to fluency development and the readiness of these approaches for extensive use by the teachers. However, this search on cognitive processes, as well as the tasks that are used to operationalize them, have to be theoretically meaningful and appropriate regarding reading acquisition (Papadopoulos 2001).

A second challenge is to understand the nature of these processes. For instance, although PA underlies successful reading acquisition in all languages (e.g., Caravolas et al. 2005; Frith et al. 1998; Ho and Bryant 1997; Scarborough 1998), the nature and conceptualization of PA differs across languages (e.g., Loizou and Stuart 2003; Shu et al. 2008; Ziegler et al. 2001). Similarly, despite the acknowledged importance of RAN in predicting reading, the reason why RAN predicts reading is a matter of an ongoing debate (see Kirby et al. 2010, for a review). To address this challenge, we need to evaluate prominent theory-driven models of various cognitive correlates of reading (e.g., PA, RAN) and explore the factor structure and measurement stability across time or between adjacent grades in the early stages of learning to read. Cracking the code of the nature and conceptualization of these abilities will allow us to understand better these processes, fully incorporate them into formal models of reading development, and build new universal theories of literacy acquisition. Recent longitudinal studies offer findings to this direction

regarding the nature and conceptualization of both phonological awareness and RAN. For instance, Papadopoulos et al. (2012) have found that PA is better represented as an overall unified construct rather than distinc abilities, which also remains invariant across time in early years in Greek, a language with a transparent orthography. Also, RAN has been found to be a unique predictor of oral reading fluency, but not silent reading fluency and that its effects on word reading fluency are partly mediated by both PA and orthographic processing (e.g., Georgiou et al. 2016; Papadopoulos et al. 2016). The evidence from these or other similar longitudinal studies (e.g., Furness and Samuelsson 2011; Georgiou et al. 2014; Kjeldsen et al. 2014; Poulsen et al. 2015) is clear enough to allow future studies to investigate these concepts across languages.

A final challenge is whether the relations between the cognitive processes and reading fluency we have described are language-specific or whether they generalize across languages. It is well established that languages differ in their orthographic complexity (see Joshi and Aaron 2006). On the one hand, children who are learning to read in languages with transparent orthographies such as Greek, Finnish, or German, rely heavily on strategies focusing on grapheme-phoneme conversions as the relationship between graphemes and phonemes is highly consistent. On the other hand, children learning to read in languages with less transparent orthographies, such as English or Danish, have to rely on larger sub-word units as the reliability of smaller units is comparatively reduced (Ziegler and Goswami 2005). These cross-linguistic differences have developmental implications for the role and relative contribution of cognitive skills to word reading fluency. Thus, addressing language-general and language-specific factors in reading fluency can contribute to our theoretical understanding of the factors and processes that are 'universal' in the development of word reading skills, and inform both theories of word reading and theories of cognitive development.

To conclude, our findings not only confirm the contribution of PA and PAN to the development of reading and spelling but also show that these skills are based on distal cognitive processes that are necessary for literacy. We believe that it is important for both research and psychological and educational practice to continue to search for such processes in different languages if we are to gradually end up with some universal principles upholding the development of literacy skills.

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Chapter 12
Reading and Spelling Skills in Transparent Orthographies: Phonological Encoding and Rapid Automatized Naming in Turkish

Ecehan Candan, Nalan Babür, Belma Haznedar, and Gülcan Erçetin

Abstract The aim of the present paper was to investigate the influence of phonological encoding (PE) and rapid automatized naming (RAN) on word reading and word spelling in Turkish. Seventy-seven students attending Grade 3 and Grade 4 participated in the study. Tests of word reading, word spelling (dictation), PE and RAN were administered in order to examine the relationships among the variables. The results showed that both RAN and PE were significant predictors of word reading and word spelling above and beyond grade level. Correlational analyses revealed that as the grade level increased, RAN demonstrated stronger correlations with word reading and word spelling while the influence of PE on these two measures tended to decrease. The findings are discussed in terms of the development of phonological and orthographic processing with reference to the transparent orthography of the Turkish language.

Keywords Orthography · Phonological encoding · Rapid naming · Word reading · Word spelling · Turkish

Introduction

Spelling is one of the essential components involved in the development of literacy skills. Despite its importance though, it has not received as much attention as reading (Bourassa and Treiman 2014) due to the early view that spelling is acquired through reading practices (Gentry 2004) and rote visual memory (Joshi and Aaron 2005). It is now established that in comparison to reading, spelling involves more

E. Candan · N. Babür · B. Haznedar (✉) · G. Erçetin
Boğaziçi University, Istanbul, Turkey
e-mail: ecehan.sonmez@boun.edu.tr; nalan.babur@boun.edu.tr; haznedab@boun.edu.tr; gulcaner@boun.edu.tr

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phonologically sensitive processes (e.g. Babayiğit and Stainthorp 2007; Kemp 2009; Perfetti 1997) and the influence of phonological knowledge appears to last longer for the acquisition of spelling skills (Scharer and Zutell 2013; Treiman and Bourassa 2000). It is, therefore, important to investigate spelling development across languages with different orthographic features.

Orthographic depth, which refers to the complexity of the mapping between spelling and sound, is an influential factor in reading and spelling development (Liberman et al. 1980). In a comparative study, Seymour et al. (2003) found that in opaque languages such as English, reading skills develop twice as slowly as in transparent languages. In languages such as German, on the other hand, the regularity of phoneme-grapheme correspondences makes it easier for learners to acquire literacy skills (Furnes and Samuelsson 2010; Seymour et al. 2003; Wimmer and Goswami 1994; Ellis and Hooper 2001). In a similar vein, Turkish, the language under discussion in the current study, has a highly transparent orthography reflected with a simple syllable structure and consistent one-to-one mappings between phonemes and graphemes in both directions (Durgunoğlu 2006). The Turkish alphabet is based on the Latin script and consists of 29 letters (21 consonants, 8 vowels). Turkish syllables are mostly (98%) in the form of V, VC, CV, and CVC (Durgunoğlu and Öney 1999), and the most frequent syllable type is CV (51%) (Aşlıyan et al. 2006). Since Turkish words have salient syllabic boundaries and do not include consonant clusters, it is easier to divide them into syllables. This feature makes it easier to distinguish between the phonemes within the syllables. As this regularity facilitates the mastery of phonological skills quite early, normally-developing children learn to read Turkish words accurately within a year of formal instruction (Babayiğit 2009; Durgunoğlu and Öney 1999). Due to this regularity, reading fluency, rather than reading accuracy, is taken as an index of successful word reading in transparent orthographies. Consequently, when compared to phonological awareness, Rapid Automatized Naming (RAN) plays a more influential role for word reading in transparent languages (de Jong and van der Leij 2002). Among a variety of linguistic and cognitive factors associated with word reading and word spelling performance, this paper deals with two major components: (i) phonological awareness, and (ii) rapid automatized naming.

Phonological awareness (PA) is a significant predictor of reading and spelling achievement across different languages (e.g., Adams 1990; Aidinis and Nunes 2001; Babayiğit and Stainthorp 2007; Ball and Blachman 1991; Bradley and Bryant 1983; Bryant et al. 1990; Caravolas et al. 2005; Geva and Siegel 2000; Landerl and Wimmer 2008; MacDonald and Cornwall 1995; Nikolopoulos et al. 2006). Traditionally, PA is divided into several components such as syllable awareness, onset-rime awareness, and phoneme awareness; and the roles of these components in reading and spelling achievement are investigated separately. This approach contributed to the formation of a developmental theory which suggests that children initially rely on larger phonological units such as onsets and rimes, and later develop sensitivity for phonemes in spoken words (Bradley and Bryant 1983; Ziegler and Goswami 2005). However, when comparisons were made between rime awareness and phoneme awareness, it was found that phoneme awareness was a more powerful

predictor in explaining individual differences in word reading skills (Mann and Foy 2003; Nation and Hulme 1997). On the other hand, Papadopoulos et al. (2009b) suggest that PA is a unitary construct which should be measured as a complex, single entity. According to this approach, it is not useful to make any distinctions between different phonological size units especially in transparent orthographies. In their study with Greek-speaking children measured at kindergarten and later in Grade 1, Papadopoulos et al. (2009b) found that several dimensions of PA such as rhyme generation, syllable segmentation and phoneme elision fit into a unidimensional measurement model. In another study, Papadopoulos et al. (2009a) tested the double deficit hypothesis for Greek, and found that different phonological skills overlapped with each other. The authors concluded that kindergarten children utilized both larger (syllabic) and smaller (phonemic) grainsize units equally due to the consistent orthography of the Greek language. On the other hand, a recent meta-analysis by Melby-Lervåg et al. (2012) has revealed that phoneme awareness is the strongest correlate of word reading achievement across different alphabetic languages with consistent and inconsistent orthographies beyond the effects of rime awareness and verbal short-term memory. The authors conclude that PA is not unitary and "different measures of phonological ability tap meaningfully different constructs" (p. 340). They also suggest that "the successful development of word reading skills depends upon the child's possessing phonemically structured phonological representations" (p. 341). Given the pivotal role of phoneme awareness in predicting word reading achievement, the current study focuses on the processing of phoneme-level information. What we define as phonological encoding (PE) represents a subskill of the more complex PA; and it is operationalized as the ability to convert speech sounds (phonemes) into their corresponding letters (graphemes) in a given set of nonwords.

Another key component involved in reading and spelling performance is Rapid Automatized Naming (RAN). Designed by Denckla and Rudel (1974), RAN tasks require the participants to name a set of objects, colors, letters or digits as accurately and rapidly as possible. RAN is documented to be a strong predictor of reading across different languages (Norton and Wolf 2012; Wolf and Bowers 2000). Although it is well-accepted that RAN and reading are closely related, there are different views as to the nature of this relationship. For example, Kail and Hall (1994) argue that the strong relationship between RAN and reading derives from the fact that both RAN and reading involve speed of processing. Torgesen et al. (1994) suggest that RAN is a subcomponent of phonological processing skills as it involves speeded access to and retrieval of phonological knowledge from the long term memory. Other accounts, such as the double deficit hypothesis, hold that RAN is independent from phonological processing based on the evidence that children experiencing difficulty both in RAN and PA demonstrate more severe problems in word reading when compared to children with either RAN or PA deficits (Wolf and Bowers 1999).

Proponents of the double deficit hypothesis focus on the link between RAN and orthographic knowledge (Wolf and Bowers 1999). Accordingly, high performance in RAN is associated with accurate and fluent reading (Bowers 1993; Savage and

Frederickson 2005), which is achieved by recognizing words as a whole, without resorting to word decoding strategies (Ehri 1992). This ability is closely linked to orthographic processing (Holland et al. 2004), which is defined as "the ability to form, store and access orthographic representations" (Stanovich and West 1989, p.404). In line with this account, Bowers and Wolf (1993) claim that poor RAN performance might indicate impaired orthographic knowledge, which leads to reading difficulty at stages where readers start relying on orthographic processing rather than decoding strategies. In a recent study, Stainthorp et al. (2010) compared high and low achievers in RAN tasks and found that the high achievers in RAN were also significantly better in visual processing tasks than the low achievers. In addition, they found that the poor performance of the low achievers was independent of their PA, reading achievement and processing speed. In a similar study, Powell et al. (2014) found that on a set of orthographic processing measures, the low RAN group was outperformed by the control group who were matched in terms of print exposure and decoding ability. Thus, the authors suggested that poor RAN performance might be associated with the deficits in the orthographic knowledge. Aiming to contrast these three theoretical accounts, Georgiou et al. (2016) conducted a study in which several measures were administered to Greek-speaking children in Grade 4. The findings showed that speed of processing was more influential in explaining the relationship between RAN and phonological/orthographic processing than the one between RAN and reading fluency. Even though RAN was a predictor of phonological processing, phonological processing failed to predict reading fluency. The authors explain that this outcome is not surprising due to the "time-limited" effects of PA on word reading in consistent orthographies (p. 1808). Findings also showed that orthographic processing (when operationalized via speeded measures) partly mediated the significant influence of RAN on reading fluency. The authors interpreted this outcome as "some evidence to support the argument that RAN contributes to the building of high-quality orthographic representations that can then be used to read fluently" (p. 1809). They suggested that the predictive power of orthographic processing in RAN-reading fluency relationship could be explained by the fact that advanced readers (Grade 4) might have relied on whole word recognition in the tests of reading fluency. Still, they warn that orthographic processing cannot fully explain why RAN is related to reading fluency as it only accounted for a small amount of variance in this complex relationship. In another study, Georgiou et al. (2013) found that RAN is related to reading due to the fact that they both rely on seriality and oral production. The researchers argue that the link between RAN and reading cannot be accounted for solely by the recognition of visual patterns but also by the oral production of a given set of names based on the successful retrieval of phonological representations.

Although the nature of the link between RAN and reading is far from clear, the strong relationship between RAN and reading achievement is now well-documented (Norton and Wolf 2012). The extent to which RAN is related to spelling, on the other hand, remains to be investigated further. In languages with opaque orthographies such as English and French, RAN predicts spelling performance as an independent variable (Plaza and Cohen 2003; Savage et al. 2008; Stainthorp et al. 2013).

These findings are generally interpreted with the possible role of orthographic processing in mediating the RAN-spelling relationship, which allows learners to retrieve the word specific orthographic information as a whole before spelling the target words. As far as transparent languages are concerned, research has revealed conflicting results. For instance, Babayiğit and Stainthorp (2010) followed Turkish speaking children from Grade 1 to Grade 2 and found that early RAN performance did not contribute to spelling achievement at later stages. In contrast, Verhagen et al. (2010) found that RAN made a small but statistically significant contribution to spelling in Dutch in addition to the major contribution of PA in Grade 1. Similarly, Moll et al. (2009) found that RAN contributed to spelling beyond PA in German. However, the authors did not make direct associations between RAN and orthographic knowledge. Instead, they claimed that students with low RAN performance made fewer reading attempts and had more limited vocabulary knowledge, which in turn, negatively affected their spelling performance. Smythe et al. (2008) conducted a cross-linguistic study in which they investigated the effects of RAN and several other measures on the spelling of Grade 3 children in English, Portuguese, Hungarian, Arabic, and Chinese. Their results showed that RAN made a unique contribution to spelling only in English and Hungarian, which have highly different features in terms of orthographic transparency. In another study, Georgiou et al. (2012) found that RAN predicted spelling achievement in English and Greek, but not in Finnish, which has a truly transparent orthography like Turkish. In Brazilian Portuguese, Dos Santos and Befi-Lopes (2012) found that both PA and RAN had strong correlations with spelling accuracy in Grade 4. The authors interpreted the relationship between RAN and spelling skills as follows:

> This result may indicate that the lexical access involved in the rapid naming task would influence the writing of high-frequency words, which are expected to be written from a memory strategy, being therefore strongly dependent of the quality of this lexical access. It is also possible to speculate that the subprocesses of visual integration involved in the RON [rapid object naming] task would be related to the establishment of orthographic mental pictures of the HFW [high frequency words]. (p. 272)

Albuquerque (2012) investigated the relationship between RAN, PA, reading and spelling in European Portuguese with a focus on developmental differences (Grade 1 and Grade 2) and found that PA correlated with decoding accuracy while RAN was more strongly related to reading fluency. There were strong associations between PA and spelling accuracy in both grades. RAN had moderate correlations with spelling accuracy and writing fluency mostly in Grade 2. Although RAN had a greater impact on reading than on writing, it still predicted spelling accuracy and fluency in composition. An important finding was that as the grade level increased from Grade 1 to Grade 2, PA correlations with reading and spelling measures tended to decrease while RAN correlations started to increase. This finding probably resulted from the fact that phonological decoding is acquired early in Portuguese and fluency indexed by RAN becomes more important at later stages of schooling. The author explains that in European Portuguese, "reading initially involves phonological processing, but as reading acquisition progresses, it involves other processes, such as lexical" (p. 790).

As the research findings presented here thus far show, the interplay between RAN and word spelling needs further investigation. Therefore, one of the aims of this study is to contribute to research on RAN and spelling, based on data from a less studied language, Turkish. In specific terms, we investigate the relationship between phonological encoding (PE), RAN, word reading and word spelling in the truly transparent orthography of Turkish.

Method

Research Hypotheses

Based on the evidence from the literature, the following research hypotheses have been developed for the current study:

1. RAN is hypothesized to be more associated with word reading given its well-established role in reading achievement (Norton and Wolf 2012), and PE is expected to be more associated with word spelling since phonological processes are more influential on spelling development than on reading development (Treiman and Bourassa 2000).
2. Given that phonological processing is more important for literacy acquisition at earlier stages and its effects are time-limited especially in transparent orthographies (Georgiou et al. 2016), PE will be more strongly associated with word reading and word spelling in Grade 3, and the correlations of PE with word reading and word spelling will be smaller in Grade 4. It is also hypothesized that there will be an increase in the correlations of RAN with word reading and word spelling in Grade 4.
3. While RAN is expected to explain significant amount of variance in word reading above and beyond grade level, PE will not be a powerful predictor of word reading given the findings that in transparent orthographies, phonological awareness might not be an important factor of reading (Babayiğit and Stainthorp 2007) or it is important only during the early years (Grade 1 and Grade 2) of education (de Jong and van der Leij 2002; Papadopoulos et al. 2016).
4. PE is hypothesized to make a significant contribution to word spelling above and beyond grade level given the importance of phonological awareness for spelling especially in transparent orthographies (Babayiğit and Stainthorp 2007; Öney and Durgunoğlu 1997). In addition, RAN is expected to predict word spelling because the mediating role of orthographic processing will exert a stronger influence on the RAN-spelling relationship (as on the RAN-reading relationship, Georgiou et al. 2016) at later stages of development (Grade 3 and Grade 4).

Participants

The participants were 77 Turkish-speaking children in Grade 3 (n = 46) and Grade 4 (n = 31) with no documented learning difficulties. They were all attending the same state school which is located in İstanbul. As phonological processing is mastered quite early in the consistent orthography of Turkish (Durgunoğlu and Öney 1999), students in Grade 3 and 4 were considered to be advanced readers and spellers. Besides, RAN's relationship with word reading is expected to be more stable at these stages (Georgiou et al. 2016). Therefore, the decision to include third and fourth graders in the current study was made in order to better understand the relationship between PE, RAN, word reading and word spelling at these specific stages of development. Another study (Yılmaz, forthcoming), which was conducted in conjunction with the current one investigated the same phenomena for Grade 1 and Grade 2, and its findings will enable us to see the developmental picture more clearly.

The mean age was 106.76 months in Grade 3 (SD = 3.71), and 119.29 months in Grade 4 (SD = 3.9). There were 19 males and 27 females in the former group while there were 17 males and 14 females in the latter group. As for the educational background of the participants' parents, the demographic information retrieved from the school's online administrative system revealed that the parents mostly had primary school education (58% of the mothers and 47% of the fathers in Grade 3; 38% of the mothers and 35% of the fathers in Grade 4). The participants were all trained with the help of a phoneme-based teaching method in which the teacher focuses on letter sounds instead of letter names, and later uses these sounds to form syllables, words and sentences. Known as the phoneme-based sentence method, this type of instruction has been in use since 2005 in all public and private schools in Turkey. As for writing, the students were taught to use cursive style handwriting.

Data Collection Instruments

Word Reading

The word reading test was developed by the authors of the current study, and it is in the process of standardization for Turkish participants. It includes 76 items ordered in increasing difficulty (length and frequency) and measures word reading efficiency, which was operationalized as the ability to identify words correctly and fluently (without any hesitations). However, as the test was not a speeded reading measure, it was more related to word reading accuracy than to word reading fluency. The test was administered individually in a quiet room by a trained research assistant. When the participant misread a word, or read the word accurately but hesitantly,

a 0 point was assigned by the experimenter. For each word which was read correctly and fluently, 1 point was assigned. The session was terminated upon six consecutive errors, and the internal consistency reliability of the test (Cronbach alpha) was .69.

Phonological Encoding

Developed by the authors of the present study, this test measured the ability to match phonemes given in a set of nonwords with their corresponding graphemes. The participants were asked to listen to the nonwords carefully and write them down after the researcher read aloud each nonword twice. There were 40 items in this test, and the answers were evaluated by using a 0–3 scoring system for the first section (partly correct answers were scored) and a 0–1 scoring system for the second part. The maximum score which could be achieved in the test was 49, and the answers coming after four consecutive errors were not graded. For practical reasons, the students took this test in groups of five. The internal consistency reliability of the test was found to be .65.

RAN (HOTI)

RAN tests (Wolf and Denckla 2005) were adapted for Turkish as *Hızlı Otomatik İsimlendirme Testleri* (HOTI), and the adapted versions were documented to produce credible outcomes in terms of reliability and validity (Bakır and Babür 2009). In the current study, HOTI digit naming task was used. The test items were made up of five numbers (2, 4, 6, 7, 9) that were repeated randomly ten times in an array of five rows. The test was administered individually in a quiet room. The participant was asked to name the digits as accurately and rapidly as possible. A chronometer was used to record the time spent (seconds) by each participant for the completion of the task.

Word Spelling

This test was designed by the authors of the current study to measure the ability to spell high frequency words accurately. The items were chosen from among the most common words found in the students' course books. The test included 35 items ordered in increasing difficulty (based on the number of syllables), and it was administered collectively in the classroom. As in all other tests, the administration and scoring of this test was done by a trained research assistant. The researcher read aloud each item twice and asked the students to write them down carefully. For each correct item, 1 point was assigned, and for words containing spelling errors a 0 was registered. The internal consistency reliability of the test was .86.

Data Analysis

For data analysis, Pearson product-moment correlations and hierarchical regression analyses were conducted in SPSS 20.0. Prior to these analyses, the data were checked for normality, linearity, and homoscedasticity. The distributions of word spelling and phonological encoding scores did not meet the normality assumption as the majority of the sample tended to receive high scores in these tests. This situation probably resulted from the fact that phonological processing skills reach ceiling levels quite early in Turkish, and the students at Grade 3 and 4 mostly performed well on these measures. Therefore, nonlinear transformations[1] were applied for the negatively skewed distributions of PE and word spelling scores before moving to the statistical analyses. Collinearity statistics were checked for the independent variables, and it was found that variance inflation factor levels (smaller than 10) and tolerance levels (greater than 0.10) were all within the acceptable ranges.

Results

The analyses conducted were based on raw scores, and the descriptive statistics for the test measures are illustrated in Table 12.1. Results showed that the scores of PE, word reading and word spelling increased form Grade 3 to Grade 4, and RAN was completed in a shorter period of time in Grade 4.

As shown in Table 12.2, the results of the correlational analyses revealed that the measures were substantially and significantly correlated with each other. RAN correlations were all negative since completing the test in a shorter period of time was an indication of higher performance. Although the correlations were quite similar, RAN was more associated with word reading (−.572) than with word spelling (−.412). On the other hand, PE was more associated with word spelling (.597) than with word reading (.425).

Table 12.1 Descriptive Statistics for the Literacy Measures

	Grade level: 3 (N = 46)				Grade level: 4 (N = 31)				
Tests	M	SD	min	max	M	SD	min	max	max possible score
RAN (seconds)	27. 50	5.2	–	–	23.65	3.7	–	–	–
PE	42.85	3.8	30	48	44.26	2.8	38	48	49
Word spelling	26.91	5.7	10	35	29.42	4.6	19	35	35
Word reading	51.04	7.2	39	65	57.58	6.7	43	72	76

[1] Non-linear transformations were applied by using *reflect and logarithm* formula both for PE and word spelling tests.

Table 12.2 Intercorrelations among the Measures

	PE	RAN	word reading
RAN	−.234*	–	
Word reading	.425**	−.572**	–
Word spelling	.597**	−.412**	.489**

Note. N = 77. ∗ p < .05, ∗∗ < 0.01

Table 12.3 Intercorrelations among the Measures across Grade 3 and Grade 4

Variables	1	2	3	4
1. PE	–	−.188	.358*	.538**
2. RAN	−.165	–	−.540**	−.474**
3. Word reading	.380**	−.477**	–	.573**
4. Word spelling	.627**	−.358*	.451**	–

Note. Below diagonal = Grade 3; above diagonal = Grade 4. ∗p < .05, ∗∗ p < .01

Table 12.3 illustrates the correlations among the measures across Grade 3 and 4. In both grades, PE and RAN were substantially and significantly correlated with word reading and word spelling. In addition, RAN and PE were weakly correlated.

When grade-level variations in the correlational analyses were examined, it was found that PE had slightly stronger correlations with word reading (.380) and word spelling (.627) in Grade 3 than in Grade 4 (.358 and .538 respectively). On the other hand, RAN had stronger associations with word reading (−.540) and word spelling (−.474) in Grade 4 than in Grade 3 (−.477 and − .358 respectively). This result suggests that as the grade level increased, the importance of phonological processing decreased and RAN had stronger associations with reading and spelling processes.

In order to see the influence of RAN and PE on word reading, a hierarchical regression analysis was performed. As shown in Table 12.4, when grade level was entered into the analysis as the control variable, it accounted for 16% of the total variance in word reading [F (1, 75) = 15.984, $p < .001$]. The change in group membership (from Grade 3 to Grade 4) significantly explained word reading achievement ($\beta = .419$, $p < .001$).

Based on its strong association with reading, RAN was entered into the analysis in the second step, and it accounted for 20% of the variance in word reading (F change = 23.670, $p < .001$). Lastly, PE was included in the model, and explained 7% of the remaining variance at a statistically significant level (F change = 9.688, $p < .01$). Overall, the model explained 42% of word reading achievement in the sample, and RAN was the strongest precursor of word reading. Contrary to the expectations, PE was a significant predictor of word reading.

The regression analysis for word spelling (see Table 12.5) revealed that as the control variable, grade level accounted for 6% of the total variance in word spelling achievement [F (1, 75) = 5.978, $p < .05$]. The change in group membership (from

Table 12.4 Summary of Hierarchical Regression for Word Reading

N = 77						
Independent variable	β	t	R	R^2	R^2 (adj)	ΔR^2
Step 1			.419	.176	.165	.176***
Grade level	.419	3.998***				
Step 2			.613	.375	.359	.200***
Grade level	.238	2.400*				
RAN	−.482	−4.865***				
Step 3			.670	.449	.426	.073**
Grade level	.195	2.058*				
RAN	−.432	−4.546***				
PE	.281	3.113**				

Note. RAN = Rapid Automatized Naming, PE = Phonological Encoding, β = Standardized Beta, R^2 (adj) = Adjusted R Squared, ΔR^2 = R Squared Change. ∗p < .05, ∗∗p < .01, ∗∗∗p < .001

Table 12.5 Summary of Hierarchical Regression for Word Spelling

N = 77						
Independent variable	β	t	R	R^2	R^2 (adj)	ΔR^2
Step 1			.272	.074	.061	.074*
Grade level	.272	2.445*				
Step 2			.615	.378	.361	.304***
Grade level	.148	1.573				
PE	.565	6.012***				
Step 3			.662	.438	.415	.060**
Grade level	.057	.591				
PE	.522	5.723***				
RAN	.268	2.789**				

Note. RAN = Rapid Automatized Naming, PE = Phonological Encoding, β = Standardized Beta, R^2 (adj) = Adjusted R Squared, ΔR^2 = R Squared Change. ∗p < .05, ∗∗p < .01, ∗∗∗p < .001

Grade 3 to Grade 4) significantly explained word spelling achievement (β = .272, $p < .05$). However, grade level was a less influential variable in explaining word spelling achievement when compared to its predictive power in word reading.

As phonological processing is strongly associated with spelling development, PE was entered into the analysis after the control variable, and it accounted for 30% of the variance in word spelling (F change = 36.146, $p < .001$). Upon the inclusion of PE into the model, group membership was no longer a significant predictor of word spelling. Lastly, RAN was entered into the analysis as the third predictor, and it accounted for 6% of the remaining variance at a statistically significant level (F change = 7.779, $p < .01$). The ultimate model explained 41% of the variance, and PE was the most powerful predictor of word spelling achievement.

Discussion

By nature, spelling relies on highly sensitive phonological processes such as retrieving the graphemes of the given phonemes in a spoken word (Perfetti 1997). Therefore, phonological processing is more pivotal for spelling development than for reading development (Treiman and Bourassa 2000). In transparent orthographies such as Turkish, PA is considered to be more strongly involved in spelling processes due to the regularity of phoneme-grapheme correspondences (Öney and Durgunoğlu 1997). On the other hand, RAN is documented to be a powerful predictor of reading achievement across languages (Norton and Wolf 2012) including Turkish (Babayiğit and Stainthorp 2010). The results of the current study provided supportive evidence for these findings. Correlational analyses showed that RAN was more associated with word reading while PE was more associated with word spelling in Turkish. Therefore, the first hypothesis of the current study was supported.

Correlational comparisons based on grade-level differences demonstrated that PE was more strongly correlated with word reading and word spelling in Grade 3 than in Grade 4. While the involvement of PE in reading and spelling tended to decline in Grade 4, RAN started to establish stronger connections with these measures at this later stage of development. Given the important role of orthographic processing in mediating RAN-reading/spelling relationships (Papadopoulos et al. 2016) we argue that Turkish speaking learners rely on phonological processing for reading and spelling more often at earlier stages while they utilize orthographic processing at more advanced stages (Georgiou et al. 2016). This finding showed parallelism to the developmental patterns observed in Albuquerque's (2012) data and confirmed the second hypothesis of the present study.

When the relationships among the variables were further examined in regression analyses, it was found that grade level played a significant role in explaining some of the variance in word reading. Accordingly, the higher levels of word reading performance demonstrated by the fourth graders significantly accounted for the increase observed in word reading achievement. On the other hand, grade level failed to be a significant predictor of word spelling achievement upon the inclusion of PE and RAN in the analysis. This might result from the fact that the word reading test was a better measure for contrasting Grade 3 and 4 based on their performance. To be more specific, the word reading test included items which differed in terms of word length and word frequency while the word spelling test included items which were all familiar, but differed in terms of word length only.

RAN was the strongest predictor of word reading while PE was the most powerful precursor of word spelling above and beyond grade level. This outcome corroborates the findings of Babayiğit and Stainthorp (2010). Based on the central role of RAN in determining word reading performance, one can speculate that reading at the later stages of development is highly associated with orthographic processing (Bowers and Wolf 1993; Powell et al. 2014), or readers in Grade 3 and 4 are mostly involved in sight word reading (Ehri 1992) in Turkish. Upon being entered into the analysis after RAN, PE made a unique contribution to word reading above and

beyond grade level. This result was not expected, given that the effect of PA on reading is time-limited in transparent orthographies (Georgiou et al. 2016) and the participants were at advanced stages (Grade 3 and 4) of reading development. It should be acknowledged that although the word reading test used in the present study required the participants to read individual words both accurately and fluently, it was not a speeded-reading measure, and therefore it might have tapped word reading accuracy more than word reading fluency. Given that PA is a stronger predictor of reading accuracy (Georgiou et al. 2008), the significant role of PE in predicting word reading performance is an understandable finding in this situation. Overall, these results partly confirmed the third hypothesis of the present study.

Although RAN was the primary predictor of word reading, it also made a significant contribution to word spelling beyond PE. Therefore, it might be argued that besides the central role of phoneme-grapheme conversion strategies, automatized retrieval of word specific orthographic knowledge is additionally involved in the process of spelling in Turkish. This finding partially supports the argument that RAN is closely related to orthographic processing skills (Bowers and Wolf 1993) and confirms the fourth hypothesis of the current study. However, it should be noted that orthographic processing cannot be the only explanation for the associations of RAN with reading (Georgiou et al. 2016) and spelling. The finding that RAN was a significant predictor of word spelling is not compatible with the findings of Babayiğit and Stainthorp (2010), who investigated the relationship between RAN and spelling in a longitudinal design (Grade 1-2). The current study adopted a cross-sectional design, and included students from Grade 3 and 4, during which children become advanced readers and spellers. Therefore, it is not possible to make a direct comparison between the findings of these two studies. In addition to the participants' relatively higher levels of proficiency in spelling, an important factor to consider here is the familiarity of the test items. In the current study, the items used in the word spelling test were all familiar words which appeared in the students' textbooks frequently. In line with the arguments of Dos Santos and Befi-Lopes (2012), the high-frequency test items might have facilitated the involvement of automatized retrieval of word specific orthographic information during word spelling in Turkish. It is likely that the participants made use of their word specific orthographic knowledge to a greater extent as they spelled the roots of the familiar items, and they applied phoneme-grapheme conversion strategies when spelling the suffixes attached to the long and multimorphemic words such as *söyleyebileceğiniz [(the thing) that you can say].* Hence, it would be appropriate to suggest that Turkish speaking learners rely not only on phoneme-grapheme correspondence rules, but also on word specific orthographic knowledge for spelling.

Some limitations of the present study should be acknowledged. First, since we did not include participants from lower Grades (1 and 2); it was not possible for us to see the developmental picture more clearly. In addition, we used convenient sampling (all participants were attending the same school), and the sample size was rather small. This condition risks the generalizability of the results for the Turkish context. Second, the word reading test used in the current study was mostly a

measure of reading accuracy rather than fluency. Given the importance of assessing fluency in transparent languages (de Jong and van der Leij 2002), we should have included speeded reading and speeded spelling tests to see how PE and RAN were related to accuracy and fluency separately.

Conclusion

This study has provided evidence that PE was a significant predictor of word spelling and RAN was an important index of word reading in Turkish. The influential role of PE in word spelling showed that the participants mostly relied on the consistent phoneme-grapheme correspondences of the Turkish orthography as they spelled the target words. As the grade level increased, RAN became more associated both with reading and spelling processes. When we adopt a theoretical approach which focuses on the close link between RAN and orthographic processing (Bowers and Wolf 1993) among others, we might suggest that the participants in the current study were mostly involved in sight word reading during the administration of the word reading test. Importantly, RAN was also a unique predictor of word spelling, which might indicate that familiar words or parts of familiar words could be retrieved and processed in an unanalyzed, automated manner for word spelling in Turkish. More research is needed in order to have a deeper understanding about the nature of the relationship between PA, RAN, word reading and word spelling skills in Turkish and other languages with different orthographic features.

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Chapter 13
The Development of Reading and Spelling in Polish: A Semi-transparent Orthography

Izabela Pietras and Marta Łockiewicz

Abstract Polish is a West Slavic, inflectional, consonantal language, with a semi-transparent orthography. The level of transparency, however, is higher for reading, than for spelling. These characteristics influence the learning of reading and spelling and literacy instruction. In emergent readers, phonemic awareness is the strongest reading achievement predictor, but its impact decreases with age, reading experience, and education. According to a Model of Reading and Spelling Acquisition in Polish by Awramiuk and Krasowicz-Kupis (L1-Educational Studies in Language and Literature 14:1–24, 2014), initial reading strategy is an analytical phonological, alphabetic one, followed by an interim, mixed one, until a global, word and phrase based, lexical strategy emerges. The development of spelling proceeds from partial and incorrect transcription, through the domination of phonetic strategy, to the growth of orthographic and morphological awareness. Moreover, research on the input of perceptual – motor functions, in addition to of linguistic functions, for the development of literacy has also been conducted in Poland.

Keywords Reading · Spelling · Polish · Semi-transparent orthography

Introduction

Reading and writing are necessary for the effective functioning in society, as achieving academic and professional success depends on literacy. The degree of transparency of a given alphabetic language impacts the difficulty of phonological awareness tasks (Geva and Siegel 2000). The speed of reading acquisition mirrors the transparency of the orthography (Ziegler and Goswami 2005). In deeper orthographies, as

I. Pietras (✉)
Maria Curie-Skłodowska University, Lublin, Poland

M. Łockiewicz
University of Gdansk, Gdańsk, Poland
e-mail: marta.lockiewicz@ug.edu.pl

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compared with shallow orthographies, reading words and nonwords poses more problems (Seymour et al. 2003), as syllabic complexity affects decoding, whereas orthographic depth affects both word and nonword reading. Thus, Seymour et al. (2003) suggest a hypothesis that in deeper orthographies children go through a longer reading foundation phase, both logographic and alphabetic, as compared to a shorter, single foundation phase in shallow orthographies. In addition, the studies focused on beginning writing also emphasize the importance of the structure of the language and children learn to write earlier in transparent orthographies (Caravolas and Bruck 1993; Caravolas and Volin 2001). In this chapter, we will discuss a West Slavic, inflectional, semi-transparent orthography – Polish. We summarize theoretical assumptions and research findings, which have often been published only in Poland, but that could be an interesting starting point for further research. Therefore, we will present the characteristics of Polish orthography, including the literacy instruction approach. Moreover, we will outline the literacy development in Polish and discuss the predictors of reading, spelling, and writing. Special focus will be placed on the relationship between reading skills and phonological awareness. We will also describe the typical symptoms of dyslexia, the understanding of the risk of dyslexia, and conclude with future research directions.

The Polish Language

Polish belongs to the West Slavic language group (with Czech and Slovak). It differs from the other members of the group in certain aspects:

1. it retains nasal vowels <ą>, <ę>,
2. it has undergone ablaut – the change of the vowel <e> into <o> or <a> before consonants:
   <t, d, s, z, r, ł, n >(e.g. <ni**e**sie> – <ni**o**sła> [she carries – she carried], <w l**e**sie> – <l**a**s> [in the forest – forest). This is the reason why vowels are different in the various form of the same word,
3. stress falls on the penultimate syllable (not on the first syllable, and neither it is mobile, as in other Slavic languages),
4. the plural has two types: masculine personal and not masculine personal (e.g. <dziewczyny przysz**ły>** [girls came] – <chłopcy przysz**li**>[boys came]),
5. it gives a lot of possibilities to create diminutives (e.g. <mały>, <maleńki>, <malutki>, <maluteńki>, <malusieńki>, <malusi>[a small one]) (Urbańczyk 1992).

Polish is an inflectional, consonantal language (Dryer and Haspelmath 2013) and thus, can influence literacy development. Polish includes 35 (Świdziński 1997) to 42 phonemes (Stieber 1966), which do not correspond to Latin-borrowed alphabets. Currently, Polish alphabetical system consists of 23 basic and 9 additional letters, the latter introduced to represent units non-existent in Latin (e.g.,: <ą>, <ę>,< ł>),

and it uses 13 digraphs (e.g., <si>, <dz>, <cz>) and one trigraph (<dzi>). Moreover, Polish inflectional and derivational morphology is rich and complex. It results in the changes of word forms depending on the context (e.g.<ja widzę>, <ty widzisz>,<on widzi>[I see, you see, he sees] or <ja zobaczę> [I will see])..

Polish phonology, as compared to English, is characterized by: a fixed accent (on the penultimate syllable), simple vowel phonology (many fewer segments), and complex consonantal phonology (more segments, frequent consonant clusters) (Awramiuk 2006).

Polish Spelling System

Polish is characterized by a relatively high transparency in the grapheme – phoneme relationship for reading skills. This means that in most words the same letters are read in exactly the same way. This full transparency applies to 14 characters of the Polish alphabet (<a>, <ć>, <e>, <f>, <h>, <j>,<l>, <ł>, <m>, <ń>, <o>, <ó>, <p>, <t>) (Awramiuk 2006). The remaining letters are less transparent in reading, as they may be pronounced in more than one way, which depends on the surrounding letters (Awramiuk 2006). Thus, for example, the letter b can be read as the phoneme p in the word chleb /xl∑p/[bread] (in the final position) and the phoneme b in the word brama /brama/[gate] (in the initial position). Apart from a phoneme's position in a word, the proximity of other phonemes may become voiceless, e.g., in the word wtorek /ftor∑k/ [Tuesday] the letter <w> is read as the phoneme /f/. However, the situation differs in relation to spelling, where the correspondence between phonemes and graphemes is rather low. Firstly, in several cases the same phoneme can be written in two ways, for example the phoneme /ż/ can be spelled as: ż – żaba /ʐaba/ [frog] or rz – rzeka /ʐ∑ka/ [river], the phoneme /x/as: h – herbata /x∑rbata/ [tea] or ch – chusteczka /xust∑tʂka/ [handkerchief], and the phoneme /u/ as: u – czuły /tʂuwə/ [affectionate] or ó – ołówek /owuv∑k/ [pencil]. These alternative ways of spelling constitute the main reason why the students commit numerous errors (cf. Reid 2006). Another inconsistency can be seen in the way of indicating soft sounds. In Polish, palatal /t͡ɕ, ɕ, ʑ, d͡ʑ, j̃/ and palatalized consonants can be rendered in different ways in writing, e.g., in the words siano /sianɔ/[hay] and świat /ɕfiat/[world] the same phoneme / ɕ / appears, but in a different graphic form. Another spelling difficulty is the negation <nie> [no]. <Nie> is spelled separately with verbs, numerals, pronouns, prepositional phrases, adverbs not derived from adjectives, comparative and superlative adjectives, and adverbs, e.g., nie znam /ni∑ znam/ [I do not know], nie wy /ni∑ wɘ/ [not you], and as one word with other parts of speech, such as: nouns, adjectives, adverbs, numerals, and participles, e.g., < nieprawda> /ni∑pravda/ [not true]; <niemiło> /ni∑miwo/ [not nice]. However, every rule has its exceptions, e.g., if a noun is spelled with a capital letter, nie is separated from the following noun: nie Polak [not a Pole].

Polish Educational System

These specific features of Polish influence literacy instruction, with particular regard to its compliance with the systemic characteristics of the Polish language and its spelling. As indicated by comparative research on the acquisition of reading skills in 13 European languages (Seymour et al. 2003) the process of mastering reading skills to a large extent depends on the features of the language and the type of spelling.

Compulsory full-time education in Poland lasts for 10 years, and includes a Reception Year (called zero grade) in kindergarten, 6 years in primary school, and 3 years in lower secondary school (Polish Eurydice Unit 2015). The obligatory entrance age is 7 years, with an optional admittance at 6 years due to a parental decision. Primary school education begins with 3 years of early integrated education. An academic year lasts around 180 days divided into two semesters, ranging from September to June. All core curricula are the same for all students, as they are developed at the central level by experts appointed by the Ministry of National Education. Obligatory modern foreign language instruction (usually of English) begins from the reception year; sometimes even from the kindergarten. Taking an external foreign language exam is mandatory to graduate from high school. In 2015, during the external exam at the end of junior high school, 14% of students were identified as exhibiting dyslexia-type problem based on the report by a state or private psychological-educational counselling centre (Junior high school exam report 2015 2015). Such centres have to follow the recommendations of the Polish Ministry of Education, which include such criteria, as: average or higher IQ, below average reading and spelling achievement scores, and/or deficits in cognitive and language functioning important for literacy, e.g., in phonemic blending and segmentation, verbal memory, etc.

Dominant Methods of Literacy Instruction

Learning to read slightly precedes learning to write. Many authorities recommend, and teachers prefer, various phonics methods of literacy instruction (Bielén and Malkowska-Zegadlo 1998; Więckowski 1995). The methods of reading and writing instruction used today in Polish schools result from many years of searching for the optimal way to teach these skills. During the process, dilemmas have appeared whether reading and writing should be taught at the same time, whether one should start from the sound or the letter, and at what age should the teaching begin (Awramiuk 2006). The opinions on the methodology of teaching are divided. Some researchers believed that teaching reading and writing should be combined (Cackowska 1984; Jakubowicz et al. 1999). Another point of view, however, bases its assumptions on the views of those methodologists who believed that writing should follow reading (Więckowski 1995; Wróbel 1985,). Next aspect is the

direction of the methodological concern. Majchrzak (1995) believes that the teaching of reading should be holistic. Children should get to know the correct graphic model of a word, and then, as a result of mastering reading skills, they will be able to produce proper sounds. Other views (Rocławski 2000) show the importance of practicing the segmentation and blending of sounds as a necessary condition for mastering the skills of reading and writing. The dilemma concerning the starting age was also tackled by methodologists. Most of them agree that the first contact with letters should be as early as possible (Kamińska 1999; Majchrzak 1995).

Predictors of Reading, Spelling, and Writing in Polish

Reading requires linguistic skills: phonological, morphological, syntactic, and semantic, paired with cognitive abilities: visual perception, auditory perception, memory, and conceptual-verbal reasoning (Krasowicz-Kupis 1999). Thus, the assessment of reading skills should include: the fluency and accuracy of decoding, comprehension, and dominant reading strategy, which might be a bottom-up vs. top-down, or analytic vs. global one (Krasowicz-Kupis et al. 2015). In young readers, key elementary skills: letter knowledge, phonological processing, and a nonword reading task should be additionally assessed.

Decoding Predictors

Krasowicz-Kupis's (1999) longitudinal research on the impact of phonological awareness on the fluency and accuracy of decoding and on reading comprehension in young learners demonstrated that in Polish 6.6–9 year-olds, followed from the beginning of Reception Year till the end of Year II, phonemic awareness influenced the speed of reading in the highest degree in the Reception Year, but its impact decreased significantly in the next 2 years. The strongest fluency and accuracy of decoding achievement predictors included:

1. For Reception Year: phonemic blending and segmentation of nonwords, syllable deletion (real word material), phonological memory;
2. For Year 1: phonemic and metaphonological awareness (as measured with phonemic blending and segmentation of words and nonwords, alliteration identification, and phoneme deletion), phonological memory;
3. For Year 2: metaphonological awareness: swapping the order of sounds in words, phonemic structure of words comparison, phonemic structure of nonwords comparison, phonological memory (the impact of which decreased for decoding, but not for reading accuracy). In Year 2, phonological skills impacted the speed of decoding stronger than accuracy.

Łockiewicz and Ciecholewska's study (2017) found that in Year 4 students phonological awareness (as measured with a composite score including minimal pairs comparison, phoneme segmentation, blending, and deletion, phonological memory, and spoonerisms production and recognition tasks) predicted the accuracy of reading aloud (as measured with the number of errors made when reading a short story), and rapid automatized naming (RAN) – both the accuracy and fluency (as measured with the number of words read correctly within a minute). Similarly, in 16–17 year-old age high school students RAN and phoneme segmentation and blending (a composite score) predicted the fluency of reading single words (as measured with time of reading in seconds), and verbal working memory (as measured with forward and backward Digit Span, a composite score) predicted the accuracy of reading pseudowords, which is a task performed without or with a limited use of vocabulary (Wieczorek et al. 2016). As phonemic awareness impact on decoding decreases with reading experience, readers increasingly rely on the access to entire words and/or phrases stored in their mental lexicon (cf. the discussion of the Krasowicz-Kupis's model of reading acquisition in Polish on p. 9).

As reading exposure increases, brain activity to words relative to symbol strings changes, specifically in left superior temporal, inferior frontal and fusiform gyri (Chyl et al. 2018). Polish kindergarten and/or elementary school emergent-readers showed higher activity for print than for symbol strings in left inferior frontal, precentral, and postcentral gyri as compared with prereaders (matched for age, $M = 6.90$, sex, family history of dyslexia, socio-economis status, and IQ). Literacy facilitated speech comprehension, as it enhanced activation to speech in the temporal cortex, which might reflect better phonemic processing. Moreover, print-speech coactivation was observed only in readers, and correlated positively with reading skill in the left superior temporal sulcus, which suggests its importance for subsequent literacy acquisition.

Longitudinal studies (Pawlicka et al. 2015) indicated that children attending a bilingual, English-Polish elementary school improved their phonological processing skills in a higher degree than children attending a monolingual school. Specifically, Polish children who had received a paired-bilingual literacy instruction (all courses were taught in English, except for Polish, religion, and German as a Foreign Language) for two and a half years scored higher in a Polish word reading fluency task than their peers who received literacy instruction only in Polish, which suggest that literacy instruction in two languages of different levels of transparency may be beneficial for reading achievement (Pawlicka et al. 2018).

In addition to the research on the development of language awareness as an important predictor of literacy, research on the input of perceptual – motor functions for the development of these skills have also been conducted in Poland. Spionek (1989b) assumed that there exists a connection between visual, aural, and kinesthetic deficits and difficulties in developing literacy abilities. Bogdanowicz (2000) indicated a significant correlation between the perceptual – motor integration and reading (correlation coefficients ranged from 0.32 to 0.42). The perceptual – motor integration involves the coordination and transformation of sensory functions of

various modalities with motor reactions. This process influences the speed of auditory-visual-motor learning, which is fundamental for literacy skills.

Reading Comprehension Predictors

Krasowicz-Kupis (1999) found that phonological memory predicted reading comprehension in Year 2 students, unlike phonological skills, which had almost no bearing on reading comprehension, with the exception of swapping the order of sounds in words. Interestingly, mathematical skills and language competence in 4-year-old children correlate with reading comprehension and language skills in 7-year-olds (Bielén and Malkowska-Zegadlo 1998). For older students, Rajchert et al. (2014) suggested another predictor of reading comprehension skills using data from the Organization for Economic Co-operation and Development (OECD) Polish national extension of the Program for International Student Assessment (PISA) conducted in 2009 and 2010. They reported that high-school students scored higher in reading than vocational school students, and girls higher than boys; these differences were larger in the second test. Intelligence and prior reading score predicted reading skills. Trait- and state anxiety were negatively correlated with reading, but trait-anxiety had a positive effect on time two reading performance. Socio-economic status of the family predicted intelligence and first time reading score. Moreover, the studies by Danks and Kurcz (1984) indicated different preference for reading strategies in a reading comprehension task between Polish and English native speakers. University students read aloud into a tape recorder an approximately 2000-word story, in which 16 words were modified to violate: lexical (a word replaced with a nonword), within-syntactic (a word ending changed in terms of gender, number, case, and/or tense within the same part of speech), syntactic and semantic (a word replaced with a word that did not match semantically and syntactically) information in experiment 1, and between-syntactic (one part of speech replaced with another or only distorted with a word ending change), semantic (a word replaced with a word that did not match semantically, but it did match syntactically), and factual (contradictory information inserted in a sentence preceding the one with a critical word) information in experiment 2. The same story was used for English and Polish (translation of the English original) native speakers, and production times around violations were measured. Polish readers were more sensitive to syntactic violations, while English readers – to factual and semantic ones. Moreover, Polish readers preferred a focused strategy, in which a reader concentrates on a narrow part of the text, which could be a few letters. This relates to the fact that in Polish syntactic information is expressed within a word structure, specifically in a word ending. English readers preferred a diffused strategy, in which a reader concentrates on a broader portion of the text, which could be several eye fixations. This relates to the fact that in English syntactic information is primarily expressed outside a word structure, specifically in a word order. However, both groups adapted their reading strategies to the available information.

Writing Predictors

Few Polish studies discuss writing skills. Bogdanowicz (1989) developed the overall scheme of writing words and the models of different forms of writing: from memory, from a model, and from dictation, created on the basis of cybernetic models of language communication by Kaczmarek (1969), the neurophysiological concept of Łuria (1979), and psychological assumptions of the theory of Spionek (1989a). The research on the mastery of writing skills was conducted in Poland also by educators and the specialists of early teaching and Polish orthography. Therefore, the analysis of the writing process is focused on the consecutive steps leading to an efficient, effective spelling of words (cf., Radwiłowiczowa 1972), and on the functioning of perception and epiphonological and metaphonological skills (cf. Krasowicz-Kupis 1999).

The Development of Linguistic Awareness/The Relationship Between Reading Ability and Phonological Awareness

The issue of acquiring literacy skills led many researchers to attempt to determine the stages of the development of these skills (Ehri 2000; Gentry 1982). Frith (1985) developed a universal developmental model mastering literacy abilities. She singled out three main stages: a logographic, alphabetic, and orthographic one. Polish children, however, begin learning to read using an analytical, alphabetic strategy, which is based on phonemic skills and phonological awareness (Krasowicz-Kupis 1999). Krasowicz-Kupis (1999) presented a 3-stage model of reading acquisition as mentioned earlier: Stage 1: Dominance of Analytical Phonological Strategies: reading is based on letter-sound-phoneme correspondence. Intrasyllabic units: rhymes and alliterations exert no clear impact on reading, due to language transparency. Children blend sounds into words, with dominant mistakes being pauses and sound repetitions. There are almost no distortion errors, like semantic or visual substitutions; Stage 2: Interim between Analytical Phonological to Global Word-based strategy: Children blend greater units: syllables, morphemes, make more distortion errors, fewer temporal ones. Metalinguistic skills play a bigger role; and Stage 3: Dominance of Global Strategy: Word or Phrase based, corresponding to syntactic and semantic structures. Children read entire words and/or phrases, they make fewer temporal mistakes, more semantic substitutions, conditioned by linguistic context, and self-correct, repeating words or phrases. This developmental path of reading strategies was confirmed in an older group of Year 4, 11-year-old elementary school students (Łockiewicz and Ciecholewska 2017). Most children achieved a Global Stage in reading, as the most frequent mistake was an entire word repetition. On average, only 2 such errors appeared in a 138-word short story reading task, with a 1-min time limit. The repetitions were followed by syllable blending and syllable and sound blending errors (on average, 1 error of each type appeared), typical of

earlier Analytical Phonological and Interim between Analytical Phonological to Global Word-based reading strategies, respectively.

Similarly, longitudinal studies conducted by Sochacka (2004) also challenged the universality of the logographic-alphabetic-orthographic stage model, stressing the importance of the specifics of a language for the mastery of reading and writing. The results of Polish children indicate the use of both the analytical and synthetic strategies in the first two years of learning. The changes in the strategy of the mastery of reading and writing skills progress in the opposite direction to the one suggested by Frith – from the phonological to the lexical level.

Kamińska's studies (2003) show that the model of spelling acquisition in Polish must acknowledge language-specific phonological and orthographic constraints. Awramiuk (2006) studied the acquisition of alphabetical writing. She compared spelling errors committed by Polish preschoolers with similar errors committed by English children. She found that the two stages of writing acquisition described in English studies: letter – name spelling stage and reliance on phonological aspects stage cannot be identified in Polish children's writing acquisition. Polish children first employ the phonological strategy, but then, relatively quickly – under the influence of the experience with reading and the instructions received from adults – they begin to notice the spelling regularity and the role of morphology. The orthographic – morphological awareness, although it develops together with the increasing experience with the written word (primarily the printed word), appears before a child receives formal instruction from the teacher. Awramiuk's conclusions are consistent with the views of Gombert (2003), who argues that the knowledge acquired independently by the child is important for the development of reading and writing skills.

Awramiuk and Krasowicz-Kupis (2014) combined their findings into a broader Model of Reading and Spelling Acquisition in Polish. The initial stage (1), before formal literacy instruction, involves the development of linguistic skills, script awareness, motivation to read and write and the key stage (2) starts with formal literacy instruction. The three sub-stages of the development of reading correspond to the described above Krasowicz-Kupis's 1999 model and three substages in Writing include: Substage I: Partial and Incorrect Transcription, due to partial representation of the phonological structure of words and poor phonetic analysis. Substage II: Domination of Phonetic Strategy, when numerous orthographic errors appear, as spelling follows the phonological structure of a word, ignoring the phonetic and grammatical context. Substage III: Growth of Orthographic and Morphological Awareness, resulting from knowledge about the alphabet system and the transcription of individual words. For writing, these substages are more flexible and individualized than for reading. The final proficiency stage, when automatisation has been achieved, and the learner might concentrate on the content and pragmatic functions, not technical aspect of the skills.

These stages are in contrast with models developed in English, which include a global or visual phase as the first one (Krasowicz-Kupis 2006). Such discrepancies result from interlingual differences, older age of Polish children when they begin formal reading instruction, and different teaching methods. However, Awramiuk

and Krasowicz-Kupis et al. (2014) notice that Polish children may go through the logographic stage prior to formal instruction.

Research on Dyslexia in Poland

According to M. Bogdanowicz (2011), who introduced the term of the risk of dyslexia to Polish research and clinical experience, children at risk of dyslexia are young learners (up to the third year of formal school instruction) who either manifest specific disturbances in psychomotor development leading to later specific difficulties in reading and writing, or already present such difficulties. Among these, delayed babbling, worse self-help skills, less interest in drawing at the age of 2–3 years, more problems with drawing a circle at the age of 3 were identified (as reported by parents when the children were during Year 1 of elementary education) (Łockiewicz and Matuszkiewicz 2016). Moreover, both a dyslexia report and dyslexic symptoms with no formal diagnosis demonstrated by a family member, and parents' reading preferences, predicted the risk of dyslexia in Year 1 children, who performed poorer in fine motor skills, linguistic perception and sound deletion, visual functions and attention. The Polish adaptation (ARHQ-PL) of *the Adult Reading History Questionnaire* by Lefly and Pennington (2000) was shown to be valid for the assessment of risk of dyslexia (Krasowicz-Kupis et al. 2014). *The Scale of the Risk of Dyslexia*, developed by M. Bogdanowicz (2003), which consists of parent-or-teacher directed questions concerning the general development of a child in motor, visual-spatial, auditory-linguistic, and attention skills, also successfully predicts the success in reading and writing achievement. On the neuronal level, familial risk of dyslexia in 6-year-old children attending either a kindergarten or an elementary school (due to a change in legislation that lowered the age of entry) was associated with decreased activation in the bilateral temporal, tempo-parietal and inferior temporal–occipital regions, and the bilateral inferior and middle frontal gyri (cortically), and in the bilateral thalami, caudate, and right putamen (subcortically) (Dębska et al. 2016). The influence of that risk increased with schooling, as regions in the ventral occipital cortex showed an interaction between familial risk and grade, and the left inferior frontal gyrus a main effect of grade (decreased activation for rhyming present only in first-graders) was observed.

In older participants, voxel-based morphometry analysis revealed a reduced gray matter volume in a single cluster in the left thalamus of children with dyslexia, as compared with the controls (Jednoróg et al. 2015). Moreover, reading accuracy and gray matter volume in the left supramarginal gyrus and in the left cerebellum correlated only in the control, but not in the criterion group. In terms of grey matter disruptions, children with dyslexia, as compared to their peers without dyslexia (Polish, German, and French participants were included in the sample, as data were merged from five different studies) differed in higher mean curvature and a greater folding index in the left hemisphere including superior and middle temporal gyri, subparietal sulcus and prefrontal areas (Płoński et al. 2017). In a phonological

priming task, when listening to a series of 7 words in which the final word was either identical or different in word onset with the preceding set, 10-year-old dyslexic children manifested a smaller (less negative-going) N400 amplitude when the final word was incongruent, and a larger (more negative-going) one when it was congruent (Jednoróg et al. 2010). An opposite pattern was observed in the control group, who demonstrated a larger N400 amplitude when the final word was incongruent. In a semantic priming task, when listening to a series of seven words in which the final word either did, or did not belong to the same semantic category as the preceding set, both groups manifested a similar pattern, with a larger N400 amplitude in the unprimed, as compared with the primed, condition, though this effect was delayed in the criterion group. These results suggest that both the process of phonological integration of similarities and identifying phonological incongruency in spoken word recognition, but not of analogous semantic processes, are impaired in dyslexia. Moreover, mixmatch negativity and P300 waves were significantly less frequent, and latencies of complex event-related potentials greater in 7–18 year-old participants with dyslexia than in their peers without dyslexia, demonstrating impaired processing of auditory information (Maciejewska et al. 2014). The latencies of mixmatch negativity and P300 did not change with age in the criterion group, while they decreased in the control group. In addition, mixmatch negativity and P300 responses in the participants with dyslexia had a wide range, which suggests heterogeneity of dyslexia, which will be discussed later. Jednoróg et al. (2011) did not find a higher N2 amplitude for coherent than for random motion in the right hemisphere in children with dyslexia, unlike in children without dyslexia. Moreover, N2 amplitude for random motion differed topographically between the two groups. Children with dyslexia manifested longer reaction times to random motion as compared with the control children, which supports the hypothesis of subtle deficiencies in the magnocellular-dorsal pathway in dyslexia.

Dyslexia prevalence study conducted by Krasowicz-Kupis (2008) in a group of 188 Year 2 students indicated that 2.28% of children read fewer than 5 words within 1 min (score below 2 SD, suggesting dyslexia), and 13.59% read between 5 and 17 words (score between 1 SD and 2 SD, suggesting lower than average reading skills). The typical dyslexic symptoms include deficits in: the accuracy and fluency of words (Jaśkowski and Rusiak 2008; Jednoróg et al. 2010, 2014; Wieczorek et al. 2016) and nonwords reading (Jaśkowski and Rusiak 2008; Jednoróg et al. 2014; Wieczorek et al. 2016), spelling (Jednoróg et al. 2014), phonological awareness, as measured with phoneme blending (Wieczorek et al. 2016), phoneme deletion (Katarzyna Jednoróg et al. 2014), and spoonerisms (Jaśkowski and Rusiak 2008), the tempo of the access to mental lexicon (Jednoróg et al. 2014; Krasowicz et al. 2009; Wieczorek et al. 2016), working memory (Wieczorek et al. 2016), short-term phonological memory of pseudowords (Jednoróg et al. 2010), and a limited active and passive vocabulary (Długosz and Rejnowska-Wawryn 2007). Likely, students with dyslexia rely longer on analytical, rather than global, reading strategies, as phonological awareness explained more variance than RAN in a single word fluency reading task in high school students with dyslexia (an opposite relation was observed for their peers without dyslexia) (Wieczorek et al. 2016).

Using the fuzzy-trace theory of Brainerd and Reyna, (2015), Obidziński and Nieznański (2017) found that adolescents with dyslexia, as compared with their normally reading peers, were less likely to reject a stimulus only related to the previously presented target stimulus when using verbatim memory traces (i.e., concrete perceptual information about a stimulus), in the condition of both semantic and orthographic similarity between the stimulus and the target (Obidziński and Nieznański 2017). This deficit in recollection rejection process may impair the ability of dyslexic readers to differentiate between similar words, characters, and other similar shapes during reading. However, even though the participants with dyslexia were less likely to identify a stimulus to actually be a target using gist memory traces (i.e., the meaning of a stimulus) in the condition of semantic similarity, they were more likely to reject a stimulus only related to the previously presented target stimulus in the semantic condition. An advantage in gist retrieval may serve as a way to overcome verbatim retrieval deficits, and lesser likelihood to recognize a stimulus as a target protects from an increased false recognition rate. No deficits exist in the phonological and semantic verbal fluency, though students with dyslexia struggle with differentiation between the representation of a sound and a letter (Mielnik et al. 2015).

Pietras (2008) found no dominant neurological problems for spelling difficulties, as the results of the tests for diagnosing cognitive functions failed to differentiate the groups with dysorthography. Furthermore, no relationship between cognitive deficits and a specific type of errors was discovered. Students with difficulties in writing made the same types of errors as their peers without such difficulties, though these mistakes were more frequent.

As a consequence of these studies the methods of dyslexia assessment used in psychological and pedagogical counseling centers were verified and modern test batteries for the diagnosis of dyslexia in grades III and V were developed (see Bogdanowicz et al. 2009).

Studies in Poland have also focused on non-linguistic deficits in dyslexia, as opposed to approaches stressing solely the importance of the phonological processing. For instance, Lewandowski et al. (2014) reported that elementary school students with dyslexia do not differ in rhythm perception strategies from their nondyslexic peers. Lipowska et al. (2011) found that individuals with dyslexia present deficits in perception organization and in manipulation of visual information, though only in more difficult tasks. Lipowska (2011) compared the memory functioning in four groups of elementary school students (mean age = 11 years): 1. with dyslexia and ADHD, 2. with dyslexia, 3. with ADHD, and 4. controls. The three criterion groups, as compared with the control group, manifested deficits in visual perception, visual-spatial perception, planning and organization of elements in a pattern (as they correctly copied fewer elements of the Rey-Osterrieth Complex Figure) and scored more points in the forward than in backward visual-motor working memory task (as measured with the repetition of a sequence of movements),

when for the controls both tasks were equally difficult. Moreover, students with dyslexia and ADHD, as compared with all other groups, manifested deficits in visual-motor working memory (as measured with the repetition of a sequence of movements), and visual perception, visual-spatial perception and memory, planning and organization of elements in a pattern, as they made more errors when reproducing a complex figure from memory (as measured with Rey-Osterrieth Complex Figure Test), indicating deeper disturbances in case of co-occurrence of dyslexic and attention deficits. Radtke (2015) examined visual-spatial functions in 4–6 Year students. The students with dyslexia manifested deficits in visual perception, visual-motor coordination, perceptual organization, and visual memory (as measured with comparing figures to a model, copying figures, copying a complex figure, and reproducing the same complex figure from memory, respectively), which encourages to include non-literacy symptoms in the definition of dyslexia and add visual processing tasks in the assessment. Bednarek et al. (2006) reported reduced eye movement latencies toward peripheral stimuli in 10-year-old children with dyslexia, as compared with their normally reading peers. Jaśkowski and Rusiak (2008) found a generally poorer ability to determine the temporal order of visual stimuli, regardless of the direction and position relative to fixation in adolescents and university students with dyslexia than in matched controls.

In fact, there might be some types of dyslexia present, which differ in symptomatology. Voxel-based morphometry revealed grey matter volume (GMV) clusters specific for three subtypes of dyslexia, differentiated on the basis of four cognitive deficits: phonological, RAN, magnocellural/dorsal, and auditory attention shifting (Jednoróg et al. 2014). In all subtypes, GMV was reduced in the left inferior frontal gyrus in 10-year-old children with dyslexia, as compared with age-matched controls. The first subtype with impaired phonological awareness and magnocellular-dorsal skills (all impairments relative to other groups in the study) had an increase of GMV in the left cerebellum, lingual gyrus and right putamen, and a decrease of GMV in the left parietal (mainly somatosensory) and right dorsal premotor cortices. The second subtype with impaired RAN and auditory attention shifting had a decrease in GMV in the left cerebellum, lingual gyrus and an increase of GMV in the left parietal (somatosensory) cortex and the medial part of the right superior frontal gyrus. The third subtype with impaired phonological awareness and RAN had a decrease of GMV in the right parietal cortex.

Reid et al. (2007) identified heterogeneous profiles in Polish adults with dyslexia, who exhibited isolated phonological, isolated cerebellar, isolated visual magnocellular, and combined deficits. This variability might be due to different conditions, such as phonological (Snowling 2000), magnocellular (Stein 2001), or cerebellar (Nicolson et al. 2001) factors; the latter theory has been developed into procedural learning hypothesis (Nicolson and Fawcett 2011). However, Reid et al. (2007) underline that, according to Ramus (2004), the phonological deficit might be the causal factor, and the other deficits: cerebellar and magnocellular, only co-occur.

Polish adults with dyslexia, as compared with their peers without dyslexia, manifested deficits in: phonological (verbal) short-term memory, phonological awareness, RAN on pictorial material (both speed of naming and the number of self-corrections), visual perception, and visual–motor control and coordination (Bogdanowicz et al. 2014; Łockiewicz et al. 2012).

In addition to reading, writing skills have been studied in relation to literacy acquisition in Polish language. One of the first Polish researchers stressing the linguistic aspect of deviations from the spelling standards was Starz (2000). In his study, he analyzed 2.500 essays of 10–14 year-old students', on the basis of which he developed lists of words displaying deviations from the spelling standard, showing that the types of errors change with the students' age. This finding is of great value for the methodology of spelling instruction. In a timed free writing task, dyslexics students produced more word structure errors, but they performed on a level in the length of the essay, the number of linguistic and punctuation errors, and linguistic richness of the text (as measured with the number of adjectives and stylistic devices) (Bogdanowicz et al. 2014). Moreover, highly functioning Polish high school students, university students and graduates with dyslexia exhibited a higher level of aspirations than their normally reading peers with a comparable educational level, which was particularly conspicuous in dyslexic females (Łockiewicz et al. 2014). Therefore, achieving success by adults with dyslexia may depend more on personality and motivational factors, in addition to cognitive factors. The same study reported equal creative and visuo-spatial skills in adults with dyslexia as compared with adults without dyslexia.

Makarewicz (2006) analyzed 60 essays of Year 6 elementary school students in terms of syntax and stylistics. She concluded that the written texts of dyslexic students fulfill the basic function of language (the reader can understand them), and their syntax does not differ from the structure of the correct colloquial language. Moreover, repetition and punctuation errors were frequent, but agrammatisms scarce (punctuation is not considered to be an indispensable element of writing).

Polish students with dyslexia also experience difficulties in learning English as L2. Łockiewicz and Jaskulska (2016) reported that Polish students with dyslexia as compared with their peers without dyslexia, were less accurate and fluent in reading actual words and nonwords in English, and they committed more phonological and orthographic errors in English word spelling task. The dyslexia group also identified correctly the meanings of fewer English words, both very easy (of 1000 frequency), and more challenging ones (of 2000 and 3000 frequency). The speed and accuracy of reading and spelling in the two languages correlated positively, which is consistent with the Linguistic Coding Differences Hypothesis (LCDH) (Sparks et al. 2012). Spelling and reading accuracy deficits were also reported by Nijakowska (2010). Moreover, memory skills predicted vocabulary, especially of higher frequency, in a higher degree in the normal readers than in the dyslexic ones, which might constitute a risk factor for English vocabulary acquisition in dyslexia (Łockiewicz and Jaskulska 2015).

Conclusion

The research on the development of reading and writing skills in Poland is conducted in various theoretical contexts and can serve as an example of the specifics of the development of those skills in an inflectional, semi-transparent language. In Polish, the level of transparency, however, is higher for reading, than for spelling. In Polish elementary school children, phonemic awareness is initially the strongest reading achievement predictor, as initial reading strategy is an analytical, alphabetic one, but its impact decreases with age and education, and mature, orthographic, lexical strategy. The development of spelling proceeds from partial and incorrect transcription to the growth of orthographic and morphophonological awareness. Literacy problems in young learners, such as specific disturbances in psychomotor development leading to later specific difficulties in reading and writing, or already present such difficulties, may indicate dyslexia. Polish students with dyslexia exhibit both reading and spelling difficulties, committing more phonological and orthographic errors than students without dyslexia. They also have difficulties with learning English as a foreign language.

Polish has not yet been a matter of extensive scientific discussion with regard to literacy, though it may produce interesting data, especially when compared with languages of a different degree of transparency. An overview of the research conducted in Poland on literacy, presented in this chapter, points to several research directions that could be followed. First and foremost, a huge disproportion between the research on reading and writing encourages to conduct more studies on spelling and text writing in Polish, especially as Polish orthography poses serious problems for both normal young learners, and learners with dyslexia of any age. It would therefore be advisable to expand this area of research. Research on proficient adult readers is lacking. In addition, the issue of second language acquisition in a monolingual society should be advanced, as Polish children typically begin learning English as L2 when they are as young as 6 years old. Therefore, it would be possible to examine second language acquisition in learners who have not yet completed their first language acquisition, especially in terms of literacy. We believe that the addition of Polish to the inter-language comparisons would be especially interesting, as Polish research basically corresponds to the current trends in the world literature.

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Chapter 14
Research of Reading and Writing in Lithuania: Past, Present and Future

Reda Gedutienė

Abstract If to compare with the abundant literature available on the development of reading and writing, especially in English speaking population, the literature on research evidence of reading and writing in Lithuanian is still sparse. The strong negative influence on Lithuanian research had Soviet occupation. It destroyed the development of Lithuanian psychological and psycholinguistic research as Soviet ideology tried to create a so-called "fusion of nations and languages" and "scientifically" justify Russification in Lithuania. Thus, any attempt to introduce national languages as objects of study in psychology and psycholinguistic was treated as an example of ideologically corrupted "nationalist bourgeoisie research". In Soviet period, there were no research papers on the theoretical models of the development of reading and writing skills in Lithuanian language, no research dealing with the topics on teaching reading and writing skills, no development of psychological assessment tools and no empirical research. After the restoration of Independence in 1990, the several papers and empirical research tried to tackle these problems, but the field still lacks critical mass of research to start productive discussion.

Keywords Research of reading and writing · Lithuanian language · Historical perspective

Introduction

Most of what we know about how children learn to read and write comes from the studies mainly conducted with English speaking children. More than 15 years ago, Arab-Moghaddam and Sénéchal (2001) stated that despite the numerous research of English speaking populations in many places around the world, majority of alpha-

R. Gedutienė (✉)
Department of Psychology, Klaipėda University, Klaipėda, Lithuania
e-mail: reda.gedutiene@ku.lt

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betic languages, in which children learn to read and write are other than English. We know significantly less about how children acquire reading and writing skills in other languages, especially in those, which are used in relatively small populations. For this reason, the development of reading and writing skills is central to current research studies in different writing systems. Research evidence on reading and writing skills and their connections in Lithuanian language is still highly limited. Despite the shortage of theoretical and empirical research, this chapter aims to review reading and writing research in Lithuania from historical perspective, to introduce the main characteristics of Lithuanian language and to present teaching of reading and writing skills in the Lithuanian education system.

Development of Reading and Writing Psychology in Lithuania: Historical Perspective

As Lithuanian psychologists Bagdonas et al. (2008, p. 227) claimed, "*the history of Lithuanian psychology as science parallels the socio-political history of country*". As an overview of the research of reading and writing skills in Lithuania, we can divide short history of reading and writing psychology into two rather broad periods:

- Soviet period: *empty field* in research on reading and writing skills in Lithuania (1940–1989),
- Independent Lithuania: *emerging research* in the field of reading and writing psychology (since 1990).

Soviet Period: Empty Field *in Research on Reading and Writing Skills in Lithuania*

Highly negative impact on Lithuanian science and education had 50 years of Soviet occupation (1940–1989). It devastated the country's economy, culture and language, destroyed the development of science as a major part of Lithuanian intelligentsia were exiled, perished or were forced to emigrate (Bagdonas et al. 2008). Because of the war and Soviet occupation, Lithuania lost one third of its population (Zinkevičius 1998).

Due to various societal forces that operated in the USSR from the 1930s to the 1970s, there was a gap in understanding childhood developmental conditions (Grigorenko 2010; Kornev et al. 2010). During the occupation and Soviet times, research and academic communication in Lithuania was possible on one side of the "iron curtain" (Bagdonas et al. 2008). Thus, academic discourse and its achievements in the Western countries were neglected and ignored. Scientific research and

discussion was hampered by the fact that many books were kept in secret storage "special fund". Foreign scientific literature became virtually inaccessible (Zinkevičius 1998). One-sided orientation towards so-called '*ideologically pure'* psychology sometimes destroyed any productive attempt to inquire problems of reading and writing acquisition because ideologically there was no illiteracy and, consequently, no literacy related problems in Soviet Union.

With the political changes, Lev Vygotsky's collected works in Russian were published in 1983. Lev Vygotsky's ideas on the development of written language in preschool period were rediscovered and made an impact on the preschool education in Lithuania. Previously, the predominant beliefs among the educational scientists and within the society were the following: reading and writing skills are acquired in the educational settings by the formal schooling. The shift towards understanding that the development of literacy skills begins far earlier – even before the child starts attending school – was influenced by the ideas of Vygotsky.

Describing the principles of child development Vygotsky (1983a, b) claimed that the development of children and its transformations happen through adaptation to the external environment. New stage of development is caused not only by innate encoded potential, but it rather stems from the interplay of organism and environment, as well as from child's adaptation to environment. The cognitive processes of children develop when they interact with adults. Vygotsky (1983a, b) introduced genetic principle of cultural development. According to him, any mental function in the cultural development of a child manifests itself in two ways, i.e. as a social and as a psychological: "*firstly inter-human mental function manifests itself as inter-psychic category, then, in the case of child it manifests as intra-psychic category*" (Vygotsky 1983a, b, p. 145). Therefore, it is obvious that "*for Vygotsky social environment is not only a precondition of child's development but also its source and stimulus*" (Bagdonas 1995, p. 136).

Vygotsky (1983a, b) wrote that child's awareness of symbolic functions of written language are developed at an early age, therefore, it makes sense to start the teaching of written language in preschool period. Observing child's development, it is obvious that in families, where books are read, writing devices are used, and especially in families, where there are reading and writing adults, 4–5 years old children learn how to write and read spontaneously. Children start writing numbers, letters, read billboards. During the social interaction process in the preschool age, children naturally acquire the basics of reading and writing skills and understanding of the functions of written language. In other words, Vygotsky (1983a, b) claimed that the awareness of the symbolic function of writing takes place in early age and thus it makes sense to begin teaching written language before school. Moreover, the development of literacy skills cannot be isolated from the social context. Children cannot acquire literacy skills without participating in social activities. Socio-cultural ideas introduced by Vygotsky had profound impact on the understanding of reading and writing skills acquisition in Lithuanian context.

Independent Lithuania: Emerging Research *in the Field of Reading and Writing Psychology*

On 11 March 1990, Lithuania re-established its independence. The changes after 1990 resulted in transition of Lithuanian psychology. It became much more open-minded as the possibilities to communicate with colleagues from Western countries opened. After the restoration of independence, five universities started the psychology studies with the new curricula according to the internationally confirmed standard. However, Lithuania never had state-funded institutions for scientific research in psychology (Bagdonas et al. 2008); comparing to other disciplines in social sciences and humanities (i.e. state-funded *Research Institute for Lithuanian Language*, which was established in 1941 *or Research Centre of Philosophy and Sociology*, which was established in 1990). It is highly probable, that for most readers of this chapter it will be the first acquaintance with the Lithuanian research. Therefore, it is beneficial to provide a short introduction on the characteristics of Lithuanian language and the teaching of reading and writing skills in the Lithuanian education system before proceeding to analyse the empirical research on reading and writing.

The Importance of Language Orthography to the Learning to Read and Write: The Lithuanian Case

Lithuanian is the official language of Lithuania. The language comes from the Baltic branch of Indo-European language family. Only two languages from this large ancient family of languages have survived to the present day: *Lithuanian* and *Latvian* (Ambrazas et al. 2006; Zinkevičius 1998). A remarkable feature of Lithuanian is diversity of dialects: the main dialect areas being High Lithuanian and Low Lithuanian, or Samogitian. Standard Lithuanian is based on the West High Lithuanian dialect spoken in the southern part of the area (Ambrazas et al. 2006).

The Lithuanian alphabet has developed from the Latin alphabet under the influence of the writing systems of languages such as Polish, German, and Czech. The present-day Lithuanian alphabet took the shape by the early twentieth century. Today the Lithuanian alphabet consists of 32 letters (20 consonants/45 phonemes and 12 vowels/10 phonemes) and is based mainly on Latin script. Vowels are represented in writing by 12 letters. The Lithuanian vowels are pronounced as short and long sounds. The two pairs of letters – *y* and *į, ū* and *ų* – represent the same long vowel phonemes, */i:/* and */u:/,* respectively. Lithuanian written language has six diphthongs (*ai*, *au*, *ei*, *ie*, *ui*, *uo*). Consonants are represented in writing by 20 letters; for 3 consonants the digraphs *ch*, *dz*, *dž* are used. The Lithuanian consonants are pronounced as hard and soft sounds. To indicate certain sounds in writing, auxiliary marks are added above or below some letters; e.g. letters with caudata (*ą, ę, į, ų*) and letters with diacritical marks (*č, ž, š, ė, ū*) (Zinkevičius 1998; Ambrazas et al.

2006). In teaching texts diacritics are used to indicate the word stress and syllable accents or intonations (e.g., <Aš noriu nãmo> – *I want a house* or <Aš noriu namõ> – *I want to go home*). Lithuanian is a highly inflected language.

The same letter in Lithuanian language often marks different sounds (for example, letter b means [b'] in the word <**b**erti> – *to pour,* but in the word <dir**b**ti> – *to work* marks sound [p']). Sometimes there is discrepancy between the sounds and the number of letters in word (for example, <juodas> – *black* has 6 letters, 5 sounds or <iššoko> – *jumped out* has 6 letters, 5 sounds). Syllables in Lithuanian language quite often contain consonant clusters in the word (e.g., <**skr**ybėlė> – *hat*, <**skr**andis> – *stomach*, <i**nks**tas> – *kidney*, <akimi**rks**nis> – *flash,* <žvi**lgs**nis> – *sight*). The majority of Lithuanian words are polysyllabic (e.g. <par-duo-tu-vė> – *shop*, <mo-ky-to-jas> – *teacher*, <pa-si-vaikš-čio-ji-mas> – *walk*, <mie-go-ti> – *to sleep*, <ra-šy-ti> – *to write,* <aš-tuo-ni> – *eight*).

There are three principles of Lithuanian orthography – phonetic, morphological and historical. According to the phonetic principle, some Lithuanian words are written in the same way as they are pronounced (e.g., <mama> – *mother*, <teta> – *aunt*, <kava> – *coffee*). The most important principle in Lithuanian orthography is morphological. It depends on the rules of word-formation and inflection (e.g. <au**g[g]**alai au**g[k]**dami užau**g[k]**s> – *growing plants will grow up*). Some words are written using historical principle, i.e. this means writing the same traditional way, disregarding pronunciation and rules of word formation and inflection (e.g., <dr**ą**sus> – *brave*, <**ąž**uolas> – *oak*, <**ž****ą**sis> – *goose*) (Ambrazas et al. 1999).

It is possible to classify Lithuanian language as other alphabetic orthographies along a continuum according to the transparency or regularity of their letter-sound correspondences. Moreover, according to the structure of syllable, alphabetic orthographies are classified into simple and complex (Seymour et al. 2003; Widjaja and Winskel 2004). According to sound-symbol correspondence, English has an exceptionally irregular orthography for reading and spelling. Whereas Lithuanian orthography is largely transparent for reading, but it is not the case for spelling: "*it is proved that some languages are "asymmetrical", i.e. their spelling is more difficult than reading; Lithuanian is the example of this group*" (Pukinskaitė 2006, p. 40). Based on aforementioned criteria, Lithuanian can be interpreted as having *quite complex* syllable structure. The difference in the transparency of writing system influences the development of reading and writing skills, and the connections between these two processes (Pinto et al. 2015). According to the orthography of language, one possibility is that the mechanisms of the development of reading and writing are the same across all languages. Another is that the characteristics of the language affect how children learn to read and write. The "asymmetry"of Lithuanian language (i.e., decoding printed symbols to the language sounds is easier than encoding sounds into printed symbols) influences the teaching of reading and writing skills in schools.

Teaching Reading and Writing in Lithuania

After the restoration of Independence, the reforms in the Lithuanian education system were initiated. Prior to them, children would started compulsory school education from 6 to 7 years of age and there was no compulsory preschool education. After the reforms, the age at which children start a compulsory preschool education is age of six, and compulsory school education starts now at the age of seven. Obligatory preschool education tries to "fill the gap" between children from diverse socioeconomic backgrounds, especially regarding spoken language. The speech therapists in each kindergarten and preschool education unit screen the children in order to identify difficulties of their expressive and receptive spoken language and help to cope with them before the entering the primary school. In Lithuanian kindergarten, there is no formal teaching of reading and writing skills. During the preschool year, children are encouraged to differentiate sounds of language – to notice differences and similarities between them. In addition, children are encouraged to recognize and write letters, and connect them with sounds. The Vygotskian idea of the importance of sociocultural context to the acquisition of literacy was applied, i.e. teachers of the preschool education are encouraged to immerse children into the different literacy activities.

Formal literacy instruction starts at first grade when children are approximately 7 years of age. The four grades of primary school are the *period to teach children to read and write accurately and fluently that they could learn other school subjects by reading and writing* in the secondary school. Before teaching how to decode words and how to write them, during the first semester the listening of spoken language and comprehension of spoken text are developed. Simultaneous reading and writing instructions are used in the primary schools. Reading and writing are taught through the analytic-synthetic teaching strategy, in which the learning of speech sounds and sound-symbol correspondences is important. Normally, by the end of the first school year majority of children are reasonably fluent decoders and spellers of the simple words. It is important to mention that in schools the rules of Lithuanian grammar are taught for 10 years out of the total 12 years of schooling, whereas it is assumed that the ability to decode words and to read fluently will be acquired by the end of the fourth grade. A substantial portion of children experience difficulties in literacy acquisition. The difference in the acquisition of reading and spelling skills is evident as difficulties in spelling occur twice as much as reading difficulties.

There is a lack of epidemiological research providing data on the percentage of schoolchildren facing the reading and writing difficulties as well as on the nature of the reading and spelling mistakes and their analysis. It is supposed that in Lithuania the number of children with the reading difficulties is approximately 6–8%. Spelling difficulties are the most common problem of all learning problems among Lithuanian children. It is estimated that approximately 10–15% of children in primary schools have various spelling disorders (Mokymosi Negalės [Learning Disabilities] 1995). As mentioned before, one of the main reason to explain this discrepancy is *the*

asymmetry of the Lithuanian written language that affects the acquisition of these two processes differently.

The most frequent mistakes in written works of primary school pupils are mistakes of phonetic character. The most difficult cases are established: troubles in writing of short and long vowels, not differentiating of *e* – *ė*, a large amount related to missed or changed letters. The reasons for those mistakes are different: the weakness of auditory perception, the delayed development of the whole speech system, and individual cognitive characteristics. The specific phonetic and dialect features of Lithuanian are of no less importance. The first and second year schoolchildren make mistakes because of the lack of phonemic awareness and underdeveloped skills in auditory analysis and synthesis. About 10% of first to fourth year schoolchildren make many spelling mistakes, both phonetic and morphologic, in their written works because of language disorders (Gedminienė 1997; Šukienė 1997). When the students of the upper classes are compared to the first and second year students it becomes obvious that the former often make more morphologic mistakes, e.g., in the works of the third and fourth year schoolchildren morphologic mistakes constitute approximately 40–42% of total. Collected material shows that every class has approximately from two to six children who need the help of a specialist for learning word spelling (Gedminienė 1997; Šukienė 1997).

After the restoration of Independence, the reforms regarding the education of students with the special needs in the Lithuanian education system were initiated. Due to the high percentage of children with the literacy acquisition problems, each primary and secondary school in Lithuania has a group of specialists (consisting of speech therapist, special educator, social educator and psychologist). This group of specialists helps the students with the special educational needs and gives recommendations to their teachers how to accommodate teaching process to the needs of these students and how to create dyslexia friendly environment.

Review of Emerging Research in the Field of Reading and Writing Psychology

After the Independence, some important works by Lithuanian psychologists analysing reading and writing issues were published. Nevertheless, from recent perspective it is obvious that this topic still lacks both academic discussion and empirical research. In other words, this field still lacks a critical group of researchers and practitioners, who would be able to analyse thoroughly the reading and writing issues in Lithuanian. As an overview of the research during the almost 30 years of the independent Lithuania reveals at least four unresolved issues related to reading and writing psychology. Due to the quite long isolation from the academic discourse in the West, the first issue is related to the lack of knowledge of theoretical models on typical and atypical reading and writing development. Just four theoretical articles and three books regarding this issue were published during aforementioned period:

Psychological analysis of writing and reading (Gučas 1992),
Psychological models of reading (Laugalys et al. 1997),
The changes of conception of early development of literacy: theoretical aspect (Gedutienė 2003a),
The conception of phonological awareness in educational psychology (Gedutienė 2010),
Reading Disorders of Children (Pukinskaitė 2006),
The Dyslexia Archipelago (Gedutienė 2017).
Dyslexia – from Assessment to Coping (Gedutienė 2018).

To sum up the main ideas of these publications, they clearly state that the development of reading and writing skills is highly dependent on the sociocultural and linguistic context. It was supposed that despite the quite different trajectories and speed of development of reading and writing skills in Lithuanian, the successful acquisition of these skills is closely related to the spoken language and motor skills development, phonological awareness and letter knowledge etc. The reciprocal influence between reading and spelling skills was discussed, especially in the context of atypical developmental cases, such as dyslexia.

The next issue is related to the teaching of reading and writing skills. During Soviet times, "*homogeneous education system was a tightly controlled and monitored*"(Grigorenko 2010, p. 10), there were no discussions on different teaching methods and no choice of them. Just one article regarding this issue was published during this period. In the article *Psychological factors in teaching reading* (Poškienė 1992) author claimed, that poor reading skills of students are mainly influenced by two main "teaching deficits". Poškienė (1992) stated that teaching should be focused on the reading of meaningful texts; teaching of reading should be treated as the way-stimulating child's intellectual potential, critical thinking etc., but not as the simple drilling of decoding skills. She claimed that we teach children to read too late and the age of 5 years, instead of 7 years, is sensitive period for learning to read.

One more important and unresolved issue is related to the lack of psychological assessment tools to measure reading and writing skills in Lithuanian. Bagdonas and Čepanskytė (1989, p. 23–24) commented the situation: "*the reading efficiency assessment of Lithuanian readers has no traditions yet. The lack of empirical research on reading process is obvious, especially of the first stages of reading skills acquisition*". Tackling the assessment issues, several publications on the preparation of the psychological assessment tools were published:

The battery of reading tests for adults (Laugalys et al. 1989),
The battery of reading efficiency measures (Bagdonas 1992),
The measures of letter knowledge, phonological awareness, reading and writing skills for preschool and first-year students (Gedutienė 2003a, b; Gedutienė and Rugevičius 2005; Gedutienė 2008),
The assessment battery of reading and writing difficulties for second grade students (Gedutienė and Bogdanowicz 2012).

The last issue is related to the shortage of empirical research. During this period, just several articles were published. In one of the first articles on the psychological profiles of good and poor readers, Bagdonas and Čepanskytė (1989) compared the reading skills of second and third year students in primary school. Based on teachers' evaluations, the children were divided into two groups, as good and poor read-

ers. The results of their reading skills revealed that good readers reached the stage of synthetic reading, i.e. as children from this group recognized words using context, the global word picture and dominant letters in the word. In contrast, poor readers used to read dividing words into syllables and their reading was still on the analytic-syllabic stage.

From 2003 to 2010, several articles on the relationship between pre-school literacy skills and first-grade reading and spelling skills in Lithuanian speaking population were published (Gedutienė 2003a, b, 2010; Gedutienė and Rugevičius 2005, 2006, 2009). In this study, data were collected as part of a longitudinal research investigating the interplay of children literacy skills and their family factors. Almost one third of preschool children (28%) from the sample accurately decoded all separate words and only half of them (14%) were able to spell all the words correctly. This tendency confirmed the idea of Ouelette and Sénéchal (Ouellette and Sénéchal 2008), that ability to decode words is not a necessary condition to spell words phonologically accurately. Consistent with other research (Joshi and Aaron 2003; Lerkkanen et al. 2004) this longitudinal study revealed that word reading and spelling in Lithuanian were strongly related in the preschool age and in the first grade. Most of studies suggested that reading and spelling skills in first grades might share the same component skills or depend upon similar cognitive processes. Word reading and spelling seems to form a reciprocal cycle during the first grades. The results of the present study were in accordance with earlier studies (Aarnoutse et al. 2005; Babayiğit and Stainthorp 2007; Lombardino et al. 1999; Morris et al. 2003; Torppa et al. 2007) that suggested strong interrelationships between knowledge of letters, phonological awareness, word reading and spelling.

Conclusions

Compared to the abundant literature available on the development of reading and writing especially in English speaking population, the literature in Lithuanian is still sparse. Soviet occupation had a heavily negative influence on Lithuanian scientific research. It destroyed the development of Lithuanian psychological and psycholinguistic research as Soviets tried to create a so-called “fusion of nations and languages” and “scientifically” justify Russification in Lithuania.

After the restoration of Independence in 1990, the academic community realized that there was a lack of the theoretical and empirical research on reading and writing psychology. Comparing with the abundant research in another countries, there were no research papers on the theoretical models of the development of reading and writing skills, no research dealing with the topics on teaching reading and writing skills, no psychological assessment tools and no empirical research. The several papers and empirical research tried to solve these problems, but the field still lacks critical mass of research to start productive discussion. The research evidence on reading and writing skills and their connections in Lithuanian language is still highly limited, and there are still quite a lot unanswered questions. Nevertheless,

now there are positive signs that Lithuanian research on reading and writing is on the right path.

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Chapter 15
A Mature Science of Reading and Spelling

Barbara Arfé

Abstract For long, literacy research has been characterized by a "modular" and "anglocentric" approach to the study of reading and spelling. The first has led to consider that word reading and spelling processes could be isolated and studied independently from one another. The second has led to theoretical models of reading and spelling based exclusively on English, an exceptional orthography. A mature science of reading and spelling requires overcoming these two limitations, to develop an integrated -and cross-linguistically valid- model of reading-spelling development. Chapters 11, 12, 13 and 14 in this book examine the relationship between word reading and spelling processes in different orthographies and instructional systems (Turkish, Greek, Polish, and Lithuanian), contributing to enrich the ongoing reflection on a mature science of reading and spelling development.

Keywords Spelling · Reading · Shallow orthographies

Interest in the link between reading and spelling is not new in literacy research (Abbott et al. 2010; Bruck 1993; Curtin et al. 2001; de Jong and Share 2007; Lefly and Pennington 1991; Plaza and Cohen 2003). However, two scientific biases have slowed down the progresses in our comprehension of the concurrent and developmental relationship between these two processes: An attitude of "scientific modularity" in the field of literacy studies (Wengelin and Arfé 2017), and an anglocentric approach to the study of word reading and spelling processes (Share 2008). Scientific modularity derives from considering reading and spelling as two distinct and separate research areas. The implicit idea underlying this attitude is that reading and spelling processes can be isolated and studied independently from one another and that models of reading and spelling can be developed separately (Wengelin and Arfé 2017). The scientific weakness of this approach becomes apparent when we observe that children who fail to learn to decode and read words very often present also significant and persistent problems with spelling and handwriting processes both in

B. Arfé (✉)
University of Padova, Padua, Italy
e-mail: barbara.arfe@unipd.it

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deep (Berninger et al. 2008; Sumner et al. 2013, 2014) and shallow orthographies (Angelelli et al. 2010a, b; Arfé et al. 2018). Yet, the appeal of modularity is so strong that in some countries a diagnostic category exists for isolated spelling difficulties, independent of decoding or word reading problems: dysorthographia. Dysorthographia is assumed to be a specific (modular) developmental spelling disorder, and, as such, it is treated with a focus on spelling skills only (Arfé and Fastelli 2016).

The anglocentric approach to reading and spelling research stems, instead, from the tendency to develop theoretical models for word reading and spelling based on empirical evidence derived from studies on English -an exceptional orthography (Berninger et al. 1998; Share 2008). Although of limited relevance for a universal science of reading and spelling, these models have been a-priori generalized to spelling and reading skills development across languages and educational systems (Share 2008). If anglocentric models inform instructional practices, instruction may not target the more language-specific needs of learners.

Conducting reading and spelling research across different orthographies and educational systems is essential for testing the universal validity of these models and of the knowledge we have explicitly derived from them. Recently, many efforts have been made in this direction, contributing significantly to increase our comprehension of word reading and spelling development (Angelelli et al. 2010a, b; Babayigit and Stainthorp 2010; Barca et al. 2006; Caravolas 2004; De Sousa et al. 2010; Li et al. 2012; Papadopoulos et al. 2009; Schiff and Joshi 2017; van Sette et al. 2017). In this book, the relationship between word reading and spelling processes is examined through the lens of four shallow or semi-shallow orthographies (Turkish, Greek, Polish, and Lithuanian) which have received little attention from international literacy research. Focusing on the common component skills of word reading and spelling (phonological awareness, or phonological encoding, and rapid automatized naming) and addressing the developmental relationship between word reading and spelling, these chapters offer us the opportunity to take a better (broader) perspective on the problem (i.e, how reading and spelling develop) and to consider new elements for the development of a universal and integrated model of reading-spelling development (Papadopoulos, Georgiou, and Apostolou, Chap. 11).

The chapters 12 (Candan, Babür, Haznedar and Erçetin) and 11 (Papadopoulos, Georgiou, and Apostolou) zoom on the role of phonological awareness and rapid automatized naming (RAN) in learning to read and spell words with a focus on two shallow orthographies (i.e., Turkish and Greek). Due to their influence on reading and spelling development across different orthographic systems (e.g. Babayigit and Stainthorp 2007; Berninger and May 2011; Papadopoulos et al. 2009; Plaza and Cohen 2003, 2007), phonological awareness and RAN have been assumed to have a universal role in learning alphabetic scripts (Landerl et al. 2018). Yet, their impact and the timing of their influence may vary across languages and instructional contexts, depending on language-specific factors, such as the shallowness of the orthographic system (Landerl et al. 2018), and on contextual-specific factors, like instructional policies and teaching methods (Pietras and Łockiewicz, Chap. 13, and Gedutienė, Chap. 14).

Chapters 11 and 12 show how, in shallow orthographies, both phonological awareness and RAN can be critical for the acquisition of word reading and spelling. However, when reading is examined across orthographies varying for orthographic depth, phonological awareness skills are found to be a less consistent predictor than RAN (Greek, French, Enlgish, German, and Dutch, Landerl et al. 2018). Landerl et al. (2018) have for example found that whereas RAN can be considered a language-universal cognitive mechanism in learning to read, the contribution of phonological awareness is more complex and variable across orthographies, i.e. it is more language-specific. In spelling, however, a different pattern can emerge, as word spelling processes are typically more analytical than word reading processes (Shahar-Yames and Share 2008). The studies by Candan et al., and Papadopoulos et al., reported in Chaps. 11 and 12, suggest that phonological awareness is more critical for the early phases of learning to spell, and, differently from reading, in spelling it continues to play a significant role even at a later stage, when children show more advanced spelling skills (Candan et al., Chap. 12). The role of phonological awareness could be more consistent (universal) across orthographies in spelling than in reading. Studies that compare the contribution of phonological awareness and RAN both in spelling and reading and across orthographies are needed to test this hypothesis.

Another limitation of current literacy research is the lack of studies which examine the integrated development of reading and spelling across orthographic systems. As suggested by Papadoupulos et al. (Chap. 11) such studies require longitudinal methods. Without a longitudinal analysis of how reading and spelling development are related in an orthographic system, the conclusions we can draw from research are limited and do not allow for causal inferences.

Chapters 13 and 14 zoom on contextual factors and on the role of reading and spelling instruction. Current cross-linguistic literacy research has mainly focused on the dimension of linguistic variability and its contribution to reading and spelling. The characteristics of the language affects how children learn to read and write and the role played in reading and spelling development by specific linguistic and cognitive components such as phonemic awareness or RAN. However, other dimensions of the cultural context, besides language, have an influence on how children learn to read and spell. Current literacy research has largely neglected the sociocultural, political and educational factors that mediate children's experience with reading and spelling. Chapters 13 (by Pietras and Łockiewicz) and 14 (by Gedutienė) well illustrate how not only language structures, but also instructional policies substantially impact on the development of reading and spelling skills through their influence on instructional approaches to reading and writing. Variability in instructional practices has significant impact on the conclusions we may draw from cross-linguistic comparisons. In some countries at the beginning of grade 1 most children are still non-readers, while in others they have comparatively advanced reading skills (Landerl et al. 2018). Thus, while cross-linguistic researchers assume to compare readers in the same reading (and spelling) phase, they may actually compare readers who are in different phases of development of their reading (or spelling)

skills. Neglecting this variability may lead to wrong assumptions and, consequently, less valid conclusions.

An alternative to this cross-linguistic approach is to relate cognitive processes and learning to the context in which they occur. Socio-cultural researchers have demonstrated that to gain a full comprehension of the universal (and cultural) aspects of cognition, analysing cognitive processes across different cultural contexts is essential (Rogoff 2015; Rogoff et al. 2017). Contextual factors and socio-cultural aspects are often a missing piece of the puzzle in current cross-linguistic research. Although the characteristics of a language undoubtedly have a strong impact on reading and spelling acquisition, contextual (educational) constraints are not less important (Pietras and Łockiewicz, Chap. 13; Gedutienė, Chap. 14). The way children are taught a written language may indeed impact on the extent they will use different component skills in reading and writing, the value they will give to the practice and their motivation to read and learn to spell words. The reading and spelling curriculum may vary within and between educational and cultural systems, from explicit teaching of analytical procedures (phonics) to holistic reading and spelling activities, based on the child's exposure to models of written words through print and meaningful reading practices (Chap. 13). Different instructional methods may impact on the use of different linguistic and cognitive resources in learning to read and spell. This large variability in terms of linguistic and instructional factors explains why developing a universal science of reading and spelling is difficult.

As suggested by some contributors of this volume (e.g. Pietras and Łockiewicz, Chap. 13), developing a universal science of reading and spelling does not mean testing the generalizability of developmental models of reading or spelling developed in English (e.g., the Frith's model) to other contexts and languages. A universal science of reading and spelling aims instead at combining evidence derived from cross-cultural and cross-linguistic comparisons in an integrated model capable of identifying both the universal factors and the language-(cultural)-specific cognitive underpinnings of reading and spelling acquisition. As the chapters in this book suggest, universal models of reading and spelling development should include the learning context and specify how both language-specific and educational-specific aspects modulate children's development of reading and spelling skills. The chapters in this book represent a first important step in this direction and show new promising avenues through which this cultural and scientific enterprise can be accomplished.

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Part IV
Integrative Approaches to Literacy Instruction and Remediation

Chapter 16
The Reading – Writing Connection in Assessment of Reading Comprehension. Exploring the Role of a Communicative Aspect of Writing

Per Henning Uppstad, Oddny Judith Solheim, and Atle Skaftun

Abstract In the wake of large reading-comprehension surveys, the role of writing in assessment of reading comprehension has attracted interest. The present explorative study adds to this discussion by investigating whether students' ability *to communicate* their understanding in writing is associated with their reading comprehension scores. We activate the concept of positioning from socio-cultural literacy research, and operationalize it as a task in which the communicator sees him- or herself relative to others during the act of writing. We investigated whether performance on this task could explain unique variance in reading comprehension, as measured by two widely used item formats: constructed response items, where a written response is required, and multiple choice, where students select a response from a set of options. The sample consisted of 209 fifth-grade students (52% girls). Hierarchical multiple regression analyses showed that, after controlling for variance associated with word reading and listening comprehension, scores on the writing task were significant positive predictors of reading comprehension irrespective of item format (i.e., constructed response and multiple choice). Results are discussed as indicative of communication as a core element in both reading and writing, and as a way of supporting the rationale for using constructed response items in reading assessment. This implies making underlying assumptions about communication as part of the reading-writing-connection explicit, and further explore how to include aspects of communication in reading assessment.

Keywords Reading comprehension · Assessment · Writing · Communicative · Positioning

P. H. Uppstad (✉) · O. J. Solheim · A. Skaftun
Norwegian Centre for Reading Education and Research, University of Stavanger, Stavanger, Norway
e-mail: per.h.uppstad@uis.no

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The Reading – Writing Connection in Assessment of Reading Comprehension. Exploring the Role of a Communicative Aspect of Writing

During the past 30 years of reading assessment practice we have witnessed a growing interest in the connection between reading and writing (see e.g., Anderson and Briggs 2011; Fitzgerald and Shanahan 2000; Irwin and Doyle 1992; Jenkins et al. 2004; Johnson et al. 2005; Pearson 1990; Shanahan 1984; Uppstad and Solheim 2011). One aspect of this interest is the introduction and use of items involving a written response in large scale assessment of reading comprehension. As testing techniques employed may affect which (aspect of a) construct is being assessed, questions of validity have been put forward, and there has been a discussion about how the construct of reading comprehension should be understood when writing is involved (Alderson 2000; Jenkins et al. 2004; Johnson et al. 2005). The present explorative study adds to this discussion by investigating whether fifth-grade students' ability *to communicate* their understanding in writing is associated with their reading comprehension scores when measured in different item formats, with varying writing demands.

Written Responses in Assessment of Reading Comprehension

Large-scale studies typically assess reading comprehension by asking students to answer questions about texts they have read (see e.g., Alderson 2000). Typically, the questions are framed in one of two item formats: multiple choice (MC) or constructed response (CR) (see for example Mullis and Martin 2013; OECD 2016). The main difference between these two item formats is that answering a MC question means choosing among listed alternatives, while answering a CR question involves formulating and writing an answer. In the research literature, there is a consensus about the value of using various item formats in a test. In part, this is based on research findings indicating that variation in item formats allows for different types of questions and require different problem-solving strategies (Alderson 2000; Campbell 2005; Farr et al. 1990; Langer 1987; Rupp et al. 2006). Moreover, the variation offered by the use of different item formats may enhance test takers' motivation and reduce the risk of boredom or fatigue undermining validity (Haydel and Roeser 2002).

There have been extensive discussions on how different item formats contribute to the breadth and depth of the construct being measured (i.e., reading comprehension). Also, the risk that specific item formats could affect students' scores in a way that is irrelevant for reading comprehension has been highlighted. Therefore, a central question is: Are writing and reading comprehension two completely different constructs, or do they share common features that are relevant to the assessment of reading comprehension? Some support for both perspectives can be found in

previous research. One example is Shepard (1993) who worried that writing skill might confound a pure assessment of reading ability. His perspective reflects a view of writing as construct-irrelevant to reading comprehension. According to Messick (1995), construct-irrelevant variance implies that an assessment is too broad and affects responses in a manner that is irrelevant to the interpreted construct. In our context, this means that by including CR items, which require a written response, we measure more than pure reading comprehension (i.e., also writing ability). The assessment is thus considered to be too broad, as reading comprehension scores would be affected by differences in both, for example, inference skills (construct relevant) and writing skill (construct irrelevant). Johnson et al. (2005), however, represents a different view. They suggest that we should change the definition of reading such that writing is seen as part of the reading construct. Thus, rather than arguing that any correlation between writing skill and reading comprehension represents construct-irrelevant variance, we should change the construct definition and intentionally try to measure literacy as a construct that implies both reading and writing.

Writing as Communication

Considering reading and writing as communication has since long been central in the theoretical constructs of reading and writing. From a sociocultural perspective, reading and writing have always been situated in a world of utterances – spoken and written (Bakhtin 1981, 1986; Vygotsky 1986). Writers all occupy a position in communication contexts, from where they produce, receive and respond to utterances (Ongstad 2009; Smith 2009; Evensen 2010). Writer development implies an increasing ability to make use of adequate ways of positioning oneself in written texts (Smith 2009; Ivanič 1998). In this sense, Smith (2009) applies the term *positioning* as analytic term: We *respond* to the world or texts when we write, and we *produce* meaning as we read. Insights like these are broadly acknowledged in the humanities (cf. Iser 1978; Fish 1980; Tompkins 1980; Rosenblatt 1995; Langer 1995, 2011). They can also be found in the psychological tradition of reading research. The influential construction-integration model of comprehension (Kintsch 1998) is a prominent example of an implicit emphasis on the connectivity between productive and responsive acts of meaning. *Contruction* points toward production (of new meaning) and *integration* toward a more responsive act of processing existing elements of meaning into new units of understanding. Indeed, constructivist approaches also provided the backdrop for the introduction of the constructed-response format in reading assessment in the late 1980s, and the rationale was to be found in the possibility to ask open ended questions, that is questions with more than one right answer (Pearson and Hamm 2005). An example of this thinking can be found in the framework of Progress in International Reading Study (PIRLS) where it is stated that:

> The emphasis placed on constructed-response questions in the PIRLS assessment is consistent with the definition of literacy underlying the framework. It reflects the interactive, constructive view of reading – meaning is constructed through an interaction between the reader, the text and the context of the reading task (Mullis and Martin 2013, p. 63).

In this line of thought, the constructed-response format gives the opportunity to ask different types of comprehension questions, which is grounded in the idea that the CR format and the written response may capture a qualitatively different and deeper form of understanding than the MC format. However, the argument that we risk measuring aspects of writing skill instead of pure reading skill may exist alongside. In our view, this is possible because reading and writing still are treated as separate objects of research, and largely also as different constructs when it comes to assessment. Our approach has been to study *positioning* as a potential indicator of the double nature of communication, that is, the deep connectivity between its responsive and productive aspects. This study's suggestion of a shared predictor may have implications for the rationale underpinning the choice of item format(s) in reading assessment.

The Present Study

The potential problem that students may understand the text, but may be unable to adequately express that understanding through writing has been repeatedly raised (Alderson 2000). In the present study, we investigated whether students' performance on a communicative writing task could explain unique variance in their reading comprehension, as measured by the CR and MC items format, respectively. The fundamental idea of the design was to present students with a writing task where information to be explained was easy to understand and given graphically, making the *communication* of the information to an imaginary dialogue partner the major task. The task was contextualized as writing a road description by text message to a friend. The fact that the students' road description is written is assumed to yield a different result than if it was orally delivered. The written text was delivered without the characteristic interruptions of an oral description in which a dialogue partner typically would acknowledge the directions one by one. As such, the oral text would be supported by continuous feedback, resulting in an oral road description that would be different from the written. To this adds that conditions for working memory is likely to be different in written versus an oral text of this kind. The approach taken is in line with the deeper rationale for including CR in reading assessment in that we highlight the constructive – or productive – aspect of communicating one's own understanding. What is innovative in our study, however, is the attempt to foreground the communicative aspect per se in a task where we can expect comprehension of the task to be under control.

In the present study, we hypothesized that scores on the communicative writing task would explain unique variance in reading comprehension. More specifically we expected either one of two findings. On the one hand, the written communication

task could predict scores on CR items, but not on MC items. Such a finding would indicate that constructing a response (CR) is different from recognizing a correct answer (MC). On the other hand, the communicative writing task could predict scores on both MC and CR items. Support for this hypothesis would indicate that communicative aspects, traditionally associated with writing, is part of the reading comprehension construct, regardless of the assessment format. This latter prediction is in line with a rationale considering reading and writing as one construct (Johnson et al. 2005).

As predicted by the Simple View of Reading (Gough and Tunmer 1986; Hoover and Gough 1990), word reading skill and listening comprehension has repeatedly been found to predict differences in reading comprehension. Also, previous research has found that aspects of writing, including content, style, organization and writing conventions predicts reading comprehension over and beyond word reading and listening comprehension (Johnson et al. 2005). To our knowledge, the literature has not previously explored whether a highly communicative aspect of written communication – in the frame of positioning – can add to prediction of reading-comprehension scores.

Method

Participants

The participants were 209 fifth-graders (52% girls) from twelve classes at five Norwegian public primary schools. Students enter Grade 5 the year they turn10 years. All children in the five classes participated in the study.

Tasks and Measures

All tasks were group-administered in the students' respective classrooms. The reading-comprehension tests were administered by the respective class teachers in two consecutive days (90 min each day). All other tests (word reading, listening comprehension, and the writing task) were group administered in one session (60 min) by one of the authors and a research assistant.

Word Reading The participants' word-reading ability was measured by Ordkjedeprøven (Høien and Tønnesen 1998). This is a standardised, Norwegian version of the word-split task (for a description see Miller-Guron 1999). Word-split represents a fluency-focused measure of decoding ability, suitable for transparent orthographies (Wimmer 1993). In this test, four words are combined in a word chain without spaces, and participants are instructed to segment letter strings into their constituent words. Words length range between two and seven letters and are

semantically unrelated (Anglicised example: 'treeoverlifesee'). There are 90 word chains in the test, and the participants are only allowed to spend 4 min on it. The score obtained relates to the number of word chains correctly segmented (max 90). The reliability coefficient (Spearman–Brown correction formula based on odd–even correlation) for the standardised sample was .86.

Listening Comprehension Listening comprehension was assessed by means of a standardised classroom-administered screening battery, whose main purpose is to identify children with special needs in reading at the end of Grade 6 (Kartlegging av leseferdighet, 6. klasse [Assessment of Reading Ability, Grade 6] 1995). However, in order to reduce the influence of reading skill on the listening comprehension measure, the administration of the test was adapted. Specifically, while the text was being read aloud, participants had no access to the written text (in the typical administration participants have the text in front of them and may read it themselves). After listening to the text, participants were given a sheet with seven MC questions, which were read aloud to them, along with the response alternatives. Reliability (Cronbach's Alpha) in the present sample was .72.

The Communicative Writing Task The communicative writing task involved writing a text message to a friend on the phone. The writer was given a map (see Fig. 16.1) and was asked to write by hand road directions on a sheet of paper designed to look like the screen of a mobile phone (see, Fig. 16.2). The writer's own position on the map and that of the intended recipient were explicitly shown to the writer, and the positions were repeated in order to ensure that the starting positions were properly understood by all students.

The task consisted of four pages. The first (left-hand) page showed a message on a mobile phone from the writer's friend, asking for directions (Fig. 16.2a). The second (right-hand) page showed an empty mobile-phone screen, where the writer was supposed to give directions (Fig. 16.2b). The third (left-hand) page showed a second message from the friend, who have lost his way (Fig. 16.2c). Finally, the fourth (right-hand) page showed another empty mobile-phone screen, where the writer was supposed to give the second set of directions (Fig. 16.2d). The map was provided on a separate sheet of paper, available to the writer during the entire communication task. The message given on the first page read as follows: 'You are standing at the school, waiting for a friend. You are going to go to the cinema together. The friend you are waiting for has sent you a text: "I'm at the swimming pool. Can you tell me how to get to the school?" However, only you have a map! Help your friend find the way – use the map you have got.'

The design is based on the fact that the two locations are easily identified – and also made explicit by the test administrator – on the map, and that finding the way from one to the other is rather straightforward, meaning that the more difficult task is to make the route between these locations clear to the recipient of the text. In this way, the task addresses the writer's awareness of what information the recipient needs. In the second step of the task, on the third (left-hand) page, this awareness

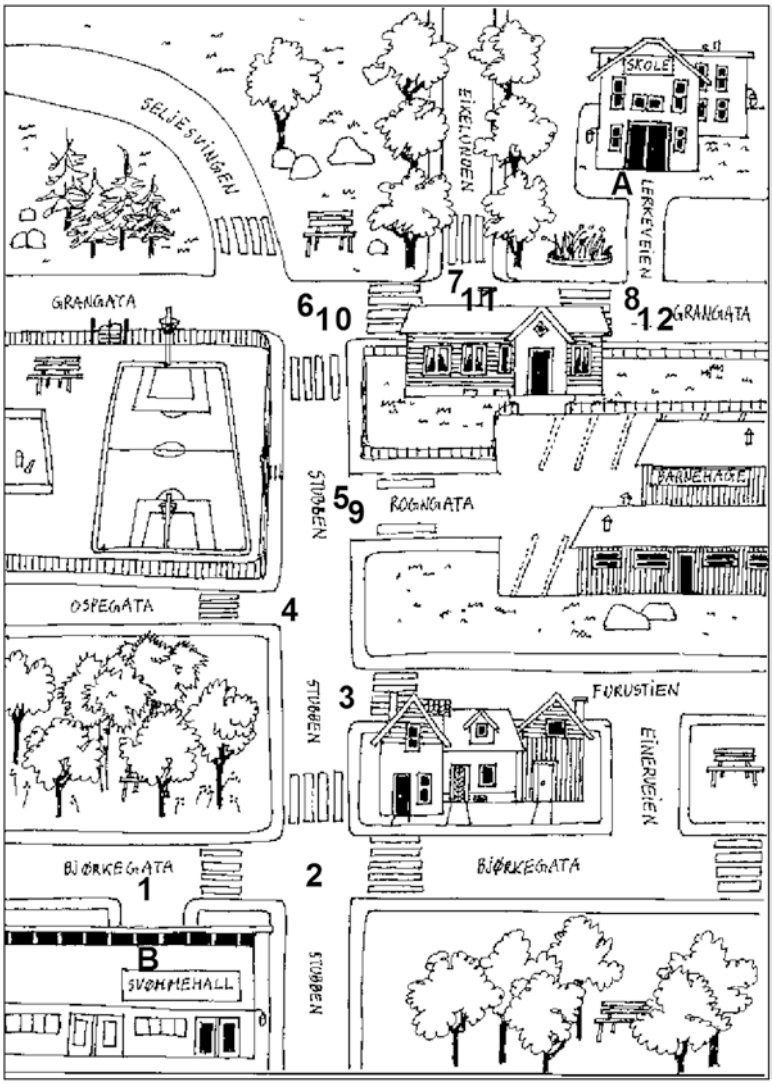

Fig. 16.1 Map used in the communication task. The positions of the writer and his or her friend are marked A (school) and B (swimming pool), respectively. The scoring waypoints are marked 1–12

was targeted by giving the writer a message saying that the recipient had failed to follow the first set of directions: 'After a while you get a new text from your friend: "I'm standing in a parking lot near a day nursery. Am I on the right way?" Write him a new text where you tell him how to get to the school.'

The scoring of the students' answers was based on a number of waypoints on the map identified as representing a potential for misunderstanding (see, Fig. 16.1).

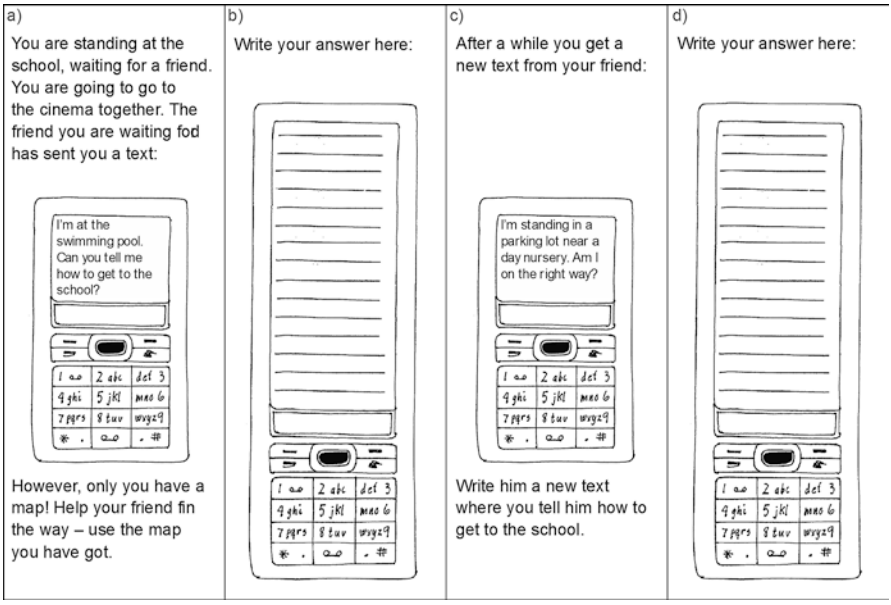

Fig. 16.2 Communication task to measure the ability to make oneself clear to an imaginary recipient. The task consists of four pages (**a**–**d**), but only two of them were visible at a time: first (**a**) and (**b**), then (**c**) and (**d**)

Directions leading to success in relation to one waypoint were awarded one point (see Appendix 4 for detailed scoring guides). The maximum score was 12 points, of which 8 points in the first step (pages 1 and 2) and 4 points in the second step (pages 3 and 4). For waypoints 3, 4, 5 and 7 (crossings where the recipient was not supposed to make a turn), a writer scored 1 point if the message contained information sufficient to bring the recipient of the text beyond the respective waypoint. For waypoints 1, 2, 6, 8, 9, 10, 11 and 12 (waypoints where the recipient was supposed to make a turn), a writer scored 1 point if the message contained information about direction and movement sufficient to bring the recipient beyond the respective waypoint. Failure at one waypoint did not necessarily affect the scoring of the next waypoint. It turned out that three of the waypoints (3, 4 and 5) (see Fig. 16.1) discriminated poorly among students, as reflected in low item-total correlation. The three removed items were the easiest items in the scale (answered correctly by 91%, 99% and 86% of the students respectively), and had an item-total correlation < .16. All other items had an item-total correlation above .30. The poorly discriminating items were removed from the analysis, meaning that the final scale had a maximum of 9 points (Cronbach's Alpha = .72).[1] All student writings were scored by two scorers. Inter-rater reliability (Pearson *r*) was .98.

[1] We did all regression analyses with both scales, and ended up with identical results.

Reading-Comprehension Measures To obtain representative measures of reading comprehension, the participants read and answered questions about 13 different texts, all included in a piloting of Norwegian National Tests for fifth graders. The texts belonged to either of two main categories (viz., fiction and non-fiction), and varied in content, length (from 55 to 744 words), and complexity. All texts had originally been written for children, and they represented different text types including narrative, short story, report, recipe, instruction, and expository text (see Appendix 1 for more information about the included texts). The 13 texts were distributed across two booklets, each containing fiction texts and non-fiction texts. Each text was followed by a mixture of MC and short-answer CR questions (see Appendix 2 and 3 for sample items). CR items (or limited production response type) only required short answers. The questions were designed in line with the four comprehension processes used for item development in PIRLS (1) focusing on and retrieving explicitly stated information, (2) making straightforward inferences, (3) interpreting and integrating ideas and information, and (4) examining and evaluating content, language, and textual elements (Mullis and Martin 2013). The participants were allowed to refer back to the text passages while answering the questions.

In total, there were 64 comprehension items, half of them were in MC format and the other half in CR format. Across both forms there were items from fiction texts and items from non-fiction texts. Scoring criteria for the CR items were produced during item development. Scoring was done by a team of four scorers, provided with a detailed written scoring manual. 10% of the items (including both MC and CR) were scored twice, by two different scorers, and inter-rater reliability (Pearson *r*) was .99. Each item – both MC and CR – was worth 1 point and maximum score for each scale was 32. Reliability (Cronbach's Alpha) was .89 for the MC scale and .88 for the CR scale.

Results

Descriptive statistics and a correlation matrix for all variables are presented in Table 16.1. The mean, standard error of the mean, standard deviation, skewness and kurtosis for each variable are presented at the bottom of the Table. As can be seen, the coefficients of skewness ranged from −1.45 to 0.42, and the coefficients of kurtosis ranged from −0.80 to 1.50. No score distribution was found to be substantially skewed, and all scores were deemed suitable for use in parametric statistical analyses.

We used hierarchical multiple regression analysis to investigate whether the writing task predicted unique variance in reading comprehension. In the first step, we entered word-reading ability and listening comprehension. In the second step, we added the writing task. This was done separately for scores on the MC scale and the CR scale, respectively, as the dependent variable.

Table 16.1 Descriptive statistics and correlations for all variables

	Variable	1	2	3	4	5
1	Word-reading ability	–				
2	Listening comprehension	.14∗	–			
3	Communicative writing	.15∗	.26∗∗∗	–		
4	MC scale	.50∗∗∗	.39∗∗∗	.42∗∗∗	–	
5	CR scale	.48∗∗∗	.41∗∗∗	.41∗∗∗	.86∗∗∗	–
	Mean	30.84	5.79	5.54	19.88	18.07
	Standard error	0.70	0.11	0.16	0.51	0.45
	Standard deviation	10.16	1.58	2.31	7.31	6.52
	Skewness	0.42	−1.45	−0.38	−0.44	−0.61
	Kurtosis	0.11	1.50	−0.56	−0.80	−.26

∗$p < .05$, ∗∗$p < .01$, ∗∗∗$p < .001$

Table 16.2 Summary of hierarchical regression analyses for variables predicting CR and MC reading-comprehension scores

	CR reading comprehension			MC reading comprehension		
	B	SEB	B	B	SEB	B
Step 1						
Word-reading ability	0.28	0.04	.43∗∗∗	0.33	0.04	.46∗∗∗
Listening comprehension	1.43	.0 24	.35∗∗∗	1.51	.0 26	.33∗∗∗
Step 2						
Word-reading ability	0.26	0.04	.40∗∗∗	0.31	0.04	.43∗∗∗
Listening comprehension	1.15	0.23	.28∗∗∗	1.17	0.25	.25∗∗∗
Communicative writing	0.78	0.16	.27∗∗∗	0.93	0.17	.29∗∗∗

∗$p < .05$, ∗∗$p < .01$, ∗∗∗$p < .001$

Table 16.2 shows the results of regression analyses of the CR and MC reading comprehension scores separately. For CR items, both word-reading ability ($B = .43$) and listening comprehension ($B = .35$) were positive predictors of reading comprehension scores in the first step. This model explained 34% of the variance in CR reading comprehension scores ($R = .592$, $R^2 = .344$, $p < .001$). After controlling for the variance associated with the variables entered in the first step, scores on the writing task ($B = .27$). accounted for additional variance in the CR reading comprehension scores. The full model explained 42% of the variance in CR reading comprehension scores ($R = .648$, $R^2 = .419$, R^2 change = .069, F change = 24,390, $p < .001$). This indicates that participants who performed better on the road directions performed better on the CR reading comprehension items. Although the three independent variables contributed to CR reading comprehension scores in Step 2, the inclusion of writing task slightly reduced the predictive power of word-reading ability ($B = .40$) and, especially, listening comprehension ($B = .28$).

Table 16.2 further shows that both word-reading ability ($B = .46$) and listening comprehension ($B = .33$) were positive predictors of MC reading comprehension scores in the first step. This model explained 36% of the variance in MC reading comprehension scores ($R = .598$, $R^2 = .357$, $p < .001$). Again, after controlling for

the variance associated with the variables entered in the first step, scores on the writing task ($B = .29$) accounted for additional variance. The full model explained 44% of the variance in MC reading comprehension scores ($R = .660$, $R^2 = .436$, R^2 change = .078, F change = 28,457, $p < .001$). As regards changes in beta values, the same pattern as for CR reading comprehension was observed for MC reading comprehension. Entering the writing task in the model reduced the predictive power of both word reading ($B = .43$). and listening comprehension ($B = .25$).

Overall, results showed that writing, as measured by the communicative writing task involving the writing of road directions, did make an independent contribution to the variance in reading-comprehension scores above and beyond, the contributions from word reading and listening comprehension. This was observed for both the MC scale and the CR scale.

Discussion

This explorative study examined whether performance in a communicative writing task would account for unique variance in two widely used item formats for measuring reading-comprehension (CR vs. MC). Results showed that the pattern of predictors explaining variance in reading comprehension was very similar across item format, and further that performance in the communicative writing task was an important predicator of reading comprehension irrespective of item format. In this last part of this chapter, we first discuss a traditional rationale for considering reading and writing as separate constructs, before we return to the starting point: Communication as a core element in the reading-writing connection and thus also as a construct representation issue, in theory and in assessment.

Reading and Language Comprehension Versus Writing and Language Production

In the tradition of reading-assessment research, the predictive power of listening comprehension, interpreted as reflecting a close connection between reading and language comprehension (reception), has been a central part of the rationale for demarcating reading from writing. The simple view of reading (Hoover and Gough 1990) is a prominent example, providing a model where reading comprehension is the result of two factors: general linguistic comprehension (operationalized as listening comprehension) and decoding. Our results show that the communicative writing task, traditionally seen as an aspect of writing, explains unique variance in reading comprehension over and above the contribution of word reading and listening comprehension. These findings call for critical reflections. First and foremost, they indicate that there is more to reading than the simple view model tells us. This claim is supported by branches of research such as reading comprehension research (Israel

and Duffy 2014) and what is called *New Literacy Studies* (cf. Barton 1994; Street 1984), which have emphasised that other factors such as motivation, knowledge and strategies (cf. Alexander 2005), lifelong learning and the situated nature of literacy (Barton et al. 2000) is associated with reading comprehension The communicative writing task in the present study task was designed to foreground situated communication and the positioning of oneself relative to another. To the extent that the task does what it is designed to do, our result indicate that active response is an important feature of reading, that deserves to be considered as important part of assessment. This suggestion is not a radically new one. It is based on the rationale for bringing in the CR-format in order to afford students to construct their own responses.

Returning to the Construct Representation Issue

In the introduction, we presented concerns voiced in reading-assessment research about the impact of writing in relation to the use of CR items. The first one – the claim that formulating written answers to CR questions brings non-reading skills into play, or, more radically, results in the assessment of aspects of writing rather than pure reading skill – assumes that reading and writing are unique constructs, and that combining them means blurring the ideal pure measure of reading. Moving away from considering the writer and the reader separately, to focus instead on what the reader – who is also (at least potentially) a writer – does when responding to a written utterance, we may turn to a concept of 'responsiveness' that encompasses important aspects of dialogue theory: response and responsibility (Bakhtin 1986), and stresses that positioning of oneself in an utterance is inevitably linked to past and future utterances. In our view, these aspects cannot be captured by the standard listening comprehension measure, which not only addresses a different, less responsive situation, but also largely measures the ability to understand a text read out aloud in a linear, monological way.

In a previous study, Johnson et al. (2005) found that a component score of writing, including content, style, organization and writing conventions, predicted reading comprehension over and above word reading and listening comprehension. This was true even when they deconstructed the comprehension test into a MC score only. In the present study we emphasised another aspect of writing, that is, a communicative aspect. However, our results add to evidence that indicate common features in the reading and writing process. Both studies are examples of Alderson's (2000) suggestion of using research on reading assessment to better understand the construct in question. Based on insights from this research, Johnson et al. (2005) suggest that we should change the definition of reading in such a way that writing and reading are viewed as one combined literacy construct, rather than unique constructs.

Cutting the Gordian Knot of Item Formats

The rationale for using CR items in reading assessment contains potential for further development, as the communicative aspect is largely taken for granted. Student-created responses is associated with "depth of meaning" (Mullis and Martin 2013; Solheim and Skaftun 2009), that is, with the communicated content, rather than with the act of communication or what we might call responsiveness. The present study has explored the potential in the rationale for bringing CR into reading assessment, and our results suggests that bringing the communicative aspect of reading and writing to the foreground might deserve the attention of future research on reading assessment design. Rather than maintaining a strong equation between different reception skills (reading and listening) on one hand, and between production skills (writing and speaking) on the other, future research should investigate the common ground of these skills. Our modest ambition with the present explorative study is to inspire to such initiatives.

The idea of responsiveness as a shared feature of reading and writing may, more speculatively suggests a solution to the Gordian knot relating to the use of CR in reading assessment. The conception of writing as a problem in assessment of reading comprehension may actually arise as a direct consequence of separating reading from writing, meaning that the problem derives from the underlying theoretical assumptions. The knot is impossible to untie precisely because of division by definition, and because of the complex entanglement of theoretical assumptions and pragmatic compromises in test design. We have argued that the communicative aspect of reading implicitly underlies the turn toward CR as a way of affording students to form their own responses. On the way from theoretical framework to concrete items and scoring guidelines, what is implicit in theory, is forgotten or – with our metaphorical reference to Alexander – twisted into an unresolvable knot. Like Alexander the Great, we might cut the knot open instead, thus separating the theory from the assessment tools so that we may reconsider each of them. We suggest that conceiving reading and writing as realisations of one potential of comprehension might serve as sword in this situation. It should be noted that a theory according to which reading and writing form an inseparable whole does not prevent the use of separate measures of reading and writing, respectively – all it does is to contextualise such delimitations. When operationalized, reading and writing could be highlighted as foreground versus background, respectively. Such a theory would provide an alternative background for reasoning about the meaning of writing in reading assessment, and it also makes room for taking other perspectives on the different properties of various item formats. When we aimed at investigating the predictive power of a communicative writing task on reading comprehension, it was necessary to find an established conception of the double nature of communication. Identifying this conception in sociocultural research, in terms of *positioning*, we found ourselves involved in contributing to bridging a gap between different traditions of research. Further research might bring more arguments in both directions across this bridge.

Limitations

First, the CR and MC scales were highly correlated (r = .86), meaning that they measure almost the same. This could be a consequence of the CR items being restricted to a short-answer format. If we had chosen a CR format where students were required to write more elaborate answers, this could potentially have resulted in lower correlations between the two scales, meaning that the two scales to a larger degree measure different things. Such a scenario would also have allowed for larger differences in prediction patterns between a MC and CR scale. However, the correlation between CR items in a restricted versus an elaborate format, and between MC and CR questions in different formats respectively, is a question for further research.

Also, in this study we chose to focus on one specific aspect of writing (i.e., communication). The choice is intentional, but by doing this we exclude other components of writing that may also influence reading comprehension assessments (see Johnsen et al. 2005).

The communicative writing task also carries some methodological challenges. The communicative task targets the ability to take the receiver's perspective into account when formulating a road description. As such the written product is evaluated from a receiver's point of view. In the present study, a task was given in relation to a map in place of a written text in order to diminish – not exclude – the influence of reading in the task. However, we cannot exclude potential differences in the students' ability of spatial orientation and their skill of reading a map. To reduce the impact of this issue the test administrator provided a very explicit instruction of the positions of the student and the receiver of the message on the map, and where the student should guide the receiver to go. Also, the CR items in the reading comprehension assessment tended to elicit rather short written answers. It remains an empirical question whether a more comprehensive writing task and reading comprehension items eliciting more extensive written answers and would give a different picture than reported in the present study.

Educational Implications

Interestingly, the students engaged enthusiastically in performing the task, followed by a dedicated discussion about how to best make one's own understanding clear when writing to another person. For the educational field, the perspective of the present study may point to educational practices maintaining the idea of reading and writing as communicative acts. As such, the communicative writing task in the present study seemed to represent a task in which students experienced and realized that writing actually matters. For future educational scrutiny it would be even more interesting to study the potential impact of this kind of experience on further writing.

Appendixes

Appendix 1: Texts Used in the Assessment of Reading Comprehension

Title	Text type
Kan jeg forandre på hjernen? [Can I change my brain?]	Non-fiction written for children
Skyer [Clouds]	Non-fiction written for children
Slik lager du en drage [How to make a kite]	Instruction
De tause vitnene [The silent witnesses]	Article
Jakten på Titanic [The search for Titanic]	Non-fiction written for children
Urfolk uten fremtid [Indigenous without a future]	Non-fiction written for children
Grekerne [The Greeks]	Non-fiction written for children
Sveler [Raised pancakes]	Recipe
Den blanke bjølla [The shining bell]	Short story
Stakkars mann [Poor man]	Short story
Hoppetauet [The skipping rope]	Short story
Livsfarlig jungle [Dangerous Jungle]	Short story
Løveungen som ikke kunne brøle [The lion who didn't know how to roar].	Short story

Appendix 2: Sample Items for the MC Reading-Comprehension Measure

What is the Greek word for 'knowledge'?

A History
B Politics
C Archaeology
D Logos

'They taste extra good with Norwegian goat cheese and jam', the text says. Which description fits this paragraph best?

A Serving advice
B Instructions
C Advertisement
D Recipe

What does the lion father think is the worst that can happen to a lion?

A Being eaten by a crocodile
B Not being able to roar
C Being laughed at
D Only being able to eat mice

What is the similarity between Karsten and Stian?

A They are both proud and solemn
B They both live in the jungle
C They both have to leave their families but come home in the end
D They are both laughed at, but in the end they are both admired

Appendix 3: Sample Items for the CR Reading-Comprehension Measure

What animals pulled Medea's chariot?

_____

Why do you think you should not fly a kite near a road with heavy traffic?

_____

At the end of the story, Karsten's family no longer laugh at his squeaky roar. What has happened to make them stop laughing at Karsten?

_____

Why does Stian stick his front paw in his mouth to throw up what he has eaten?

_____

Appendix 4: Scoring Criteria for the Communication Task

Each waypoint is scored separately, meaning that failure at one waypoint will not affect the scoring of the next waypoint.

At waypoints 1, 2, 6, 8, 9,10, 11 and 12 it is mandatory to indicate direction. 'Left' or 'right' scores 1 point, but not 'up' or 'down' ('up'/'down' is deemed to be a correct answer only at crossings where there is only one option). Wrong direction (left instead of right and vice versa) is scored as a correct answer, to avoid measuring students' knowledge of left and right.

At waypoints 3, 4, 5 and 7, students have to verbalise a way to go beyond the respective point. For waypoints 3, 4 and 5, this criterion is met by answers such as 'Grangata', 'Seljesvingen' [two street names], 'the end of the road'and 'the top of the hill'. Similarily for waypoint 7 when 'Lerkevegen' [street name] is identified as the target, as well as 'the end of Grangata'.

Examples

Waypoints 1 and 2:

'You first leave the swimming hall and then turn right. Then take the first left.' 1+1
'First you go out to Bjørkegata [street name], then right, then you turn north onto Stubben [street name]' 1+1
'You go to Bjørkegata, then you turn right, then you go to the end of Stubben' 1+0
(does not indicate direction at waypoint 2)
'First you go to Bjørkegata. Then you go straight ahead until you see a street that is called Stubben. Then you go straight ahead …' 0+0
'Go down Bjørkegata until you reach Stubben. Go down Stubben until you reach …' 0+0 (does not indicate direction at either 1 or 2)

Waypoints 3, 4, 5 and 6:

'And then take the fourth road to the right' 1+1+1+1
'(To the left) until you reach a crossing were there is a road going both left and right, there you turn right onto Grangata' 1+1+1+1
'And then you go straight ahead until you see Grangata, then go on until you see …' 1+1+1+0
(no point awarded for point 6 because there is no indication of direction (left/right), but still the student manages to go beyond waypoints 3, 4 and 5)

Waypoints 7 and 8 as well as 11 and 12:

'And then the second road to the left, and then you have reached the spot, and then you go straight in' 1+1
'Down the road until you reach Lerkeveien, and go down that road, and then you reach me' 1+1
'To Grangata and up Lerkeveien' 1+1
(indicates passing Eikelunden [a park] and going onto Lerkeveien)
'The school is in Lerkeveien' 1+1
'Straight ahead until you reach Lerkeveien, then you go into the school yard' 1+0
'Then you move to Lerkeveien. Then you see the school after a short walk' 1+0

(no point awarded for waypoint 8/12 because there is no indication of going onto Lerkeveien)
'Then to Lerkeveien, and you are there' 1+0
(does not indicate turning onto the street)
'Then you see Lerkeveien, there is the school' 1+0
(passes Eikelunden, but does not indicate direction at waypoint 8)
'To the right onto Grangata, then you cycle up to the left, and there you find the school' 0+1
(does not pass waypoint 7)

Waypoints 9 and 10

'Then you go to Stubben, then right, and then right again' 1+1
'To the left there is a soccer field, then you go up to the crossing and then turn right onto Grangata' 1+1 (indicates direction at waypoint 9 in relation to the soccer field)
'No, leave the parking lot, then go until you see Grangata, and you continue' 0+0 (indication of direction missing for both waypoints)

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Chapter 17
Mothers Teaching their Children the Hebrew Writing System: The Effects on Children's Early Writing and Reading Skills

Adi Elimelech, Dorit Aram, and Iris Levin

Abstract The chapter presents two studies that longitudinally assessed the efficacy of home-based literacy interventions focusing on writing, in promoting preschool children's writing and reading skills. Within both studies, mothers gained theoretical knowledge about early literacy. They learned how to efficiently support their children's early writing in Hebrew and use everyday activities to encourage their children to go through the process of spelling words. Children and mothers practiced short, guided, pre-planned activities focusing on writing, 3–4 times a week. The two studies differed in the audience that they approached and the intensity of the guidance. In the first study, participants were mothers from a low SES and they were guided weekly on an individual basis in their homes (8-weeks intervention). In the second, parents were from a middle SES and they were guided in four group meetings over 12 weeks. In both studies, the intervention significantly promoted children's spelling. At the end of the programs and at the follow up (a couple of months later), children from the intervention group showed advantages over the children in the comparison group. Although we did not discuss word reading with the mothers and did not encourage them to practice word reading with their children, we found that the writing interventions were effective in promoting children's word reading.

Keywords Early intervention · Socioeconomic status · Early literacy · Home literacy environment · Parent-child interactions

A. Elimelech
The Department of Education, Shaanan Academic Teachers College, Haifa, Israel

D. Aram (✉) · I. Levin
Department of School Counseling and Special Education, Constantiner School of Education, Tel Aviv University, Tel Aviv, Israel
e-mail: dorita@tauex.tau.ac.il

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Introduction

The transition to school is a significant period in children's development, and gaining an understanding of the writing system constitutes one of its central challenges. At the preschool age, writing activities encourage children to analyze the sound structure of words, and support internal phonemic segmentation and learning of letters (Hall et al. 2015). Writing is a fun yet demanding task for children. We aimed to learn whether guided experience in writing at home enhances children's writing. Thinking about the relationship between reading and writing, we asked whether guided writing activities at home promote children's reading ability. Will these benefits be sustained a few months after the end of the intervention? Lastly, do these parent-child writing activities promote children's reading and writing abilities across different socio-economic status (SES)? This chapter presents two intervention studies examining these questions. The purpose of the studies was to assess the contribution of home-based intervention programs, which guided mothers of preschoolers in practicing writing Hebrew with their children, to the children's early writing and reading skills immediately following the intervention and a few months later.

Early Literacy

Early literacy includes the cognitive foundations of reading and writing that develop in children before they are formally and methodically taught in school. Early literacy includes language abilities, letter knowledge, phonological awareness, familiarity with conventions of print, and early reading and writing (Reese et al. 2010). There is evidence that early literacy skills predict children's success in the acquisition of reading and writing in school (e.g., in the United States – Lonigan and Shanahan 2009; in Mexico – Pratt et al. 2015; in Canada – Hipfner-Boucher et al. 2014; in Israel – Aram 2005). In alphabetic languages, the main predictors of reading and writing school achievements are phonological awareness, letter knowledge, and early writing (NELP 2008).

Phonological Awareness Phonological awareness is defined as the sensitivity to the structure of the sounds of the word. It relates to the ability to identify and manipulate the parts of the spoken word (Pufpaff 2009). In alphabetical writing systems, reading and writing are based on phonological awareness skills (Katzir et al. 2012). The child is required to divide the word into phonemes (the smallest sounds in the language) and to integrate the phonemes and the letters into a word (Levin and Aram 2013). Studies have found strong correlations between the level of phonological awareness in preschool and children's reading and writing achievements in school (Castles et al. 2012; Reese et al. 2015). Compelling evidence also has shown that practicing phonological awareness skills at preschool age (for example, through

activities requiring the division of words into syllables or sub-syllables) has a positive effect on reading and writing acquisition in school (Metsala 2012).

Letter Knowledge Letter knowledge includes recognition of the shapes of the letters, their names, and the connection between their graphic representation and their names and sounds (Robins et al. 2014; Treiman, et al. 2012). This knowledge is the basis for learning to read and write (Share 2008). Preschool children with better letter knowledge understand the writing system more rapidly and accurately than those who are less aware of the letter shapes, names, and sounds (Neumann and Neumann 2014). Letter knowledge has been consistently found to predict reading and writing acquisition in school (Bowles et al. 2013; Foulin 2005; Robins et al. 2014). There is evidence that training children in letter knowledge improved their word reading skills as well as their understanding of the written system (Levin et al. 2006).

Early Writing In literate societies, children show an interest in the written marks and spontaneously engage in writing much before they receive formal training to read and write (Dunsmuir and Blatchford 2004; Love et al. 2007; Neumann et al. 2012; Tolchinsky 2006). Children begin to understand the written code when they start to represent the sounds within words with phonetically relevant letters. Early writing integrates phonological awareness and letter knowledge via the process of learning to convert the sounds of the word into the appropriate sequence of letters (Jones 2015; Levin and Aram 2013). Studies have found that children's early writing levels predict success in the acquisition of reading and writing in school in various languages. Hall et al. (2015) conducted a review of studies that showed preschool writing abilities as predictive of reading ability including deciphering, reading comprehension, and spelling in Hebrew and in English. In Australia and in the United States, positive correlations were found between levels of English writing at preschool age and the child's success in reading at school as well as levels of motivation to learn (Donica et al. 2013; Neumann et al. 2013). In Israel, writing in preschool predicted reading and writing achievements at the end of first grade in both Hebrew (Shatil et al. 2000) and Arabic (Hassunha Arafat et al. 2017).

Overall, phonological awareness, letter knowledge, and early writing are major literacy predictors. An efficient way to practice these skills is through adults' mediating writing activities for their children (Levin and Aram 2013).

Writing Mediation

Writing is a mentally challenging task that involves transforming a spoken word to written symbols on the page (Berninger et al. 1996). Preschool children are interested in writing, but they know how to write only a few words independently (e.g., their first or last name; Levin et al. 2013). They therefore need help to master the

principles of writing. When parents support their children's writing efforts, they help them integrate basic literacy skills, such as phonological awareness and letter knowledge (Skibbe et al. 2013). Through joint writing activities with adults, children gather key principles about writing functions and productions (Tolchinsky 2006).

Effective writing mediation occurs when the adult directs the child to break up the word into its sounds (phonological awareness), connect the sound with the letter, and independently produce the written form of the letter (letter knowledge) (Hall et al. 2015; Levin and Aram 2013). Analysis of parental writing mediation mainly reflects the degree to which parents guide their children through this process (e.g., Aram and Levin 2001, 2004).

The nature of parents' writing mediation predicts children's literacy achievements in different languages (for a review see Aram and Levin 2011; Levin et al. 2013; Neumann et al. 2012). For example, in the United States, Bindman et al. (2014) assessed mothers' writing mediation of a birthday invitation with their preschool-aged children. They found that maternal writing mediation correlated with children's alphabetic skills, after controlling for the child's age and maternal education. Skibbe et al. (2013) followed these children and 1 year later, found that maternal writing mediation in preschool longitudinally predicted the children's alphabetic skills in kindergarten. In Israel, researchers found that mothers writing mediation level in kindergarten predicted children's early literacy skills beyond the family socio-economic status (SES), both in Hebrew (Aram and Levin 2001) and in Arabic (Aram et al. 2013a, b). In follow-up studies, the researchers found that the mothers' writing mediation level in kindergarten also predicted their children's reading and writing levels in school (Aram and Levin 2004 in Hebrew; Aram et al. 2013a in Arabic).

The Present Studies

Despite the importance of joint writing activities, adults are less familiar with effective ways to support preschoolers' writing (Aram and Levin 2011; Pelatti et al. 2014; Sverdlov et al. 2014). The two intervention studies described below assessed the benefits of teaching parents of preschoolers how to effectively support their children's writing at home. Israeli children aged 3–6 study in preschool and formal reading and writing instruction begins in the first grade. Both studies are longitudinal, that is, we assessed the children's reading and writing skills at beginning and at the end of the interventions as well as two and a half months later (in the first study) or three and a half months later (in the second study). The major differences between the two studies were the participants' SES and the intensity of parents' guidance. In the first study, participants were parents from a low SES and they were guided individually in their homes. In the second study, parents were from a middle SES and they were guided in group meetings in the local school.

Writing in Hebrew Learning the impact of early writing practice on children's reading is especially interesting in Hebrew. Hebrew is an abjad writing system. In Hebrew[1] all consonants are represented fairly consistently, but only some vowels are marked by letters, and inconsistently so. Due to the language structure, children usually try to write before they try to read (Katzir et al. 2012). The consonant root is at the center of the Hebrew word. It carries the principal meaning of the word, and is retained in all morphological declensions. The vowels/diacritics change from one morphological declension to another. The consonant form of writing without diacritics (the way that books are written and people, as well as children, write in everyday life) is easy to write but difficult to read because it includes homographic words that are identically written, yet read differently. For example, the word ספר (s'f'r') can be read as *safar (counted), sefer (a book),* and more. Certain letters (the 'vowel letters') have an additional function of representing vowels (Levin et al. 2013). Vowel letters do not represent all of the vowel sounds. At times one letter can represent two vowels (for instance, the letter *Vav* ו' can make the sounds [o] or [oo]. Preschool children have difficulty learning these rules. Most of Hebrew writing is based on consonant letters, which is hard to read because children do not know which vowels to use (is the r letter - ra, ro, ree, etc). However, when a child wants to write a word he or she does not need to differentiate between the various vowels and only uses the consonants (Levin and Aram 2013). Levin and Aram (2013) found that providing information for segmenting a word into its sounds and mappings each sound to its letter effectively promotes the Hebrew writing of five-year-old children. Furthermore, feedback that related merely to the names of the letters and their appearance was no more helpful than writing with no feedback at all. The researchers found that short tasks of active writing (writing five words twice a week) together with effective feedback greatly enhanced children's early literacy.

Guiding Parents from Different SES Our studies targeted parents based on the rationale that parents not only hold the primary responsibility for their children's wellbeing and are motivated to promote their present and future welfare, but also they are their children's first teachers (Britto et al. 2006). Helping parents to realize that they are capable of assisting their child to prepare for schooling might broaden their conception of parental roles. This may, however, be influenced by parents' SES, which has been shown to be associated with children's academic achievements. Children from families of a low SES exhibit lower achievements in language, literacy, and mathematics (Jordan et al. 2009; Lee and Burkam 2003). The most significant influence of SES level is on the acquisition of language and literacy (Hoff 2013; Mayor and Plunkett 2010; Reese et al. 2015). Children from low SES families experience fewer effective literacy interactions than those of higher SES (Duncan and Murnane 2011; Klein and Yablon 2008). Because the differences between children of different strata increase as they get older (Fernald et al. 2013;

[1] Unpointed Hebrew without the diacritics is the Hebrew that preschoolers see in their surroundings and the one that they use in their early writing.

Hackman et al. 2010; Lipsey et al. 2013), it is important to recognize and fill in this gap as early as possible (Fernald et al. 2013).

Encouraging parents from a low SES population to take on the role of their children's teachers might be an effective way to bridge this gap. However, it is also an ambitious endeavor because these parents tend to have more limited educational resources and competing duties and stressors. Nonetheless, successful interventions with parents from a low SES have already been documented (e.g., Morgan and Goldstein 2004). To bridge this gap in parental resources and assure that parents from both strata will cooperate, we developed two interventions. The program for parents from low SES individually guided the parents in their homes. The program for parents from middle SES guided them in a group in the preschool.

Hypotheses

Based on the literature described above, we predicted that in both studies, children in the intervention group would outperform their peers in the comparison group on word spelling at the posttest and the follow-up assessments. Acknowledging the relations between reading and writing (Ahmed et al. 2014), we predicted that children in the intervention group would outperform their peers in the comparison group on word reading at the posttest and the follow-up assessments. To ensure that the interventions promote children's reading and writing beyond their basic early literacy skills we controlled for children's letter knowledge (e.g., Treiman et al. 2014).

Study 1: Promoting and Guiding Writing Activities at Home with Preschoolers among Families of a Low SES

Participants

Recruitment to the study was conducted by preschool teachers in a low SES neighborhood. The teachers invited parents to an upcoming school readiness intervention. Both mothers and fathers were invited, but only mothers attended. Participants in the study were 59 mother-child dyads, which were randomly assigned to two groups, the writing intervention group and the comparison group ($n = 32$ and $n = 27$, respectively), which were statistically indistinguishable on several demographic parameters. The number of girls/boys was similar in the intervention (12/20) and comparison groups (19/18), χ^2 (1) = 0.41, *ns.* Children's age at the pretest ranged from 59 to 79 months and was equivalent in the intervention ($M = 66.04$, $SD = 4.63$) and comparison groups ($M = 65.60$, $SD = 4.29$), t (57) = 0.55, *ns*. Mothers' age ranged from 22 to 51 years and did not differ between the intervention ($M = 32.88$, $SD = 6.86$)

and comparison groups ($M = 33.81$, $SD = 4.76$), $t\,(57) = 0.55$, *ns*. Finally, mothers' education, measured on a 5-point scale ranging from *not finishing high school* to *graduating from college/university* averaged 3.41 ($SD = 1.17$) for the intervention group and 3.30 ($SD = 1.24$) for the comparison group, $t\,(57) = 0.35$, *ns*. As expected, only 12% of the mothers had a college or university degree. This education level is low relative to Israeli standards, where 43% of the population graduates from college or university. Mothers in the comparison group participated in the workshop and received the intervention activities (described below) after the completion of the data collection.

Writing Intervention Program

The intervention started with a 3-hour workshop held in the evening in a local club. This was followed by mother-child pre-planned activities, which were implemented at home in periods of about 20 min three times per week across 8 weeks, and accompanied by weekly home visits of tutors to discuss the previous week's activities and to provide the tasks for the coming week.

Workshop The authors directed the workshop which addressed the following topics in a fixed order: (a) a discussion of the importance of school readiness and maternal contribution to this area (e.g., Sénéchal 2012); (b) presentation of the principles underlying high-quality scaffolding (Kozulin 2002; Vygotsky 1978), including mother-child dialogue and sensitivity to the child's perspective and attention span (the importance of providing scaffolding at a challenging but not frustrating level was stressed); (c) discussion in small groups regarding the current literacy practices at the participants' homes; (d) 10-minute film introducing mothers to short scenes illustrating the implementation of high-quality writing mediation; (e) description of the mothers' role in the program (viz., to engage their child three times per week for about 20 min, in educational-entertaining pre-planned literacy activities), which would be supported by weekly meetings with a tutor; and (g) delivery of materials and activities for the first week.

Intervention Activities Materials included a commercial kit produced by Rosenberg (2004; adapted to English as "Sound & Letter Time"). The kit includes two magnet boards and nine small boxes of games with magnetic cards of letters and pictures. Each week, the mother received a game to play during the three weekly sessions. For instance, one game focused on rhyming and consisted of pairing pictures whose referents rhyme; a second on segmenting words to phonemes; a third on pairing words that start or end with the same phoneme or the same letter. Following the 15-minute game, mother and child were involved in joint writing of words in tasks like preparing a family phone book, writing a shopping list, or making a chart of the child's weekly activities. Each week the mother received new writing tasks.

Individual Meetings with Mothers Every week, a female graduate student in educational counseling or child psychology, visited the mother at home for a meeting of about half an hour. One goal of these meetings was to summarize the intervention experiences of the previous week and collect the previous week's products. Tutors were therefore able to confirm and document fidelity of implementation, that is, whether planned activities were completed as expected. Almost all mothers reported that all sessions were completed, and that the activities were engaging and productive. The tutors checked maternal reports by discussing the activities and observing children's written products. Another major goal of the individual meetings with the mothers was to introduce the activities for the coming week, while promoting maternal level of training and solving emerging problems. The tutors devoted about 5 min to illustrating how to work with the child and observed the mother guiding the dyadic interaction for another 5 min.

Procedure

Trained graduate students assessed all children individually in the preschool classroom, in a quiet atmosphere. Pretest data were collected before the mothers participated in a workshop. Posttest data were collected about a week after the last home visit by the tutor. Follow-up data were collected two and a half months later.

Measures

Letter Naming Children received a set of 32 cards displaying all 27 Hebrew letters and five pictures of familiar objects to ensure some success for all children. Presentation was in a random order that changed across children. Children were asked to name each letter or object. The score for letter naming was the percentage of the letters that the child named correctly (not including correct naming of the objects). This basic alphabetic measure (Levin et al. 2002) was assessed at the pretest and served as a control measure when assessing children" progress in the more advanced literacy measures (word spelling and recognition).

Word Spelling Children were asked to write eight words prompted by objects' drawings. The words comprised almost all of the Hebrew letters. Each letter that the child spelled was scored as follows: A correct letter received 3 points; a medial letter instead of a final one or a homophonous letter received 2 points; an incorrect letter or no letter scored 0. The total score was the percentage of points out of the maximum possible points (see Levin 2007). Children received three different sets of words (matched by letters), one set at each of the three testing waves.

Word Recognition This task presented a set of four word pairs from the spelling task. Children received a pair of cards placed side by side on the table, each displaying a drawing. The children then were handed two cards consecutively, each displaying a printed word (e.g., *shafan* [rabbit], *naxash* [snake]). Children were asked to match each printed word with its drawing. For half of the pairs, the first printed word handed to the child matched the drawing on the right, and for the other half, the first card matched the drawing on the left. The total score was the percentage of word-drawing pairs matched correctly (see Aram and Levin 2002).

Results

We first compared the groups on pretest scores to ascertain that there were no group differences before the intervention. Table 17.1 presents the means and standard deviations of the pretest, posttest, and follow-up scores.

Prior to the intervention, children correctly named about half of the letters and recognized words slightly above the chance level. The spelling level of all children was very low and displayed high variance, because most of the children wrote all the words using random letters. T-tests revealed that the two groups were statistically indistinguishable on pretest scores.

To assess the intervention's effect on children's word writing and word recognition at the posttest and the follow-up, controlling for children's pretest letter naming, we used Generalized Estimating Equations (GEE) regression analyses with repeated measures. We chose to use GEE because it handles well dependency between the three measurements (pre-test, post-test, and follow-up) and the reading count measures (Hanley et al. 2003). When we found an interaction between time and group, we used pairwise adjusted Least Significance Difference (LSD) tests to assess the source of the interaction. Figure 17.1 presents the children's progress in word spelling and recognition across the three testing moments and by group. Table 17.2 presents the results of the GEE analyses.

Table 17.1 Study 1: children's mean scores, by group, at each wave and comparison between the groups at the pretest

	Intervention *n = 32*			Comparison *n = 27*			
	Pretest *M(SD)*	Posttest *M(SD)*	Follow-up *M(SD)*	Pretest *M(SD)*	Posttest *M(SD)*	Follow-up *M(SD)*	*t (57)*[a] *(p)*
Letter naming	47.92 (33.25)			53.50 (28.32)			−0.69 (.50)
Word spelling	18.25 (28.55)	52.31 (32.70)	56.04 (28.36)	30.58 (30.42)	46.42 (32.95)	48.19 (30.45)	−1.49 (.14)
Word recognition	65.36 (23.10)	86.72 (17.56)	86.20 (16.74)	74.69 (23.10)	78.39 (23.14)	82.72 (20.27)	−1.61 (.11)

[a]Comparison between groups at the pretest

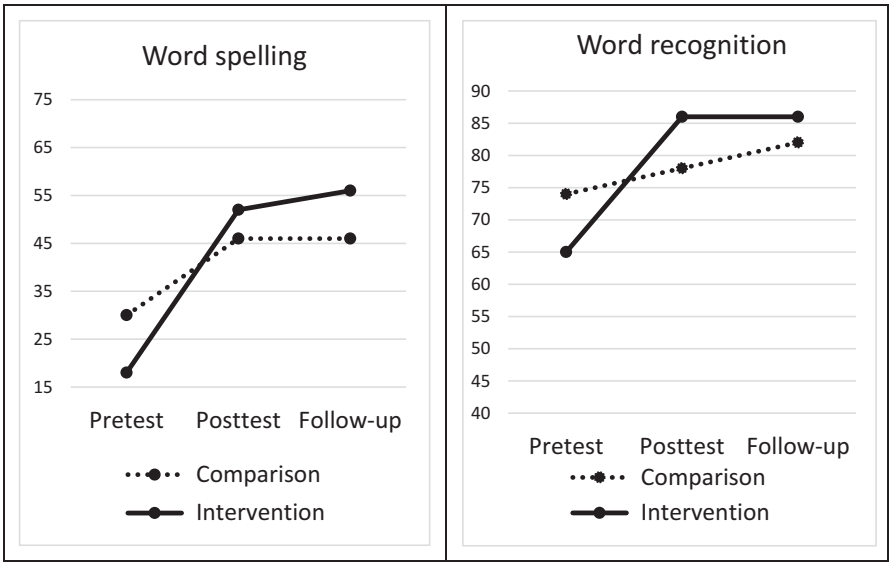

Fig. 17.1 The intervention's effect on children's word spelling and word recognition in Study 1

Table 17.2 Study 1: regressions (GEE) predicting children's progress on word spelling and recognition controlling for children's letter naming

	Word spelling	Word recognition
	B (SE)	*B (SE)*
Intercept	−13.82*** (2.83)	50.88*** (4.26)
Letter naming	0.87*** (0.06)	0.39*** (0.04)
Follow-up vs Pretest	29.32*** (3.80)	14.97*** (2.32)
Posttest vs Pretest	26.41 ***(3.88)	13.28*** (2.59)
Group	−2.20 (4.22)	−2.81 (3.34)

***$p < .001$

We found that children's letter naming at the pretest predicted word spelling, Wald $\chi^2 = 173.86$, $p < .001$, and word recognition, Wald $\chi^2 = 88.27$, $p < .001$. Time also predicted children's word spelling, Wald $\chi^2 = 80.27$, $p < .001$, and word recognition, Wald $\chi^2 = 44.66$, $p < .001$. Group did not significantly predict children's word spelling, Wald $\chi^2 = 0.28$, $p = .59$, and word recognition, Wald $\chi^2 = 0.70$, $p = .40$. We detected an interaction between time and group for word spelling, Wald $\chi^2 = 12.81$, $p = .002$, and word recognition, Wald $\chi^2 = 16.56$, $p < .001$.

Concerning word spelling, pairwise comparisons showed that controlling for letter naming, children in both groups progressed significantly from pretest to posttest, $MD = -34.06$, $p < .001$, and $MD = -15.84$, $p < .001$, for the intervention and the comparison group, respectively. They did not progress significantly from posttest to the follow-up, $MD = -3.74$, $p = .15$ and $MD = -1.76$, $p = .37$, for the intervention and the comparison group, respectively. Although there were no group differences

at the pretest, children in the intervention group showed significantly higher scores in word spelling than children in the comparison group both at posttest, $MD = 10.12$, $p = .05$ and follow-up $MD = 12.08$, $p < .05$ (see Fig. 17.1).

Concerning word recognition, pairwise comparisons showed that controlling for letter naming, children in the intervention group progressed significantly from pretest to posttest, $MD = -21.35$, $p < .001$, but did not progress significantly from posttest to the follow-up, $MD = 0.52$, $p = .88$. Children in the comparison group did not progress significantly from pretest to posttest, $MD = -3.70$, $p = .19$, or from posttest to the follow-up $MD = -4.32$, $p = .13$. Although there were no group differences at the pretest, children in the intervention group showed significantly higher scores in word recognition than children in the comparison group at posttest, $MD = 10.51$, $p < .05$, but not at follow-up $MD = 5.66$, $p = .19$ (see Fig. 17.1).

Discussion

This study showed the effectiveness of a short intervention (8 weeks) promoting mediated writing activities with preschoolers among families from a low SES. The intervention included several features that may explain its success: it guided mothers from low SES regarding their important role as their children's first teachers, told them about the centrality of writing in children's literacy development, and taught them individually how to support their children via joint writing activities. Specifically, mothers learned to support their children's word writing by practicing letter knowledge, phonological awareness, and grapho-phonemic mapping during joint writing, which are critical predictors of early literacy (e.g., Aram and Levin 2004). Compared to children whose mothers had not participated in the intervention, the writing intervention benefited both the children's word spelling and word recognition skills, even after controlling for children's letter naming abilities, assessed before the intervention. However, children in the intervention group did not continue to progress after the end of the intervention. They kept their advantage over the comparison group on word spelling but not on word recognition. It may be the case that once this short intervention was terminated, mothers only sporadically continued to involve their child in mediated shared writing activities.

Study 2: Promoting and Guiding Writing Activities at Home with Preschoolers among Families of a Middle SES

After the first study, we explored an intervention based on similar principles among families from a middle SES. This intervention was more economical because it was carried out by group meetings rather than in individual home visits.

Participants

Recruitment to the study was conducted by preschool teachers in a middle SES neighborhood. The teachers invited parents to an upcoming workshop on school readiness. Both mothers and fathers were invited, but only mothers attended. Sixty mothers attended the workshop (described below). At the end of the workshop, the researcher invited these mothers to participate in four additional meetings. All the mothers wanted to participate. They were given a page with four specific dates. The 30 mothers who could attend all four meetings became the intervention group and the 30 mothers who could not became the comparison group.

Participants in the study were 60 mother-child dyads. The intervention and comparison groups were statistically indistinguishable on several demographic parameters. The number of girls/boys was similar in the intervention (13/17) and comparison groups (15/15), χ^2 (1) = 0.61, *ns.* Children's age at the pretest ranged from 60 to 81 months and was equivalent in the intervention ($M = 68.804$, $SD = 4.80$) and comparison groups ($M = 67.33$, $SD = 4.29$), t (60) = −1.37, *ns*. Mothers' age ranged from 27 to 49 years and did not differ between the intervention ($M = 37.57$, $SD = 5.56$) and comparison groups ($M = 38.41$, $SD = 4.90$), t (60) = 0.66, *ns*. Mothers' education ranged from high school graduates (0) to Masters degrees (2), with a mean of 1.57 ($SD = 0.50$) for the intervention group and 1.43 ($SD = 0.57$) for the comparison group, t (60) = 0.57, *ns*. One mother completed 12 years of study, 29 mothers completed a Bachelor's degree and 31 completed a Master's degree. This education level is relatively high compared to Israeli standards, where 43% of the population graduates from college or university.

Mothers in both the intervention and the comparison groups participated in the workshop. Following data collection, the mothers in the comparison group received all the intervention activities (described below).

Writing Intervention Program

Workshop The authors directed the workshop. The workshop addressed the following topics in a fixed order: (a) a discussion of the importance of school readiness – socio-emotional and academic readiness and maternal contribution to children;s school readiness; (b) presentation of the principles underlying high quality scaffolding based on Vygotsky;s (1978) theories; (c) a discussion of literacy practices at home, including opportunities to practice early literacy at home; (d) a discussion of the importance of shared book reading and joint writing at home and the importance of collaborative literacy activities that encourage the child to be active.

Intervention Activities Mothers practiced writing with their children using eight workbooks of increasing difficulty. Each of the workbooks consisted of pre-planned

activities including letter knowledge, phonological awareness and writing. For example, regarding letter knowledge: The children were asked to name the letters, say the sounds of each letter, and connect between the written letter and its sounds. For phonological awareness: Children were asked to divide words into sounds (GE-ZE-R, carrot), say the first sound of a word, think of words that begin with the same sound. Mothers focused on practicing writing with their children by writing lists (guest, friends, family members, favorite food, shopping, etc.), describing a picture (family photograph, photo from the newspaper, etc.), playing sentence completion games, writing story endings, and the like.

Group Meetings with Mothers The four 60-minute meetings took place in the local school at intervals of 3 weeks (across 12 weeks). In each meeting, mothers were guided in how to engage their children in alphabetic and writing activities four times a week for 20 min during 12 weeks (36 sessions total) according to the preplanned activities (workbooks and games). Each of the four meetings included three parts. The first part was devoted to discussing the activities carried out during the previous 3 weeks, as well as the children's progress, successes, and difficulties. In the second part, the researcher elaborated on the theoretical perspectives of early literacy with a focus on early writing. The third part of each meeting consisted of explaining mothers' assignments over the course of the next 3 weeks, until the next meeting. At each meeting, the mothers received activities (two workbooks with detailed instructions and tasks to practice at home). They were then asked to bring the completed workbooks and children's written products to the next meeting. These materials allowed for tracking children's progress as well as for the researcher to check whether all assignments had been completed.

Procedure

Trained graduate student assessed all children individually in their homes prior to the intervention. Posttest data were collected about a week after the end of the intervention. Follow-up data were collected three and a half months later.

Measures

Letter Knowledge Letter knowledge was assessed only at the pretest and served as a control measure. For each letter of the alphabet, children were asked to say which letter matches a certain sound, and then to identify that letter from alphabet cards put before them. Presentation was in a random order that changed across children. The score for letter knowledge was the percentage of letters that were both named and identified correctly.

Word Spelling Children were asked to write eight words prompted by drawings of the items, which were presented in random order. The words comprised almost all of the Hebrew letters. Scores for each letter that the child had to spell were as follows: A correct letter scored 3 points; a medial letter instead of a final one or a homophonous letter scored 2 points; an incorrect letter or no letter scored 0. The total score was the percentage of points out of the maximum possible points. Children received three different sets of words, one set at each of three testing waves.

Word Reading Children were asked to read eight words presented on cards. The words covered almost all of the Hebrew letters. We calculated the percentage of the words that the child read or sounded out the consonants correctly (for example, read the word 'rakevet' correctly or as 'rkvt', 'rakavata, 'rakavot', etc.). Children received three different sets of word, one set at each of three testing waves.

Results

We first compared the groups on pretest scores to ascertain that there were no group differences before the intervention. Table 17.3 presents means, standard deviations, and ranges of the pretest, posttest, and follow-up scores.

From these data, it is apparent that children exhibited fairly high letter knowledge at pretest (around 65%). At the same time, their word reading and spelling levels were rather low. They used few correct letters in their writing and were able to read, imprecisely, about 20% of the words. T-tests revealed that the two groups were statistically indistinguishable on the pretest scores (see Table 17.3).

To assess the intervention's effects on children's word spelling and word reading at the posttest and the follow-up, controlling for children's pretest letter knowledge, we used GEE regression analyses with repeated measures. When we found an interaction between time and group, we used LSD tests to assess the source of the interaction. Figure 17.2 presents the children's progress in word spelling and reading

Table 17.3 Study 2: children's mean scores, by group, at each wave and comparison between the groups at the pretest

	Intervention *n = 32*			Comparison *n = 27*			
	Pretest *M(SD)*	Posttest *M(SD)*	Follow-up *M(SD)*	Pretest *M(SD)*	Posttest *M(SD)*	Follow-up *M(SD)*	*t (57)*[a] *(p)*
Letter knowledge	64.58 (32.00)			64.59 (27.68)			0.00 (.50)
Word spelling	28.61 (4.25)	79.51 (2.22)	83.38 (1.73)	25.09 (3.83)	37.36 (4.33)	55.00 (3.93)	−0.60 (.14)
Word reading	23.33 (6.86)	67.91 (7.94)	86.66 (5.33)	15.42 (5.02)	27.50 (7.39)	55.00 (7.94)	−0.91 (.11)

[a]Comparison between groups at the pretest

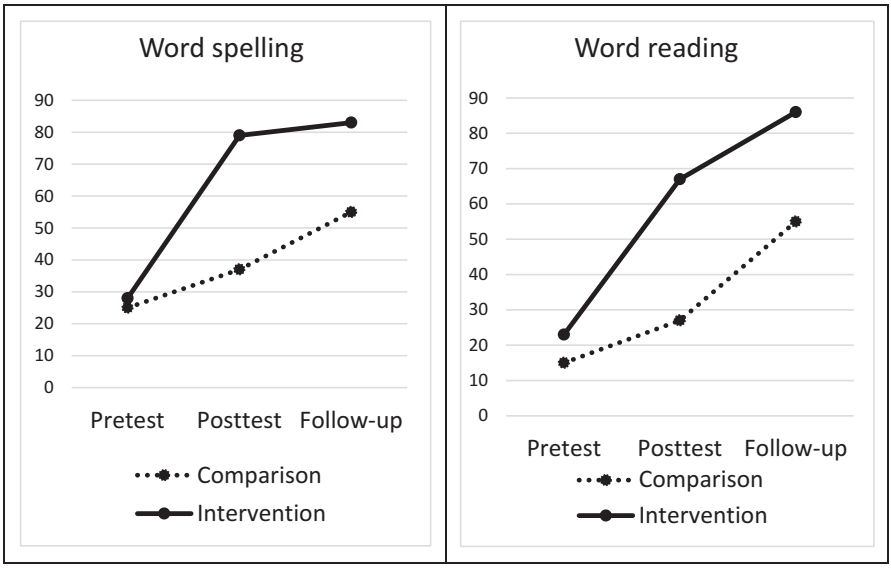

Fig. 17.2 The intervention's effect on children's word spelling and word reading in Study 2

Table 17.4 Study 2: regressions (GEE) predicting children's progress on word spelling and reading controlling for children's letter knowledge

	Word spelling	Word reading
	B (SE)	*B (SE)*
Intercept	−12.60∗∗ (4.76)	−21.91∗∗ (7.39)
Letter knowledge	0.44∗∗∗ (0.06)	0.58∗∗∗ (0.10)
Follow-up vs Pretest	42.33∗∗∗ (2.63)	51.45∗∗∗ (5.98)
Posttest vs Pretest	31.58 ∗∗∗ (2.99)	28.33 ∗∗∗ (5.12)
Group	21.52∗∗∗ (3.35)	23.70∗∗∗ (5.54)

∗∗$p < .01$; ∗∗∗$p < .001$

from the pretest to the posttest and to the follow-up. Table 17.4 presents the results of the GEE analyses.

We found that children's letter knowledge at the pretest predicted their word spelling, Wald $\chi^2 = 54.06$, $p < .001$, and word reading, Wald $\chi^2 = 0.58$, $p < .001$. Time predicted children's word spelling, Wald $\chi^2 = 435.18$, $p < .001$, and word reading, Wald $\chi^2 = 85.52$, $p < .001$. Group also predicted children's word spelling, Wald $\chi^2 = 55.10$, $p < .001$, and word reading, Wald $\chi^2 = 20.40$, $p < .001$. We detected an interaction between time and group for word spelling, Wald $\chi^2 = 166.40$, $p < =.001$, and word reading, Wald $\chi^2 = 12.47$, $p < .002$.

Concerning word spelling, pairwise comparisons showed that controlling for letter knowledge, children in both groups progressed significantly from pretest to posttest, $MD = -50.90$, $p < .001$, and $MD = -12.26$, $p < .001$ for the intervention and the comparison group respectively. Both groups progressed significantly from posttest to the follow-up, $MD = -3.86$, $p < .05$, and $MD = -17.63$, $p < .001$ for the

intervention and the comparison group respectively. Although there were no significant differences between the two groups at the pretest, children in the intervention group showed significantly higher scores than children in the comparison group at posttest, $MD = 42.15$, $p < .001$ and at follow-up, $MD = 28.37$, $p < .001$ (see Fig. 17.2).

Concerning word reading, pairwise comparisons showed that controlling for letter knowledge, children in the intervention group progressed significantly from pretest to posttest, $MD = 44.58$, $p < .001$, and from posttest to the follow-up $MD = 18.75$, $p < .05$. Children in the comparison group progress significantly from pretest to posttest, $MD = -12.08$, $p < .05$, and from posttest to the follow-up, $MD = -59.16$, $p < .001$. Although there were no group differences at the pretest, children in the intervention group showed significantly higher scores in word recognition than children in the comparison group at posttest, $MD = 40.41$, $p < .001$, and at the follow-up $MD = 31.66$, $p < .001$ (see Fig. 17.2).

Discussion

This study showed the effectiveness of a short, 4-meeting group intervention with mothers from middle SES, which guided them in how to support their children via joint writing activities. Specifically, mothers learned about the importance of early writing and how to effectively practice writing with their children. This intervention benefited both the children's word spelling and word reading relative to the comparison group. Moreover, children in the intervention group continued to progress after the end of the intervention in both word spelling and word reading and kept their advantage over the comparison group on word spelling as well as word reading at the follow-up. We think that having a greater understanding of the alphabetic system, these children were more interested in it and their mothers kept guiding them using opportunities to draw their children's attention to the written system.

General Discussion

In the two studies described above, we evaluated the efficacy of two home- based early interventions that taught mothers from low (Study 1) and middle (Study 2) SES how to effectively support their preschool children's Hebrew writing. The interventions approached different audiences and were somewhat different in their methods. Yet, within both interventions, mothers learned about the importance of early writing and how to practice writing with their preschool children. Our research opted to achieve a more comprehensive view of reading-writing connections. Although we did not discuss word reading with the mothers and did not encourage them to practice word reading with their children, we studied the benefits of the writing interventions on children's word spelling and word reading, beyond the children's letter knowledge - a basic early literacy skill. Moreover, both studies

were longitudinal, studying the stability of the interventions' effects on both word spelling and reading not only immediately after the interventions, but also a few months after their end. In general, our studies demonstrate the efficacy of early home-based writing interventions in promoting both children's spelling and reading in Hebrew among preschoolers of different socioeconomic backgrounds.

Immediate and Sustained Effects on Word Spelling and Reading

Home literacy interventions have focused mainly on parent-child shared book reading (e.g., Korat et al. 2013; Sénéchal and Young 2008; Sim et al. 2014; Zevenbergen and Whitehurst 2003). The uniqueness of the intervention programs presented in this chapter is that they guided the mothers in how to effectively engage their children in practicing writing. In both interventions, we followed Levin and Aram's (2013) basic effective Hebrew writing support principles: We emphasized the importance of attention to the process of separating the word into its sub-syllable/phonemes (phonological awareness) and of connecting each sound to a letter (letter knowledge). We taught mothers to use meaningful everyday activities that encourage writing to help their children to go through this process of spelling words. The mothers learned to help their child become familiar with the power of writing as a significant communication activity in life. For example, writing the names of friends, notes to remember, or a shopping list.

Effects on Word Spelling Both interventions significantly promoted children's spelling. At the end of the programs and at the follow up (two and a half months later in the first study and three and a half months later in the second study), children from the intervention group showed advantages over the children in the comparison group. These results support previous interventions that focused on writing within preschools and concluded that specific writing practice promotes children's spelling (Aram and Levin 2016; Martins and Silva 2006; Ouellette and Sénéchal 2008; Rieben et al. 2005). These studies show the importance of explicit teaching of the alphabetic system by caregivers who know how to deliver this knowledge. Writing becomes symbolic when the child internalizes that it is a system of symbols comprised of letters representing the sounds of the language (Levin and Bus 2003). Our results demonstrated that children in the intervention groups (in low and in middle SES) learned the principle and generally represented the sounds correctly by letters. Although their spelling was not perfect, it certainly showed a basic understanding of the idea of writing. Our conclusion raises some doubts regarding the belief, once quite popular (Goodman 1967) and sometimes still advocated (Edelsky 2006), that children can learn these skills just from growing up among literate people and searching autonomously for the meaning of print. Note, however, that our conclusion does not mean that children who have acquired some foundations of the writing code do not continue to learn independently about the written system within their environment.

Effects on Word Reading The effect of the writing interventions on children's reading level is especially interesting. The intervention programs did not target word reading, yet at the programs' conclusion, the children in both interventions showed higher scores than children in the comparison groups. Children from low SES progressed in word recognition and children from middle SES progressed in word reading. Three months later, the children from middle SES still showed a significant advantage while the advantage of the children from low SES had disappeared and their word recognition achievements matched their peers in the comparison group. In general, we know that reading and writing is a two-way street. Traditional practices teach reading before spelling, but our results support practicing writing, in line with Chomsky's (1971) idea that children should first be taught to spell and then to read. It is easier for Hebrew speaking preschool children to write words than to read them. Treiman et al. (2012) explained that the Hebrew language is a consonant language based on roots. In writing without diacritics, there is only partial representation of vowels by the 'vowel letters'. Consonant writing is difficult to read because the child sees a consonant, but does not know how to read it. For example, when we see the letter 'G' in a text, it can be read as GI, GA, GE, GOO, GO or G. However, when the child wants to write the sound GI, GA, GE, GOO, GO or G he can convert the sound to the letter G without paying attention to the vowel (Levin and Aram 2013). Practicing writing at preschool promotes reading because the child attempts to read what s\he has written, thereby learning about the connection between writing and reading (Katzir et al. 2012). We can assume that children who practice writing gain a better understanding of the structure of the language, which enhances their ability to decipher words in reading (Ehri et al. 2001). Nonetheless, the children from a low SES who participated in the intervention did not maintain their advantage in word reading over children in the comparison group at the later follow-up. It may be that this group requires a more intensive and ongoing program in order to retain the reading advantage. The effects on word spelling persisted, likely because spelling was a direct measure more aligned with the exercises whereas reading worked as a transfer measure.

Home-Based Early Literacy Interventions

Writing is often referred to as a school-like activity and thus it is typically not considered suitable for a parent-child joint activity. We selected parents to be the agents of change and execute the writing intervention with their children in this study. In line with Bronfenbrenner's (1999) ecological systems theory, children's reading and writing development occurs within a sociocultural context. The home and the parents are the closest context to the child, and they play a significant role in promoting children's early literacy. The results of the present studies strengthen the evidence regarding the efficacy of mothers from both low and middle SES backgrounds as their children's literacy mediators. Parents' knowledge is a key element in programs for the promotion of early literacy (Powel 2004). Home-based interventions can

successfully increase parents' knowledge and in turn, their children's literacy achievements (Abbott-Shim et al. 2003; Connell and Prinz 2002). Beyond that, most of the parents in Israel have several children ($M = 3.13$) (Israel Central Bureau of Statistics 2016a, b) and the knowledge that they absorbed from the programs can pass on to their younger children. Parents have the ability to combine the advantages of individualized sensitive instruction and optimal teaching. Additionally, with guidance, they can incorporate literacy in natural family talk and in various home-based activities.

Differences Between SES

The multidimensional concept of SES captures family capital, which includes financial capital (monetary and material resources), human capital (educational and cultural resources), and social capital (social connections linked with career and the like), all of which broadly affect child development (e.g., Chiu and McBride-Chang 2006). The gap between lower and higher SES is evident not only in early literacy but also in the acquisition of reading and writing in school (e.g., Duncan and Seymour 2000; Korat and Levin 2001).

In spite of the similar principles of both programs (organized writing activity in the home based on analysis of the sounds of words and matching letters), we adapted the intervention programs to the families' SES. The first study was done with mothers and children of a low SES and guidance was conducted individually for each mother across eight meetings in the family home. The second study, however, was with mothers and children of a middle SES where maternal guidance took place in a group setting with only four meetings.

Although, we did not initially intend to compare between the early literacy skills of children from different SES, the results of the two studies gave us an opportunity to do so. The results show differences in the children's early literacy between the two groups before and after the intervention. Prior to the intervention, the letter knowledge of children from low SES (intervention and comparison groups) was poorer than children from middle SES (intervention and comparison groups). When asked to name letters presented to them visually, children from low SES successfully identified about half of the letters, whereas children from middle SES succeeded in identifying by sound and naming 65% of the letters. Interestingly, both SES groups scored very low in the word spelling prior to the intervention, with children in both studies successfully spelling only about a quarter of the words. We think that the reason for this low level is the fact that parents and teachers tend to write very little with children, and that writing is not a widespread activity in Israeli preschools (Hall et al. 2015; Sverdlov et al. 2014). After the intervention, the children from both intervention groups (low and middle SES) progressed very well and achieved higher scores than the children from the comparison groups. However, while children from middle SES succeeded in correctly spelling about 80% of the words, the children from low SES succeeded in spelling about 60% of the words. It

is possible that the mothers from a middle SES learned to guide their children in writing and used this knowledge more effectively with their children in a short, focused intervention. Nonetheless, it is important to be optimistic and see the power of parents from low SES to promote their children's writing level. This is supported by a series of studies conducted by Aram and Levin (2004), which examined interactions between mothers from low SES and their preschool children. They found that the way in which mothers assist their children in completing a writing task in preschool predicts the children's achievements both in preschool, and later, in the second grade, beyond the family's SES.

Regarding word reading, the knowledge of the children from differing SES backgrounds, before and after the interventions, cannot be compared in the chapter because the children from low SES were asked to identify words, whereas the children from middle SES were asked to read words. It can, however, be seen that prior to the intervention, the level of early reading among Israeli preschool children at differing socio-economic strata is generally low. It is interesting to note that the writing program also promoted the reading ability of children from both SES, but the advantage in reading was retained only by the children of middle SES. It may be that the extent of the intervention was not sufficient for children of low SES families to maintain their progress. Perhaps the mothers stopped writing with their children after the intervention had ended, and they stopped getting direct guidance and therefore the reading achievements faded. Perhaps mothers from the middle SES group internalized the principles of word writing and continued writing with their children after the intervention ended.

Research Limitations

Two limitations should be considered when interpreting our findings. First, the studies described involved home-based interventions, whose implementation was not directly observed. Thus, we cannot be certain that activities were really implemented as planned. It should however be noted that we closely followed the interventions' implementation to ensure that they were done according to our instructions. In the first study, tutors made weekly visits to mothers, where they discussed previous activities and examined children's written products. In the second study, we asked mothers to bring the outcomes to the four group meetings and discuss implemented and upcoming tasks. Overall, there was no evidence of large deviances from the planned intervention that could threaten the validity of our findings.

Second, although mothers were randomly assigned to the intervention and comparison groups in the first study, they were not in the second study. All of the mothers participated in the first workshop and manifested interest in participating in the study. Yet only the mothers who committed to coming to the specific four additional meetings were chosen to form the intervention group. It may be that the mothers in the intervention group were somewhat more prepared to invest more time and resources in their children. Equally possible, mothers in the comparison group may

not have been able to participate in the four meetings, not because they were not willing to collaborate, but because their agenda was not compatible with the meetings schedule. In future studies, we recommend greater flexibility when scheduling session to enable more mothers to participate, so random assignment can be used.

Educational Implications

The studies presented here emphasize the importance of raising educators' and parents' awareness regarding the importance of integrating writing activities in preschool and at home. In Israel, writing is often seen as a school-based activity that is less appropriate for preschool or for parent-child "together time" at home. These conceptions deserve to be changed. Parents and preschool teachers should be encouraged to engage in writing activities with young children. In our studies, we found that children and their mothers enjoyed their engagement in the writing activities. Guidance given to mothers contributed to their understanding of themselves as their children's teachers, their knowledge about effective literacy activities within everyday activities and their children's literacy development. During the interventions, the mothers learned to provide their children with literacy experiences suited to their home environment, and related to their children's literacy level and interests. Further thought should be devoted to considering how to most effectively guide and direct parent groups of different backgrounds, and how to offer assistance in the home for continued literacy activity after interventions are over.

In sum, intervention programs for promoting writing at preschool age are successful in promoting both reading and writing. Hebrew speaking preschoolers who practice writing also practice phonological awareness and letter knowledge via meaningful activities. They write mainly consonants and fewer vowels, but this writing promotes both their writing and reading abilities in preparation for formal studying in school. We see the importance of writing activities and encourage parents to keep writing with their children when they enter school.

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Chapter 18
Decoding and Self-Assessment Intervention with Persistently Struggling Readers: Impacts on Reading, Self-Efficacy and Transfer on Spelling

Marie Van Reybroeck, Egidia Cumbo, and Claire Gosse

Abstract Previous studies conducted amongst persistently struggling readers in secondary schools mainly focused on reading comprehension. However, these students still encounter decoding troubles. Moreover, they suffer from a low self-efficacy because they have been failing for several years. Providing support on decoding and trying to improve their self-efficacy through a self-assessment procedure may be determinant for them. The present study aims to demonstrate the effectiveness of decoding and self-assessment strategies intervention (i) on reading skills and (ii) on self-efficacy beliefs, in contrasting a student-guided self-assessment with a teacher-guided self-assessment and (iii) on spelling skills.

Over a period of 7 weeks, two groups of eight French-speaking students from a secondary special school (aged 14 with a reading level of third grade primary school) received a treatment focusing on word-level decoding strategies including a self-assessment procedure. In the student-guided self-assessment tool, the students chose the procedure and support, whereas the teacher suggested them in the teacher-guided self-assessment group. The intervention groups were compared to a control group of eight students receiving standard reading instruction. Students were compared on reading, self-efficacy beliefs and spelling before and after the treatment.

Results indicated that the students from both intervention groups showed greater improvement than the control group in reading, self-efficacy beliefs and spelling. Regarding the type of self-assessment, both groups showed sizeable improvements.

By showing the efficacy of a decoding and self-assessment instruction, these findings have a clear practical implication for teachers' instructional practices at school. These results also enrich our understanding of the persistently reading difficulties among older students.

M. Van Reybroeck (✉) · E. Cumbo · C. Gosse
Psychological Sciences Research Institute, Université catholique de Louvain, Louvain-la-Neuve, Belgium
e-mail: marie.vanreybroeck@uclouvain.be; claire.gosse@uclouvain.be

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Keywords Reading intervention · Persistently struggling readers · Decoding · Self-assessment · Self-efficacy beliefs

School is a real challenge for students with reading difficulties. Their trouble may have an impact on learning across subjects and throughout schooling, especially in secondary school, where the majority of learning goes through written language. Consequently, the learning in almost all disciplines may be impeded by difficulties in written language acquisition. Research has paid little attention to persistent difficulties in basic decoding skills amongst secondary school students, whilst reading comprehension troubles have been more documented. However, good decoding skills are core abilities for efficient reading comprehension. Because of the wide impact of reading difficulties, and specifically decoding trouble amongst older students, it is determinant to provide support for struggling readers, even if such support arrives late. The present study aimed at evaluating the benefits of reading interventions for secondary students. Specifically, we investigated whether a decoding treatment would still be efficient for them, and if positive effects on reading would transfer to spelling. Moreover, the study sought to assess whether providing students with two kinds of self-assessment tools to control their learning, would be beneficial and improve their self-efficacy beliefs for reading. Indeed, experiencing day after day reading difficulties may also affect students' emotional engagement for reading, which is as important as the reading skills themselves.

Decoding Treatments

According to the Simple View of Reading (Hoover and Gough 1990), the reading skill is made up of word-reading ability and listening comprehension. Although both components can be impaired, studies with secondary school students have been more interested in tackling the issue of comprehension problems rather than poor word reading skills. For instance, most prior studies with older struggling readers have focused on the investigation of the processes of inferences, monitoring of comprehension, or understanding of story structure (see work on poor comprehenders, Cain and Oakhill 2007; Garcia and Cain 2014). It seems that decoding skills are thought to constrain more the reading comprehension in younger readers than in older ones (Cain and Oakhill 2007). Consequently, only one side of the reading process has been predominantly investigated in this older age group, even if some secondary students still demonstrate persistent deficits in basic decoding abilities (Fayol 2000). This is problematic because those basic abilities are recognised as being the foundation of reading skills, enabling the creation of fully specified orthographic representations of words, and influencing reading comprehension (Hoover and Gough 1990). Indeed, as stated in the self-teaching hypothesis by Share (1995, 1999), the word-specific representations in the lexicon are shaped through the

repeated decoding of new letter strings via the indirect route of reading. In a study with second graders, Cunningham et al. (2002) demonstrated that the repeated decoding of a pseudoword in a real text lead to the creation of an orthographic representation of the pseudoword, which was then correctly decoded and spelled. Further analyses demonstrated the importance of correctly decoding the pseudowords in order to be able to read or spell them at a later time. Therefore, the success of decoding, as well as the difficulties encountered by struggling readers, will have an impact on the whole reading strategies set up by students. As a result, it seems necessary to direct research attention to the difficulties faced by secondary school students with decoding skills, and develop evidence-based materials to palliate them.

In an intervention study, McCandliss et al. (2003) showed that young children from second grade with deficient decoding skills benefitted from a decoding intervention called Word Building training. The authors observed that the children correctly decoded the first letter of the words, but made mistakes on the subsequent letters. For this reason, the training was centred on making children pay direct attention to each letter within the word, through progressive minimal pairing of words. Children were asked to change a particular letter card to create a new word (e.g., for the word *sat*, take away *t* and put *p* in its place). By focusing on a precise alphabetic decoding, children demonstrated greater improvements in decoding compared to the control group, as well as in reading comprehension and phonological awareness. However, considering the persistent decoding trouble amongst persistently struggling readers (Fayol 2000), it is still unclear whether a basic decoding treatment may be efficient for older students.

Self-Assessment and Self-Efficacy Beliefs

From a motivational perspective, it is widely accepted that struggling readers suffer from a lack of motivation in reading because they have been failing for several years (Elbaum and Vaughn 2003). A motivation-related variable that may be largely affected by this history of failure is self-efficacy beliefs. According to Bandura's (2007) social cognitive theory, "beliefs of self-efficacy or perceived personal efficacy concern the belief of the individual in his capacity to organise and to carry out the necessary steps to produce the desired results" (Bandura 2007, p. 12). These beliefs will influence students' choices, efforts and persistence when confronted with difficulties. Self-efficacy beliefs have been shown to predict students' academic achievement in various domains (Pajares 2006), including written language (Pajares and Cheong 2003). Several studies found that children with learning disabilities tend to display weaker self-efficacy beliefs than typically developing children in primary or secondary schools (Hojati and Abbasi 2013; Frederickson and Jacobs 2001; Jodrell 2010). The greatest source of self-efficacy beliefs is the mastery experience, which corresponds to success or failure experiences encountered in the past. The many failures experienced by struggling readers throughout schooling

may potentially deteriorate their self-efficacy beliefs, which may in turn have a negative impact on the way they handle future reading-based tasks. Indeed, even before starting to read, they will be likely to suppose that the task will be too complex for them and that they will fail again. Consequently, they may not persist in face of potential difficulties, and avoid any efforts to complete the exercise. Therefore, improving these students' self-efficacy beliefs seems critical.

Of particular interest to the current study are the instructional classrooms practices that may improve students' self-efficacy beliefs for reading. One of those practices concerns self-assessment, which is part of self-regulated learning (Evans 2013; Allal 1999). Self-assessment encourages students to ask themselves whether the procedures they used were efficient or not, and whether future tasks would require additional effort, or better strategies (Paris and Paris 2001). Andrade et al. (2009) demonstrated the effect of the use of self-assessment referenced with criteria on self-efficacy for writing. During the intervention, students were asked to fulfil several criteria related to the achievement of subcomponents of a text production, which led to an increase of their self-efficacy beliefs at the post-test. In a previous study, we demonstrated the benefit of a progressive treatment combined with self-assessment teaching practices to foster self-efficacy beliefs and grammatical spelling amongst typically developing ninth grade students (Van Reybroeck et al. 2017). Students who received a progressive treatment based on cognitive cost improved more in spelling than students who did not receive it. Moreover, when the progressive treatment included self-assessment for each exercise, the students improved even more than students who did not have to use a self-assessment support, on both the spelling tests and self-efficacy beliefs. Students could use the self-assessment support during or after the spelling task. A feature of the self-assessment support was that students had the choice of the moment for using the support (e.g., during or after the task), or the type of support (e.g., table or map), which constituted an open-structured support (Bandura 2007). The idea was to allow them to be independent and to develop control over their own learning by choosing some characteristics of the self-assessment support. However, it was unclear whether the positive effects brought out were due to the open-structured nature of the self-assessment support or to the self-assessment itself. On the one hand, by giving freedom to the students, the open-structured support may have enhanced their engagement and sense of control over their learning. On the other hand, the introduction of a self-assessment support by the teacher could per se also enhance the belief of being responsible for their learning. Both cases could improve learning and self-efficacy beliefs. So, it is unclear whether leaving the characteristics of self-assessment up to the students (student-guided self-assessment) would be more efficient than a self-assessment support provided by their teacher (teacher-guided self-assessment).

Transfer from Decoding Treatment to Spelling

As noted above, decoding treatments are thought to impact the reading process and, consequently, the students' beliefs about their skills. However, the repeated reading of words progressively sets up fine-specified orthographic representations, which are assumed to be used in both reading and spelling. This means that, although spelling might not be explicitly trained during decoding treatments, their benefits may transfer to spelling. According to Ehri (1997) and Perfetti (1997), reading and spelling share common orthographic representations that are recognised in the reading modality, and retrieved and produced from the mental lexicon in the spelling modality (Ehri 1997, 2005). The spelling modality requires a better specification of the orthographic representations to produce each letter, compared to reading which only necessitates recognition. Indeed, children need to have a clear representation of each letter composing a word, such as *robinet* ([tap] in which the last letter is silent), when they have to spell it. On the contrary, they could recognise this kind of word through global or less precise reading because they can for example infer the three final letters of the word on the basis of the first ones. Therefore, spelling necessitates fully specified orthographic representations, which may not be fully required for reading. Writing a word also implies using graphomotor patterns (Van Galen 1991) that must be created. It is not the case in reading, for which children can rely upon their pre-existent phonological representations of the words.

The question of transfer from reading to spelling has been addressed by Conrad (2008) who compared the transfer effects from one modality to the other through repeated reading treatment or repeated spelling treatment of specific words. In an intervention study with second graders, she demonstrated that the learning of 40 words was more beneficial when words were taught in the spelling modality compared to the reading modality. The specific words learned in spelling were all transferred to reading (100 percent of the words learned in spelling were correctly read), while the words learned in reading were not necessarily correctly spelled after the intervention (around 60 percent of the words learned in reading were correctly spelled). The results confirmed transfer effects across modalities, but these were smaller from the reading treatment to spelling than from the spelling treatment to reading. Only a few studies addressed this question of transfer effects from decoding training to spelling. To the best of our knowledge, no study explored these transfer effects in French. This could allow a better understanding of the transfer processes in a language system that differs from English in terms of phoneme-grapheme correspondences.

The Present Study

Currently, there is no experimental evidence showing that persistently struggling readers still benefit from a basic decoding treatment. Moreover, previous studies investigated neither the potential instructional practices that could trigger better self-efficacy beliefs among these students, nor the potential transfer of a reading treatment on spelling in French. The present study aimed to examine whether an intervention on decoding strategies combined with self-assessment support for persistently struggling readers in secondary school would impact on students' reading skills, self-efficacy beliefs, and spelling skills. We further aimed to compare the benefits of student-guided self-assessment over teacher-guided self-assessment, particularly in terms of self-efficacy. For that, 24 students were randomly assigned to a control group or to one of the two experimental treatment groups: student vs. teachers-guided self-assessment. In the student-guided self-assessment group, students were invited to personalise their self-assessment, while in the teacher-guided self-assessment group, they used a self-assessment support given by their teacher. In either case, students received exactly the same decoding treatment. Before and after the interventions, we assessed students' reading skills, self-efficacy beliefs, and spelling skills.

We made the following predictions. First, persistently struggling readers would improve their level in reading, in terms of both accuracy and speed at the word and text levels. The benefit of decoding treatments has already been demonstrated amongst younger children learning basic decoding abilities (McCandliss et al. 2003). Thus, because participants still encounter difficulties in decoding (Fayol 2000), the decoding and self-assessment procedures were then expected to improve their reading skills. Second, students in the student-guided self-assessment group would increase their self-efficacy beliefs more than students in the teacher-guided self-assessment group. The open-structured dimension of the self-assessment support should promote a high levels of engagement in the task, therefore nurturing enhanced self-efficacy beliefs (Bandura 2007). Finally, students would improve their word spelling skills through a transfer effect from the decoding intervention to spelling. As reviewed before, the constitution of orthographic representations is common for reading and spelling modalities (Ehri 1997).

Methods

Participants and Design

Twenty-four French-speaking students from a secondary special school took part in the experiment. They originated from a rural school in Belgium, from a middle social economic status. Students came from three classes and they were randomly assigned to one of the three groups, each made up of eight students: decoding and

student-guided self-assessment group (two boys), decoding and teacher-guided self-assessment group (three boys), and control group (three boys). In the classrooms, two other students who had been receiving additional speech therapy did not participate, as well as one absent student. In the control group, students had their usual French lessons, in accordance with the school programmes. They did not work specifically on word reading during their French lessons.

All participants were struggling readers according to the school multidisciplinary team assessment and to their scores at the standardised reading test Batterie Analytique du Langage Ecrit (BALE; Jacquier-Roux et al. 2010). Their scores in reading accuracy and reading speed were around one standard deviation below the mean of fifth grade (i.e., 10 years old), the upper limit of the norms, while being 14.50 years old. For word reading accuracy scores, in standard scores (M = 100, SD = 15), they obtained 76.23 (SD = 15.49) in the student-guided self-assessment group, 73.03 (SD = 12.20) in the teacher-guided self-assessment group, and 81.07 (SD = 13.29) in the control group. For the word reading speed scores, they obtained 84.85 (SD = 10.97) in the student-guided self-assessment group, 87.12 (SD = 9.89) in the teacher-guided self-assessment group, and 86.96 (SD = 12.88) in the control group. The mean age of the students was 14.50 (SD = 1.01) in the student-guided self-assessment group, 14.50 (SD = 0.93) in the teacher-guided self-assessment group and 14.50 (SD = 0.93) in the control group. There was no significant difference between the groups.

The participants had a reading level of third grade primary school whilst being in secondary school. According to their teachers, they also suffered from reading comprehension problems and the reading activities caused anxiety for them. The teachers, the students and their parents gave their active consent to participate in the experiment. The study was approved by the Ethics Committee of the Psychological Science Research Institute.

Treatment Conditions

The two experimental treatments focused on decoding strategies of reading and were conducted in the same way. The two treatments only differed on the self-assessment practice: one treatment included an open self-assessment tool, designed by the students themselves (student-guided self-assessment), while the other comprised a self-assessment tool introduced by the teachers (teacher-guided self-assessment). The two treatments were administered for the same duration, nine lessons of 50 minutes, one lesson per week between January and April.

Decoding Treatment This treatment was inspired by the McCandliss's Word building intervention (2003). It consisted in a progressive minimal pairing of words in which children were asked to transform one word into the next by changing a letter (e.g., from *sat* to *sap* to *tap*, etc.). They then had to decode the similar words one after the other. The aim of the task was to force the children to decode precisely

the orthographic neighbours that should in turn enable them to create fully specified orthographic representations of the words. During the two first lessons, the treatment focused on 20 specific complex graphemes-phonemes correspondences that were still difficult for the students, namely, complex sounds or contextual graphemes (i.e., graphemes that vary depending on the following grapheme in the word; Lessons 1 and 2). Students had to correctly read from three to five words for each complex grapheme-phoneme correspondence. Then, the same structure was followed during the next seven lessons: reading lists of 20 words based on minimal pairing, recognition of some words of the lists, reading in context of a text including some words of the lists, short comprehension questions. The minimal pairing lists of words were created with words of the text for which three to five orthographic neighbours were created (e.g., *gars* was a word from the text, the list then comprised *gras*, *gars*, *grâce*, *grasse* vertically presented). We accepted a broader view of orthographic neighbours in adding words that differed from more than one letter, up to four (e.g. *frisquet* was a word from the text, we added *froid*, *frisquet*, *frais*, *fais*, *fait*). Students were invited to use a frame – a sheet with a centre hole – to ensure that they staid concentrated on the list. They were also asked to record their reading speed per list with a timer. The exercises gradually increased in the level of difficulty either due to the number of 20-words lists (two lists in lessons 3 and 4, three lists in lessons 5 to 8, four lists in lesson 9; 400 words in total), either to the text length (from 80 words to 220 words). The reading mistakes were immediately corrected by the experimenter.

Self-Assessment Practices In addition to the decoding treatment, students from the two intervention groups were invited to use a self-assessment tool. In the student-guided self-assessment, this tool was designed by the students themselves, whereas in the teacher-guided self-assessment, it was provided by the teacher. In both groups, an extra lesson was organised at the start of the intervention to design or present the self-assessment tool, respectively, in the student- and teacher-guided conditions. In both groups, students started by sharing their representations of self-assessment. Then, in the student-guided self-assessment group, the students collectively created a self-assessment tool by choosing one out of several tools, which constituted an open self-assessment tool. The experimenter presented either a flower illustrating the amount of correct answers by adding colours, or a gauge with graduations. The students suggested to replace the graduations of the gauge by three smileys accompanied by explanations, and finally to remove the gauge to save space on the sheet. The final self-assessment decided by the group was three "smileys" presented at the end of each lesson with the following three states: (i) everything went well for me; (ii) I had some difficulties but I did not surrender; (iii) I needed help, I had many difficulties.

In the second group, teacher-guided self-assessment, the teacher gave the students a self-assessment tool composed of six questions for which they had to answer on a 4-point Likert scale at the end of each lesson: (i) I correctly read the words; (ii) I understood the text; (iii) I understood the questions; (iv) I did not make mistakes;

(v) I still need some help to understand the text; (vi) what can I do to improve my reading skills? In both groups, the students were asked to answer to the self-assessment tool at the end of each lesson.

Treatment Fidelity

To ensure that the treatments were conducted as planned and as similar as possible between the two experimental groups, the following safeguards were taken: a manual was created including the exercises and the instructions; before the intervention, the experimenter followed a training session; during the treatment, the experimenters had two-weekly meetings to make sure that the implementation was as similar as possible between the two groups. Students' booklets were also checked in order to verify that the intervention had been accomplished as planned. All the exercises were done and the self-assessment tool was properly used after each lesson.

Testing Measures

To assess interventions' effectiveness, before and after the treatment (i.e., pre-test and post-test), we administered a set of tests evaluating students' reading and spelling skills along with a questionnaire assessing their self-efficacy beliefs for reading.

Word Reading Skill Word reading skill was measured with the standardised subtest from BALE (Jacquier-Roux et al. 2010) on accuracy and speed for three kinds of words: regular words, irregular words and pseudowords. Each type of words was assessed using two lists composed of 20 highly frequent words and 20 low frequent words. Students were asked to do the best they could to read the words presented in columns of 20 words. For the pseudowords, the experimenter explained that words did not exist and they did not have to try to understand them. Speed and accuracy were scored for each list, by measuring reading time (RT) in seconds and by attributing one point for each item correctly read. In total, four scores of word reading accuracy were attributed to each student: regular word reading accuracy, irregular word reading accuracy, pseudoword reading accuracy, and global word reading accuracy, which included all types of words. The maximum accuracy score is 40 for each type of words (regular, irregular, pseudowords) and 120 for global accuracy. In the same way, speed measures led to four different scores, one for each type of words (regular, irregular, pseudowords) and one for global reading speed. The words in the assessment were different from the words in the training to evaluate the generalisation process.

Text Reading Skill Text reading skill was assessed by the standardised subtest from BALE (Jacquier-Roux et al. 2010). Students were asked to read out loud a text

the best they could within a time limit of 1 min. Their score consisted in the number of words correctly read in 1 min, which led to two scores: accuracy and speed.

Reading Comprehension Skill Reading comprehension skill was evaluated by the standardised subtest L3 from Orlec battery (Lobrot 1967). It consisted of a multiple-choice test involving the completion of 36 sentences by selecting the missing word out of five possible options, in a time limit of 5 min. The options included distracters such as homophones (e.g., *mère* [mother] instead of *mer* [sea]), phonological distracters (e.g. *palais* [palace] instead of *balai* [broom]), or semantic distracters (e.g. *pattes* [paws] instead of *oreilles* [ears]). The scores used consisted in the number of words correctly chosen to complete the sentences (Max. score 36).

Self-Efficacy Beliefs Self-efficacy beliefs were evaluated via a questionnaire composed of nine items adapted from Galand and Philippot (2002) for reading skill. Students had to respond on a 4-point Likert scale (e.g., *I think I am good in reading*). Coefficient of internal consistency (Cronbach's alpha = .82) supported the a priori grouping of the items into one scale, by averaging responses to all items.

Word Spelling Skill The word spelling skill was measured by the standardised subtest from BALE (Jacquier-Roux et al. 2010). Students were asked to write down the words orally presented to them. Spelling was assessed with a list of 30 items for word spelling and a list of 20 items for pseudoword spelling. For pseudowords, students were informed that the words did not exist and they had to write them the way they had been pronounced. One point was attributed to each word correctly spelt, ending up in a maximum score of 30 for words and 20 for pseudowords. A global word spelling score was also computed, by adding up the pseudoword spelling score and the regular spelling score.

Procedure

All testing and intervention sessions took place at school. The same experimenter trained the two experimental groups, by group of eight. Participants of the three groups were tested at pre-test and post-test by two experimenters. The reading tasks of pre-test and post-test were individually administered in a 20-min session. The spelling tasks and the self-efficacy questionnaire were collectively administered the classroom by the two experimenters. All the measures were presented before (January) and immediately after (April) the interventions. To ensure a blind process, the score sheets were anonymised prior to corrections by the experimenters.

Results

Preliminary Analyses

Due to the small sample size, data was analysed with non-parametrical methods. To ensure that there was no pre-existing difference between the three groups at pre-test, Kruskal-Wallis tests were conducted on the different measures (i.e., reading, self-efficacy, and spelling). Results indicated that there were no differences between the three groups at pre-test on global word reading accuracy score, $\chi^2(2, N = 24) = 1.449$, $p = .484$; regular word reading accuracy, $\chi^2(2, N = 24) = 0.672$, $p = .715$; irregular word reading accuracy, $\chi^2(2, N = 24) = 0.708$, $p = .702$; pseudoword reading accuracy, $\chi^2(2, N = 24) = 1.632$, $p = .442$; global word reading speed, $\chi^2(2, N = 24) = 0.114$, $p = .945$; regular word reading speed, $\chi^2(2, N = 24) = 0.536$, $p = .765$; irregular word reading speed, $\chi^2(2, N = 24) = 0.060$, $p = .970$; pseudoword reading speed, $\chi^2(2, N = 24) = 0.081$, $p = .960$; text reading, $\chi^2(2, N = 24) = 0.212$, $p = .900$; reading comprehension, $\chi^2(2, N = 24) = 1.192$, $p = .551$; self-efficacy beliefs, $\chi^2(2, N = 24) = 0.966$, $p = .617$; global word spelling, $\chi^2(2, N = 24) = 3.086$, $p = 214$; regular word spelling, $\chi^2(2, N = 24) = 3.613$, $p = .164$; pseudoword spelling, $\chi^2(2, N = 24) = 1.121$, $p = .571$.

Table 18.1 presents the means and standard deviations in the reading, self-efficacy, and spelling measures by group and across the two testing points. Because of the small size of the present sample, the treatment effects were analysed for each dependent variable using a Kruskal-Wallis non-parametrical test. A variable representing students' improvement for each score was computed, by making the difference between post-test and pre-test for each score. When the Kruskal-Wallis test was significant, Mann-Whitney local analyses were then conducted in order to evaluate pairwise differences among the three groups. Table 18.2 displays the p values and effect sizes (Cohen's d) for all pairwise comparisons, while the text presents only significant ones.

Treatment Effects on Reading

Global Word Reading Accuracy The Kruskal-Wallis test indicated a significant difference in the improvement of the three groups between pre- and post-test, $\chi^2(2, N = 24) = 9.667$, $p < .01$. The results of the pairwise analyses indicated that students from the teacher-guided self-assessment experimental group and students from the student-guided self-assessment group showed greater improvement than the control group (teacher-guided: $p < .01$; student-guided: $p = .02$), while no significant differences were found between the two experimental groups ($p = .25$).

Table 18.1 Means and standard deviations for dependant variables by testing time and group

		Student-guided self-assessment		Teacher-guided self-assessment		Control	
	Testing time	*M*	*SD*	*M*	*SD*	*M*	*SD*
Global word reading accuracy (max. 120)	Pre-test	91.50	11.04	89.50	9.21	95.00	10.16
	Post-test	106.12	3.72	109.37	3.02	102.00	5.98
Regular word reading accuracy (max. 40)	Pre-test	35.12	2.53	34.37	2.56	35.37	2.87
	Post-test	38.75	1.03	39.00	1.07	38.00	2.07
Irregular word reading accuracy (max. 40)	Pre-test	28.12	4.15	28.75	3.77	29.25	4.27
	Post-test	32.87	1.36	34.62	1.51	31.62	3.46
Pseudowords reading accuracy (max. 40)	Pre-test	28.25	5.70	26.37	5.90	30.37	4.63
	Post-test	34.50	2.39	35.75	1.67	32.37	3.29
Global word reading speed	Pre-test	190.87	35.08	184.62	31.68	184.50	42.49
	Post-test	146.50	9.72	150.00	18.17	175.87	35.55
Regular word reading speed	Pre-test	58.00	12.28	53.87	9.67	55.75	14.33
	Post-test	44.12	4.55	45.12	5.46	53.12	10.52
Irregular word reading speed	Pre-test	56.37	12.55	55.87	11.57	55.62	13.61
	Post-test	44.75	4.56	44.25	5.75	54.12	13.01
Pseudowords reading speed	Pre-test	76.50	12.32	74.87	14.41	73.12	16.11
	Post-test	57.62	2.82	60.62	10.11	68.62	14.12
Text reading (correct words in 1 min.)	Pre-test	97.87	22.55	102.25	18.29	101.38	20.72
	Post-test	117.62	16.63	115.87	10.40	106.00	21.27
Reading comprehension	Pre-test	44.09	11.73	37.50	13.85	37.50	14.32
	Post-test	57.64	14.60	55.90	12.37	41.67	14.16
Self-efficacy beliefs	Pre-test	12.25	3.33	11.87	3.04	10.62	2.67
	Post-test	22.87	2.99	19.50	4.98	12.75	2.60

Word spelling (max. 50)	Pre-test	34.12	4.61	30.87	3.44	29.62	6.07
	Post-test	42.12	2.17	41.00	3.07	32.37	4.75
Regular word spelling (max. 30)	Pre-test	22.25	3.77	19.37	2.82	19.00	3.55
	Post-test	25.62	2.06	25.50	2.27	20.50	2.78
Pseudoword spelling (max. 20)	Pre-test	11.87	2.03	11.50	1.93	10.62	2.61
	Post-test	16.50	0.92	15.50	1.51	11.87	2.10

Table 18.2 P Values and effect sizes (Cohen's d) of pairwise comparisons between conditions

	Student-guided self-assessment vs. Teacher-guided self-assessment		Student-guided self-assessment vs. control		Teacher-guided self-assessment vs. control	
	p	*d*	*p*	*d*	*p*	*d*
Word reading accuracy						
Global word reading accuracy (max. 120)	.25	−0.60	**.02**	**1.13**	**<.01**	**1.72**
Regular word reading accuracy (max. 40)	.49	−0.37	.22	0.32	.11	0.62
Irregular word reading accuracy (max. 40)	.63	0.34	**.03**	**0.94**	**.03**	**1.39**
Pseudowords reading accuracy (max. 40)	.24	−0.58	**.01**	**1.33**	**<.01**	**1.62**
Word reading speed						
Global word reading speed	.53	−0.43	**<.01**	**−1.75**	**<.01**	**−1.84**
Regular word reading speed	.19	−0.66	.06	−1.38	**.05**	**−1.16**
Irregular word reading speed	.87	0.00	**.001**	**−1.58**	**<.01**	**−1.93**
Pseudowords reading speed	.25	−0.47	**.01**	**−1.74**	**.03**	**−1.41**
Text reading and comprehension						
Text reading (correct words in 1 min.)	.19	0.64	**<.01**	**2.08**	**.01**	**1.38**
Reading comprehension	.24	−0.75	**.001**	**2.43**	**<.001**	**2.29**
Motivation						
Self-efficacy beliefs	.15	0.84	**.001**	**3.24**	**<.01**	**2.05**
Word spelling						
Word spelling (max. 50)	.24	−0.79	**.001**	**2.35**	**.001**	**3.49**
Regular word spelling (max. 30)	**.01**	**−1.44**	.09	1.17	**<.01**	**3.33**
Pseudoword spelling (max. 20)	.44	0.42	**<.001**	**2.60**	**.001**	**2.45**

Regular Word Reading Accuracy The Kruskal-Wallis test did not show a significant effect, $\chi^2(2, N = 24) = 3.044$, $p = .22$. The students from the three groups showed a similar improvement from pre-test to post-test.

Irregular Word Reading Accuracy The Kruskal-Wallis revealed a significant difference between groups, $\chi^2(2, N = 24) = 6.519$, $p = .04$. Locally, students from both the teacher-guided self-assessment treatment and the student-guided self-assessment treatment improved more than control students (teacher-guided: $p = .03$;

student-guided: $p = .03$). The students from the two experimental groups showed equivalent improvement from pre-test to post-test, $p = .63$.

Pseudoword Reading Accuracy A significant group effect was found, $\chi^2(2, N = 24) = 11.612$, $p < .005$. The pairwise analyses revealed no difference between the two experimental groups, $p = .24$. Students from the teacher-guided self-assessment group improved more than control students ($p < .01$). The same difference is observed between the student-guided self-assessment group and the control group ($p = .01$).

Global Word Reading Speed The Kruskal-Wallis test indicated a significant difference in the improvement of the three groups between pre- and post-test, $\chi^2(2, N = 24) = 11.110$, $p < .005$. The pairwise analyses revealed no difference between the two experimental groups, $p = .53$, and a significant advantage from both the student-guided self-assessment group ($p < .01$) and teacher-guided self-assessment group ($p < .01$) compared to the control group.

Regular Word Reading Speed The Kruskal-Wallis test revealed significant differences in the growth of the three groups, $\chi^2(2, N = 24) = 5.872$, $p = .05$. Students from the two self-assessment groups showed greater improvement between pre-test and post-test than students from the control group (teacher-guided self-assessment: $p = .05$; student-guided self-assessment: $p = .06$), while those two groups showed equivalent improvement, $p = .19$.

Irregular Word Reading Speed The Kruskal-Wallis test indicated a significant difference in the improvement of the three groups between pre- and post-test, $\chi^2(2, N = 24) = 13.378$, $p < .001$. The pairwise analyses revealed no difference between students from the two experimental groups, $p = .87$, and that students from both groups improved more than the students in the control group (student-guided self-assessment; $p = .001$ and teacher-guided self-assessment; $p < .01$).

Pseudoword Reading Speed The Kruskal-Wallis test indicated a significant difference in the improvement of the three groups between pre and post-test, $\chi^2(2, N = 24) = 8.457$, $p = .015$. The local effects revealed that students from the student-guided self-assessment group improved significantly more than the students from the control group, $p = .01$, as well as students from the teacher-guided self-assessment, $p = .03$. No differences were found between the two experimental groups, $p = .25$.

Text Reading The Kruskal-Wallis test indicated a significant difference in the improvement of the three groups between pre and post-test, $\chi^2(2, N = 24) = 12.189$, $p < .005$. While no differences between the two experimental conditions were found, $p = .19$, the pairwise analyses revealed a significant advantage of the student-guided self-assessment group compared to the control group ($p < .01$) and of the teacher-guided self-assessment group compared to the control group ($p = .01$).

Reading Comprehension The Kruskal-Wallis test indicated a significant difference in the improvement of the three groups between pre and post-test, $\chi^2(2, N = 24) = 14.491$, $p < .001$. The pairwise analyses revealed no difference between students from the two experimental groups, $p = .24$, while both experimental groups showed a larger improvement compared to students from the control group (student-guided self-assessment group $p < .001$; teacher-guided self-assessment group $p < .001$).

Treatment Effects on Self-Efficacy Beliefs

The Kruskal-Wallis test indicated a significant difference in the improvement of the three groups between pre and post-test, $\chi^2(2, N = 24) = 14.646$, $p < .001$. The pairwise analyses demonstrated no significant difference between the two experimental groups, $p = .15$, and a significant benefit for students from the two experimental conditions (student-guided self-assessment; $p = .001$, and teacher-guided self assessment; $p < .01$) compared to control students.

Transfer Effects to Spelling

Global Word Spelling The Kruskal-Wallis test indicated a significant difference in the improvement of the three groups between pre and post-test, $\chi^2(2, N = 24) = 14.998$, $p < .001$. The pairwise analyses revealed no difference between students from the two experimental groups, $p = .24$, and that students from both groups improved more than the students from the control group (student-guided self-assessment; $p = .001$, and teacher-guided self-assessment; $p = .001$).

Regular Word Spelling The Kruskal-Wallis test indicated a significant difference in the improvement of the three groups between pre-test and post-test, $\chi^2(2, N = 24) = 13.576$, $p < .001$. The local effects revealed that students from the teacher-guided self-assessment group improved significantly more than the students from both the control group ($p < .01$) and the students from the student-guided self-assessment group, $p = .01$. No differences were found between the student-guided self-assessment group and the control group, $p = .09$.

Pseudoword Spelling The Kruskal-Wallis test indicated a significant difference in the improvement of the three groups between pre-test and post-test, $\chi^2(2, N = 24) = 14.745$, $p < .001$. The pairwise analyses demonstrated no significant difference between the two experimental groups, $p = .44$, and a significant benefit for students from the two experimental conditions (student-guided self-assessment; $p = .001$, and teacher-guided self-assessment; $p = .001$) compared to control students.

Discussion

The main goal of the present study was to examine the benefits of reading interventions targeting decoding skills and including self-assessment support for 14-year-old persistently struggling readers. Although previous research focused on reading comprehension problems of these students, they seem to still encounter difficulties with the basic decoding strategy. To the best of our knowledge, no study has ever investigated the efficacy of providing them so late with a decoding treatment, mainly combined with instructional practices to nurture self-efficacy beliefs, such as self-assessment. The transfer effects from reading treatment to spelling have also never been studied in French.

Treatment Effects on Reading

The first purpose of the study was to assess if a decoding treatment, including self-assessment, would lead to improvements in word reading, text reading, and reading comprehension among persistently struggling readers. Students were randomly assigned to either a decoding and self-assessment treatment group, where they were drilled with 400 orthographic neighbour words, or to the control group, where they followed their usual class lessons. In line with our prediction, results showed that a basic decoding treatment, coupled with self-assessment, was still efficient for persistently struggling readers in secondary school. Compared to students in the control group, the performance of the students benefitting from the decoding treatment increased more in word reading, text reading – in terms of accuracy and speed – and reading comprehension.

Our results provide empirical evidence that a treatment focused on the early learning strategies of reading offers older students opportunities to improve reading, even if they have been struggling for several years. Findings therefore offer support to the self-teaching hypothesis (Share 1995, 1999), even for persistently struggling readers. As in younger children, the repeated decoding correctly enabled older students to create orthographic representations in the lexicon. In our treatment, students were asked to read several orthographic neighbours before reading them into context, in a similar way as the Word building training (McCandliss et al. 2003). Our results support this previous work in confirming that making students pay attention to each letter within a word enables the use of a fine-grained decoding strategy and prevent reading mistakes. In this sense, this kind of treatment is thought to induce a precise decoding strategy covering all the letters of the word. Furthermore, since the words assessed in the word reading task at pre-test and post-test were different from the ones drilled during the intervention, we observed a generalisation effect to novel words. A similar effect was observed in a recent training study on tablet (van Gorp et al. 2017), whilst not found in previous works (Berends and Reitsma 2006; Thaler et al. 2004). This generalisation to novel words suggests that

the treatment impacted the underlying processes of reading. Indeed, students read more accurately words that were not trained during the treatment, which can be explained by a change in the reading process itself. They probably moved from an imprecise decoding strategy to a fined-grained and precise decoding process that can be used for both untrained and trained words.

Treatment Effects on Self-Efficacy Beliefs

A second purpose of the study was to examine different instructional practices that may enhance the engagement of the students, considering their long experience of failure in reading tasks. More precisely, we wanted to assess whether a student-guided self-assessment support would be more efficient compared to a teacher self-assessment support in looking at the improvement in self-efficacy beliefs. Within the experimental group, students were randomly assigned either to the student-guided self-assessment group, where we let them choose the procedure, or to the teacher-guided self-assessment group, where the teacher provided the support.

Results demonstrated that the two experimental groups improved more than the control group their self-efficacy beliefs, with the two self-assessment treatments showing sizeable improvements. Thus, contrary to our hypotheses, students who experienced the student-guided self-assessment treatment did not appear to make more progress than those students who could not choose their support. Although these findings seem to imply that students may not benefit from being allowed to choose the self-assessment support, three caveats should be mentioned. First, both groups showed very large effect sizes in comparison to the control group but the student-guided self-assessment had a larger effect size (d = 3.24) than the teacher-guided self-assessment (d = 2.05). Second, the procedure used for the open self-assessment condition did not give the students as much control and freedom as required. Indeed, students had to decide together, as a group, the form of the open structure, which is not the same as making a personal choice. It would be interesting to conduct a similar experiment giving students as much independence as possible when it came to choosing the characteristics of their self-assessment tool. Third, no benefits appeared on the assessed measures but our motivation-related variable was limited to one aspect of motivation. It would be a nice avenue for future research to evaluate other motivational variables such as the interest for the task or the engagement, which may be differently affected by the type of self-assessment support.

Regardless of the nature of the self-assessment support, the overall results showed important findings on motivation since students from both experimental groups clearly increased their self-efficacy beliefs. Our results suggest that the self-assessment support and the decoding treatment enabled them to strengthen their self-perception about their reading skills. More specifically, since the items included self-perception about reading comprehension and not only decoding, it can be suggested that they perceived to have better skills that were not directly trained, though dependent on those trained. This result supports the findings of Andrade (2009) on

self-assessment. Bearing in mind that the participants of the present study were persistently struggling readers, with a long history of failure, our findings demonstrating such improvement on self-efficacy beliefs are remarkable (Bandura 2007). Even so, since we did not have a group receiving a decoding treatment alone, the data do not provide direct evidence that the use of the self-assessment tools was responsible for the increase in self-efficacy beliefs. It is possible that the improvement in reading lead to an increased feeling of control on the task since the mastery experience is the main source of self-efficacy beliefs. However, in a previous study we have demonstrated the specific impact of self-assessment on the self-efficacy beliefs and on the spelling skills among typically developing students (Van Reybroeck et al. 2017). It could be relevant to confirm this first evidence of the specific impact of self-assessment on motivation with struggling readers as well.

Transfer Effects to Spelling

Our third goal was to evaluate whether the improvements in reading through the decoding treatment could be transferred to spelling skills of older French-speaking students, who learn in a different language system in terms of phoneme-grapheme correspondences than English. Students were asked to read regular words, irregular words and pseudowords, and to spell regular words and pseudowords, which gave information about the use of the phonological route and the lexical route of reading and spelling (Coltheart et al. 2001). Indeed, unfamiliar words like pseudowords relied on the phonological route, while irregular words, made up of inconsistent grapheme-phoneme conversions, could only be recognised by the lexical route (once the student had stored the orthographic representation in his mental lexicon). We expected students to improve their word spelling skills due to the better specification of their orthographic representations. However, we anticipated a lesser impact on spelling than on reading since the spelling task requires more finely-specified representations than the reading task, as demonstrated by Conrad (2008).

We found that the decoding treatment enabled amelioration in reading speed and in pseudowords reading accuracy, with an improvement in spelling for the two types of words: pseudowords and regular words. The increase in the number of correctly spelled pseudowords confirms the improvement of the decoding processes, or the better quality of the phonological route. This also gives evidence that the orthographic representations drilled in reading are transferred to spelling tasks, which confirms their common underlying processes (Ehri 1997). Moreover, the current study showed a clear improvement in spelling with high effect sizes for pseudowords spelling. The large amount of transfer from reading intervention to spelling is somewhat in contrast to the observations of Conrad (2008) who demonstrated a lower transfer from reading intervention to spelling than from spelling intervention to reading. At least two aspects between our study and Conrad's study may explain the different results: participant-related aspects and intervention-related aspects.

With respect to participant-related aspects, a first possible explanation of the different results may be linked to the transparency of the letter-sound mappings in reading and spelling, differing in English and in French. Indeed, as reported by Peereman and Content (1998), the orthography-to-phonology consistency (i.e., reading) in English is lower (77.4) than in French (96), while the phonology-to-orthography consistency (i.e., spelling) is similar in both languages: English, 69.6 and French, 71.2. Therefore, reading is more transparent than spelling in French, while both reading and spelling have a similar level of transparency in English. It could be the case that a treatment is more efficient in the highest transparent modality of the orthographic system, which enables higher levels of transfer to the other modality. Indeed, training in reading in French, the most transparent modality, may enable students to transfer to spelling tasks more efficiently since they have acquired stable mappings. In English, training in reading could be less efficient due to the opacity of the mappings, because the opacity of reading is not greater than the opacity of spelling. A second possible explanation of the different results relates to the age of the participants. Students in our study were older than the ones who participated in Conrad's study (Grade 2) and were persistently struggling readers. Therefore, our students could have had a better transfer of learning due to their previous written language experience.

With regards to intervention-related aspects, another possible explanation of the differences between the results of the two studies could be the number of words drilled during the intervention: we worked with 400 words, while second graders from Conrad's study learned 40 words. The higher number of words drilled may have better improved the quality of the orthographic representations. Finally, we integrated in our study a self-assessment support, which could have led to more effective learning. One very interesting avenue for future research may be to more fully investigate the specific cause of the remarkable improvement in spelling.

Limitations

This experiment holds at least three limitations. First, due to the characteristics of the target population (i.e., persistently struggling readers), sample size was small ($N = 24$, eight participants per group), which did not allow us to conduct parametrical analyses. It would be relevant to reproduce the same experiment with a higher number of participants, in order to replicate the present results. A second limitation relates to the multi-componential nature of the intervention. Indeed, the two experimental groups were trained on both decoding and motivation. This does not allow to isolate the effect of the decoding treatment itself on the one hand, and the effect of adding a motivational component to the intervention on the other hand. Further experiments should allow to compare the effectiveness of a decoding treatment

alone, compared to the same decoding treatment coupled with the use of a self-assessment tool. A last limitation refers to the treatment fidelity measures. Even if several procedures were implemented to ensure that the interventions were conducted as planned, and there were no indication of large deviance from the plans, the measures could have been improved by evaluating for example, the level of students' engagement during lessons.

Practical Implications

Finally, the results from this experiment lead to practical implications regarding persistently struggling readers. The present study shows that working on improving teenagers' decoding skills, with a self-assessment axis, is still efficient. While struggling readers in secondary school tend to exclusively practice their reading comprehension skills, it would be useful for teachers to propose more basic decoding exercises. Our results also highlight the need to take into consideration both the cognitive and motivational dimensions involved in reading. Indeed, by targeting both abilities simultaneously, this experiment revealed positive effects on both self-efficacy beliefs and reading performance. Using a self-assessment tool seems to help students to dedicate themselves to the tasks by giving them control over the learning process and by helping them measure the extent of their improvements. Moreover, the study shed light on the impact from reading training to spelling skills, which demonstrates the widespread benefit from the decoding intervention on their entire literacy skills.

Conclusion

In conclusion, the present study gives evidence that a decoding treatment is still efficient for persistently struggling readers, supporting the self-teaching hypothesis even for older students. The findings also indicate a significant transfer from learning in reading to spelling, confirming the common orthographic representations for reading and spelling. Finally, the treatment also shed light on the potential of teaching practices that allow students to be involved in their learning even when it constitutes a real challenge for them. These findings have a clear practical implication for teachers' instructional practices at school and also for our understanding of the persistent reading difficulties among older students and the close relationship between reading and writing skills, even for teenagers.

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Chapter 19
Reading and Writing Connections: A Commentary

Steve Graham

Abstract This commentary reviews the theoretical and empirical support for how reading and writing are connected and can support the development of each other and can be used in conjunction to accomplish learning goals. It then reviews studies on reading and writing presented in three chapters, detailing how they advance our knowledge and theory in this area. Finally, it provides recommendations for future research.

Keywords Reading · Writing · Reading and writing connections · Future research · Learning

Reading and writing are connected at the most basic level and in the most intimate ways. There is no reading without writing, and no purpose for writing without readers.

When readers write and writers read, they draw on many of the same cognitive resources. This is the case even though reading and writing are not identical skills (Fitzgerald and Shanahan 2000). Readers rely on their background knowledge to understand what they are reading; writers turn to this same source of information to obtain ideas for their writing. Readers and writers apply what they know about the functions and purposes of written language, as this helps them interpret an author's message and construct their own message for others to read. Readers make sense of what they read by using procedural knowledge about how to access information purposefully, set goals, question, predict, summarize, visualize, and analyze, whereas writers apply such knowledge when planning and crafting text. Readers and writers draw on their knowledge of the features of text, words, syntax, and usage to decode/encode words and comprehend/construct sentences or larger units of text.

S. Graham (✉)
Mary Lou Fulton Teachers College, Arizona State University, Tempe, AZ, USA
e-mail: steve.graham@asu.edu

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While readers often read text without doing any writing, writers commonly read the text they write to determine if it conveys their intended message. Even so, the purposes of reading and writing are to communicate. Effective communication when reading or writing involves specific processes that inform each other (Nelson 2008). For instance, readers acquire important insights into writing, as they think about why an author used a particular word, phrase, sentence, or rhetorical device to deliver an intended meaning. Likewise, writers gain insights about reading by creating text as they need to make their assumptions and premises clear as well as observe the rules of logic when composing text, making them more aware of these same issues in the material they read.

Not only do reading and writing draw on common cognitive resources and inform each other, they are frequently used in tandem to solve a specific problem or accomplish a particular task (Langer and Applebee 1987). For example, this includes using writing and reading together to acquire, understand, or study content material, using reading to gather information for writing, and writing about text to enhance comprehension of it.

These theoretical views on reading and writing connections are supported, at least in part, by empirical evidence collected with children and adolescents. Writing about material read improves their comprehension of it; teaching them how to write improves their reading comprehension, reading fluency, and word reading; and increasing how much they write enhances their reading comprehension (Graham and Hebert 2011; Graham and Santangelo 2014). Similarly, teaching children and adolescents how to read improves writing quality, output, and spelling, and increasing how frequently they read (and even observe others read) strengthens writing quality and spelling (Graham et al. 2018a, b). Teaching reading and writing together improves reading comprehension, writing quality, word decoding, spelling, reading vocabulary, and writing mechanics (Graham et al. 2018a, b).

While there is theoretical and empirical support for reading and writing connections, the available evidence supporting these connections are relatively thin. The three chapters in this section of the book provide new evidence about reading-writing connections and how one can influence the other.

The study presented in the chapter by Uppstad, Solheim, and Skaftun provides empirical evidence that is consistent with the theoretical proposition that engaging in the process of writing is beneficial to reading. In a correlational study with fifth grade students in Norway, they found that children who wrote directions that more successfully detailed how to get from one location to the other, taking into account both the writer's location and the reader's eventual destination, had stronger reading comprehension skills (after variance due to word reading and listening comprehension were first controlled). The findings from this study did not establish a causal link, demonstrating that engaging in writing informs reading, but they are consistent with the theoretical proposition that reading and writing inform each other (Nelson 2008). This theoretical viewpoint is under investigated, and this study provides a welcome addition to this literature.

The two investigations reported in the chapter by Elimelech, Aram, and Levin make an important contribution to the study of reading and writing connections by

examining if writing instruction delivered by parents at home enhanced the writing and reading skills of preschool and primary grade Israeli children. Parents are children's first literacy teachers, but most intervention studies that examine the impact of literacy instruction involve either teachers or researchers as instructors. The two studies presented here turn this typical narrative on its head by bringing school literacy instruction into the home, with parents acting as teachers. Such instruction had positive benefits in these two studies, as students who received writing instruction from their parents made greater writing and reading gains than students who did not receive parental instruction. These findings provide support for the theoretical proposition that students draw on the same sources of knowledge as they read and write (Fitzgerald and Shanahan 2000).

Reybroeck, Cumbo, and Gosse in the study presented in their chapter approach reading and writing connections from the opposite direction: providing reading instruction to determine if it enhanced both reading and writing. They set themselves a challenging task, as their investigation involved secondary students with a long history of difficulties learning to read. Reading growth for these students often plateaus after the elementary grades, possibly because reading is no longer taught (Biancarosa and Snow 2006). Fortunately, they found that Belgian students who practiced recoding words with similar orthographic patterns evidenced greater gains in word reading and reading comprehension as well as spelling than students who did not receive any special reading instruction. Like the studies by Elimelech, Aram, and Levin, these findings provide additional support for the theoretical proposition that students draw on the same sources of knowledge as they read and write (Fitzgerald and Shanahan 2000).

Not only do these studies provide empirical support for reading and writing connections, they also provided directions for future research. The most obvious limitation of these studies, at least in terms of examining reading and writing connections, is that they were unidirectional in focus. More specifically, they examined the relation from writing to reading or from reading to writing, but not the reciprocal interaction between these two related skills. I do not mean this as a criticism (as the reciprocal effects of these two skills was not the focus of these researchers), but use this omission to identify a direction for future research.

To provide some indication as to why I think that the reciprocal interactions between reading and writing connections needs to be the subject of additional research, I draw on a recent meta-analysis I conducted with my colleagues (Graham et al. 2018a, b). In this review, we identified published and unpublished true-and quasi-experiments where reading and writing were both taught. No more than 60% of the instructional time could be focused on either reading or writing in the studies reviewed. We were only able to identify 47 experiments that involved such instruction and assessed students' growth as readers, writers, or both. While a variety of different combined reading and writing programs were tested in the identified studies (e.g., cooperative learning, strategy instruction oriented, whole language, literature-based, content-based), no single approach was tested in more than eight experiments. Further, some of the approaches (e.g., cooperative learning, and whole language) did not produce statistically significant effects for both reading and

writing. Thus, we need to know much more about how to take advantage of reading and writing connections when providing combined literacy instruction if we are to maximize students' reading and writing growth. It is particularly important to better determine how much emphasis to place on each skill, as we found that treatments that placed an equal emphasis on reading and writing yielded greater effects than studies that placed a greater emphasis on reading or writing. Moreover, the long-term effects of combined reading and writing instruction are unknown.

The call for additional research that tests the effectiveness of combined reading and writing instruction should not mean that additional research testing the unidimensional effects of reading instruction on writing or vice versa is no longer needed. For example, in another meta-analysis conducted by my colleagues and I (Graham et al. 2018a, b), we were only able to identify 91 published and unpublished papers that assessed the impact of reading or reading instruction on students' writing via a true- or quasi-experiment. While phonological awareness, phonics, and reading comprehension instruction had a positive impact on one or more aspects of writing performance immediately following instruction and beyond, research investigating the impact of vocabulary and fluency instruction on writing is almost non-existent. Likewise, increasing students' interaction with words and text through reading improved writing performance, but such effects were not maintained over time. As a result, we need to explore new avenues for how reading and reading instruction can lead to better writing. In the case of interventions that provide more interaction with words and text, we also need to determine how obtained effects can be maintained over time.

The need for more research looking at the causal relationships between reading and writing also applies to writing and writing interventions effects on reading. In other meta-analysis (Graham and Hebert 2011; Graham and Santangelo 2014), we found a relatively small number of studies that tested if increasing how much students wrote improved reading comprehension; providing spelling instruction improved word reading, reading fluency, and reading comprehension; and teaching sentence skills or text structure improved one or more aspects of students' writing. More research is needed (and some of it is found in this book) that tests these relationships as well as examines the impact of other approaches to teaching writing on reading growth. For example, teaching students strategies for planning and revising text has a strong impact on writing quality (Graham and Perin 2007), but we do not know if such instruction enhances students' reading.

It is important to note that in one of our meta-analyses (Graham and Hebert 2011), over 50 studies examined if writing about text read increased students' comprehension of said material (it did). Many of these investigations involved writing without compositing (e.g., short answers, notetaking), so it is important that future research examines if more extended writing tasks like constructing a written narrative about material read, describing how to apply information in the text, or defending in writing a position relevant to the material read are each effective in improving students' understanding of the read text (when considered collectively they are effective at doing this). In addition, there is a need for studies that test the impact of

reading source text in advance of composing as well as testing the effectiveness of combining different reading and writing activities to enhance content learning.

I conclude my commentary by encouraging reading and writing intervention researchers to commonly collect both reading and writing measures in their studies. It is particularly important that a more diverse array of measures in each area be applied. For instance, reading researchers are fond of spelling measures, but rarely assess other aspects of writing. Similarly, it is important that writing researchers assess a broad array of reading skills including word reading, fluency, and reading comprehension.

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