Comparing the Word Processing and Reading Comprehension of Skilled and Less Skilled Readers

İ. Birkan GULDENOĞLU
Ankara University

Tevhide KARGIN[a]
Ankara University

Paul MILLER
University of Haifa

Abstract

The purpose of this study was to compare the word processing and reading comprehension skilled in and less skilled readers. Forty-nine, 2nd graders (26 skilled and 23 less skilled readers) partici-pated in this study. They were tested with two experiments assessing their processing of isolated real word and pseudoword pairs as well as their reading comprehension skills. Findings suggest that there is a significant difference between skilled and less skilled readers both with regard to their word processing skills and their reading comprehension skills. In addition, findings suggest that word processing skills and reading comprehension skills correlate positively both skilled and less skilled readers.

Key Words

Reading, Reading Comprehension, Word Processing Skills, Reading Theories.

Reading is one of the most central aims of school-ing and all children are expected to acquire this skill in school (Güzel, 1998; Moates, 2000). The ability to read is assumed to rely on two psycho-linguistic processes: a) a word recognition process, and b) a sentence comprehension process. The word recognition process is implemented as a cog-nitive procedure that converts graphemes into cor-responding phonemes whereas the sentence com-prehension process is implemented as a process that integrates the meaning of recognized printed words into a meaningful whole (Hoover & Gough, 1990; Lewis & Doorlag, 1983; Ross, 1976).

a   **Tevhide KARGIN, Ph.D.,** is currently a professor at the Department of Special Education. Her rese-arch interests include mainstreaming, assess-ment and individualized educational programs, early childhood special education, deaf studies, supporting reading and reading comprehension skills. Correspondence: Prof. Dr. Tevhide KARGIN, Ankara University, Educational Sciences Faculty, Department of Special Education, Ankara/Turkey. E-mail: tkargin@ankara.edu.tr Phone: +90 312 363 3350/3019 Fax: +90 312 3636145.

According to the above mentioned phonologi-cal reading theory, readers first recognize written words phonologically via their spoken lexicon and, subsequently, apply their linguistic (syntactic, se-mantic, pragmatic) knowledge in order to make sense of them within the context of a sentence. Given this to be true, reading comprehension problems may originate from a processing failure at the word decoding level, from failure at the word integration level, or both (Abott & Berninger, 1999; Torgesen & Hudson, 2006; Vaughn, Linan-Thomp-son, & Hickman-Davis, 2003; Wauters, Van Bon, & Tellings, 2006). More specifically, the efficient decoding of written words is hypothesized to be contingent upon the reader's phonemic awareness (Ehri, Nunes, Stahl, & Willows, 2001; Report of the National Reading Panel, 2000; Share, 1995; Shay-witz & Shaywitz, 2005Snow, Burns, & Griffin, 1998; Stanovich, 2000; Troia, 2004; Vellutino, Fletcher, Snowling, & Scanlon, 2004) whereas his/her abil-ity to integrate recognized words into a meaning-ful whole is assumed to be intrinsically linked to his/her basic language skills (Bradley & Bryant, 1983; Caravolas, Hulme, & Snowling, 2001; Høien, Lundberg, Stanovich, & Bjaalid, 1995; Stothard &

Hulme, 1996; Torgesen & Hudson, 2006; Torgesen, Wagner, & Rashotte, 1997).

Strong phonological reading theories hypothesize that the recognition of a written word proceeds along a reading route that converts written words into phonological code via the application of grapheme-to-phoneme conversion rules (Frost, 1998, 2006; Ramus, Pidgeon, & Frith, 2003; Ziegler & Goswami, 2005, 2006). On the other hand, some theoreticians assume that processing written words phonologically may not be the only way to their recognition. Instead, they theorize that word recognition is possible along two distinct reading routes, a nonlexical reading route and a lexical reading route (Jackson & Coltheart, 2001). The recognition process of written words along the nonlexical reading route – as stated above – involves a grapheme-to-phoneme conversion procedure that outputs phonological forms the reader is able to recognize in his/her phonological lexicon (spoken vocabulary) as known or unknown words. In contrast, word recognition along the lexical reading route is assumed to rely on a process that connects the letter strings of written words with permanent orthographic knowledge (representations) that mediates their meaning (Paap & Noel, 1991).

According to the dual route reading theory, the lexical and the nonlexical reading routes operate in parallel (simultaneously). However, proficient readers – in the majority of instances – are hypothesized to recognize written words along the fast orthographic-knowledge-based reading route. Word recognition along the indirect nonlexical reading route is assumed to be restricted to low-frequency words for which the reader has not yet established well-internalized orthographic representations or to instances in which the reader encounters an unfamiliar word or a nonsense letter strings.

The efficient and accurate recognition of written words is undoubtedly a prerequisite for proper reading comprehension, but not sufficient on its own. In order to comprehend a sentence or paragraph, the final meaning of correctly recognized words has to be elaborated with reference to the reader's syntactic and semantic knowledge (Miller, 2000, 2005a, 2010b; Tily, Fedorenko, & Gibson, 2010), which the reader acquires to a large extent within the general development of his/her spoken language (MacLeod & Masson, 2000; Weldon, 1993). In addition, research indicates that there is a positive relationship between the phonological abilities, word knowledge, word reading accuracy, and the reading comprehension of proficent read-

ers (Redd & Vaughn, 2012; Schiff, Schwartz, & Nagar, 2011; Therrien, 2004; Young-Suk, Richard, & Danielle, 2012). Given this to be true, a question of central interest is, of course, whether there is a causal relationship between readers' basic written word processing skills and their ability to understand connected text? In other words, are readers' word processing skills powerful predictors of their reading comprehension skills and vice versa?

Clarification of the above research question has particular appeal with regard to Turkish orthography that – due to complete orthographic transparency (Spencer & Henley, 2003) – requires the mastery of only a simple set of grapheme-to-phoneme conversion rules in order to sustain the processing of written words at the lexical level (Durgunoğlu & Öney, 1999, 2002; Peynircioğlu, Durgunoğlu, & Öney, 2002; Raman, 2006; Raman, Baluch, & Besner, 2004; Raman & Weekes, 2005; Spencer & Henley, 2003). On the other hand, Turkish is highly complex at the morpho-syntactic level (Durgunoğlu & Öney, 2002), a complexity that my fail reading comprehension even in instances in which Turkish readers recognize written words with great efficiency. Taking this into consideration, comparing the word processing and reading comprehension skills of proficient and less proficient Turkish readers may prove to be particularly helpful in providing satisfactory answers to whether there is a causal relationship between these two domains. These answers eventually may facilitate the development of more adequate reading instruction methods for those who fail to make sense of what they read.

In order to elucidate how skilled and less skilled Turkish readers' word processing skills predict their reading comprehension, we administered two research paradigms, one assessing the efficiency with which such readers determine the identicalness of written words or pseudowords, and another testing their comprehension of sets of semantically plausible and semantically implausible sentences.

Aim

The present study was designed to compare the word processing and reading comprehension skills of skilled and less skilled readers. According to this aim, present study was designed to answer the following research questions and hypothesis;

1. Are there any meaningful differences in word processing skills of skilled and less skilled readers?

1a. Participants will process real words faster and more accurately in comparison to the pseudowords, (b) In comparison to less skilled readers, skilled readers will be faster and more accurate in both the processing of real words and pseudowords.

2. Are there any meaningful differences n the reading comprehension of skilled and less skilled readers ?

2a. In comparison to less skilled readers, skilled readers will demonstrate better reading comprehension,

2b. Participants will understand semantically plausible sentences better than semantically implausible ones.

3. Is there a significant correlation between the word processing and reading comprehension skills of the participants?

3a. There will be a statistically significant correlation between the participants' word processing skills and their comprehension of the test sentences.

Method

Participants

Forty-nine participants, 26 of them skilled readers and the remainder (23) less skilled readers were tested. All of them were recruited from 2nd grade classes in Ankara. All the participants in this study came from an average socioeconomic background. Only students with no record of particular learning or emotional disorders were included in this study.

The assignment of participants to either the skilled reader group or the less skilled reader group was based upon a specific word reading fluency criterion developed by Şenel (1998) randomly sampled from second grade classes in Ankara. Participants assigned to the skilled reader group manifested at least 99 % word reading accuracy whereas participants assigned to the less skilled reader group manifested 90 % or less word reading accuracy in reading second grade level reading material.

Stimuli

In order to understand whether basic word processing skills predict differences in reading comprehension, we used two research paradigms, the first asking participants to make rapid same/different decisions for familiar real words or pseudowords presented on a computer monitor; and the second testing the participants' comprehension of 16 syntactically complex sentences with half of them conveying a semantically plausible message and the remainder a semantically implausible message. Both paradigms were originally developed within a large-scale international reading study executed in four different countries (Israel, Turkey, Germany and USA) with the goal to bring about a better understanding of the factors underlying reading comprehension failure in individuals reading in different orthographies.

Results

In order to test our research hypotheses we analyzed the data in three steps; (a) we compared the processing speed and processing accuracy of real words and pseudowords, overall, and with respect to their processing by skilled and less skilled readers, (b) we compared the reading comprehension skills of skilled and less skilled readers, overall, and for semantically plausible and semantically implausible sentences, separately, (c) we correlated between the participants' word processing skills and their comprehension of the test sentences.

Overall, there was no significant evidence that real words were processed faster and more accurately in comparison to pseudowords (word processing speed, $F[1,47]=.021$, $p>.05$, $\eta^2=.00$; word processing accuracy, $F[1,47]=1.17$, $p>.05$, $\eta^2=.02$). Of note, overall, analyses did not indicated that less skilled readers processed written information slower than skilled readers, $F[1,47]= .090$, $p<.05$, $\eta^2=.00$. However, poor readers were significantly less accurate in processing the stimulus words than skilled readers, $F[1,47]= 40.23$, $p<.01$, $\eta^2=.46$. Analyses failed to reveal statistically significant interactions between the two main effects, both with regard to processing speed and with regard to processing accuracy, $F[1,47]= 1.42$, $p>.05$, $\eta^2=.02$; $F[1,47]= .13$, $p>.05$, $\eta^2=.00$, respectively.

Analyses of the participant groups' sentence comprehension indicated that skilled readers overall manifested markedly reduced sentence comprehension scores in comparison to less skilled readers, $F [1,47] =28.77$, $p<.001$. Interestingly, there was no statistical evidence that overall semantically plausible sentences were understood better than semantically implausible sentences, $F[1,47]=2.96$, $p>.05$, $\eta^2=.05$. However, a statistically significant interaction between the group and semantic plausibility main effects indicated that comprehension

differences between skilled and less skilled readers were larger for plausible sentences in comparison to implausible sentences, $F[1,47]= 6.47$, $p<.05$, $\eta^2=.12$.

Finally, correlation analyses revealed that there was a statistically significant relationship between the participants' word processing accuracy and their overall reading comprehension skills, $r=.36$, $p<.01$, suggesting that better readers were also more efficient in the processing of written words at the lexical level and vise versa.

Discussion

This study aimed to investigate the relationship between word processing and reading comprehension skills of skilled and less skilled readers. Our analyses highlight several notable findings concerning differences related to the reading skills of these groups. First, it is word processing accuracy rather than word processing speed that differentiates between skilled and less skilled Turkish readers. This seems to be true whether they process familiar real words or unfamiliar letter strings (pseudowords).

There are several possible explanations for the processing accuracy advantage manifested by skilled readers. It is likely that – because they have good reading comprehension – skilled readers get more involved in reading, an experience that enhanced both their ability to process written words along the lexical reading route (real words) and the nonelexical reading route (pseudowords) (Kargin et al., 2011; Miller, 2004a, 2004b, 2005b, 2006a, 2006b). Moreover, the skilled readers in our study were likely to have more phonological awareness than their less skilled counterparts. This would reasonably explain why their word processing advantage was equally prominent in relation to the processing of pseudowords, a word category readers are forced to process via a grapheme-to-phoneme conversion procedure the operation of this procedure is hypothesized to be directly gained by the reader's sensitivity to the sounds of words (phonemic awareness) (Miller, 2010a). This explanation would also be in line with evidence reported by other researchers that pinpoints phonemic awareness as the most powerful indicator of word reading skills (Byrne, Freebody, & Gates, 1992; Durgunoğlu & Öney, 1999, 2002; Ehri, 2002; Francis, Shaywitz, Stuebing, Shaywitz, & Fletcher, 1996; Perfetti, 1985; Raman et al., 2004; Samuels & Farstrup, 2006; Share & Stanovich, 1995; Torgesen, 1999; **Vaughn et al., 2003;**

Whitehurst & Lonigan, 1998; Wauters et al., 2006). A further yet less plausible possibility to be considered is that our instruction to make 'fast' decisions causes less skilled readers to adopt a strategy that was focused on speed rather than on accuracy. This would reasonably explain why they were distinguishable from their skilled counterparts only at the processing accuracy dimension, but not at the speed of processing dimension.

Of note, overall both skilled and less skilled readers manifested serious limitations in understanding the test sentences. This raises the possibility that both groups had insufficiently developed syntactic knowledge to adequately interpret what they read. It is noteworthy in this regard that – whereas less skilled readers' performance was at chance level, suggesting reliance on a guessing strategy, skilled readers' RC scores were significantly below chance level and, consequently, also below those of their less skilled reader counterparts. This indicates that skilled readers did not guess sentence meaning. Rather, they seemed to process the test sentences with limited syntactic knowledge what resulted in their misinterpretation. This line of reasoning is supported by the fact that the skilled readers' RC failure was particularly prominent in relation to semantically implausible sentences, the understanding of which requires application of syntactic knowledge. For semantically plausible sentences their comprehension deficits – although still striking and below chance level – were more moderate suggesting that their impoverished syntactic processing skills proved less detrimental in instances in which sentence meaning could be elaborated via a semantic top-down processing strategy.

It is of course puzzling that students defined by their teachers as skilled readers turned out to underscore those labeled by the same teachers as unskilled. However, this apparent contradiction is resolved if one assumes that teacher evaluations were based upon their students' understanding of texts composed primarily of syntactically simple or coordinate sentences rather than of syntactically complex sentences as those used in this study. Given this to be true the skilled readers tested in the present study may indeed manifest markedly enhanced understanding of what they read given that for this kind of reading materials their still incomplete syntactic knowledge may prove sufficient for proper comprehension, although it may fail them when applied to syntactically more demanding sentences, as those used in the present study.

In Turkish written words are normally morphologically highly complex, making their lexical processing particularly demanding. In the present study the interdependence between word processing accuracy and RC is reflected in a statistically significant correlation. It should be emphasized here that participants from the skilled reader group manifested qualitatively better word processing skills than those determine as less skilled readers. Such qualitative word processing advantage logically should have led to a paralleling advantage in RC. However, such advantage would only be expected if the reader is in possession of adequate structural knowledge that allows him to properly integrate correctly processed written words into the a broader sentence meaning. The poor performance of the skilled reader group in the present study strongly indicates that gains from the lexical level were completely overshadowed by an inadequacy of their structural (syntactic) knowledge. As already stated, this may not have been the case with syntactically less demanding sentences.

In summary, based upon findings revealed from this study, fostering proper word recognition skills in their students seems to be an issue that teachers in Turkey should give high priority. This may include the development of phonemic awareness as a first step in order to develop an efficient indirect reading route that mediates word recognition via the rapid and accurate conversion of graphemes into phonemes. This process, in a second step, provides the basis for the development of a more direct, orthographic-knowledge-based reading route. Of note, the fact that Turkish readers did not manifest a significant speed of processing advantage of real words over pseudowords strongly suggests that – even after more than one year of formal reading instruction – the majority of them was still not in possession of a developed a functional direct reading route as the basis for proficient reading.

It seems that the morphological complexity of Turkish turns the development of permanent orthographic representations for written words into a major challenge and teachers should therefore give it high priority at the primary school level in order to prevent such deficits to be carried over to more advanced levels of schooling where reading becomes a tool for learning. Another major problem seems to be the ability of Turkish readers to acquire adequate syntactic knowledge and/or to apply it effectively to the materials they read. The poor sentence understanding of the participants, over-all, and of the participants from the skilled reader group, in particular, is alarming and it's persistency at more advanced levels of schooling and the way it is related to Turkish readers' lexical processing skills should be further investigated.

References/Kaynakça

Abbott, S. P., & Berninger, V. W. (1999). It's never too late to remediate: Teaching word recognition to students with reading disabilities in grades 4–7. *Annals of Dyslexia, 49*, 223–250.

Bradley, L., & Bryant, P. E. (1983). Categorizing sounds and learning to read: A causal connection. *Nature, 301*, 419–421.

Byrne, B., Freebody, P., & Gates, A. (1992). Longitudinal data on relations of word-reading strategies to comprehension, reading time and phonemic awareness. *Reading Research Quarterly, 27*, 141-151.

Caravolas, M., Hulme, C., & Snowling, M. J. (2001). The foundations of spelling ability: Evidence from a 3-year longitudinal study. *Journal of Memory and Language, 45*, 751–774.

Durgunoğlu, A., & Öney, B. (1999). A cross-linguistic compraison of phonological awareness and word recognition. *Reading and Writing: An Interdisciplinary Journal 11*, 281-299.

Durgunoğlu, A., & Öney, B. (2002). Phonological awareness in literacy acquisition: It's not only for children. *Scientific Studies of Reading, 6* (3), 245-266.

Ehri, L. C. (2002). Phases of acquisition in learning to read words and implications for teaching. In R. Stainthorp & P. Tomlinson (Eds.), *Learning and teaching reading* (pp. 7-28). London: British Journal of Educational Psychology Monograph Series II.

Ehri, L. C., Nunes, S. R., Stahl, S. A., & Willows, D. M. (2001). Systematic phonic instruction helps students learn to read: Evidence from the National Reading Panel's meta-analysis. *Review of Educational Research, 71*, 393–447.

Francis, D. J., Shaywitz, S. E., Stuebing, K. K., Shaywitz, B. A., & Fletcher, J. M. (1996). Developmental lag versus deficit models of reading disability: A longitudinal, individual growth curves analysis. *Journal of Educational Pscyhology, 88*, 3-17.

Frost, R. (1998). Toward a strong phonological theory of visual word recognition: True issues and false trials. *Psychological Bulletin, 123*, 71–99.

Frost, R. (2006). Becoming literate in Hebrew: the grain size hypothesis and Semitic orthographic system (*The Authors Journal compilatation*). Blackwell Publishing Ltd.

Güzel, R. (1998). *Alt özel sınıflardaki öğrencilerin sesli okudukları öyküyü anlama becerilerini kazanmalarında doğrudan öğretim yöntemiyle sunulan bireyselleştirilmiş okuduğunu anlama materyalinin etkililiği*. Yayınlanmamış doktora tezi, Gazi Üniversitesi, Ankara.

Hoien, T., Lundberg, I., Stanovich, K. E., & Bjaalid, I. K. (1995). Components of phonological awareness. *Reading and Writing, 7*, 171–188.

Hoover, W. A., & Gough, P. B. (1990). The simple view of reading. *Reading and Writing: An Interdisciplinary Journal, 2,* 127-160.

Jackson, N. E., & Coltheart, M. (2001). *Routes to reading success and failure: Toward an integrated cognitive psychology of atypical reading*. Philadelphia, PA, US: Psychology.

Lewis, R. B., & Doorlag, D. H. (1983). *Teaching Special Studies in Mainstream*. Ohio: Charles E. Merill Publishing Company.

Kargin, T., Guldenoglu, I. B., Miller, P., Hauser, P., Rathmann, C., Kubus, O., et al. (2011). Differences in word processing skills of deaf and hearing individuals reading in different orthographies. *Journal of Developmental and Physical Disabilities, 24* (1), 65-83.

MacLeod, C. M., & Masson, M. E. J. (2000). Repetition priming in speeded word reading: Contributions of perceptual and conceptual processing episodes. *Journal of Memory and Language, 42* (2), 208-228.

Miller, P. (2000). Syntactic and semantic processing in deaf and hearing readers. *American Annals of the Deaf, 145*, 436-448.

Miller, P. (2004a). Processing of written word and non-word visual information by individuals with prelingual deafness. *Journal of Speech, Language, and Hearing Research, 47*, 990-1000.

Miller, P. (2004b). Processing of written words by individuals with prelingual deafness. *Journal of Speech, Language, and Hearing Research, 47*, 979-989.

Miller, P. (2005a). Reading comprehension and its relation to the quality of functional hearing: Evidence from readers with different functional hearing abilities. *American Annals of the Deaf, 150*, 305-323.

Miller, P. (2005b). What the word recognition skills of prelingually deafened readers tell about the roots of dyslexia. *Journal of Development & Physical Disabilities, 17*, 369-393.

Miller, P. (2006a). What the processing of real words and pseudo-homophones tell about the development of orthographic knowledge in prelingually deafened individuals. *Journal of Deaf Studies and Deaf Education, 11*, 21-38.

Miller, P. (2006b). What the visual word recognition skills of prelingually deafened readers tell about their reading comprehension problems. *Journal of Development and Physical Disabilities 18*, 91-121.

Miller, P. (2010a). Orthographic and phonemic awareness and their relation to reading comprehension in individuals with prelingual deafness: What can we learn from skilled readers? *Journal of Development and Physical Disabilities, 26* (6), 549-580.

Miller, P. (2010b). Phonological, orthographic, and syntactic awareness and their relation to reading comprehension in prelingually deaf individuals: What can we learn from skilled readers? *Journal of Development and Physical Disabilities, 22,* 549-580.

Moates, L. C. (2000). *Speech top rint: Language essentials for teachers*. Baltimore: Brookes.

Paap, K. R., & Noel, R. W. (1991). Dual-route models of print to sound: Still a good horse race. *Psychological-Research, 53*, 13–24.

Perfetti, C. A. (1985). *Reading ability*. New York: Oxford University Press.

Peynircioğlu, Z. F., Durgunoğlu, A., & Öney, B. (2002). Phonological awareness and musical aptitude. *Journal of Research in Reading, 25*, 68-80.

Raman, İ. (2006). On the age-of-acquisition effects in word naming and orthographic transparency: Mapping specific or universal? *Visiual cognition, 13* (7), 1044-1053.

Raman, İ., Baluch, B., & Besner, D. (2004). On the control of visual word recognition: Changing routes versus changing deadlines. *Memory & Cognition, 32* (3), 489-500.

Raman, İ., & Weekes, B. S. (2005). Deep dysgraphia in Turkish. *Behavioural Neurology, 16*, 59-69.

Ramus, F., Pidgeon, E., & Frith, U. (2003). The relationship between motor control and phonology in dyslexic children. *Journal of Child Psychology and Psychiatry, 44*, 712–722.

Reed, D., & Vaughn, S. (2012). Comprehension instruction for students with reading disabilities in grades 4 through 12. *Learning Disabilities: A Contemporary Journal 10* (1), 17-33.

Report of the National Reading Panel. (2000). *Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction* (NIH Publication No. 00-4769). Washington, DC: U.S. Government Printing Office.

Ross, A. O. (1976). *Psychological Aspects of Learning Disabilities and Reading Disorders*. NY: MacGraw-Hill Book Company.

Samuels, S. J., & Farstrup, A. (2006). *Reading fluency: The forgotten dimension of reading success*. Newark: International Reading Association.

Schiff, R., Schwartz, S., & Nagar, R. (2011). Effect of phonological and morphological awareness on reading comprehension in Hebrew-speaking adolescents with reading disabilities. *Annual of Dyslexia, 61*, 44–63.

Share, D. L. (1995). Phonological recoding and self-teaching: Sine qua non of reading acquisition. *Cognition, 55*, 151–218.

Share, D. L., & Stanovich, K. E. (1995). Cognitive processes in early reading development: Accommodation individual differences into a model of acquisition. *Issues in Education, 1*, 1-58.

Shaywitz, S. E., & Shaywitz, B. A. (2005). Dyslexia (specific reading disability). *Biological Psychiatry, 57*, 1301–1309.

Snow, C. E., Burns, M. S., & Griffin, P. (1998). *Preventing reading difficulties in young children*. Washington, DC: National Academic Press.

Spencer, H. L., & Henley, R. (2003). Effects of orthographic transparency on reading and phoneme awareness in children learning to read in Wales. *British Journal of Psychology, 94*, 1-28.

Stanovich, K. E. (2000). *Progress in understanding reading: Scientific foundations and new frontiers*. New York: Guilford.

Stothard, S. E., & Hulme, C. (1996). A comparison of reading comprehension and decoding difficulties in children. In C. Cornoldi & J. Oakhill (Eds.), *Children with reading comprehension difficulties: Processes and interventions* (pp. 93-112). New Jersey: Lawrence Erlbaum Associates.

Şenel, H. (1998). *Okuma güçlüğü olan ve olmayan ilkokul öğrencilerinin okuma düzeylerinin ve dislektik özelliklerinin karşılaştırılması.* Yayımlanmamış doktora tezi, Ankara Üniversitesi, Ankara.

Therrien, W. J. (2004). Fluency and Comprehension gains as a result of repeated reading: A meta-analysis. *Remedial and Special Education, 25* (4), 252-61.

Tily, H., Fedorenko, E., & Gibson, E. (2010). The time-course of lexical and structuralprocesses in sentence comprehension. *Quarterly Journal of Experimental Psychology,63* (5), 910–927.

Torgesen, J. K. (1999). Phonologically based reading disabilities: Toward a coherent theory of one kind of learning disability. In R. J. Sternberg & L. Spear-Swerling (Eds.), *Perspectives on learning disabilities* (pp. 231–262). New Haven: Westview.

Torgesen, J. K., Wagner, R. K., & Rashotte, C. A. (1997). Prevention and remediation of severe reading disabilities: Keeping the end in mind. *Scientific Studies of Reading, 1* (3), 217–234.

Torgesen, J., & Hudson, R. F. (2006). Reading fluency: Critical issues for struggling readers. In S. J. Samuels & A. E. Farstrup (Eds.), *What research has to say about fluency instruction* (pp. 130–158). Newark, DE: International Reading Association.

Troia, G. (2004). Phonological processing and its influence on literacy learning. In C. Stone, E. Silliman, B. Ehren, & K. Appel (Eds.), *Handbook of language and literacy: Development and disorders* (pp. 271–301). New York: Guilford.

Vaughn, S., Linan-Thompson, S., & Hickman-Davis, P. (2003). Response to treatment as a means for identifying students with reading/ learning disabilities. *Exceptional Children, 69*(4), 391–410.

Vellutino, F. R., Fletcher, J. M., Snowling, M. J., & Scanlon, D. M. (2004). Specific reading disability (dyslexia): What have we learned in the past four decades? *Journal of Child Psychology and Psychiatry, 45*, 2–40.

Young-Suk, K., Richard, W., & Danielle, L. (2012). Developmental relations between reading fluency and reading comprehension: A longitudinal study from Grade 1 to Grade 2. *Journal of Experimental Child Psychology, 113* (1), 93-111.

Wauters, L. N, VanBon, W. H. J., & Tellings, A. J. M. (2006). Reading comprehension of dutch deaf children. *Reading and Writing, 19*, 49-76.

Weldon, M. S. (1993). The time course of perceptual and conceptual contributions to word fragment completion priming. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 19* (5), 1010-1023.

Whitehurst, G. J., & Lonigan, C. J. (1998). Child development and emergent literacy. *Child Development, 69*, 848-72.

Ziegler, J., & Goswami, U. (2005). Reading acquisition, developmental dyslexia, and skilled reading across languages: A psycholinguistic grain size theory. *Psychological Bulletin, 131* (1), 3-29.

Ziegler, J. C., & Goswami, U. (2006). Becoming literate in different languages: Similar problems, different solutions. *Developmental Science, 9* (5), 429–436.