L2 Micro-skill Proficiency and ELL Reading

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Abstract

This research study investigated the relationship of L2 micro-skills to English reading comprehension for adult community college ELL students. Skills of phonemic awareness, orthographic knowledge, decoding, vocabulary, and grammar were assessed. Results suggest that a vocabulary paradigm with supporting micro-skills can best explain reading proficiency for this population. Neither the proposed grammar paradigm nor simple phonemic decoding showed a significant relationship to reading comprehension. Adult second language reading processes were compared to those of first language reading.

Introduction

The motivation for this study was to gain a more complete understanding of the experience of adults learning to reading in a second language. The particular focus is on the reading of extended complex text (global reading comprehension) and how the small components of reading skill (micro-skills) contribute to proficiency in reading these texts. The design of the study applied generally accepted reading acquisition assessments, commonly used with children learning to read in their native language, to second language adult readers. From the research literature, we know that first language reading requires a strong foundation of micro-skills, sometimes referred to as basic skills. These essential micro-skills-- phonological awareness, orthographic knowledge, and decoding-- are considered to be the building blocks of reading (Ehri, 2005). Weaknesses in any of the micro-skill areas are known to cause reading difficulties (Anthony & Francis, 2005).

The purpose of the study was to explore how L2 micro-skills relate to global reading comprehension for ELL adults in a community college. The intent was to look at adult second language reading from a perspective that has not received much research attention. First of all, most first and second language reading research studies concern children (Snow, 2002), and at the time of the original study there was very little information showing how micro-skill knowledge might impact adult reading (Wade-Woolley & Geva, 2000). Second, as first language reading studies involve young readers, they usually use word reading (decoding) as

the measure of reading ability (Greenberg, Ehri, & Perin, 1997; Shankweiler, Crain, Brady, & Marcuso, 1992; Wade-Woolley, & Geva, 2000). This study was about college-level reading skill, and accordingly, used global reading comprehension as the criterion of reading ability. The overall objective of this study was to investigate the relationship of L2 micro-skills to global reading comprehension in order to understand more about adult second language reading proficiency. Results were evaluated in the context of current research, the relationship of vocabulary to reading comprehension, and aspects of vocabulary acquisition that would be particularly relevant to ELL readers. Revisiting Gogh and Tunmer's Simple View of Reading (1986) provided a useful framework.

Fluency

Global reading comprehension can be defined as the construction of meaning from written text. It includes summarizing, predicting, clarifying, questioning, analyzing, inferencing, integrating background knowledge, and relating new ideas to old (Duke & Pearson, 2002; Lyon, 2000). The coordination of these cognitive activities depends upon fluency, the efficient processing of verbal and linguistic textual information (Burt, Peyton, & Van Duzer, 2005). When readers are fluent, the basic skills supporting word reading are processed automatically, freeing working memory for the other cognitive activities of reading comprehension (Hirsch, 2003; Koda, 2005). For all readers, inefficient micro-skill processing has a negative impact on reading comprehension. For second language readers, coping with the additional cognitive demands of incomplete vocabulary and background knowledge, as well as unfamiliar grammatical structures, deficiencies in micro-skill processing are likely to cause significant problems with fluency and reading comprehension.

Micro-skills

Three general micro-skills which have been identified as vitally related to reading are phonological awareness (PA), orthographic knowledge, and decoding (Snow, 2002). PA is knowledge of the sound system of a language, and is necessary for the processing of both oral language and print. It is a broad term covering many different kinds of sound-related processes, and can be demonstrated by such tasks as rhyming, blending, word matching, phoneme counting, and syllable deletion (Anthony & Francis, 2005; Yopp & Yopp, 2000). Four decades of reading research have confirmed the relationship of PA to reading acquisition, and the relationship has been shown to exist in all alphabetic languages which have been studied (Anthony & Francis, 2005). In children, PA is accepted as an excellent predictor of reading skill (Caravolas, Volin, & Hulme, 2005). Orthographic knowledge is information about the visual and spelling patterns of words or parts of words (Roman et al., 2009). Spelling is considered a good test of orthographic knowledge as it demands the transformation of word sounds into their linguistically accepted graphic representation (August, 2011; Burt, 2006). Spelling supports reading by providing a reliable mnemonic for vocabulary acquisition and retrieval (Ehri, 2005), and many theorists claim that both spelling and reading draw upon a common base of orthographic knowledge (Burt & Tate, 2002). Decoding (also called word reading or word identification) incorporates both PA and orthographic skill, and is a term describing the process of identifying, reading, or verbally reproducing a word. It has been identified as a critical skill in good reading, and is considered a clear predictor of reading aptitude (Joshi & Aaron, 2002).

Vocabulary and decoding
In this study, vocabulary implies comprehension of word meanings. It is distinguished from decoding, which is essentially a pronouncing task and does not necessarily entail knowledge of word meaning. The correlation of vocabulary with reading comprehension has been documented in studies for over 50 years (Tannenbaum, Torgesen, & Wagner, 2006). Hirsch (2003) emphasizes the critical importance of vocabulary, stating that a reader must be able recognize 90 to 95% of the words in order to comprehend the meaning of a text. Nation (2005) claims that guessing the meaning of unfamiliar words from context is only possible when readers understand up to 98% of the words. Familiar vocabulary words are read automatically, as "sight" words, contributing to reading fluency (Ehri, 2005).

Second language reading and micro-skills
On the basis of an abundant research literature, we can be very confident of the important relationship of L1 micro-skills to reading in the L1. There are also some studies with children suggesting the relationship of L1 micro-skills to reading in a second language, showing that L1 PA predicts L2 PA (August, 2006; August, Calderon, & Carlo, 2002; Bialystok, Luk, & Kwan, 2005). However, at the time of this study there were very few studies investigating the relationship of L2 micro-skills to L2 reading for either children or adults (Wade-Woolley & Geva, 2000).

Research study design
The population for this study consisted of fifty-five students at an urban community college, ranging in age from 21 to 50. All were Spanish speakers, native language literate, and were intermediate or advanced ELL students. There were assessments for English reading comprehension, micro-skills (PA, orthographic knowledge, decoding), vocabulary, and grammar.

Reading comprehension
The Stanford Diagnostic Reading Test, Purple Level (Karlsen & Gardner, 1995) was used as the measure of reading ability. The Purple Level is designated for grades four to six, and consists of nine passages of three to four paragraphs, followed by six multiple-choice questions, for a total of fifty-four questions, to be completed in fifty minutes.

Micro-Skills
Word Attack (PA: phonological decoding)
Word Attack, a subtest of the Woodcock language proficiency battery (Woodcock, 1987), was used to test phonological decoding. The reading of nonsense words is considered a good test of phonological processing skills related to reading. Because test items cannot be part of the reading vocabulary, subjects must use spelling-sound correspondence rules to pronounce words (Wade-Woolley & Geva, 2000). For this task, the subject read orally from a list of forty-five linguistically logical nonsense words that were arranged in order of ascending difficulty. Examples are *dee, ap, bufty, bafmotbem.*

Deletion (PA: word manipulation)
Rosner and Simon's (1971) auditory analysis task (Deletion) was used as a measure of syllable and phoneme deletion performance. The ability to delete a segment from a word is considered

the most challenging kind of PA and has been shown to correlate with reading ability (Greenberg, Ehri, & Perin, 1997; Wade-Woolley, & Geva, 2000). For Deletion, the examiner said a word and the subject repeated it in its entirety; then the examiner pronounced a segment to be deleted and the subject pronounced the remaining syllable(s). Examples are *bel(t), (m)an, ti(me), g(l)ow, cr(e)ate, auto(mo)bile.*

Spelling (orthographic production)
Bear & Barone's (1989) list of words, which follows Henderson's (1985) developmental stages of spelling skill, was used as a test of orthographic ability. Spelling, the conversion of word sounds into their orthographic representation, is considered a good test of orthographic knowledge (Joshi, Trieman, Carreker, & Moats, 2008/2009). For this assessment, the examiner pronounced a word, used it in a sentence, and then pronounced it again. After the second pronunciation, subjects wrote the word on the test paper. Examples are *drive, inspection, fortunate*, *squirrel.*

Decoding (word reading)
Word Identification, from the Woodcock language proficiency battery (Woodcock, 1987) was used as a test of decoding. For this task, subjects pronounced words from a list of 106 words, arranged in order of ascending difficulty. Some of the words follow regular spelling conventions, whereas others are "exception" words, where the pronunciation differs from words with a similar spelling pattern. Correctly pronounced words were scored as correct and subjects did not have to demonstrate comprehension of test items. The list begins with high frequency words (*is, you, an, up*), and progresses to less common words (*certain, human, twilight*).

Vocabulary
Synonyms (meaning-based vocabulary)
The vocabulary section of The Stanford Diagnostic Reading Test, Purple Level (Karlsen & Gardner, 1995), consisting of thirty vocabulary items, followed by four multiple-choice synonyms, was used as a test of meaning-based vocabulary. It is totally independent of the reading comprehension component of the same exam. Subjects had ten minutes to complete this task. An example is: To *leap* is to: *turn, slide, stumble, jump*

Irregular words (reading-based vocabulary)
Adams and Huggins' (1985) Irregular Word Reading task was used to test reading-based vocabulary. Because irregular words do not follow basic spelling-sound correspondence rules, they can be used as a measure of sight word reading (Ehri, 2005). Pronouncing irregular words is considered different from phonological decoding (Word Attack) or word reading (Decoding) because irregular words cannot be identified without some prior exposure to their written form, and thus correct pronunciation is likely to be the result of reading experience (Ehri, 2005). In this activity, the subject read orally from a list of fifty irregular words and correctly pronounced words were scored as correct. Examples are *ocean, guitar*, *ukulele, island, suede.*

Grammar
The Michigan ESL Placement Test, Form A (Spann & Strowe, 1972), contains thirty items, consisting of a written prompt followed by four written multiple-choice answers. It is a test of

explicit knowledge of English grammar, including auxiliaries, connectors, verb forms, adjective forms, prepositions, etc.

Summary of results

The general results are presented in Table 1 and the correlation analyses in Table 2. Correlation coefficients were computed among the seven measures. Using the Bonferroni approach to control Type I error, a *p* value of less than .003(.05/15) was required for significance. Aside from Word Attack, all correlations were significant and highly correlated with each other, suggesting that individuals that perform well in one of the skills tend to also perform well in the other areas. (Statistical analysis was done under the guidance of Tomonori Nagano, LaGuardia Community College, City University of New York.)

Table 1: Descriptive Statistics				
Tasks	Total	Mean	Percent Correct	Standard Deviation
ESLR	54	24.44	45.3	9.47
Word Attack	45	27.22	60.5	8.03
Deletion	40	16.11	40.3	6.59
Spelling	20	8.22	41.1	3.81
Decoding	106	66.22	62.5	10.56
Synonyms	30	14.22	47.4	5.29
Irregular Words	50	16.93	33.86	7.00
Grammar	30	14.04	46.8	4.5

TABLE 2: Bivariate Correlations (**Bonferroni p-value <.003)							
	Word Attack	Deletion	Decoding	Spelling	S	Irregular Words	Grammar
ESLR	.093	.507**	.399**	.298*	.461**	.488**	.309*
Word Attack		.319*	.581**	.407**	.234	.461**	.407**
Deletion			.536**	.475**	.416**	.558**	.510**
Decoding				.552**	.375**	.767**	.555**
Spelling					.399**	.649**	.586**
Synonyms						.525**	.460**
Irregular Words							.586**

S=Synonyms

Two different kinds of partial correlation coefficients were computed among six measures (all except Word Attack). The first case held the grammar scale as a constant and the second case held the vocabulary scales (synonyms and irregular word reading) as a constant. The p values were set less than .005 and less than .03, respectively, for significance.

Table 3: Partial Correlations						
Controlling for grammar (**Bonferroni p-value <.005)						
	Synonyms	Irregular Word Reading	Grammar	S	Decoding	D
Synonyms	1					
Irregular Word Reading	0.34	1				
Grammar						
Spelling	0.16	.44**		1		
Decoding	0.15	.66**	0.34		1	
Deletion	0.24	0.37	0.25	0.35		1
Controlling for vocabulary (**Bonferroni p-value <.008)						
	Synonyms	Irregular Word Reading	Grammar	S	Decoding	D
Synonyms						
Irregular Word Reading						
Grammar			1			
Spelling			0.36	1		
Decoding			0.19	0.14	1	
Deletion			0.23	0.18	0.21	1

D = Deletion   S= Spelling

The objective of these analyses was to investigate beyond the inter-related skills and to identify an overriding linguistic process which appears to coordinate the micro-skills (deletion, spelling, decoding,) involved in reading. It was hypothesized that if either grammar or vocabulary were

the coordinating process, all of the partial correlations would be equal to zero. When grammar was controlled, two partial correlations of irregular word reading scale were significant and their correlation coefficients were large in magnitude. Hence the hypothesis was not supported for grammar. However, the hypothesis was supported for vocabulary. Although the partial correlation between irregular word reading scale and deletion scale wasn't significant, its p value was fairly small (p=.007) compared with other partial correlation coefficients. When two vocabulary scales were controlled, all the partial coefficients were not significant. The hypothesis was therefore supported for vocabulary but not for grammar.

General discussion

In drawing conclusions from this kind of study, we must be cautions and speculative. The statistical results show the various sub-skills to be highly inter-related, making it difficult to tease out their individual roles in second language reading. Only a study with a much larger number of subjects could yield clear statistical conclusions about specific skills. Nonetheless, given the lack of L2 micro-skill research available at the time of this study, these results contribute to our understanding of second language reading and show how it might be different from first language reading.

The results concerning vocabulary and the micro-skills (except Word Attack) were expected, given the extensive research history relating micro-skill proficiency to word reading, and also the relationship of vocabulary knowledge to reading comprehension. The two surprises of this study were the results concerning Word Attack and those of the grammar paradigm. In interpreting these results, we must be careful not to conclude that they negate the importance of phonemic decoding and grammar in reading. Phonemic decoding is basic to the application of oral language to the written code, and is likely to be embedded in many of the other micro-skills. Grammar is the abstract glue that connects pieces of linguistic information, organizing it into a comprehensible structure. Nonetheless, the results indicate that these skills, while linguistically necessary at certain levels of language processing, are not causally related to the reading comprehension task in this study. In other words, skill levels for these processes do not translate into differences in reading ability, at least at this particular level of reading.

Word Attack and grammar results

The results concerning Word Attack were surprising because in first language reading, Word Attack is a highly dependable predictor of reading skill and is commonly included in assessment test batteries (Barton-Arwood, Wehby, & Falk, 2005; Fuchs, Fuchs, & Compton, 2004). However, the Word Attack results did not contradict evidence of the importance of PA, because another PA task, Deletion, was significant. The different results of two PA tasks can be explained by assuming a distinction between simple micro-skills and complex lexically based micro-skills, defining a simple micro-skill as a task which does not require language specific knowledge and does not make complex processing demands. Under this framework, Word Attack, which essentially requires the matching of sounds to letters, is a simple micro-skill. As such, it involves minimal processing and memory demands, and can be performed by any individual with knowledge of an alphabetic language. In fact, it would theoretically be possible to perform Word Attack without knowing a single word of the English language. Deletion, requiring subjects to pronounce a word in its entirety and then repeat it without a specific segment, would be classified as a complex micro-skill. To perform Deletion, the subject must retain the word

in memory while manipulating it, entailing a heavy processing demand for those who know the language, and an almost impossible load for those who do not.

The Word Attack results suggest that the linguistic processes behind second language (adult) reading and first language reading may be somewhat different. Perhaps phonemic decoding skill, mastered in L1 and transferred to L2, does not impact second language reading at this level. It is also possible that these disparities reflect the difference between word reading (a customary criterion for first language reading ability) and reading comprehension. When moving beyond word reading to more advanced reading, individuals need fluency and the ability to coordinate many cognitive interactions. For the demands of reading comprehension, variation in simple micro-skill proficiencies may not be as relevant as differences in knowledge of the more complex micro-skills.

The results of the grammar paradigm suggest there is no causal relationship between grammar and micro-skills, and specifically no relationship between grammar and irregular word reading scales. These results could also be interpreted as specific to the demands of this reading comprehension assessment. The subjects are intermediate and advanced ELL community college students with some level of grammatical proficiency. It appears that knowledge of the kinds of distinctions required in the grammar assessment-- auxiliaries, verb and adjective forms, prepositions—may not have been critical in this reading assessment. We can speculate that subjects with weak grammatical abilities were able to use other skills such as vocabulary, linguistic redundancy, and/or clues from context to perform the reading task. It is an open question, and one for further research, whether grammar would play a significant part in the paradigm when reading more complex and demanding textual materials.

Gough's Simple View of Reading and language comprehension
We can better understand the results of this study by looking at it through the lens of Gough's Simple View of Reading (SVR), a traditional model developed 30 years ago (Gough & Tunmer, 1986). The SVR describes reading comprehension as the product of word reading and language comprehension. In applying the SVR model, the various micro-skills, constituting lower level processes which translate written symbols into meaningful words, would fall under Gough's first component, word reading. Vocabulary knowledge, understanding words to enable text comprehension, would fall under Gough's second component, language comprehension (Kendeou, Broek, Helder, & Karlsson, 2014).

Using the framework of the SVR model, we can hypothesize that adult L2 reading is more strongly influenced by the second component, language comprehension, than the first component, word reading. This would explain the results of the original study, where neither simple decoding nor grammar were showed to be significantly related to reading comprehension. This hypothesis corroborates recent first language reading research, showing that the contributions of the two SVR processes change as students mature and skill levels increase. With young readers, the micro-skill processes, represented by word reading component of the SVR, are crucial. For older readers, however, language comprehension becomes more important (Catts, Herrera, Nielsen, & Bridges, 2015). This difference between early and later reading processes can also be seen in a meta-analysis of 1197 studies of reading comprehension using native English subjects from the age of 5 to 52. The meta-analysis shows that decoding and reading comprehension have an important relationship in both child and adult readers, but that

there is a point in reading development, around the age of 9-10 for first language reading, where the contributions of the components change significantly. At this age level, micro-skills become less important, as they are integrated into higher level skills, and language comprehension becomes the more important factor (Garcia & Cain, 2013). These recent research findings about first language reading can also be applied to the ELLs in this study, as there is evidence that L2 readers go through a progression of building reading skills that is similar to first language reading, although the time frame may be more compressed for older readers (Ricketts, Bishop, Pimperton, & Nation, 2011).

Insights from recent vocabulary research
New research findings on reading comprehension and vocabulary also help to explain the unanticipated outcomes of the study (Kershaw & Schatschneider, 2012). The relevance of vocabulary to reading ability has been extensively documented in the research literature for over 20 years (Tannenbaum, et al., 2006), and the results of current research serve to highlight the fundamental importance of vocabulary knowledge in L2 reading comprehension. Several L2 studies show that micro-skill processes are important for beginning readers, but that as students advance, vocabulary knowledge becomes increasingly important. For Russian students learning Hebrew, decoding was more important for the newer readers, but in older skilled readers, vocabulary and language skills became more important (Prior, Goldina, Shany, Geva, & Katzir, 2014). In older L2 children learning Norwegian, decoding faded in importance as vocabulary skills became more relevant (Lervag & Aukrust, 2009). It is important to note that both Hebrew and Norwegian have a consistent orthography and may present less decoding problems than English, which has an inconsistent orthography.

Recent studies suggest some areas that might be particularly relevant to understanding the contribution of vocabulary to reading, and specifically to L2 reading. One interesting hypothesis is the relationship of vocabulary knowledge to inferencing, a skill which allows readers to construct meaningful connections from text, and also to guess the meanings of unfamiliar words (Kendeou et al., 2014; Prior et al., 2014). Another important concept is access. In reading comprehension, a person must retrieve stored vocabulary knowledge to make meaning from text. Efficient storage and retrieval of verbal information has been linked to fluent reading (Garcia & Cain, 2013; Perfetti & Stafura, 2014). Access requires accurate word representations in the mental lexicon, and this has been shown to be dependent upon vocabulary experience (Cain & Oathill, 2011). It is also dependent upon orthographic knowledge, which is closely related to spelling (Beck, McKeown, & Kucan, 2013). Moats (2010) asserts that spelling knowledge, described as the "fully specified memory of a word" (p.6), makes vocabulary information available to the reader. Spelling knowledge might be particularly important for L2 readers confronting a language like English, with an inconsistent orthography (August, 2011).

<div align="center">**Conclusion**</div>
Gough's traditional SVR model, with the support of recent L2 research, can explain the results of the original study. Together they illustrate that for older L2 readers, the necessary micro-skills leading to decoding and word reading are less important than the second component of the SVR equation, language comprehension. Because both the SVR model and the later studies emphasize the role of language comprehension, they also serve to highlight the fundamental importance of vocabulary knowledge in L2 reading comprehension

Future research will develop models better able to explain how vocabulary knowledge contributes to reading comprehension. It will clarify how individuals store and access verbal information to produce successful reading, and the necessity of vocabulary experience and good word representations to this process. Research will also specify how advantages in vocabulary knowledge contribute to the development of even better vocabulary knowledge, increasing reading skill (Duff, Tomblin, & Catts, 2015). In reevaluating the contribution of the various micro-skills of reading and the more advanced skills encompassed by vocabulary knowledge, we can better understand that second language reading, which occurs after an individual has learned to read in another language, may not begin at the basic stages but might start at a level where vocabulary and reading comprehension are the most important tasks to master. And so it may be that reading, like everything else in life, is not quite the same the second time around.

Endnote
This article updates an earlier publication in Academic Exchange Quarterly (2010, *L2 Micro-skill Proficiency and ELL Reading,* Gail August).

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