

## Running Head: PHONEMIC PROFICIENCY HYPOTHESIS

**Note:** *The following is taken from a manuscript submitted for publication. The introduction and general discussion have been removed in order to focus on the data relevant to the validity of the PAST, particularly the timing element. This is intended to supplement the other paper in preparation with the other studies. To save time, I've highlighted key points related to the validity of the PAST timing aspect.*

*The basic finding is that automatic responses to the PAST are what interact with reading, not simply correct or incorrect responses. Not discussed here is that I found that non-automatic responses to items above the student's expected developmental level DO correlate with reading. So, if a first grader is responding accurately but not automatically to the more difficult items on the test (e.g., second to third grade items like Levels K, L, M), that suggests good phonemic skills. But if a first grader is responding correctly but not automatically to levels like F & G, and in later first grade H & I (all levels that develop throughout first grade), those slower correct responses may be indicating that at least some subtle phonological awareness problems exist.*

**Intervention:** *If subtle or not so subtle problems surface on the PAST, the answer is not to "label" the student as reading disabled. Rather, it is to start training the student at the level he or she tested out at with a phonological awareness training approach that uses phonological manipulation tasks. These include the Lindamood LiPS program, Phonographix, Discover Reading (must be trained at a Canadian clinic), the old Rosner program, or Equipped for Reading Success, which directly aligns with the PAST (sample version also in the Dropbox folder). There may be other programs that use phonemic manipulation training (deletion and substitution of phonemes), I'm just not familiar with them.*

*Programs that do not train deletion and substitution of phonemes but only teach phonemic blending and segmentation are great for Tier 1 prevention and intervention in K-1, but are likely to be less effect after first grade. Such programs*

*include Road to the Code, Florida Center for Reading Research materials (free!), Ladders to Literacy, and Phonemic Awareness in Young Children. These all are great Tier 1 programs but only develop phonemic awareness skills up to the level of an average student at the end of first grade. However, for efficient sight-vocabulary building, students need the equivalent of the phonemic awareness skills of a third to fourth grader, and these programs just mentioned don't take students that far (the other one's mentioned earlier do). Blending and segmenting are mastered by most kids by the end of first grade. Blending and segmenting are often mastered by poor word readers between second and fourth grade. Only in the most severe phonological-core deficit cases do students not develop basic phoneme segmentation and phoneme blending. However, that level of phonemic awareness skill does not represent "enough" phonemic awareness to be a skilled reader. The "advanced" phonemic training using deletion and substitution activities are needed for struggling readers, whether in second grade or in twelfth grade. There is no statute of limitations on phonemic awareness training if a student is lacking in these skills. For more information on the relationship between phonemic awareness and reading, see the other files in the Dropbox folder.*

The Phonemic Proficiency Hypothesis of Orthographic Learning:  
An Examination of How Phonology Influences Orthographic Memory

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## Study 1

### Method

#### Participants

Participants were 132 first grade students from a suburban, lower middle class K-4 elementary school in [location]. Approximately 85% of the students were of European descent and less than 15% of students were African American, Hispanic or Asian. All students were native speakers of English. The data were gathered between late November and late December. All students were native speakers of English.

#### Materials

The Sight Word Efficiency and Phonemic Decoding Efficiency subtests from the Test of Word Reading Efficiency-Second Edition (TOWRE-2) were administered to all of the children. Both of these subtests require students to read a graded word list to determine how many words can be read in 45 seconds. Students are encouraged to say “skip” when they encounter unfamiliar words. The reasoning for using such a test is that given the time limit, recoding words would take more time than instant recognition and yield a lower score. Thus, it is presumed that it is a better indicator of the reading of familiar words from the orthographic lexicon [i.e., sight word vocabulary] than an untimed test, the latter having the inherent confound of correct responses based on familiar words and words correctly recoded during the task.

The Phonological Awareness Screening Test (PAST)<sup>1</sup> was also administered. The PAST is derived from the Rosner & Simon (1971) Auditory Analysis Test (AAT), but differs from that test in at least three ways. First, it adds substitution items along with the deletion items. Second, it provides feedback for each incorrect item to increase the likelihood that poor performance is based on weak phonological skills and not on unfamiliarity with the task (Kilpatrick, 2012).

The third feature of the PAST that differs from Rosner & Simon's AAT is that the PAST distinguishes between instant (presumably automatic) and delayed (presumably non-automatic) responses. After each item is presented, the experimenter does a two-second mental count ("one thousand one, one thousand two"). If the child responds correctly before the word "two" in that mental phrase, the item is scored as an automatic response. Correct responses beyond the two-second count are scored as correct but non-automatic.<sup>2</sup> Automatic and non-automatic scores combine to make a total score, which parallels the conventional way phonological/phonemic awareness tests are scored.

The PAST is currently an experimenter-designed test, not commercially available, but has been used since 2003 in several unpublished studies (First author

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<sup>1</sup>The PAST must not be confused with another test using the same acronym called the Phonological Awareness Skills Test. This latter test turns up in an Internet search and approaches the assessment of phonological awareness in a different manner.

<sup>2</sup>It should be noted that most instant responses occur within a second to a second and a half while non-instant responses normally occur after three to five seconds. Thus, it is typically easy to judge whether a response was within the time limit.

and colleagues, in preparation) and also in clinical practice in schools in the first author's area. The PAST has test-retest and alternate form reliability in the low to mid .80s and the correlation between the PAST and word reading ranges from .36 and .84, depending on grade level and reading test (all correlations from several studies were well above .50 except for one study of beginning kindergarteners that was .36). Correlations with reading were consistently stronger than the CTOPP/CTOPP-2 Elision subtest in the four studies in which both tests were administered (First author and colleagues, in preparation). The PAST begins with syllable-level deletion and moves on to onset-rime deletion and substitution and eventually phoneme-level deletion and substitution. The 50-item PAST can be broken up by linguistic complexity, with 10 items each at the syllable and onset-rime levels, and 30 items at the phoneme level.

The phoneme level items on the PAST are divided into two categories. The first is the basic phoneme level, which involves deleting ending sounds (*bead* to *bee*) and deleting or substituting initial sounds in words with blends (e.g., change *clap* to *flap*). The second is the advanced phoneme level, which involves more complex phonemic manipulations, such as substituting medial vowels (*hid* to *had*), ending sounds (*roof* to *room*) and deleting or substituting internal phonemes in beginning and ending blends (*flute* to *fruit* or *paste* to *paint*). Given the developmental level of these first graders, only the onset-rime and basic phoneme levels were computed in the analyses. This was due to a strong ceiling effect with the syllable-level items and a floor effect with the advanced phoneme-level items. The total possible score was thus 20 points.

## Procedure

All 132 first graders received the two TOWRE-2 subtests followed by the PAST. The tests were administered in one session at a table just outside their classroom.

## Results and Discussion

The means and standard deviations for the data from Study 1 are listed in Table 1. The data were subjected to correlation analysis and a linear regression analysis. These are displayed in Tables 2 and 3. Only the automatic responses on the PAST correlated with the Sight Word Efficiency subtest. The correlation between the non-automatic responses and the number of words read on the Sight Word Efficiency test was essentially zero, while the automatic responses displayed a moderate correlation with words read. The PAST test, which is based upon phonemic analysis (deletion and substitution), accounted for a significant amount of variance on the Sight Word Efficiency test, controlling for the Phonemic Decoding subtest. The non-automatic PAST score accounted for no additional contribution to the Sight Word Efficiency test, controlling for recoding skill [i.e., the ability to sound out words phonically].

At the mid first grade level, the Sight Word Efficiency subtest is ostensibly a good test of the orthographic lexicon [i.e., sight word vocabulary] because if items are recoded [i.e., sounded out phonically], the student's score is lower due to the 45-second time limit. Thus, phonemic analysis skills appear to be related to the orthographic lexicon, even when controlling for recoding skill. Also, non-automatic responding appears to be uncorrelated with reading in these first graders—only instant responses were associated with reading development, as the phonemic

proficiency hypothesis proposes. If replicated in other studies, these results have important implications for the assessment of phonemic awareness as well as in understanding the relationship between phonemic awareness and word learning. The large base of research on phonological awareness in reading has not taken account of speed of responding to phonological awareness tasks.

## Study 2

### Method

#### Participants

Participants were 58 fifth graders from a K-5 suburban elementary school in a lower middle class district several miles from the school district described in the previous studies. Approximately 93% of students in the district's population were of white, European descent, with 7% shared between African American, Hispanic, and Asian. **Students were primarily average readers**, with only 5 of the 58 students receiving extra reading help. The low number of weak readers was a function of which parental consent forms were returned. All students were native speakers of English.

#### Materials

The Exception Words Test (Adams & Huggins, 1985) was administered. This experimenter-designed graded word list has 50 words, all of which are inconsistent with standard grapho-phonemic correspondences (e.g., *iron, yacht, chauffeur*) and was used to index these students' word-specific orthographic knowledge. **The goal in using this test was to disengage the assessment of familiar words in the orthographic lexicon from recoding skill.** The Word Attack subtest from the



Woodcock Reading Mastery Test-Revised (WRMT-R), the Oral Vocabulary subtest from the Woodcock Diagnostic Reading Battery (WDRB), and the PAST were also administered. The Word Attack subtest involves pronouncing nonsense words of increasing difficulty and the Oral Vocabulary subtest requires students to provide synonyms and antonyms to words that increase in difficulty. Only the basic phoneme and advanced phoneme levels of the PAST were used in the analyses, given the ceiling effect at the syllable and onset-rime levels.

### **Procedure**

All 58 students received the subtests as part of a larger data gathering effort. Tests were administered at a table just outside the classroom.

### **Results and Discussion**

Table 4 displays the means, standard deviations, and maximum possible scores of each subtest while Table 5 presents the test intercorrelations. Only the automatic score from the PAST positively correlated with the Exception Words Test. The non-automatic score negatively correlated with the reading task to a marginally significant degree ( $p = .056$ ). A regression analysis was conducted to examine the contributions of the Word Attack, Oral Vocabulary, and PAST tests to the Exception Words Test and is presented in Table 6. Both the Word Attack and Oral Vocabulary tests made substantial contributions to the Exception Words Test. When the PAST was scored in the conventional way that phonological awareness subtests are scored (i.e., items correct regardless of speed of response), it did not contribute to the Exception Words Test, controlling for Word Attack and Oral Vocabulary. By contrast, the PAST automatic score made a

significant contribution to the Exception Words Test, controlling for Word Attack and Oral Vocabulary.

These results are consistent with the phonemic proficiency hypothesis. Automatic (i.e., proficient) responses to phonemic deletion and substitution tasks are associated with skilled reading among fifth grade readers. This parallels Vaessen & Blomert's (2010) findings that timed phonemic manipulation tasks continue to significantly correlate with reading through fifth and sixth grade. Study 2 also replicates Study 1 in that it demonstrates that conventional scored phonemic awareness tasks conflate two types of responses, one that positively correlates with word reading skills and one that does not. A possible explanation for the trend toward a negative correlation between non-automatic responses and the sight-word reading task among fifth-graders (compared to the first-graders where the correlation was near zero) is that fifth-graders are presumably more capable of using a mental spelling strategy to correctly respond to the phonemic awareness task without relying on phonemic awareness. If true, it suggests that the decline in correlation between phonemic awareness and reading after first grade may be partially accounted for by the fact that conventional phonemic awareness tests do not distinguish between automatic and non-automatic/strategic responses. If students with weak phonemic skills are able to correctly respond to phonemic awareness test items using a strategy that bypasses phonemic awareness, then the impression is created that they have better phonemic awareness than they actually do. This introduces error variance that biases the overall results in a population of students to create the impression

that the phonemic skills needed for word-level reading reach ceiling at an earlier age than is genuinely the case. Evidence that this may partially explain the decrease the correlation between reading and phonemic awareness as students get older comes from the fact that when scored in the conventional manner, the PAST correlated with the EWT  $r = .38$  but correlated higher ( $r = .58$ ) when only automatic responding was considered. It also appears that Ehri's theory was supported by the fact that there is a moderate correlation between the automatic PAST score and a test of *exception word* reading, given her contention that phonemic analysis skills play a role in orthographic learning.

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Table 1

*Test Means, Standard Deviations, and Maximum Possible Scores**Grade 1 (n = 132)*

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	Mean (SD)	Max.
SWE	26.6 (14.4)	108
PDE	11.6 (7.6)	66
PAST Correct	13.3 (4.8)	20
PAST Automatic	9.9 (4.8)	20
PAST Non-automatic	3.4 (2.5)	20

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Note: SWE = Sight Word Efficiency subtest; PDE = Phonemic Decoding Efficiency subtest; PAST = Phonological Awareness Screening Test.

Table 2

*Subtest Intercorrelations**Grade 1 (n = 132)*


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	SWE	PDE	PAST-C	PAST-A
PDE	.83***			
PAST-C	.58***	.55***		
PAST-A	.58***	.57***	.86***	
PAST-NA	.004	-.29	.27**	-.26**

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Note: SWE = Sight Word Efficiency; PDE = Phonemic Decoding Efficiency; PAST = Phonological Awareness Screening Test; PAST-C = Total correct PAST score; PAST-A = Automatic PAST responses; PAST-NA = Non-automatic PAST responses.

\*\* $p < .01$

\*\*\* $p < .001$

Table 3

*Regression Analyses*

*Grade 1 (n = 132)*

Dependent Variable	Model	Independent Variables	$\beta$	$p$	$R^2$
<i>TOWRE-2 Sight Word Efficiency</i>					
	1	Phonemic Decoding Efficiency	.73	<.001	.60
		PAST-Automatic score	.17	.005	.14
	2	Phonemic Decoding Efficiency	.72	<.001	.61
		PAST-Total Correct	.56	.002	.15
	3	Phonemic Decoding Efficiency	.83	<.001	.83
		PAST-Non-automatic score	.03	.58 (ns)	.03

Note: TOWRE-2 = Test of Word Reading Efficiency–Second Edition; PAST = Phonological Awareness Screening Test.



Table 4

*Test Means, Standard Deviations, and Maximum Possible Scores**Grade 5 (n = 58)*


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	Mean (SD)	Max.
EWT	38.0 (7.0)	50
WRMT-R Word Attack	29.8 (5.3)	45
Oral Vocabulary	23.0 (4.1)	46
PAST Correct	25.1 (4.0)	30
PAST Automatic	16.9 (5.1)	30
PAST Non-automatic	8.2 (3.4)	30

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Note: EWT = Exception Words Test; WRMT-R – Woodcock Reading Mastery Test –

Revised; PAST = Phonological Awareness Screening Test.

Table 5

*Subtest Intercorrelations**Grade 5 (n = 58)*


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	EWT	WA	OV	PAST-C	PAST-A
WA	.61***				
OV	.54***	.32**			
PAST-C	.38***	.55***	.20		
PAST-A	.58***	.49***	.15	.75***	
PAST-NA	-.25†	-.08	.01	.06	-.62***

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Note: EWT = Exception Words Test; WA = Word Attack subtest; OV = Oral Vocabulary subtest; PAST = Phonological Awareness Screening Test; PAST-C = Total correct PAST score; PAST-A = Automatic PAST responses; PAST-NA = Non-automatic PAST responses.

\*\* $p < .01$

\*\*\* $p < .001$

† $p = .056$

Table 6

*Regression Analyses**Grade 5 (n = 58)*

Dependent Variable	Model	Independent Variables	$\beta$	$p$	$R^2$
Exception Words Test					
	1	WRMT-R Word Attack	.46	.001	.36
		WDRB Oral Vocabulary	.39	<.001	.37
		PAST Total Correct	.03	.82 (ns)	.02
	2	WRMT-R Word Attack	.37	.001	.32
		WDRB Oral Vocabulary	.39	<.001	.37
		PAST Automatic Score	.24	.02	.22

Note: WRMT-R = Woodcock Reading Mastery Test–Revised; WDRB = Woodcock Diagnostic Reading Battery; PAST = Phonological Awareness Screening Test.