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Analyzing the Correlates of Reading Efficiency and Comprehension Among Elementary Learners: A Cross-Sectional Study

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Abstract

This paper investigates reading efficiency among Grade 5 learners in Biliran Division, focusing on phonological awareness, language processing, cognitive skills, reading speed, and comprehension. Using a cross-sectional predictive design, data were gathered from 116 students across two schools and four sections. Tasks included rhyme detection, phoneme deletion, rapid naming of letters and objects, semantic fluency, cognitive processing speed, working memory capacity, word list and pseudoword reading, text passage reading, and comprehension assessment. Results highlight significant variability in phonological awareness and language processing, with phoneme deletion and rapid naming predicting reading speed. Cognitive skills like working memory and processing speed also impact reading fluency. Comprehension is influenced by semantic fluency, word list reading, and phonological processing. Interventions targeting these areas could enhance reading skills. The study concludes phonological awareness, language processing, and cognitive skills are vital for reading speed and comprehension. Recommendations include phonological training, integrating rapid naming tasks, enhancing cognitive skills, differentiated reading programs, and regular comprehension assessments.

Keywords: Phoneme deletion; rapid naming; semantic fluency; cognitive processing; working memory capacity

INTRODUCTION

Reading is a fundamental skill closely linked to academic success and future achievements in various life aspects, including career and health (Rabiner et al., 2016; Stage & Jacobsen, 2001; Boland, 1993; DeWalt et al., 2004; Lee, 1999). Children failing to acquire adequate literacy skills by third grade are more likely to struggle academically (Snow & Matthews, 2016). Therefore, early educational efforts focus significantly on developing reading proficiency.

The complexity of reading involves two main components: fluency and comprehension (Hoover & Gough, 2010). There's a varying degree of correlation between these two, influenced by the efficiency of reading fluency (Petscher & Kim, 2011; Chard et al., 2002; Jenkins et al., 2003; Klauda & Guthrie, 2008). Reading fluency encompasses accuracy in word decoding, automaticity in minimal attentional resource usage, and prosody, which involves using phrasing and expression effectively (Rasinski, 2004). While some researchers emphasize decoding as a core aspect of reading (Gough & Tunmer, 1986), others highlight the significance of prosodic reading (Schwanenflugel et al., 2004). Generally, reading fluency is often equated with speed and accuracy (Fuchs & Fuchs, 1999), with (2010) suggesting reading speed as a key feature of proficient reading. The relative importance of speed, accuracy, and prosody in fluency is an area of ongoing research (Abbott et al., 2012; Barth et al., 2014; Manolitsis et al., 2017; Memisevic et al., 2019; Kuhn et al., 2010; Pikulski & Chard, 2005; Hruby et al., 2011).

Reading comprehension, crucial for academic progression, especially in higher grades, is influenced by reading fluency (Guthrie et al., 2004; Alvarez- Canizo et al., 2015). Proficient reading, combining accurate and automatic decoding, aids comprehension by freeing mental resources for understanding the text (Leppänen et al.,2008). It also relies on linguistic comprehension, applicable across alphabetic orthographies (Florit & Cain, 2011).

Despite advances in understanding reading processes, gaps remain, particularly in models predicting reading outcomes (Burke et al., 2009; Memisevic et al., 2019; Proctor et al., 2005; Florit & Cain, 2011). Research shows that 6–9% of second and third graders experience reading difficulties (Shaywitz et al., 1990). The simple view of reading identifies these difficulties as stemming from decoding issues, comprehension challenges, or both (Gough & Tunmer, 1986). Phonological processing deficits are a significant cause of reading disability (Shaywitz, 1998; Wagner & Torgesen, 2007). However, naming speed, tapping into non- phonological skills like perceptual processing speed, is also a distinct contributor (Clarke et al., 2005).

Understanding successful reading factors is vital for developing effective instructional strategies and early interventions (Mathes & Denton, 2002; Menzies et al., 2008; Schwartz, 1994; Lonigan et al., 2000). Phonological awareness, linked to reading speed and accuracy, affects reading across various orthographies (Ziegler et al., 2010; Landerl et al., 2013). However, phonological skills alone are not enough for early reading success (Bus & Van IJzendoorn, 1999). Studies have shown that letter knowledge and naming ability are strong early predictors of later reading proficiency (Leppänen et al., 2008; Stanley et al., 2018). Rapid automatized naming (RAN) is another critical factor, influencing oral reading fluency (Clarke et al., 2005; Logan et al., 2011; Norton & Wolf, 2012; Papadopoulos et al., 2016).

Vocabulary size and semantic fluency also impact reading comprehension and achievement, with the latter possibly influencing reading through its relationship with vocabulary (Puolakanaho et al., 2008; Yovanoff et al., 2005; Memisevic et al., 2019; Kavé, 2005). Cognitive aspects, such as intelligence and its components like working memory and processing speed, also play roles in reading (Peng et al., 2019; Wechsler, 2003; Elsayyad et al., 2017; Peng et al., 2018; Wang & Lin, 2019; Jacobson et al., 2011; Kail & Hall, 2004). This overview underscores the multifaceted nature of factors influencing reading skills.

In the Philippines, children typically begin formal education at the age of 6 by entering the first grade of compulsory elementary school. The Philippine educational system, structured under the K-12 program, emphasizes the importance of early literacy skills. By the third grade, Filipino children are expected to read independently and extract information from texts effectively. However, research indicates that certain reading difficulties may not become apparent until the third grade (Wolf & Katzir-Cohen, 2001), making early assessment crucial. This study, therefore, focuses on third-grade students' reading speed and reading comprehension.

The Filipino language features a relatively transparent orthography, which generally allows for a more straightforward phoneme-grapheme correspondence. Despite this, the Philippines faces unique challenges in literacy development. According to the 2022 Program for International Student Assessment (PISA) results, the Philippines ranked low in reading comprehension among participating countries. This highlights a significant need for improved understanding and strategies in teaching reading comprehension and fluency in Filipino schools.

There is limited research on the specific predictors of reading efficiency in the Filipino context, particularly concerning reading comprehension. This study aims to explore a new set of predictors to develop a more comprehensive model of reading, encompassing various measures of reading speed and comprehension. The study will investigate the impact of several variables: two phonological awareness tasks, two rapid naming tasks, a semantic fluency task, processing speed, and working memory on reading speed. In line with recommendations for comprehensive assessments (Florit & Cain, 2011), the study will employ three different tasks to gauge reading speed: Word list reading, Pseudoword list reading, and Text passage reading. The inclusion of Pseudoword reading is particularly important for assessing decoding abilities independent of vocabulary familiarity.

Additionally, the paper aims to examine the effects of these variables, along with the reading speed tasks, on reading comprehension. The lack of models for reading comprehension in languages with transparent orthographies, as noted by Florit and Cain (2011), makes this research especially pertinent. The chosen predictors are not only potentially influential in reading development but also malleable, making them suitable targets for early intervention. The outcomes of this study will be measured using the three reading speed tasks and one reading comprehension task, providing valuable insights for enhancing literacy education in the Philippines.

FRAMEWORK OF THE STUDY

Theoretical Framework

The theoretical underpinning is grounded in the Simple View of Reading (SVR) model, a framework developed by Gough and Tunmer in 1986. This model conceptualizes reading comprehension as a product of two distinct yet interrelated components: decoding and linguistic comprehension (Gough & Tunmer, 1986). Decoding

refers to the ability to translate text into spoken words, while linguistic comprehension pertains to the understanding of language (Hoover & Gough, 2010). SVR suggests that deficiencies in either component can lead to reading difficulties, emphasizing the necessity of both for proficient reading.

This study's focus aligns with the SVR model, particularly in examining how various factors influence reading efficiency among learners. The emphasis on phonological awareness, including rhyme detection and phoneme deletion skills, is integral to the decoding process outlined in SVR (Adams, 1990). Similarly, the exploration of language processing skills, such as rapid automated naming and semantic fluency, alongside cognitive skills like processing speed and working memory capacity, corresponds to the linguistic comprehension component of the SVR (Wagner & Torgesen, 2007).

Moreover, the investigation into the relationship between these skills and reading speed and comprehension is central to SVR. By assessing how phonological awareness, language processing, and cognitive skills impact reading proficiency, the study provides insights into the multifaceted nature of reading as conceptualized by the model (Kuhn et al., 2010). Furthermore, the development of educational interventions based on these findings reflects SVR's application in identifying areas of reading that require enhancement, whether in decoding, comprehension, or both (Fuchs & Fuchs, 1999).

The SVR model serves as a comprehensive guide for this study, offering a structured framework for analyzing the complex interplay of skills that contribute to reading proficiency. It supports the methodology in evaluating and enhancing reading abilities among Filipino learners, ensuring a focused and effective approach to literacy education.

The conceptual framework of this study is intricately woven around the Simple View of Reading (SVR) model, which distinguishes reading proficiency as a synergy between decoding and linguistic comprehension. This framework serves as a guiding blueprint for exploring various dimensions of reading development in learners, intricately relating to the theoretical underpinnings of the SVR model.

In the realm of phonological awareness, this study delves into the investigation of rhyme detection skills and phoneme deletion abilities. These foundational skills in phonological processing are pivotal in the decoding process, a critical component of the SVR model. Understanding how these skills influence reading speed is paramount, as the SVR posits that proficient decoding is a precursor to effective reading comprehension. Language processing skills, encompassing rapid automated naming of letters and objects, along with semantic fluency, are also a focal point of the study. These skills are indicative of efficient language processing, crucial for both the decoding and comprehension aspects of reading. The SVR model emphasizes that seamless language processing is integral to reading fluency, subsequently facilitating comprehension.

Cognitive skills, specifically cognitive processing speed and working memory capacity, are explored for their integral roles in reading development. These cognitive abilities are fundamental to the processing capabilities required for both decoding and linguistic comprehension as outlined in the SVR model. The study examines how these cognitive skills underpin and interact with the reading process.

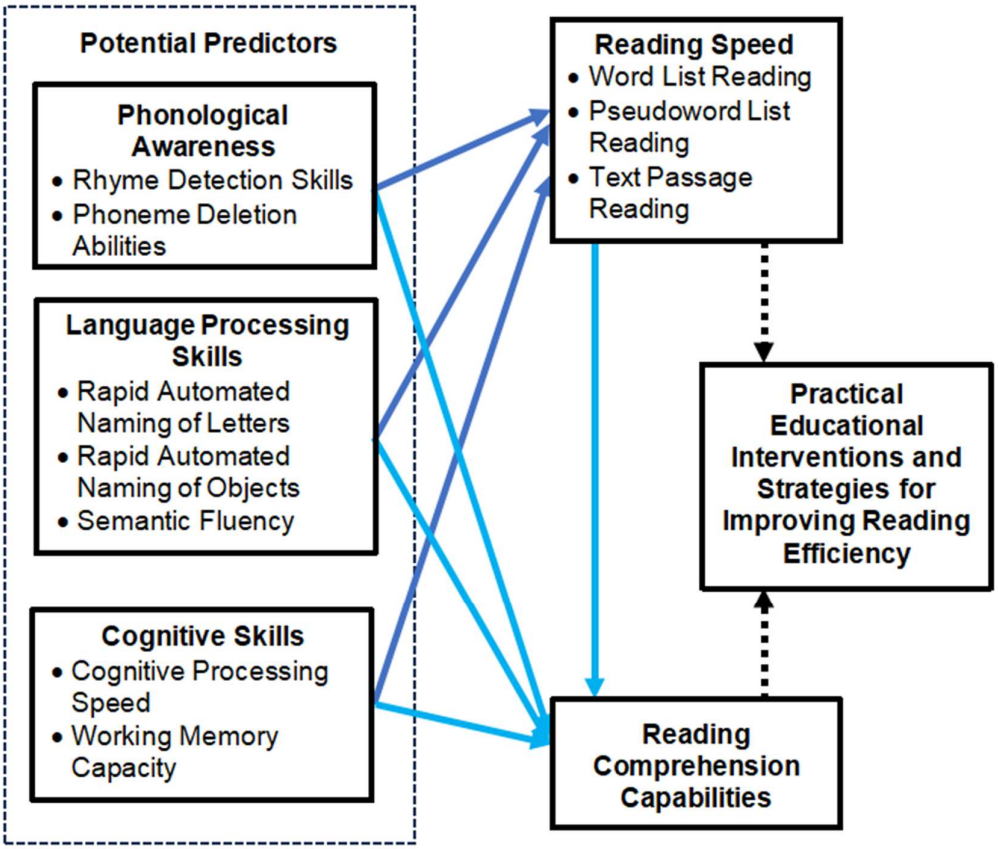
Further, the study investigates reading speed and comprehension capabilities through diverse measures like word list reading, pseudoword list reading, and text passage reading. These elements are directly linked to the SVR model, where reading speed—a facet of decoding—and comprehension are viewed as interdependent. The study is aimed at unraveling how phonological awareness, language processing, and cognitive abilities collectively impact these crucial aspects of reading.

Finally, the study s to translate its findings into practical educational interventions and strategies. This objective is rooted in the SVR model's practical application, where an in-depth understanding of strengths and challenges in decoding and comprehension can inform targeted and effective instructional strategies.

Conceptual Framework

This conceptual framework, therefore, not only aligns with the SVR model but also holistically addresses the multifaceted nature of reading proficiency. It underscores the interconnectedness of various skills and their collective impact on reading development, aiming to enhance literacy education among learners in the Biliran Division. This is shown in Figure 1.

1.1 Figure 1. *The schematic diagram of the study*



METHODDOLOGY

Research Design

This study utilized the cross-sectional predictive research design, an approach that is particularly suited for quantitatively assessing the relationships and predictive capabilities of various factors at a single point in time. In educational research, and specifically in studies focused on reading proficiency, this design is advantageous for its efficiency and effectiveness in capturing a comprehensive snapshot of learners' abilities and the influencing variables. The cross-sectional aspect allows for the collection and analysis of data from a representative sample of Grade 5 learners, offering insights into their current reading skills and related cognitive and linguistic capabilities. This method is ideal for this study's objective to analyze the correlates of reading efficiency, as it facilitates the examination of multiple variables simultaneously without the need for longitudinal tracking.

Furthermore, the predictive element of this design is crucial for understanding how different factors like phonological awareness, language processing skills, and cognitive abilities contribute to reading speed and comprehension. By employing regression analysis, the study can identify key predictors and quantify their influence on reading outcomes. This approach not only provides a clear picture of the current state of reading efficiency among the targeted learners but also lays a foundation for developing targeted educational strategies. Overall, the cross-sectional predictive research design offers a structured and focused approach for investigating the complex interactions between various developmental skills and reading proficiency in a specific educational context.

A cross-sectional predictive research design allows researchers to collect and analyze data from participants at one specific time, providing a "snapshot" of the learners' reading abilities and the factors that influence these abilities. This approach is efficient, especially in the field of education, as it facilitates the assessment of several variables, such as cognitive and linguistic factors, within a specific population (in this case, Grade 5 learners). By utilizing predictive analysis techniques, such as regression models, the study identifies key predictors that can forecast future reading proficiency, helping to shape effective educational strategies and

interventions.

This design also suits the study's goal of exploring the correlates of reading speed and comprehension, both essential components of literacy development. By using this approach, the researchers can assess how various cognitive and linguistic factors interact with reading skills without needing a long-term observational period.

Research Participants and Sampling Procedure

The selection of research respondents was conducted through stratified random sampling. This method ensures a representative distribution of participants, accounting for various demographic variables, which in this case include gender and school size. The stratification will allow for the collection of data that reflects the diverse student population in the school districts of Naval, Division of Biliran. The choice to stratify by gender and school size is grounded in the goal to capture a broad spectrum of reading abilities and experiences, which can be influenced by these factors.

The determination of the sample size is based on a meticulous calculation using Dr. Daniel Soper's A-Priori Sample Size Calculator for Multiple Regression. This calculation considered an anticipated effect size (f2) of 0.15, a desired statistical power level of 0.8, nine predictors, and a probability level of 0.05. These parameters resulted in a minimum required sample size of 113. However, to accommodate potential data variability and ensure more robust results, the target sample size has been set at 140, split evenly between boys and girls. This approach not only enhances the statistical power of the study but also contributes to the generalizability of the findings.

In addition, the sample will be further stratified based on the size of the school, with 35 boys and 35 girls selected from small-medium size schools and an equal number from large-mega size schools. This stratification is intended to account for potential differences in educational experiences and resources available in schools of varying sizes. The inclusion criteria for the study are specific: participants should be free of any developmental disability or other neurological condition and should not have received any special education support. This criterion ensures that the study focuses on a population that represents the general student body, thereby enhancing the applicability of the findings to a broader educational context.

Research Instrument

The research instrument for this study was a comprehensive test battery, tailored to assess a range of cognitive and reading skills in children. The battery includes tasks for reading speed such as word list reading, pseudoword list reading, and text passage reading. The word list and pseudoword list tasks involve children reading aloud lists of words and non-words, respectively, with the number of words read in a minute serving as the dependent variable. The test-retest reliability for these tasks is reported to be high, exceeding .90 (Georgiou et al., 2012). In the text passage reading task, children read a grade-level text aloud, with the time taken to complete the reading serving as the measure. This task is known for its simplicity and ability to differentiate reading abilities, with a test-retest reliability above .80 (Georgiou et al., 2012).

For predictive measures, the study uses a rhyme detection task, where children identify rhyming pairs among a set of pictures, and a phoneme deletion task, where they name objects without the initial sound. Additionally, the study employs Rapid Automatized Naming (RAN) tasks for both letters and objects, with test-retest reliability for RAN: Letters at .90 and for RAN: Objects at .84 (Wolf & Denckla, 2005). These tasks are complemented by a processing speed measure using a computerized letter-digit symbol substitution test (Mueller & Piper, 2014) and a working memory assessment via a computerized Corsi backward test (Kessels et al., 2000). Finally, the semantic fluency task involves naming as many animals as possible in one minute, a standard test in neuropsychological evaluation with a reported test-retest reliability of .68 (Harrison et al., 2000).

Each of these instruments has been chosen for their proven reliability and validity in assessing the targeted cognitive and reading skills. The detailed instructions and structured scoring system accompanying each task ensure consistent administration and accurate measurement of each child's abilities. This battery, therefore, provides a robust tool for assessing the various factors that influence reading efficiency and comprehension in learners.

Data Analysis Procedure

The statistical treatment of data in this study will involve several key analytical techniques to comprehensively examine the relationships between the variables. Initially, descriptive statistics, including means and standard deviations, will be calculated for all variables. This provides a foundational understanding of the data distribution and central tendencies, which is essential for the subsequent analysis.

A correlation analysis was then be conducted to explore the relationships between the dependent and independent variables. This step is crucial to identify potential connections and the strength of these relationships.

Following this, the study employed four stepwise multiple regression analyses. These analyses are designed to predict outcomes based on a set of independent variables. The first regression model will focus on Text passage reading as the outcome variable, incorporating predictors such as Phoneme deletion, Rhyming detection, Rapid Automatized Naming of Letters and Objects, Working Memory, Processing Speed, and Semantic Fluency. The stepwise backward procedure will be used to refine the model by iteratively removing the least significant predictors.

The other two regression models analyzed Word list and Pseudoword list reading as outcome variables, employing the same set of predictors as in the first model. The fourth regression model investigate Reading Comprehension as the outcome variable, including the same predictors along with the addition of two reading fluency tasks. This approach allows for a detailed examination of how various cognitive and language processing skills contribute to different aspects of reading proficiency.

In all models, omega squared was reported for all statistically significant predictors to quantify the effect size, providing a deeper insight into the practical significance of the findings. An alpha level of 0.05 was used for all statistical tests to determine the significance of the results. This comprehensive statistical approach, utilizing advanced analytical techniques, ensured a robust and detailed exploration of the data, contributing to the reliability and validity of the study's conclusions.

RESULTS AND DISCUSSION

Phonological Awareness of Learners

Phonological awareness was assessed through two key tasks: rhyme detection and phoneme deletion. The data are summarized in Table 1.

Table 1

Phonological Awareness of Learners

	N	Mean	SD	Min	Max	Median
Rhyme Detection[a]	116	64.63	24.941	15	133	63
Phoneme Deletion[a]	116	110.69	33.694	36	188	107

Note: [a] measured in time (seconds).

The mean time for learners to detect rhymes was 64.63 seconds (SD = 24.941), with a range of 15 to 133 seconds and a median of 63 seconds. The large variation in times suggests significant differences in learners' phonological awareness abilities.

The mean time for phoneme deletion tasks was 110.69 seconds (SD = 33.694), with times ranging from 36 to 188 seconds and a median of 107 seconds. The longer time for phoneme deletion tasks compared to rhyme detection indicates that this is a more complex task for learners.

Language Processing Skills of Learners

The learners' language processing abilities were evaluated through rapid automated naming (RAN) of letters, RAN of objects, and semantic fluency. Table 2 presents the results.

Table 2

Descriptive Statistics for Language Processing Skills of Learners

Variable	N	Mean	SD	Min	Max	Median
RAN: Letters[a]	116	26.41	8.211	14	61	24
RAN: Objects[a]	116	50.48	16.590	28	118	46
Semantic Fluency[b]	116	11.87	4.738	4	26	11

Note: RAN - Rapid Automated Naming; [a] measured in time (seconds); [b] number of named animals in 1 min.

Learners took an average of 26.41 seconds (SD = 8.211) to name letters, with times ranging from 14 to 61 seconds and a median of 24 seconds.

The mean time to name objects was higher at 50.48 seconds (SD = 16.590), with a range of 28 to 118 seconds and a median of 46 seconds.

Learners named an average of 11.87 animals (SD = 4.738) in one minute, with a range of 4 to 26 animals and a median of 11.

Cognitive Skills of Learners

The cognitive abilities of the Grade 5 learners in Biliran Division were assessed in terms of Cognitive

Processing Speed (CPS) and Working Memory Capacity (WMC). The findings are presented in Table 3.

Table 3
Cognitive Skills of Learners

Variable	N	Mean	SD	Min	Max	Median
CPS[c]	116	158626.09	79685.177	53000	475000	139000
WMC[d]	116	3.83	1.517	0	7	4

Note: CPS – Cognitive Processing Speed; WMC – Working Memory Capacity; [c] measured in time (milliseconds); [d] number of correct retrieval.

The mean cognitive processing speed was 158,626.09 milliseconds (SD = 79,685.177), with a minimum of 53,000 milliseconds and a maximum of 475,000 milliseconds. The median was 139,000 milliseconds. These results highlight substantial variability in the processing speed of learners.

The mean working memory capacity was 3.83 correct retrievals (SD = 1.517), with scores ranging from 0 to 7 correct retrievals and a median of 4. These results indicate that learners have varying abilities in holding and manipulating information over short periods.

Reading Speed of Learners

The reading speed of learners was assessed through three tasks: word list reading, pseudoword list reading, and text passage reading, as summarized in Table 4.

Table 4
Reading Speed of Learners

Variable	N	Mean	SD	Min	Max	Median
Word List[e]	116	16.79	6.717	2	29	17
Pseudoword List[e]	116	16.34	8.692	0	30	15
Text Passage[a]	116	194.53	99.784	55	620	167

Note: [a] measured in time (seconds); [e] number of words read in 1 m

Learners read an average of 16.79 words per minute (SD = 6.717), with a range from 2 to 29 words and a median of 17 words per minute.

The mean pseudoword reading speed was 16.34 words per minute (SD = 8.692), with a range from 0 to 30 words and a median of 15 words per minute.

The mean time taken to read a passage was 194.53 seconds (SD = 99.784), with a range from 55 to 620 seconds and a median of 167 seconds.

Reading Comprehension Capabilities of Learners

Reading comprehension was measured by the number of correct answers to comprehension tasks, as shown in Table 5.

Table 5
Reading Comprehension Capabilities of Learners

Variable	N	Mean	SD	Min	Max	Median
RC[f]	116	6.76	3.826	0	12	6

Note: RC – Reading Comprehension; [f] number of correct answers.

The mean score was 6.76 correct answers (SD = 3.826), with scores ranging from 0 to 12 correct answers and a median of 6.

Influence of Phonological Awareness, Language Processing Skills, and Cognitive Skills on Reading Speed

A stepwise multiple regression analysis revealed that four key predictors significantly influenced the word list reading (WLR) speed of Grade 5 pupils in Biliran Division: rapid automated naming (RAN) of objects, phoneme deletion, RAN of letters, and rhyme detection. The model explained 61.2% of the variance in WLR speed (Adjusted $R^2 = .612$), with the F-statistic confirming the model's significance ($F(4, 109) = 45.642$, $p < .001$). The significant predictors were:

Table 6

Stepwise Multiple Regression Predicting Word List Reading

Predictors	*B*	*SEB*	*β*	*t*	*p*
RAN Object	-.105	.035	-.259	-2.989	.003
Phoneme Deletion	-.070	.014	-.347	-5.173	<.001
RAN Letter	-.224	.067	-.273	-3.365	.001
Rhyme Detection	-.046	.017	-.171	-2.680	.009

Note: RAN - Rapid Automated Naming; R^2 (unadjusted) =.626, R^2 (adjusted) = .612; F(4, 109) = 45.642, p < .001.

The negative coefficients suggest that slower performance in these phonological and language processing tasks was associated with slower WLR speed.

Predictors of Pseudoword List Reading (PLR)

The analysis of predictors for pseudoword list reading (PLR) identified three significant factors: phoneme deletion, RAN of letters, and rhyme detection. This model explained 47.2% of the variance in PLR speed (Adjusted R^2 = .472). The ANOVA confirmed the model's goodness of fit (F(3, 110) = 34.625, p < .001). The significant predictors were:

Table 7

Stepwise Multiple Regression Predicting Pseudoword List Reading

Predictors	*B*	*SEB*	*β*	*t*	*p*
Phoneme Deletion	-.119	.020	-.455	-5.981	<.001
RAN Letter	-.269	.078	-.256	-3.446	<.001
Rhyme Detection	-.074	.025	-..212	-2.945	.004

Note: RAN - Rapid Automated Naming; R^2 (unadjusted) =.486, R^2 (adjusted) = .472; F(3, 110) = 34.625, p < .001.

Similarly, negative coefficients indicate slower performance in these tasks is associated with reduced PLR speed.

Predictors of Text Passage Reading (TP)

The third model focused on text passage reading (TP) and revealed that rapid automated naming of letters, phoneme deletion, and rhyme detection significantly influenced TP speed. The model explained 46.8% of the variance in TP speed (Adjusted R^2 = .468). The ANOVA results (F(4, 109) = 25.835, p < .001) confirmed the significance of the model. Significant predictors included:

Table 8

Stepwise Multiple Regression Predicting Text Passage Reading

Predictors	*B*	*SEB*	*β*	*t*	*p*
RAN Object	1.054	.611	.175	1.725	.087
Phoneme Deletion	.746	.237	.246	3.129	.002
Rhyme Detection	1.032	.300	.257	3.439	<.001
RAN Letter	3.350	1.159	.275	2.890	.005

Note: RAN - Rapid Automated Naming; R^2 (unadjusted) =.487, R^2 (adjusted) = .468; F(4, 109) = 25.835, p < .001.

The positive coefficients for phonological tasks suggest slower processing in these areas resulted in slower TP speed.

Influence of Phonological Awareness, Language Processing Skills, Cognitive Skills, and Reading Speed on Reading Comprehension

A stepwise multiple regression analysis was conducted to identify the factors that influence the reading comprehension (RC) of Grade 5 pupils in Biliran Division. The purpose of the model was to forecast reading comprehension based on various cognitive and language processing skills.

Table 9

Stepwise Multiple Regression Predicting Reading Comprehension

Predictors	*B*	*SEB*	*β*	*t*	*p*
Semantic Fluency	.351	.062	.434	5.623	<.001
Word List Reading	.203	.046	.357	4.405	<.001
Rhyme Detection	-.022	.010	-141	-2.163	.033

Note: RAN - Rapid Automated Naming; R^2 (unadjusted) =.616, R^2 (adjusted) = .605; F(3, 110) = 58.750, p < .001.

Note: R2 (unadjusted) = .616, R2 (adjusted) = .605; F(3, 110) = 58.750, p < .001.

The regression model explained a significant amount of variance in RC, with an R2 of .616 and an Adjusted R2 of .605, indicating that 60.5% of the variability in reading comprehension could be explained by the predictors. The standard error of the estimate was 2.418, suggesting a precise model fit. The Durbin-Watson statistic was 1.551, which implies no significant autocorrelation in the residuals.

The ANOVA results for the RC model were highly significant (F(3, 110) = 58.750, p < .001), confirming the robustness of the model. The coefficients revealed that Semantic Fluency (B = 0.351, p < .001), Word List Reading (B = 0.203, p < .001), and Rhyme Detection (B = -0.022, p = .033) were all significant predictors of reading comprehension. Semantic Fluency had the largest positive effect on reading comprehension, with a standardized beta coefficient of 0.434. Word List Reading was the second most substantial positive predictor (β = 0.357). Rhyme Detection had a small but significant negative impact (β = -0.141) on reading comprehension.

The results of the study provide insights into the phonological awareness and language processing abilities of Grade 5 learners in Biliran Division, highlighting both challenges and potential areas for targeted intervention.

The wide range in rhyme detection times suggests diverse levels of phonological awareness, likely influenced by varying linguistic backgrounds and exposure to English. While some learners demonstrated proficiency, others may need additional support to improve their ability to detect rhymes. Rhyme detection is an essential early reading skill, and differences in performance indicate the need for differentiated instruction.

Phoneme deletion tasks were more time-consuming, reflecting the increased complexity of this task compared to rhyme detection. The difficulty in manipulating individual sounds within words aligns with previous studies (Adams, 2010), which describe phoneme deletion as a more demanding cognitive process. The substantial range in performance times further highlights the variation in phonological processing skills among learners. This suggests that more targeted support may be needed to develop these critical phonological abilities.

The findings are consistent with previous research on phonological awareness (Anthony & Francis, 2005; Wagner et al., 1997), which indicates that rhyme detection and phoneme deletion progress at different rates, influenced by factors such as language exposure and educational interventions. The longer times observed in this study compared to Western contexts (e.g., Fuchs et al., 2001) may be attributed to differences in linguistic environments and educational practices in the Philippines.

In terms of language processing, the results indicate variability in rapid automated naming (RAN) abilities, with object naming taking longer than letter naming. This is consistent with previous studies (Denckla & Rudel, 2016) that suggest object naming requires more complex cognitive processes, including semantic and visual recognition. Learners who struggled with RAN may benefit from practice in tasks that enhance their speed in recognizing and naming letters and objects, which is critical for reading fluency.

The results for semantic fluency show moderate performance, with some learners exhibiting strong abilities in rapidly retrieving semantic information, while others struggled. These differences may reflect variations in vocabulary knowledge and retrieval speed. The findings are consistent with the work of Wolf and Bowers (2009) and Katzir et al. (2006), who found that RAN and semantic fluency are strong predictors of reading proficiency and verbal skills.

The relatively slower RAN times in this study, compared to Western studies (Denckla & Rudel, 2016), may be due to differences in language exposure and instruction. However, the similarities in semantic fluency scores suggest that this aspect of language processing may be less influenced by cultural and linguistic differences.

The findings have significant implications for educational practice. The wide variation in learners' phonological awareness and language processing abilities suggests that teachers should adopt individualized instructional strategies to address these differences. Early identification of students who struggle with phonological awareness or RAN tasks is essential, as these skills are foundational to reading success.

In particular, interventions that focus on enhancing phoneme manipulation and rapid naming should be implemented to improve learners' phonological processing and language retrieval abilities. Activities that engage learners in sound manipulation and quick retrieval of letters, objects, and words can support the development of these essential skills.

The results demonstrate significant variability in cognitive processing speed and working memory

capacity among the Grade 5 learners. Learners with faster cognitive processing speeds are likely to perform tasks more efficiently, while those with slower processing speeds may struggle to keep up with the pace of instruction, particularly in reading fluency and comprehension. As noted by Kail and Hall (2009), cognitive processing speed is a strong predictor of reading proficiency, and these results suggest that some learners may benefit from extended time and additional practice to enhance their processing abilities.

Similarly, the differences in working memory capacity suggest that some learners are better equipped to handle complex tasks that require the retention and manipulation of information, such as reading comprehension and mathematics problem-solving. This aligns with findings by Swanson and Beebe-Frankenberger (2004), who emphasized the importance of working memory in academic performance. Targeted activities that improve working memory, such as memory games, could help learners with lower WMC scores enhance their academic performance.

Regarding reading speed, the results reveal that learners generally perform better on word list reading than pseudoword list reading. This is consistent with research by Fuchs et al. (2001), who found that reading speed for familiar words tends to be higher than for pseudowords, as the latter requires more effortful phonological decoding. Learners who struggle with pseudoword reading may need additional support in phonics instruction to improve their decoding skills.

The text passage reading results suggest that learners who took longer to read may have difficulties with word recognition and comprehension, which could hinder their overall reading proficiency. These findings support the need for differentiated instruction, as some learners may require more intensive interventions, such as repeated reading practices and phonological decoding strategies.

The reading comprehension results highlight the wide range of abilities among the learners. While some demonstrate a solid understanding of the text, others face significant challenges, as indicated by the lowest score of 0 correct answers. This variability mirrors findings by Kintsch and Rawson (2005) and Cain and Oakhill (2006), who emphasized the role of vocabulary and prior knowledge in comprehension. Learners with lower comprehension scores may benefit from explicit instruction in reading strategies, as well as activities that build background knowledge and vocabulary.

The findings from this study reinforce the critical role of phonological awareness, language processing skills, and cognitive skills in reading fluency. The stepwise regression models for word list reading, pseudoword list reading, and text passage reading consistently highlighted the significant impact of phoneme deletion, rapid automated naming (RAN), and rhyme detection on reading speed.

Phoneme Deletion was consistently a strong predictor across all three models, particularly for pseudoword reading, where it had the largest standardized beta coefficient. This aligns with existing research, such as Torgesen et al. (2007), which emphasized that phoneme manipulation tasks are strong indicators of reading difficulty, especially in young learners. The importance of RAN, both for objects and letters, was also significant, which is consistent with studies by Wolf and Bowers (2009) and Norton and Wolf (2012), who found that rapid retrieval of phonological information is crucial for reading fluency.

The analysis suggests that pupils who struggle with phonological tasks like phoneme deletion and rapid automated naming are likely to exhibit slower reading speeds, supporting the hypothesis that these cognitive and language processing skills are integral to efficient reading. This has implications for educational interventions aimed at improving reading fluency.

In terms of educational practice, these findings suggest that educators should emphasize activities that target phonological awareness and language processing skills. Interventions that focus on phoneme manipulation, rapid automated naming, and rhyme detection may significantly enhance reading speed. These activities could include: timed naming tasks (Exercises that encourage quick recognition and naming of objects or letters to improve processing speed); phoneme manipulation exercises (Tasks that involve deleting or adding phonemes to words to strengthen phonological awareness); and rhyme detection (Activities that require students to identify and generate rhymes to support language processing skills). Moreover, early assessments of phonological and language processing skills can identify at-risk learners, allowing for timely interventions to prevent reading difficulties from developing further. Integrating these practices into regular teaching routines could significantly improve reading fluency among learners in the Biliran Division.

The results of the multiple regression analysis indicate that semantic fluency and word list reading are strong positive predictors of reading comprehension among Grade 5 learners. These findings align with previous studies that emphasize the importance of both decoding and fluency in understanding text. According to the Simple View of Reading (Hoover & Gough, 2010), reading comprehension relies on both word recognition and linguistic comprehension—skills clearly reflected in the significant roles of semantic fluency and word list reading in this model.

The significant impact of semantic fluency on reading comprehension highlights the importance of vocabulary knowledge and the ability to retrieve words efficiently during reading. Fluency in generating

semantically related words indicates that learners can process language quickly and understand word meanings in context, which enhances their ability to comprehend passages. This finding supports research by Cain, Oakhill, and Bryant (2004), who found that fluency in processing semantic information contributes to reading comprehension at different stages of reading development.

The strong positive relationship between word list reading and reading comprehension reinforces the notion that decoding abilities—such as quickly and accurately reading words—are fundamental to comprehending text. Decoding is an essential precursor to understanding because efficient word recognition frees cognitive resources for higher-level processes like integration and inference, as described in research on the development of reading fluency (Cain et al., 2004).

Interestingly, rhyme detection had a small negative effect on reading comprehension, suggesting that difficulties in phonological processing, particularly the ability to detect rhymes, could impede comprehension. This finding is consistent with studies that highlight the role of phonological awareness in early reading development, including work by Muter, Hulme, Snowling, and Stevenson (2004). While phonological skills like rhyme detection are critical for learning to read, their role in comprehension may diminish as other language processing abilities become more prominent in older learners.

The findings of this study suggest several important instructional strategies for improving reading comprehension. First, fluency-building exercises like repeated reading and guided oral reading should be prioritized, as semantic fluency plays a key role in reading comprehension by enhancing word recognition and overall understanding. Additionally, interventions targeting word recognition through phonics and sight word practice are essential, as stronger word list reading skills allow students to free up cognitive resources for comprehension. Despite the negative relationship between rhyme detection and comprehension, phonological awareness activities, such as phoneme manipulation and rhyme generation, remain vital for developing foundational decoding skills.

Moreover, early assessment of semantic fluency, word reading, and phonological awareness is crucial for identifying students who may be at risk for reading comprehension difficulties. By pinpointing areas where students struggle, educators can provide timely and focused interventions, ensuring that instructional efforts are aligned with each learner's needs to enhance overall reading proficiency.

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