

[博士論文概要]

Cognitive Abilities predicting Tagalog and English literacy of Filipino children:

A cross-sectional study from grade 1 to grade 4

(タガログ語と英語の文字習得を予測する認知能力 :

小学 1 年生から 4 年生までの横断的研究)

令和 2 年度

Estrera Lhannie Dagohoy

筑波大学大学院 人間総合科学研究科

感性認知脳科学専攻

## **1. Introduction**

Reading is an important skill that seems to develop easily and automatically, especially once proper education begins. However, once there is struggle or difficulty in reading, this could lead to difficulty in other aspects of life such as impairment in academic achievement or increased risk of social, emotional, and mental health problems (McArthur & Castles, 2017). In a survey of students who have reading difficulties and/or other difficulties in literacy, it has been shown that they struggle in successive stages of education that would require some support that typically developing readers would not need as much (Mortimore & Crozier, 2006).

Researchers attempt to prevent this problematic effect of reading difficulty through early identification of children who are at risk of developing reading difficulties and implementing early intervention programs. According to Kirby, Parrila, and Pfeiffer (2003), this would require reliable and valid assessments and early intervention programs that should target key processes tailoring to the pattern of potential difficulties of the child. This could be achieved by obtaining more understanding regarding the processes involved in reading. Since reading is not a simple skill but a complex one that requires different cognitive prerequisites (Goswami, 2000), different cognitive skills have been examined for several decades.

One cognitive factor that has been widely researched and assumed to measure the mastery of phonological recoding, thus leading to mastery of reading, is phonological skills. Phonological skills refer to skills involving speech sounds (Hulme & Snowling, 2009). Phonological awareness in particular, which is the awareness of and ability to manipulate sounds, is considered as the key component of reading development or even the core deficit of reading disability (Goswami, 2000; Kirby, Parrila, & Pfeiffer, 2003; Ziegler & Goswami, 2005). However, studies have opposed this theory and posited that other cognitive abilities are equally

important as, if not more than, phonological awareness. Another cognitive ability is naming speed which is the speed of naming a series of stimuli such as objects and digits. Children with reading difficulties have been found to have slower naming speed (Wolf & Bowers, 1999, 2000; Wolf, Bowers & Biddle, 2000), but how naming speed is related to reading remains controversial.

Studies which emphasized phonological awareness and naming speed as significant predictors for reading, however, were focused on reading in English. Such models of reading may not be easily generalized to reading of other languages (Su, Klingebiel & Weekes, 2010). According to McBride-Chang and Kail (2002), different cognitive predictors may come into play in different scripts (orthography) and languages. When understanding the underlying cognitive predictors of reading, different studies have considered the characteristics of an orthography like the consistency of its mapping of grapheme and phoneme or orthographic depth (Caravolas, Volin & Hulme, 2005; Caravolas et al, 2012; Georgiou et al, 2012; Moll, 2014; Seymour, Aro & Erskine, 2003; Ziegler et al, 2010) and the size of its grapheme that would represent its phoneme or grain size (Wydell & Butterworth, 1999; Ziegler & Goswami, 2005) of a language. Furthermore, depending on the experience of the reader, whether mastery of reading has been achieved or not, different cognitive factors may also come into play (Ehri, 2005).

Although there is an increase of studies regarding reading in different languages and scripts, there are still some that remain to be under-researched. One such orthography is Tagalog. Tagalog is one of the most widely used mediums of communication in the Philippines alongside English. Tagalog and English are the same in which both use the alphabet in reading and writing, but these two languages differ such that English has an inconsistent orthography and

requires processing a large grain size while Tagalog has a consistent orthography and small grain size.

The first purpose of this study was to determine the cognitive factors that would predict Tagalog and English reading of Filipino children. Previous studies mostly focused on the role of phonological awareness and/or naming speed in reading. Only a few included visual cognition, vocabulary, naming speed and phonological awareness as possible cognitive predictors for reading (e.g. Batnini & Uno, 2015; Park & Uno, 2012). For this reason, skills in phonological awareness, visual cognition, vocabulary, and naming speed were tested as possible cognitive predictors. Nonword and word reading tasks were done for measuring reading in Tagalog while nonword, exception word, and regular word reading tasks were done for measuring reading in English.

The second purpose was to clarify developmental changes in reading of Filipino children from first to fourth grades. The degree of contribution of cognitive predictors for reading were examined in each grade level in both Tagalog and English. This study also aimed to have a better understanding of children with reading difficulties. Readers were divided into good and poor readers of Tagalog and English and their cognitive ability scores were compared to see underlying cognitive deficits.

Furthermore, this study aimed to ascertain the similarities and differences between reading in Tagalog, a transparent script, and English, an opaque script. The differences in cognitive predictors and cognitive deficits for reading in each language were examined and discussed. Implications on teaching and assessment tools for identifying children with reading difficulty were also discussed.

## 2. Methodology

*Participants:* A total of 437 Filipino children from first to fourth grade from two public elementary schools in Manila initially participated in the study (Grade 1:  $n = 103$ , Grade 2:  $n = 106$ , Grade 3:  $n = 111$ , Grade 4:  $n = 117$ ). Children who were not able to complete the tests or whose recorded audio was incomplete or inaudible were excluded from the study. Raven's Coloured Progressive Matrices test (Raven, 1976) was administered to the participants to assess for their general intelligence. Children who had scores showing 'normal' performance (greater than  $-2SD$  of the mean) were included in the study for a total of 393 participants (male = 198, female = 195).

Parents/guardians of the children were asked to fill out a questionnaire to know more about their family background. Based on the responses, most of the children came from a household of low-income class, most parents have at least a high school diploma, and all the respondents use Tagalog to communicate at home. There were some who use English as well, while some used another Filipino language in addition to Tagalog.

*Tests:* Raven's Coloured Progressive Matrices test was used to assess for nonverbal intelligence. To assess for visual perception and memory, Three-Figure Copy test (Haruhara et al, 2011) for Grade 1 and Rey-Osterrieth Complex Figure Test (Corwin, 1993) was used for Grades 2 to 4. These visual tests had three sessions: copy drawing, immediate recall and delayed recall. Receptive vocabulary tests in Tagalog and English derived from the one-word picture vocabulary Test (Martin & Brownell, 2011) were used to assess receptive vocabulary of children. An original rapid automatized naming task was used to assess naming speed of children. The following tasks were used to assess phonological processing of the children: nonword repetition task in all grade levels, blending for Grades 1 and 2, syllable deletion for

Grades 1 and 2, phoneme deletion for Grades 2 to 4, and spoonerism for Grades 2 to 4. All phonological processing tasks were conducted in both Tagalog and English. To assess reading, the task had two subtasks: nonword reading and word reading tasks. This was also conducted in both Tagalog and English. For English, word reading was further subdivided to exception words, words that do not follow a regular mapping of sounds and letters, and regular words, words that do follow a regular mapping of sounds and letters.

*Analyses:* A t-test was initially conducted to determine any gender differences in the reading scores. Correlations among cognitive variables were assessed to examine for strong correlations. Variables were omitted accordingly to avoid multicollinearity in the next analyses. Principal axis factor analysis with oblimin rotation was conducted to reduce the number of cognitive variables. Tagalog and English tasks were combined in the analysis to see if both versions of the task measure the same cognitive ability. Based on these results, the following factors were used as independent variables: phonological awareness, visual cognition, receptive vocabulary, and naming speed. To determine the cognitive predictors of reading, a series of multiple regression analyses (MRA) and (SEM) were conducted. The two analyses are similar in theory, but SEM allows the use of latent variables and account for error variance in its computation. SEM was conducted to confirm the results from MRA.

Readers for each grade level were divided into good and poor readers in Tagalog and English to determine the characteristics of good and poor readers. It was assumed that scores of the poor readers were not normally distributed, so the scores in cognitive abilities of the two groups were compared using Mann-Whitney U test. Scores in visual cognition, phonological awareness, naming speed, receptive vocabulary and nonverbal intelligence of good and poor readers were compared to determine any significant differences.

### **3. Results & Discussion**

Preliminary analyses revealed that there were no gender differences in the reading scores of male and female children. This ascertains that findings in this study were not influenced by any gender differences.

Results of this study revealed that among the cognitive factors included in the analyses, visual cognition was the only factor that did not predict both Tagalog and English across grade levels. This lack of link between visual cognition and reading ability is consistent with the notion that reading disability is not a visual problem, particularly for alphabetic scripts (Plaza & Cohen, 2005; Vellutino, 1975; Vellutino & Fletcher, 2005).

In contrast, phonological awareness was the only consistent predictor for both Tagalog and English across grade levels. This is in agreement with studies showing phonological awareness as a core component of alphabetic literacy across transparent and opaque orthographies (Caravolas et al., 2005; Caravolas et al, 2012; Furnes & Samuelsen, 2011; Georgiou et al, 2008; Moll et al, 2014). This is also consistent with bilingual studies which have shown phonological awareness as a significant predictor for both languages. Furthermore, phonological awareness was the only cognitive skill that differentiated good readers from poor readers across grade levels. This shows that poor readers in both languages have lower scores in phonological awareness and may have impairment in their phonological representation.

A surprising finding in the current study is that naming speed was not a consistent significant predictor in Tagalog reading, but naming speed was more significant for English reading. Poor readers in English across grade levels had significantly slower naming speed than good readers. On the other hand, only Tagalog poor readers in the first and second grade had significantly slower naming speed. Naming speed could differentiate between good and poor

readers across grade levels in English, but not in Tagalog. This difference may be explained by the difference in grain size between Tagalog and English. English requires larger grain sizes to process when reading both regular and exception words.

Receptive vocabulary was also a significant predictor, but only for older children and it was more significant in exception reading in English. This shows that Tagalog reading relied more on phonological recoding while English reading required more cognitive processes. Reading in English required tapping into orthographic representation and semantics since mapping letters and sounds is not enough to successfully read in opaque scripts such as English

Furthermore, it was found that children in the first grade may have not mastered mapping sounds to letters as indicated by the large number of poor readers. Once phonological recoding was mastered and more reading experience was gained, older children became more experienced readers. It was inferred that a shift from phonological recoding to whole-word recognition may have possibly started from the third grade. Findings in this study would be helpful in choosing which tasks to consider when constructing assessment tools for identifying children with reading difficulty.

#### **4. Limitations and Recommendations**

This study focused on bilingual Filipino children from low-income class in Manila. Children outside Manila may be trilingual or have a different mother tongue from Tagalog. Generalizing the current findings to these children may be questionable. In addition, findings in this study may differ from children who come from middle or rich class who have more financial freedom to access more learning materials and educational programs.

Furthermore, the picture naming task used in the study may not have been sensitive enough for assessing naming speed in Tagalog. Including a digit naming task in addition to object naming is recommended but mixing digit and picture naming is not recommended at least for Tagalog assessment. Moreover, language proficiency was not measured and controlled for. A more insightful finding may be uncovered if language proficiency is also considered.

Lastly, this study was a cross-sectional study in which concurrent predictors of children from first to fourth grade were assessed. Longitudinal predictors like using cognitive skills from first grade to predict second or higher grades may show a different picture. A longitudinal approach from younger (e.g. kindergarten) to older children is also recommended.