Revista de Psicodidáctica
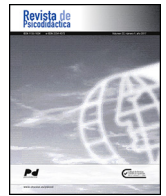
Original

Letter Knowledge and Learning Sequence of Graphemes in Spanish: Precursors of Early Reading[☆]

Ana María De la Calle [a],[*], Fernando Guzmán-Simón [b], and Eduardo García-Jiménez [c]

[a] *Departamento de Psicología Evolutiva, Facultad de Ciencias de la Educación, Universidad de Cádiz, Cádiz, Spain*
[b] *Departamento de Didáctica de la Lengua y la Literatura y Filologías Integradas, Facultad de Ciencias de la Educación, Universidad de Sevilla, Sevilla, Spain*
[c] *Departamento de Métodos de Investigación y Diagnóstico en Educación, Facultad de Ciencias de la Educación, Universidad de Sevilla, Sevilla, Spain*

ARTICLE INFO

ABSTRACT

The current article addresses a research on the predictive value of knowing the letters within the initial reading performance. Recent studies have shown a strong link between the knowledge of letters at early ages and the decoding processes. Our study deepens into the learning process of the Spanish alphabet code, focused on the graphemes, and analyzes the predictive power of knowing of letters for the decoding abilities in initial reading. To this end, the research relies on a longitudinal prospective methodology and makes use of standardised instruments (PROLEC-R and BIL) applied to 362 students aged 4 and 5. The data obtained are analysed through multiple regression, using structural equation models. Our research outlines the relevance of learning the sequence of graphemes from early ages, differentiating the sequence of learning in Spanish with respect to English language. In Spanish, the learning sequence of the graphemes is independent of the learning sequence of phonemes. Moreover, this article emphasizes the importance of a learning sequence of these letters, in order to foresee the development of the decoding abilities. This study concludes that the early educational practices that take into account the letters name and phoneme, as well as the concrete sequence in graphemes learning, optimise the reading performance of Spanish speaking children.

El conocimiento de las grafías y la secuencia de aprendizaje de los grafemas en español: Precursores de la lectura temprana

RESUMEN

Este artículo aborda una investigación sobre el valor predictivo del conocimiento de las grafías para el rendimiento lector. Los estudios precedentes han mostrado una fuerte relación entre el conocimiento de las grafías en edades tempranas y los procesos de decodificación. Nuestro estudio indaga sobre el proceso de aprendizaje del código alfabético español centrado en los grafemas y analiza el poder predictivo del conocimiento de las grafías para las habilidades de decodificación en la lectura inicial. Para ello, se apoya en una metodología longitudinal prospectiva y en el uso de instrumentos estandarizados (PROLEC-R y BIL) aplicado a 362 alumnos y alumnas de 4 y 5 años. Los datos obtenidos se analizan mediante regresión múltiple, utilizando modelos de ecuaciones estructurales. Nuestra investigación subraya la relevancia de la secuencia de aprendizaje de los grafemas en edades tempranas, diferenciándose la secuencia de aprendizaje en español con respecto a la lengua inglesa. En español, la secuencia de aprendizaje de los grafemas es independiente de la secuencia de aprendizaje de los fonemas. Asimismo, este artículo subraya la importancia de una secuencia de aprendizaje de estas grafías para predecir el desarrollo de las habilidades de decodificación. Este estudio concluye que las prácticas educativas tempranas que consideran el nombre y fonema de las grafías y la secuencia determinada en el aprendizaje de los grafemas optimizan el rendimiento lector de los niños y niñas de lengua española.

Introduction

Letter knowledge is important for learning the alphabet and implies the discovery of the rules relating *phonemes* to *graphemes*. *Letters* represent the minimal units of sound of a language (*phonemes*) with orthographic signs termed *graphemes* (Perry, Ziegler, & Zorzi, 2013). *Graphemes* are symbols perceptually determined by orientation and shape, which enables the reader to visually discriminate them (Lorenzo, 2001). Therefore, attentional skills are predominant in letter knowledge (Helal & Weil-Barais, 2015).

The mastery of *grapheme/phoneme* correspondences is key to reading achievement. The explicit instruction of *grapheme/phoneme* correspondences supports the acquisition of the alphabetic principle (Earle & Sayeski, 2017; Schaars, Segers, & Verhoeven, 2017). The systematic use of such correspondences after acquiring the alphabetic principle improves *decoding skills.* Therefore, *letter knowledge* is one of the cognitive skills that best predict future *reading performance* (Hammill, 2004; Huang, Tortorelli, & Invernizzi, 2014; Storch & Whitehurst, 2002).

The precursor nature of *letter-name and letter-sound knowledge* in early educational stages is regarded as an indicator of *reading performance* in many studies. Muter, Hulme, Snowling, and Stevenson (2004) evaluated *letter knowledge* at 4 and 5 years of age in 90 English subjects and its relation to *decoding skills* for 2 years. The research determined 63% of the variance of *decoding skills* 1 year after the acquisition of *letter-name and letter-sound knowledge*. Similarly, Evans, Bell, Shaw, Moretti, and Page (2006) evaluated *letter-name and letter-sound knowledge* in 149 English-speaking Canadian subjects at 5 years of age and, ten months later, *decoding skills*. In this case, lower-case *letter-name knowledge* explained 51% of the variance of *reading performance* of 1st-year students. Recently, Onochie-Quintanilla, Defior, and Simpson (2017) evaluated *letter-name and letter-sound knowledge* of 27 upper- and lower-case letters (and the diletters "ch" and "ll") in 100 Spanish early childhood education students (average age: 5.6 years) and *word-reading accuracy* in 1st-year primary education students. Their results reveal a lack of predictive value of *letter knowledge* for subsequent (i.e., months later) word reading.

The cited studies highlight the importance of research on *grapheme/phoneme* correspondence and its predictive value for later *reading development*. The findings of Caravolas, Lervåg, Defior, Seidlová Málková, and Hulme (2013); Fricke, Szczerbinski, Fox-Boyer, and Stackhouse (2016); Snel, Aarnoutse, Terwel, van Leeuwe, and van der Veld (2016) suggest *letter knowledge* as an early precursor of reading common to different orthographic systems (English, Spanish, Czech, German, and Dutch). However, our research considers that *grapheme/phoneme* correspondences vary according to the alphabetic code because the level of transparency of a language influences alphabet learning (Ziegler et al., 2010). In particular, our research focuses on the predictive value of *single-letter knowledge* for early *reading development* in the Spanish alphabet.

Learning sequence of graphemes

A number of studies that address the learning of the English alphabet have developed a *learning sequence of letters*. The relationship between each *single letter* and its *grapheme* facilitates evaluating the *knowledge of their associated graphemes* by studying *single-letter knowledge* at early reading stages. Thus, the previously mentioned studies show that the order of *letters* in the English alphabet and phonological development affects the *learning sequence of graphemes* (Jones, Clark, & Reutzel, 2013; Justice, Pence, Bowles, & Wiggins, 2006; Treiman, Kessler, & Pollo, 2006).

In particular, Justice et al. (2006) analysed knowledge of the 26 *letters* of the English alphabet in children between 3 and 5 years of age. Their findings reveal the *grapheme learning sequence* of the English alphabet based on a frequency analysis of *letter-name knowledge*. This sequence was determined through *graphemes* recognised by 50% of the subjects. Justice et al. (2006) also considered the relationship between the *learning sequence of graphemes* determined in their results and the *learning sequence of phonemes* determined by Sander (1972). The conclusions of Justice et al. (2006) emphasise the relationship between phonological and graphemic representations. Native English-speaking children first learn *graphemes* whose corresponding *phonemes* are acquired earlier in phonological development. The authors term this finding "the hypothesis of the order of consonants".

Learning sequence of phonemes

Studies on the learning of *phonemes* drew increasing research attention at the end of the 20th century. These studies analysed the phonetic features of *phonemes* (such as sonority and the point and mode of articulation) and age in relation to *phoneme* acquisition, primarily in English (Sander, 1972; Smit, Hand, Freilinger, Bernthal, & Bird, 1990).

Studies by Bosch (2004), Camargo (2006), and Vivar and León (2009) investigated Spanish phonological development. These studies adopted different methods with respect to the subject age ranges they considered and different criteria to determine the *learning sequences of phonemes*. Regarding the sample, Bosch (1983, 2004) and Vivar and León (2009) analysed the phonological repertoire from 3 years of age, whereas Camargo (2006) examined phonological development from the first months of life. Bosch (1983, 2004) and Vivar and León (2009) also studied the learning of *phonemes* up to 6 years. However, Camargo (2006) established the last phase in the learning of *phonemes* from 3 years of age. Regarding their results, the research by Bosch (1983, 2004) describes the acquisition of phonemic inventory between 3 and 7 years of age, classifying *phonemes* according to success rates in average-age groups (3 years, 4 years, 5 years, 6 years, and 7 years). Camargo (2006) classifies *phoneme* learning into 4 groups between 0 and 3 years. Finally, Vivar and León (2009) determine 5 groups in *phoneme* learning that range from 3 years to 5 years and 11 months.

The groups delimited by the different models implicitly define the *learning sequence of phonemes*, and the data analysis by these authors suggests discrepancies in data collection. More specifically, Bosch (1983, 2004) considered the position of *phonemes* within syllables in direct, inverse, or mixed position. In contrast, Camargo (2006) studied the position of *phonemes* within words (initial, middle, or final). Vivar and León (2009) excluded these criteria in their analysis.

Table 1 compares the *phoneme learning sequences* proposed by the previously mentioned authors. *Phonemes* are allocated to different groups when they are learned in any syllable or word position. Thus, the clusters of the cited models are comparable because there is a tendency to learn certain *phonemes* before others. However, the *phoneme learning sequences* in the different studies are not identical.

Our research on the Spanish alphabet

Our study analyses the relationships between *single-letter names, phonemes*, and their associated *graphemes* in the process of learning the Spanish alphabet. In addition, we investigate *single-letter knowledge* as a precursor of *reading performance.* Based on the