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Influence of Reading Skills on Sound Categorization Tasks in Spanish-Speaking Children

Influencia de las Habilidades Lectoras Sobre las Tareas de Categorización de Sonidos en Niños Hispanohablantes

Influência das habilidades de leitura sobre as tarefas de categorização de sons em crianças que falam espanhol

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Palabras clave: conciencia fonológica; categorización de sonidos; habilidades lectoras; desarrollo de la lectura; dislexia del desarrollo.

Palavras-chave: consciência fonológica; categorização de sons; habilidades de leitura; desenvolvimento da leitura; dislexia do desenvolvimento.

A B S T R A C T

A deficit in phonological awareness (PA) has been proposed as the main cognitive failure in developmental dyslexia (DD), since a significant proportion of children with DD show low scores on such tasks. However, it has also been argued that this poor performance is less a cause than an effect of DD, because performance on PA tasks is influenced by reading skills. This study examined the effect of reading skills on PA task performance in typical readers (TRs) and children with DD by comparing scores in two sound categorization tasks to assess PA: one in which the phonological beginnings of the words also shared spelling, and the other in which spelling of the words was unhelpful or impeded finding the correct answers. TRs and children with DD showed lower scores on the second task, demonstrating that performance on PA tasks is influenced by reading skills. In order to assess PA accurately, it is necessary to develop instruments, tasks, or procedures that control, avoid, or remove the influence of reading skills, especially in transparent languages like Spanish, in which there is a high rate of correspondence between phonemes and graphemes.

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R E S U M E N

Se ha propuesto un déficit en la conciencia fonológica (CF) como la principal causa de la dislexia del desarrollo (DD), ya que una proporción significativa de niños con DD muestran puntuaciones bajas en estas tareas. Sin embargo, también se ha argumentado que este bajo rendimiento es menos una causa que una consecuencia de la DD, ya que el desempeño en estas tareas está influenciado por las habilidades lectoras. En este trabajo se investigó la influencia de las habilidades lectoras sobre el desempeño en tareas de CF en lectores típicos y niños con DD, comparando los puntajes obtenidos en dos tareas de categorización de sonidos: una en la que las palabras que comparten sonidos iniciales también comparten ortografía, y otra en la que la ortografía de las palabras que comparten sonidos iniciales es diferente. Ambos grupos de niños obtuvieron puntajes inferiores en la segunda tarea, demostrando que el desempeño en tareas de CF se ve influenciado por las habilidades lectoras. Por lo tanto, para valorar con mayor precisión la CF, es necesario desarrollar instrumentos, tareas o procedimientos que controlen, eviten o remuevan la influencia de las habilidades lectoras. Esto es particularmente importante en idiomas transparentes como el español, en los que existe una alta tasa de correspondencia entre fonemas y grafemas.

R E S U M O

Um déficit na consciência fonológica (CF) foi colocado como a principal causa da dislexia do desenvolvimento (DD), já que uma proporção significativa de crianças com DD mostram pontuações baixas nestas áreas. No entanto, também argumenta-se que este baixo rendimento é menos uma causa que uma consequência da DD, já que o desempenho nestas tarefas está influenciado pelas habilidades de leitura. Neste trabalho, pesquisou-se a influência das habilidades de leitura sobre o desempenho em tarefas de CF em leitores típicos e crianças com DD, comparando as pontuações obtidas nas duas tarefas de categorização de sons: uma onde as palavras que compartilham os sons iniciais também compartilham ortografia e outra em que a ortografia das palavras que compartilham sons iniciais é diferente. Ambos grupos de crianças obtiveram pontuações inferiores na segunda tarefa, demonstrando que o desempenho em tarefas de CF está influenciado pelas habilidades de leitura. Portanto, para medir como maior precisão a CF, é necessário desenvolver instrumentos, tarefas ou procedimentos que controlem, evitem ou removam a influência das habilidades de leitura. Isto é particularmente importante em idiomas transparentes como o espanhol, nos quais existe uma alta taxa de correspondência entre fonemas e grafemas.

Introduction

Phonological processing is broadly defined as the ability to use the phonological structure of oral language (Wagner & Torgesen, 1987), and it includes skills such as rapid retrieval of phonological information, phonological memory, and phonological awareness (Torgesen et al., 1994; Wagner et al., 1997). Phonological awareness (PA) refers to the ability to identify, segment, and manipulate the sounds that make up words (Germano et al., 2014; Heim et al., 2008), and it encompasses awareness of the basic speech units of oral language, like phonemes, rhymes, and syllables (Castles et al., 2003).

In recent decades, it has been argued that PA plays a causal role in the development of reading skills, since it is closely related to reading development (Bruck, 1992; Castles et al., 2003). This well-documented relationship has led some researchers to propose a deficit in PA as the main underlying cognitive deficit in developmental dyslexia (DD), a neurodevelopmental disorder characterized by persistent difficulties in acquiring reading skills in individuals who have average intelligence, have received adequate school instruction, and have sociocultural opportunity (APA, 2013). This proposal, known as the phonological hypothesis, argues that DD is a consequence of a fundamental difficulty in breaking words down into their basic elements (phonemes) that interferes with mapping them to their corresponding letters, leading to difficulty in decoding printed words (Liberman, 1973; Lyon et al., 2003; Navas et al., 2014). Empirical findings supporting this hypothesis have shown that 1) PA is one of the best predictors of reading development (Bradley & Bryant, 1983; Snowling & Melby-Lervag, 2016; Torgesen et al., 1994), 2) that PA is affected in children and adults with DD (Bruck, 1992; Ferrer et al., 2015; Ramus et al., 2003), and 3) that typical readers as well as children with DD or at risk of developing it improve reading skills with PA training programs (Alexander & Slinger-Constant, 2004; Ball & Blanchman, 1988; Torgesen et al., 1999).

However, another body of research has questioned the proposed causal relationship between PA and DD. Arguments against this hypothesis point out that 1) scores on PA tasks are influenced by reading skills, and that low PA scores in people with DD can be interpreted, at least partially, not as a cause of DD but as an effect (Castles et al., 2003; Ehri & Wilce, 1980; Morais et

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al., 1979), 2) that children with DD can improve reading skills with training programs that are not based on PA (Bakker, 2006; Facoetti et al., 2003; Zhao et al., 2019), 3) that PA training programs do not benefit all children at risk of developing reading difficulties (Nancollis et al., 2005; Torgesen et al., 1999), nor are they better than other training programs in children with DD (Pape-Neumann et al., 2015), and 4) that not all children with DD have a deficit in PA (Bosse et al., 2007; Compton et al., 2001; Wimmer et al., 1998).

In the face of these conflicting views, the nature of the relationship remains unclear, and various resolutions have been considered: that PA is a prerequisite to the development of reading skills; that reading skills are a prerequisite to the development of PA; that the relationship is bidirectional or reciprocal; that the development of both skills depends on a third factor; that it is not PA that changes with the acquisition of reading skills, but the availability of cognitive resources to solve PA tasks (e.g., good readers having orthographic in addition to phonological resources) (Castles et al., 2003; Wagner & Torgesen, 1987).

In order to clarify the relationship between PA and reading skills in Spanish-speaking children, the goal of the current study was to explore whether the performance on PA tasks of typical readers and children with DD is influenced by their reading skills, by means of their orthographic knowledge or spelling of words. To answer this question, scores were compared on two PA tasks: a classical sound categorization task (CSCT) and an experimental sound categorization task (ESCT). The CSCT and the ESCT are tasks in which children must identify the one word in a set of three with a different initial sound. In the CSCT most of the words sharing a phonological beginning also share spelling, which is common in Spanish, with its consistent correspondence between graphemes and phonemes. This characteristic makes it difficult to distinguish whether children rely purely on phonological analysis to perform these tasks, or if spelling or orthographic representations, a consequence of learning to read, also play a role. To distinguish between these possibilities, an ESCT was designed in which the spelling of the words was unhelpful or even impeded solution of the task. Our hypothesis was that if children showed similar results on both tasks, the cognitive resources to solve them would be purely phonological, with no influence of reading skills on performance; on the other hand, if participants relied on the spelling of words, they would have lower scores on the ESCT, showing that PA performance was influenced by those skills.

Method

Participants

The total sample consisted of 47 children: 36 typical readers (TRs; 18 female), and 11 children with developmental dyslexia (DD; 5 female). Participants' grade in primary school ranged from second to sixth (12 in second, 8 in third, 10 in fourth, 12 in fifth, and 5 in sixth), and all were involved in an ongoing broader study. They were recruited from four public elementary schools, referred by their teachers as TRs or children with reading difficulties. The children and their parents were invited to participate in the study. Parents who agreed to participate provided written informed consent, and children provided written informed assent. The study was approved by the university ethics committee (approval no. CE/FESI/032018/1235). Participants were assessed in three sessions: the first to interview parents and evaluate the child's intelligence and reading performance, and the second and third sessions to assess the child's set of reading-related cognitive skills, including the PA tasks reported here.

Tasks and Instruments

Intelligence

The ten core subtests required to obtain the Total Full Scale IQ on the Wechsler Intelligence Scale for Children-IV (WISC-IV; Wechsler, 2007) were administrated. The WISC-IV scores were converted to *z*-scores.

Reading Skills

The Neuropsychological Battery for the Assessment of Learning Disabilities (BANETA, Batería Neuropsicológica para la Evaluación de los Trastornos del Aprendizaje; Yáñez & Prieto, 2013) includes reading and reading-related tasks with scores for children in primary school. Participants were asked to complete the BANETA reading decoding task, which includes four lists of 16 items each: frequent words, infrequent words, and two lists of pseudowords. Completion time was recorded for each list to assess fluency, and a global score of items read correctly was used to assess accuracy. Raw scores were converted to *z*-scores.

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Phonological Awareness

PA was measured by a BANETA sound categorization task (Cronbach's alpha = .87) in which children listen to three words and are asked to indicate which has a different initial sound (e.g., *sapo*, *niño*, *nido* [toad, boy, nest], 18/36 items) or a different final sound (e.g., *foca*, *burro*, *loca* [seal, donkey, crazy], 18/36 items). The instructions given to children were as follows: "I am going to say three words. One of them begins/ends differently from the others. Tell me which one sounds different." Before beginning, first with different initial sounds and then with different final sounds, children were given three practice examples and provided with feedback until the instructions were understood. There was no time limit for answering, and the three words were repeated once if children asked. Because of the high rate of correspondence between graphemes and phonemes in Spanish, in 15 of 18 triads with different initial sounds, the word with the different sound (the correct answer) also differed in spelling.

The total number of correctly answered items was a global PA score that indicates children's phonological processing ability relative to normative data. The PA scores were converted to *z*-scores. In addition, the percentage of correct answers was computed for the words with different initial sounds (18/36) and recorded as the CSCT result.

Participants were asked to complete an experimental sound categorization task (ESCT) with 10 items. In some variants of the Spanish language, the same sound (phoneme) is represented by different letters, especially at the beginning of words. For example, *b*/*v*, *y*/*ll*, *g*/*j*, *k*/*q*, and *s*/*z*/*c* are letters that can represent the same phoneme. Additionally, the letter *h* is always silent at the beginning of a word. Considering these orthographic characteristics, the ESCT was designed with words that were familiar to the children (Alva & Hernández, 2001). In this task, two words shared similar phonological beginnings but with different spelling, and the third word had a different phonological beginning but similar spelling as one of the other words (e.g., *yoyo*, *llora*, *llave* [yo-yo, cries, key]). The instructions given to the children and the procedure were the same as with the CSCT. The number of correct answers was converted to a percentage.

Although an equal number of items in both tasks would be ideal, at the time of the study only 10 items had been designed. To equalize the number of items in both tasks, the 10 items in the ESCT were matched with ten similar items in the CSCT (see Appendix), and this new result was recorded as the CSCT-M. Results are reported for the CSCT and the CSCT-M. A comparison of CSCT/CSCT-M and ESCT scores shows whether a child's performance on PA tasks is influenced by their reading skills, or if they solve the task with a purely phonological strategy.

Procedure

Assessment

In the first session (70-80 mins.), an interview was conducted with parents, and the children were given the WISC-IV and the BANETA reading tasks. The second session (70-80 mins.) included an extensive cognitive assessment using the BANETA PA task. Finally, in a third session (25-35 mins.), the cognitive assessment continued with the ESCT.

TRs were included in the study if their IQ was 85 or higher, if their accuracy scores on the four lists of the BANETA reading decoding task were greater than -1 SD and their fluency scores were less than 1 SD, and if they had no report of emotional problems, uncorrected sensory deficits, or neurological or psychiatric illness. Of a total of 41 TRs recruited, only 36 were given the ESCT, because the rest did not finish the evaluation.

For children with DD, the criteria were the same except that these children were included only if their accuracy scores were less than -1 SD and/or their fluency scores were greater than 1 SD on at least two of the four lists. The 11 children with DD reported here are a subsample of the total of 40 children recruited for whom it was possible to carry out the ESCT.

Statistical Analysis

Descriptive statistics of the variables measured were computed and a Spearman correlation analysis was run to explore the relationship between reading and PA scores. To test the main hypothesis, a comparison between CSCT/CSCT-M and ESCT scores for TRs and children with DD was performed with the Wilcoxon signed-rank test. To explore whether performance on the CSCT/CSCT-M and the ESCT changed with age, the same comparisons were run for TRs grouped by age (7, 8, 9, and 10-12 years). Finally, to explore possible relationships between ESCT performance and age or IQ, a Spearman correlation was performed. Non-parametric statistical analyses were chosen because the data were not normally distributed.

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Results

As shown in Table 1, all of the children participating had IQs in the normal range. TRs had average reading skills and PA scores, within normal ranges, while children with DD had lower scores on reading skills, accuracy and fluency, as well as on PA. Both groups obtained higher scores on the CSCT and the CSCT-M than on the ESCT.

Spearman correlation analysis with the whole sample showed significant correlations between PA scores and reading accuracy [$r_s(45) = .487$, $p = .001$], fluency of frequent words [r_s (45) = .431, $p = .003$], and fluency of infrequent words [r_s (45) = .328, $p = .025$]. A Wilcoxon signed-rank test showed that TRs scores were significantly lower on ESCT than on CSCT ($Z = -4.82$, $p < .001$, $d = 2.69$) and CSCT-M ($Z = -4.75$, $p < .001$, $d = 2.59$). As a group, TRs made 179 errors on the ESCT, and 79.3% selected the word with a different spelling as the one with a different initial sound (an orthographic error). On the CSCT, TRs made 61 errors, of which 48.4% were on the three items where triads of words shared the same initial letters, while the rest were distributed among the 15 items (see Appendix).

Table 1
Descriptive Statistics of Variables Measured

	Typical Readers (*n* = 36)			Developmental Dyslexia (*n* = 11)		
	Mean	*SD*	Rank	Mean	*SD*	Rank
Age (years)	9.21	1.43	4.91	10.13	1.46	4.75
IQ (*z*-scores)	0.00	.60	2.47	-.72	.26	.67
PA (BANETA, *z*-scores)	0.14	.73	2.82	-1.37	1.33	4.38
Frequent words - Fluency (*z*-scores)	0.29	.50	2.04	-1.90	1.87	6.30
Infrequent words – Fluency (*z*-scores)	0.22	.56	2.04	-2.18	2.07	6.17
Pseudowords - Fluency (*z*-scores)	0.12	.63	2.20	-1.51	1.49	4.56
Pseudohomophones - Fluency (*z*-scores)	0.31	.60	2.22	-.88	1.35	4.76
Accuracy (*z*-scores)	0.17	.49	1.67	-2.11	1.30	4.27
Correct answers on CSCT (%)	89.81	8.65	33.33	82.31	10.18	33.34
Correct answers on CSCT-M (%)	93.89	10.76	40.00	88.18	12.50	40.00
Correct answers on ESCT (%)	50.27	31.12	100.00	60.91	18.68	60.00

Note. Fluency *z*-scores were multiplied by -1 to invert the sign. In this way, good performance is always associated with a positive sign. *Z*-scores were computed based on normative data for the instruments.

Children with DD also showed lower scores on the ESCT than on the CSCT ($Z = -2.57$, $p = .010$, $d = 2.45$) and the CSCT-M ($Z = -2.82$, $p = .005$, $d = 3.23$). Of the total number of mistakes on the ESCT (43), 58.1% selected the word with different spelling as the one with the different initial sound. There was a total of 35 errors on the CSCT, 15 (42.8%) of which occurred on the three items where triads of words shared spelling.

As can be seen in Table 2, the Wilcoxon signed-rank test showed that subgroups of TRs showed the same pattern observed in the full sample, with lower scores on the ESCT than on the CSCT and CSCT-M.

Table 2
Comparison of Scores (%) on the CSCT/CSCT-M and ESCT for Typical Readers Grouped by Age

	CSCT/CSCT-M				ESCT							
Group	Mean	*SD*	Med	Rank	Mean	*SD*	Med	Rank	*OE*	*Z*	*p*	*d*
7 (*n* = 10)												
CSCT	86.66	8.36	88.88	27.78	49.00	20.79	50	70	3.90	-2.80	.005	3.76
CSCT-M	90	12.47	90	40						-2.86	.007	4.22
8 (*n* = 8)												
CSCT	86.80	7.82	86.11	22.22	46.25	26.69	45	90	3.88	-2.38	.017	3.05
CSCT-M	90	13.09	90	40						-2.38	.017	3.05

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9 (*n* = 9)												
CSCT	89.50	10.55	94.44	33.33	52.22	35.62	50	90	3.78	-2.36	.018	2.54
CSCT-M	95.55	10.13	100	30						-2.37	.018	2.55
10 (*n* = 9)												
CSCT	96.29	3.92	94.44	11.11	53.33	42.72	50	100	4.22	-2.19	.028	2.13
CSCT-M	100	0	100	0						-2.20	.027	2.15

Note. OE: average number of orthographic errors committed on the ESCT; *d*: Cohen's *d*, calculated as in Fritz et al. (2012).

Spearman correlation analysis showed that TRs performance on the ESCT was not correlated with age [$r_s(34)= .015$, $p = .933$] or IQ [$r_s(34)= .125$, $p = .468$]. There were no significant correlations for children with DD between the ESCT score and age [$r_s(9)= .189$, $p = .577$] or IQ [$r_s(9)= .354$, $p = .286$]. Similar results were found for the full sample between ESCT score and age [$r_s(45) = .130$, $p = .386$] and ESCT score and IQ [$r_s(45) = .021$, $p = 889$].

Discussion

This study explored the relationship between performance on PA tasks and reading skills in Spanish-speaking children, typical readers (TRs) and children with developmental dyslexia (DD), by comparing scores on two sound categorization tasks in which participants had to identify the one word in a set of three with a different initial sound. In one task (CSCT/CSCT-M), most of the words sharing initial sounds also shared initial spelling, as is frequent in transparent languages like Spanish; in this type of task, it is not possible to determine whether children rely on the phonological structure of the words or on their spelling. In the other task (ESCT), specifically designed to test the influence of orthographic knowledge on sound categorization tasks, the spelling of the words was unhelpful or even impeded finding the correct answer, in such a way that relying on the spelling of the words would lead to errors.

Our results showed significantly lower scores for the full sample of TRs on the ESCT than on the CSCT/CSCT-M. The same pattern was observed when TRs were grouped by age and even with the group of children with DD. These results provide evidence that performance on PA tasks is influenced by orthographic knowledge, independent of age or reading level. Additional support came from the analysis of errors. For instance, TRs made a large number of orthographic mistakes (80%) on the ESCT, selecting the word with different initial spelling as the one with different initial sound, and practically half of their mistakes on the CSCT were on those three items in which spelling of the words was of little or no help.

These results are in line with prior studies conducted in other languages showing that performance on PA tasks increases as a consequence of reading acquisition, and thus when orthographic information is available. Ehri and Wilce (1980) reported that English-speaking children in fourth grade frequently discovered specific phonemes embedded in words whose spelling included a letter associated with that phoneme, but rarely detected them in words with similar pronunciation but without the associated letter. In a study by Castles et al. (2003), English-speaking children in fifth grade exhibited more accuracy in a phoneme deletion task when the words had a common, simple correspondence between the phoneme to be removed and the letters representing it than when the correspondence was complex. Wimmer et al. (1991) demonstrated that German-speaking children showed little or no ability to solve a substitution vowel task before beginning reading instruction, but by the end of the first grade this ability increased considerably. Mann and Wimmer (2002) found that on various PA tasks, American kindergartners who were taught letters and their sounds outperformed German peers that were not taught letters. However, by the time the German children finished the first grade, where they received instruction in letter-sound relationships, their performance matched that of their American counterparts. Interestingly, research conducted with illiterate adults has also shown that learning to read improves performance on PA tasks (Durgunoğlu & Öney, 2002; Landgraf et al., 2012; Morais et al., 1979).

In light of these findings, it can be said that learning to read modifies the way people approach PA tasks (Castles et al., 2003); as soon as orthographic knowledge is available, it is used to solve these tasks. However, phonological knowledge does not appear to be the only means to do so, since most of the children in the present study demonstrated some degree of ability on the ESCT, despite the interference generated by the spelling of the words (the average number of correct answers was 50% and 61% in TRs and children with DD, respectively), and pre-readers and illiterate adults also show some degree of PA (Bradley & Bryant, 1983; Cheung et al., 2001; Durgunoğlu & Öney, 2002; Landgraf et al., 2012; Mann & Wimmer, 2002; Morais et al., 1979; Nancollis et al., 2005). Therefore, it can be inferred that the relationship between PA and reading skills is

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reciprocal: some degree or type of PA develops before and independently of reading skills, and when reading instruction begins, it increases and become more refined, resulting in higher scores on PA tasks.

The reciprocity of this relationship calls for care in interpreting the bases and evidence of the phonological hypothesis. For instance, since the seminal works by Liberman et al. in the 1970s, several studies have found that people with DD obtain lower scores on PA tasks than TRs. This poor performance has traditionally been interpreted as evidence that DD is caused by an impairment in PA. However, our results and those of similar studies show that the differences found in PA between TRs and children with DD are, at least partially, an *effect* of DD, and not exclusively the *cause*. Reading skills play an important role in solving PA tasks, and they are affected in DD. The question then remains as to whether the differences commonly reported would continue to be significant without the contribution of normally developed reading skills.

Another implication of assuming a reciprocal relationship is that explaining the impairment of PA on the basis of DD, as the phonological hypothesis does, means that the impairment has to be present before the beginning of formal or informal reading instruction, and it has to be independent of reading acquisition. By contrast, if there are no differences on PA tasks before reading instruction, but they appear later in development, then PA cannot be considered the main underlying cognitive deficit in DD, and poor performance would represent a symptom of DD, but not a cause.

Considering the high rate of correspondence in Spanish between spelling and the phonological structure of words, and that a large proportion of the PA tasks available in Spanish, like the tasks reported here, entail some type of categorization (Leal & Suro, 2012), orthographic representations can contribute to good performance on PA tasks. Accuracy in research and clinical assessments thus requires the development of instruments, tasks, and methodological procedures to assess PA while controlling, avoiding, limiting, or removing the influence of reading skills.

Finally, it should be noted that children with DD exhibited the same pattern as those TRs, but to a lesser degree: 58% of their errors on the ESCT were orthographic, and 43.8% of their errors on the CSCT were on those three items in which spelling and phonology differed. It has been suggested (Landerl et al., 1996) that TRs make more orthographic errors because they are distracted by the spelling of the words while solving PA tasks, due to an automatic coactivation of orthographic and phonological representations. In children with DD this coactivation is weaker: they are less distracted by orthographic representations, and commit fewer orthographic errors. Another explanation could be that children with DD do not always rely on the spelling of the words, simply because these representations are not available to them. It might be even the case that like TRs, they rely on the orthographic aspects of words, but because their decoding difficulties lead to inaccuracies in these representations, their final answers are unpredictable. Further research assessing the knowledge that both TRs and children with DD have about the spelling of the words included in PA tasks will help to answer this question.

Conclusions

The main findings of this study demonstrated that reading skills influence the way TRs and children with DD solve PA tasks. Specifically, children rely on the spelling of the words to identify phonological similarities, thus showing that the relationship between PA and reading skills is reciprocal. With the purpose to increase the accuracy when assessing PA, it appears necessary to develop tasks or procedures to control this influence. This issue is particularly relevant in transparent languages like Spanish, since there is a high rate of correspondence between phonemes and graphemes and, consequently, it is difficult to distinguish whether children rely on phonological or orthographic representations to perform these tasks.

Limitations

The limitations of this study were the small size of the sample, the small number of items on the ESCT, and the lack of other experimental tasks to assess PA. Further experimental research is necessary to confirm the main findings of this work.

Conflict of interest statement

All authors have approved the manuscript and agree with its publication in *Cuadernos de Neuropsicología*/*Panamerican Journal of Neuropsychology*. We have no conflicts of interest to disclose.

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Appendix

Triads of Words in the Classical Sound Categorization Task (CSCT), Experimental Sound Categorization Task (ESCT), and Matched Item Task (CSCT-M)

	CSCT			Syllables	ESCT			Syllables
1	**Sapo**	*Niño*	*Nido*	2-2-2	*Yoyo*	*Llora*	**Llave**	2-2-2
2	*Pandero*	**Cepillo**	*Pantalón*	3-3-3				
3	*Carta*	*Carne*	**Dado**	2-2-2	*Kilo*	*Quizá*	**Queso**	2-2-2
4	*Mesa*	*Mapa*	**Noche**	2-2-2	*Hilo*	**Hoja**	*Idea*	2-2-3
5	*Sala*	**Tina**	*Saco*	2-2-2	*Vaca*	*Bala*	**Boca**	2-2-2
6	**Mercado**	*Rebozo*	*Regalo*	3-3-3	**Koala**	*Kilo*	*Química*	3-2-3
7	*Piña*	*Pisa*	**Mina**	2-2-2	*Vela*	**Vaso**	*Beso*	2-2-2-
8	*Escuela*	**Serrucho**	*Estufa*	3-3-3	*Helado*	*Enano*	**Hola**	3-3-2
9*	*Huevo*	**Hielo**	*Hueso*	2-2-2				
10	*Uva*	**Pera**	*Uña*	2-2-2	**Hijo**	*Hugo*	*Uva*	2-2-2
11	**Rana**	*Leche*	*León*	2-2-2				
12	*Cama*	**Reloj**	*Casa*	2-2-2				
13*	*Cebra*	*Cero*	**Cisne**	2-2-2				
14	*Escoba*	**Camisa**	*Estrella*	3-3-3				
15	*Canasta*	**Bolsa**	*Cadena*	3-2-3	*Zapato*	**Zorro**	*Salón*	3-2-2
16*	*Corbata*	**Camello**	*Corneta*	3-3-3				
17	**Tenedor**	*Zapato*	*Zanahoria*	3-3-4				
18	*Teléfono*	*Televisión*	**Muñeca**	4-4-3	**Gelatina**	*Jitomate*	*Gigante*	4-4-3

Note. In each triad, the word in bold is the one with the different initial sound (the correct answer); the words in italics share the same initial sound. The matched classical sound categorization variable (CSCT-M) was created by matching the triads of words written in the same row in the CSCT and ESCT columns. The three items on the CSCT in which the triads of words share initial letters, not included in the matching process, are marked with an asterisk (*).