

Original Article

Early Speech Intervention in Students with Developmental Language Disorder (DLD)

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ABSTRACT

Some children with Developmental Language Disorder (DLD) may experience disruptions in their phonological system, leading to difficulties in speech production. These difficulties appear as substitution errors, syllable structure issues, and distortions, resulting in a higher number of phonological processes (PP) than expected for their age. The main objective of this study was to design and implement an intervention program based on the principles of stimulability and psycholinguistic approaches to improve speech production in children with DLD. An intervention program was carried out with 24 five-year-old students diagnosed with DLD using the Clinical Evaluation of Language Fundamentals, Spanish Fourth Edition (CELF-4). Phonological productions were assessed through *Registro Fonológico Inducido* (RFI). The intervention was structured under a Multi-Tiered System of Supports (MTSS), comprising a total of 30 intervention sessions, each lasting 15 minutes. The activities were designed according to the criteria of gestural support for phonemes and metaphonology. The results reveal a significant reduction in phonological processes following the intervention, particularly in those affecting words and syllables. Based on these findings, we conclude that an intervention combining these approaches effectively reduces PPs. Future research should explore the impact of increasing the length of each session and the number of trials for each goal, as suggested by the literature.

Keywords:

Developmental Language Disorder (DLD); Early Intervention; Speech

Intervención temprana en el habla de alumnado con Trastorno del Desarrollo del Lenguaje (TDL)

RESUMEN

Algunos niños con TDL pueden experimentar una alteración en su sistema fonológico, lo que podría ocasionarles dificultades en la producción del habla. Estas dificultades se manifiestan en errores de sustitución, estructura de la sílaba y distorsiones, lo que se traduce en mayor cantidad de procesos de simplificación fonológica (PSF) que los esperados para su edad. El objetivo principal del presente estudio fue implementar un programa de intervención fundamentado en los principios de los enfoques de estimulabilidad y psicolingüístico para mejorar la producción del habla en niños con TDL. Para este propósito, se aplicó un programa de intervención a 24 alumnos de 5 años diagnosticados con TDL mediante el CELF-4. Las producciones fonológicas fueron evaluadas mediante la aplicación del Registro Fonológico Inducido (RFI). El programa de intervención se organizó bajo un Sistema de Apoyo de Múltiples Niveles (MTSS), con un total de 30 sesiones de intervención de 15 minutos de duración cada una. Las actividades se configuraron bajo los criterios del apoyo gestual de los fonemas y de la metafonología. Los resultados muestran una reducción significativa PSF luego de la intervención. Esta reducción ocurrió principalmente en los PFS que afectan a los niveles de palabra y de sílaba. A partir de estos resultados, podemos concluir que una intervención que combina estos enfoques logra reducir de manera sustancial los PFS. En investigaciones futuras, se propone explorar el impacto de aumentar la duración de cada sesión y el número de ensayos para cada objetivo, conforme lo sugiere la literatura.

Palabras clave:

Trastorno del Desarrollo del Lenguaje (TDL); Intervención Temprana; Habla

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Received: 11-20-2023
Accepted: 06-14-2024
Published: 08-25-2024

INTRODUCTION

Developmental Language Disorder (DLD) is a neurodevelopmental condition that affects one or more areas of language, including phonology, syntax, morphology, lexical access, semantics, pragmatics, discourse, and verbal memory/learning (Bishop et al., 2017). In addition to these linguistic difficulties, children with DLD sometimes show speech impairments that are not attributable to motor, structural, sensory, cognitive, or neurological causes (Storkel, 2018). It is worth noting that if difficulties are limited to the phonological domain, the condition is classified as a Speech Sound Disorder (SSD) rather than DLD (Andreu et al., 2021).

During the process of language acquisition in children, multiple systems develop in parallel and interact, such as grammatical competence, lexical knowledge, and the processes of speech planning and production (DiDonato Brumbach & Goffman, 2014). Consequently, lexical and morphosyntactic development difficulties in DLD could impact speech development in this population (Kirk & Demuth, 2006). These difficulties may appear as speech errors, including phoneme substitutions, omissions, or additions.

Speech errors in children with DLD can vary depending on the lexical element. For instance, children tend to have more difficulty with longer words (Sosa, 2015). Additionally, their utterances may be affected by the phonetic or articulatory context and the phonological complexity of words. For example, simple codas (e.g., sun) are produced more accurately than complex codas (e.g., impulses). Similarly, the position of words in a sentence, as well as the length of the sentence, can influence the speech errors of these children (Aguilar & Serra, 2003; Susanibar et al., 2016).

It is proposed that the speech errors exhibited by children with DLD differ from those presented by children with SSD. This could be explained by the interaction between difficulties in different language components and the cognitive-linguistic processing deficits associated with DLD. In this regard, a comparative study by Macrae & Tyler (2014) showed that children with DLD presented a higher number of omissions (e.g., final and initial consonant omissions, as well as syllable omissions) and patterns affecting syllable structure (e.g., consonant cluster reduction) compared to children with SSD. On the other hand, the latter group exhibited more distortions than the children with DLD.

The presence of these speech errors in children with DLD, often considered functional during early school years, can affect various

areas of development and learning when they persist beyond the expected age. For instance, it has been observed that they may impact social communication, relationships, cooperative group work, socio-emotional growth, and reading acquisition (Krueger, 2019; Lewis et al., 2015). The impact of these deficits grows bigger during the transition from early childhood education to primary education, a period when formal reading instruction begins (Burgoyne et al., 2019; Tambyraja et al., 2020, 2023; Zambrana Toledo & de Avila, 2021). This poses a challenge for teachers, speech-language therapists, and educational psychologists, who must address concomitant speech, language, and reading problems.

Various approaches have been proposed in the present day to address the functional speech production issues observed in children with DLD. In a recent study, DeVeney & Peterkin (2022) highlighted the following intervention approaches: cycles, core vocabulary, recasting, stimulability, and psycholinguistic.

The cycles approach, originally designed by Hodson & Paden (1983), focuses on the intervention of specific phonemes within phonological patterns. Each phoneme is targeted for 60 minutes per week, addressing 2 to 4 patterns in a cycle lasting between 10 and 15 weeks. The intervention uses stimulable sounds (those that the child can produce correctly or almost correctly when given a model or assistance) to try to achieve the production of non-stimulable sounds. Additionally, this approach uses auditory perception activities (e.g., discrimination and recognition). The progression follows a developmental approach, starting with primary patterns in the following order: errors affecting the word (e.g., syllable omissions), followed by consonant omissions (e.g., in the initial position), and finally those involving contrasts (e.g., fronting-backing). Subsequently, secondary patterns are addressed, sonority contrasts are established, and consonant clusters are worked on. If a target phoneme is not generalized to conversational situations, it is reintroduced in a subsequent cycle.

In contrast, the core vocabulary approach focuses on achieving consistent production of high-frequency words rather than isolated articulatory precision (Crosbie et al., 2020). Its exponents argue that it addresses the underlying deficits in phonological planning, rather than attempting to correct superficial error patterns or discrete phonetic features. Interventions using this approach are typically organized into two 30-minute sessions per week (for a total of 16 sessions), during which a maximum of 10 words are targeted. Intervention techniques such as placement cues, syllable segmentation, imitation, and corrective feedback are used.

The recasting approach, in turn, focuses on the child’s utterances in a natural setting (e.g., interaction during play with a farm set) where the adult offers a corrected repetition of the child’s erroneous expression with an accurate production of the speech sound. Thus, the intervention targets words or utterances within a meaningful and functional context (Camarata, 2020).

The stimulability-based approach, developed by Miccio (2005), aims for the emergence of speech sounds absent from children’s phonetic inventories that cannot be produced through imitation or by following instructions, cues, and demonstrations (non-stimulable sounds). Consequently, this approach prioritizes non-stimulable sounds, with a focus on articulatory precision. Activities are organized around three fundamental principles: simultaneously focusing on speech perception and production, prioritizing non-stimulable sounds, and using multimodal cues for feedback (auditory, verbal, visual, and gestural). It is well-documented that gestures are often used in educational contexts because they promote learning. This is due to children’s ability to imitate goal-oriented behaviors (in this case, gestures associated with phonemes), which facilitates speech production (Hostetter et al., 2007; Melinger & Kita, 2007). In this approach, gestures are used as corrective feedback during activities, increasing the likelihood that children will produce these phonemes (Wagner-Cook & Goldin-Meadow, 2006).

Finally, the psycholinguistic approach (Pascoe & Stackhouse, 2020) attributes speech problems to processing deficits, specifically failures in input, storage, and production. For example, minimal pair contrasts and auditory bombardment are used to help the child hear and understand sound contrasts in meaningful contexts. Additionally, significant importance is given to work on metaphonology, establishing explicit links with literacy, and emphasizing, for instance, the association between phonemes and graphemes.

While all the aforementioned approaches have been successfully used in speech-language therapy practice, the psycholinguistic and stimulability-based approaches are considered the most suitable for predominantly group-based interventions in the regular classroom. This is because they can be implemented through gradually increasing group play activities that promote communication and interaction among children. Moreover, these approaches integrate effectively into a tiered organization model through the Multi-Tiered System of Supports (MTSS). This system creates synergies between speech, communication, and social relationships, facilitating active and effective participation in the learning of students with DLD, and enabling a contextualized and functional intervention.

Based on the aforementioned, this study aims to determine whether the combination of the stimulability-based and psycholinguistic approaches, organized within a Multi-Tiered System of Support (MTSS), can improve the speech of students with DLD. To this end, an intervention program was designed and implemented based on these approaches, from a perspective of prevention and early intervention. This program is supported by a dynamic system aimed at improving the speech of nursery and kindergarten students with DLD. Furthermore, this approach allows us to adopt a holistic and inclusive framework, not only focused on speech processing but also incorporating work on communication through naturalistic interactions based on play.

METHOD

A pilot study was conducted using a quasi-experimental design.

The purpose of this study was to provide a preliminary approach to structuring speech-language therapy practices to improve the speech of students with DLD, thereby preventing future complications that could affect their quality of life. To this end, phonological productions were assessed before and after implementing an intervention program to determine whether significant improvements were achieved.

Participants

The characteristics of the sample are shown in Table 1.

Table 1. Characteristics of the sample.

	Gender		Age		Non-Verbal IQ	
	Men	Women	M	SD	M	SD
DLD (n=24)	18	6	5.6	0.3	96	7

Note: DLD=Developmental Language Disorder.

The sample for this study consisted of 24 students enrolled in regular educational centers on the island of Tenerife (Canary Islands, Spain). The group of children with DLD was selected through convenience sampling, as they had to meet the diagnostic criteria for DLD.

Sample Selection

The procedure for sample selection was carried out in three stages: First, the psychopedagogy teams were asked to refer students who exhibited language difficulties not attributable to cognitive and/or hearing deficits. Subsequently, the Clinical Evaluation of Language Fundamentals Spanish, Fourth Edition (CELF-4) (Semel et al., 2006), designed to assess the language skills of Spanish speakers, was administered.

CELF-4 primarily evaluates general processes of language comprehension and expression through tasks involving sentence structuring and formulation, concepts and directions, word structure and classes, and sentence recall. It is organized into three major indices: Global Language Skills, Receptive Language, and Expressive Language. The administration time typically ranges between 30-40 minutes but may vary depending on the student's age, attention, and motivation. The test is commonly used to determine whether a student has a language disorder, to identify the type of intervention needed, to assess whether the student has an issue with expressive or receptive language (or both), to identify specific areas affected in DLD (semantics, morphology, syntax), to identify underlying clinical causes (e.g., working memory), and to provide recommendations for the design of an intervention program aligned with the curriculum. The average reliability coefficients for the Spanish CELF-4 index scores range from .90 to .96. The test structure was validated through various confirmatory analyses (by age group) to verify the hierarchical structure of the model, all showing an adequate goodness of fit.

Following the initial CELF-4 evaluation, participants were selected if their composite score was below 77.5 (i.e., -1.5 standard deviations) in at least one of the three main indices. Additionally, the students' non-verbal IQ was assessed using the Kaufman Brief Intelligence Test (K-BIT) (Kaufman & Kaufman, 2000) to rule out cognitive deficits.

From the initial sample referred by the psychopedagogy teams, 51 students were excluded for not meeting the diagnostic criteria for DLD or not presenting phonological problems, and 32 were excluded for not completing the tests due to repeated school absences. This resulted in a final sample of 24 participants.

Table 2 presents the composite scores obtained in the main indices of CELF-4.

Table 2. Composite Scores of the Main Indices of the CELF-4

	Global Linguistic Skills		Receptive Language		Expressive Language	
	M	SD	M	SD	M	SD
DLD (n=24)	73.67	5.65	78.77	11.14	74.00	3.90

Note: DLD=Developmental Language Disorder.

It is worth noting that there was a higher proportion of boys than girls in the sample (3:1). This contrasts with reports found in the literature, which indicate a prevalence of 1.22:1 for DLD, although this difference is not considered significant (Norbury et al., 2016). This phenomenon can be explained by the selection process followed by the Educational Psychology and Early Intervention Teams (EOEP for its acronym in Spanish) of each school, who mostly referred male students, considering them to meet the criteria for language impairments prior to the administration of CELF-4.

Ethical Considerations

Special care was taken regarding ethical issues given that the sample included minors. Families were asked to sign an informed consent form, which detailed the study's objectives and characteristics. Additionally, information regarding confidentiality, voluntary participation, and the absence of risks was provided. This ensured compliance with the provisions of Law 3/2018, December 5, on the Protection of Personal Data and Guarantee of Digital Rights (BOE No. 294, December 6). The research was approved by the Ethics Committee for Research and Animal Welfare (CEIBA) of Universidad de La Laguna, registration number CEIBA2017-0251.

Data Collection Instrument

Pre- and post-intervention phonological samples were evaluated through *Registro Fonológico Inducido* (RFI) (Monfort & Juárez Sánchez, 2001). This instrument allows for both qualitative and quantitative assessment of children's speech through the analysis of phonological processes, determining the child's phonological development and identifying processes that are delayed or deviant compared to typical speech development. This allows for comparing groups of children of similar ages. The RFI uses both spontaneous utterances and imitation, recording the number of phonemes that were not produced correctly for each word.

RFI includes 57 cards representing words that cover the Spanish phonological spectrum comprehensively. The results of this test must be analyzed considering the phonetic characteristics of the children's environment, whether at the family or geographic level. For example, in the Canary Islands, the phoneme /θ/ is produced as /s/. Additionally, the words presented in the RFI vary in difficulty, each one having a coefficient of probable difficulty. This coefficient reflects the progression in their presentation and the age of the participants, based on the gradual acquisition of the phonological system in children.

Procedure

The RFI was administered to each participant, both before and after the intervention, by one of the evaluators from the Acentejo Research Group. Each image was presented to the child, followed by the question, "What is shown in the image?" After recording the responses, each word was transcribed to identify the phonological processes. Following recommendations by some authors, only induced language (image naming) was considered, excluding the use of word repetition (Cervera & Ygual, 2001). The approximate administration time was 10 minutes.

Following the administration of RFI, the samples were analyzed using an adaptation of the simplification processes described in the manual *Análisis del Retraso del Habla (A-RE-HA)* (Aguilar & Serra, 2003). Thus, three levels of analysis were considered, as previously illustrated with examples:

- Word Level: This level examines phonological processes affecting word structure, including changes in word structure (omissions and additions of syllables) and phonemic sequencing (metathesis and assimilation).
- Syllable Level: This level assesses phonological processes impacting syllable structure, including omissions, reductions of vowel and consonant clusters, addition, coalescence, and metathesis of syllables.
- Segment Level: This level analyzes phonological processes affecting Spanish phonemes. In our study, only phoneme substitutions were analyzed.

The intervention program was implemented by early childhood education teachers and speech therapists who received 20 hours of training in a workshop. This training detailed the sequence of activities to be conducted in various flexible groupings, following the MTSS model (Acosta & Ramírez, 2024; Swaminathan & Farquharson, 2018). The specifics of this model will be described later. During the intervention, the professionals received weekly visits from members of the research group,

during which questions were addressed, and support was provided in the classroom. Additionally, four plenary meetings were held during the program to verify its reliability and evaluate the process.

A total of 30 intervention sessions were conducted, five times a week for six weeks, each lasting 15 minutes. These sessions followed the same sequence and used identical materials, organized according to the MTSS model (Acosta & Ramírez, 2024; Swaminathan & Farquharson, 2018). On the first four days of the week, each teacher worked within the regular classroom, combining activities with the entire student group (Level 1) and with small groups (Level 2). On Fridays, students with DLD worked outside the regular classroom, along with two peers, with a speech therapist (Level 3) to repeat the program activities.

As previously mentioned, the objectives were designed based on psycholinguistic and stimulability approaches. These approaches were selected due to their suitability for addressing speech-related issues within a MTSS framework. Following the psycholinguistic approach, a progressive methodology was employed (Arenas et al., 2014), where activities were presented in order of complexity, starting with simpler tasks. Initially, intersyllabic awareness (syllable segmentation, syllable recognition in different positions, syllable manipulation) was targeted, followed by intrasyllabic awareness (rhyme games) and phonemic awareness (recognition of vowel and consonant sounds in various positions; phonemic manipulation through inversion, deletion, etc.; phonemic analysis and synthesis).

Additionally, based on the stimulability approach, gestural aids were provided to facilitate sound production. These aids consisted of hand gestures mimicking the shape of the mouth associated with each sound. This offered intuitive gestural and phonetic support that enhanced sound discrimination, integration, and correct pronunciation. The gestures were easy to perform, executed with one hand near the face, and involved movements related to the articulation mode (Monfort & Juárez Sánchez, 1993). This approach is based on the premise that the interaction of motor, visual, and auditory information allows for better access to phonemes, facilitating articulatory automation, acquisition of contrastive features of the phonological system, and the development of abstract sound representations. This is achieved by promoting the association between the acoustic form and its production. The gestural reinforcement of phonemes is detailed in Table 3.

Data Analysis

To address the research objective, statistical analyses were conducted using SPSS version 25. Descriptive analyses of the main indices from the CELF-4, the K-BIT intelligence test, and RFI were performed; the latter was assessed both before and after the intervention (Pretest-Posttest) to determine if there were indications of improvement by comparing error means.

Before analyzing the RFI data, a preliminary analysis was conducted to determine the type of statistical test (parametric or non-parametric) to be used. The Kolmogorov-Smirnov (KS) test was employed, with values yielding $p < .000$, indicating that the data did not follow a normal distribution. Therefore, to assess significant differences between the pretest and posttest, the non-parametric Wilcoxon signed-rank test was used.

Table 3. Gestures for each phoneme, based on Monfort & Juárez Sánchez (1993).

/p/	Hand by the face, fingers closing in the shape of a beak
/t/	Arm folded with a closed fist, stretched forward
/k/	Finger touching the neck at the level of the “apple”
/b/	The hand, with the palm facing forward, descends softly in front of the face, forward and downward
/d/	Thumb from lower lip to the front
/g/	Thumb and index beside the neck and they slide until the release
/m/	Hand brushes the cheek downward
/n/	Finger pressuring one side of the nose
/ñ/	A finger, folded, makes a small circle on one side of the nose
/f/	The hand by the face, with the palm looking forward, moving the fingers as if scratching something
/j/	The thumb ascends from the base of the neck to the chin
/s/	Finger in a “quiet” position, travels from the lips forward
/l/	Finger by the face, moving in a circle
/ll/	Like /l/ but with two fingers, one on each side of the face
/ch/	The hand clenched into a fist is thrust forward and opened
/r/	Finger taps downward on the chin
/rr/	Gesture of accelerating a motorcycle

To complement the contrast tests conducted, the effect size for the Wilcoxon test was quantified using Microsoft Excel, applying the following mathematical formula: $r = \frac{Z}{\sqrt{n}}$

RESULTS

Table 4, in the Pretest (Pre-DLD) row, shows various phonological processes in the sample of students with DLD. It is noteworthy that the average number of errors was highest for Segmental Substitution ($M = 10.91$; $SD = 7.96$), followed by Assimilation at the Word Level ($M = 4.21$; $SD = 4.75$), Omission at the Syllable Level ($M = 2.13$; $SD = 2.89$), and Coalescence at the Word Level ($M = 1.33$; $SD = 1.17$). These findings suggest a problem within the phonological system, reflecting disorganized speech production.

A more detailed analysis of errors at the word level reveals a high incidence of syllable omissions (e.g., *coba* for *escoba*; *camelo* for *caramelo*), metathesis (e.g., *pasato* for *zapato*; *craba* for *cabra*), and especially regressive assimilations (e.g., *nuna* for *luna*; *tenéfono* for *teléfono*; *pampana* for *campana*) and progressive assimilations (e.g., *tortura* for *tortuga*).

At the syllable level, the predominant PSF included coalescence (e.g., *puedo* for *pueblo*; *difo* for *grifo*), addition (e.g., *jojo* for *ojo*; *lárbol* for *árbol*), reduction (e.g., *lobo* for *globo*; *fesa* for *fresa*; *ten* for *tren*), and especially omission (e.g., *tabor* for *tambor*; *lápiz* for *lápiz*; *edo* for *dedo*).

At the segmental level, a wide variety of phonological processes was also observed (e.g., *tolo* for *toro*; *chol* for *sol*; *cuchada* for *cuchara*), with notable substitutions affecting the /l/, /r/, and /d/ phonemes, as noted by Monfort & Juárez Sánchez, (1993)

In summary, the data confirm the presence of a wide range of phonological processes in students with DLD, consistent with previous evidence (Aguilar & Serra, 2003; Mejía Villalobos & Jackson-Maldonado, 2017).

Table 4. Descriptive measures for the variables in Registro Fonológico Inducido. Developmental Language Disorder, pre- and post-test.

Variables	Group	M	Gain	SD	Min	Max
Omission at the Word Level	Pre-DLD	0.29	0.04	0.62	0.00	2.00
	Post-DLD	0.25		0.61	0.00	2.00
Addition at the Word Level	Pre-DLD	0.08	0.08	0.28	0.00	1.00
	Post-DLD	0.00		0.00	0.00	0.00
Metathesis at the Word Level	Pre-DLD	1.17	1.04	0.96	0.00	4.00
	Post-DLD	0.13		0.34	0.00	1.00
Coalescence at the Word Level	Pre-DLD	1.33	1.33	1.17	0.00	4.00
	Post-DLD	0.00		10.00	0.00	0.00
Assimilation at the Word Level	Pre-DLD	4.21	1.58	4.75	0.00	19.00
	Post-DLD	2.63		1.97	0.00	9.00
Omission at the Syllable Level	Pre-DLD	2.13	-0.17	2.89	0.00	10.00
	Post-DLD	2.29		3.32	0.00	14.00
Reduction at the Syllable Level	Pre-DLD	0.79	-1.34	0.83	0.00	2.00
	Post-DLD	1.42		1.86	0.00	7.00
Addition at the Syllable Level	Pre-DLD	0.88	0.70	1.11	0.00	4.00
	Post-DLD	0.17		0.48	0.00	2.00
Epenthesis at the Syllable Level	Pre-DLD	0.17	-0.46	0.48	0.00	2.00
	Post-DLD	0.63		0.92	0.00	4.00
Coalescence at the Syllable Level	Pre-DLD	0.88	1.17	1.11	0.00	4.00
	Post-DLD	0.29		0.55	0.00	2.00
Metathesis at the Syllable Level	Pre-DLD	0.17	0.04	0.48	0.00	2.00
	Post-DLD	0.13		0.44	0.00	2.00
Substitution at the Segmental Level	Pre-DLD	10.9	3.75	7.96	0.00	26.00
	Post-DLD	7.19		7.65	0.00	25.00
Total	Pre-DLD	23.00	7.87			
	Post-DLD	15.13				

Note: Pre-DLD= Pretest Developmental Language Disorder (N=24), Post-DLD= Posttest Developmental Language Disorder (N=24).

As evidenced in Table 4, following the implementation of the intervention program, a reduction in phonological processes was observed across all levels. At the word level, there was a decrease in omissions, additions, metathesis, coalescence, and assimilation. At the syllable level, there was a reduction in addition, coalescence, and metathesis. However, a slight increase was noted in omissions and epenthesis, as well as a reduction in syllable structure. Additionally, there was a decrease in substitutions at the segmental level, showing substantial improvement in the post-test. These pre- and post-intervention changes are clearly illustrated in Figure 1.

Despite improvements observed in most evaluated variables, statistical analysis revealed significant differences only at the word level in metathesis and coalescence, and at the syllable level

in addition and coalescence (see Table 5). All these differences exhibited a substantial effect size ($r \geq 0.5$).

Table 5. Wilcoxon signed-rank test and effect size. RFI Pretest-Posttest.

	Z	Sig.	r
Metathesis at the Word Level	3.624	.000	0.7248
Coalescence at the Word Level	3.941	.000	0.4874
Addition at the Syllable Level	2.622	.009	0.5244
Coalescence at the Syllable Level	2.437	.015	0.7882

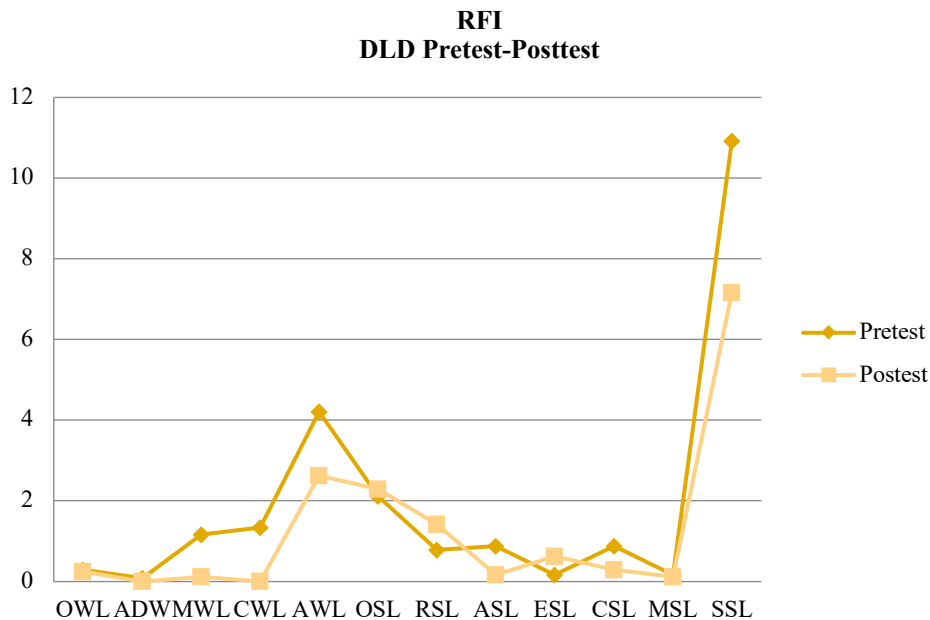


Figure 1. Descriptive measures for the variables in Registro Fonológico Inducido. Developmental Language Disorder Pretest-Posttest.

Note: OWL= omission at word level, ADW= addition at word level, MWL= metathesis at word level, CWL= coalescence at word level, AWL= assimilation at word level, OSL= omission at syllable level, RSL= reduction at syllable level, ASL= addition at syllable level, ESL= epenthesis at syllable level, CSL= coalescence at syllable level, MSL= metathesis at syllable level, SSL= substitution at segmental level.

DISCUSSION AND CONCLUSION

This study aimed to evaluate the impact of an intervention combining the stimulability-based and psycholinguistic approaches, organized within an MTSS framework, on the speech of children with DLD. Pre-intervention results reveal the presence of various phonological processes as shown in Table 4, the majority of which decreased after the intervention. These findings align with the study's objective, showing that the combination of stimulability and psycholinguistic approaches effectively improves speech in young children with DLD. The implementation of stimulability activities in particular, alongside exercises promoting phonological skills, significantly reduces phonological processes. This, in turn, could impact speech intelligibility (Gillon, 2005).

The pretest evaluation shows that 5-year-old children with DLD still present various phonological processes, which should have been resolved by their age. Evidence indicates that phonological development occurs in three major stages: expansion, stabilization, and resolution. By age 5, the resolution stage begins, where phonological processes either disappear or become merely residual (Diez-Itza & Martínez, 2004). The observed difficulties may be attributed to challenges in extracting phonological rules.

Such difficulties significantly impact learning, particularly in early literacy, as they affect fundamental skills for learning to read, such as phonological awareness and the association between graphemes and phonemes. Therefore, it is crucial to address these issues before starting the reading acquisition process.

Students with DLD who participated in the program experienced a reduction in phonological processes. While phonology in typically developing children improves steadily, progress in children with DLD is often minimal. Additionally, evidence suggests that the elimination of phonological processes tends to slow down between ages 5 and 6 (Pavez et al., 2013). Leonard (2014) highlights the importance of direct intervention of phonological processes in children with DLD. The results of this study support this assertion, as participants showed significant progress after just six weeks of intervention.

A detailed analysis of the improvements, considering the gains with a larger effect size, reveals that the most significant changes occurred at the word level. This is due to the reduction or elimination of common processes, maintaining complexity, and avoiding contextual influence. Notably, there was also a significant change in phonological processes at the syllable level, specifically additions and coalescence.

It is important to note that the intervention followed the MTSS model, which included four group sessions and one individual session. According to the literature, educational interventions are often group-based (Brandel & Frome Loeb, 2011), while clinical contexts typically involve individual sessions (Baker, 2012; Williams, 2012). Although there is debate on this matter, some authors suggest combining group sessions with individual ones, as done in MTSS (e.g., Swaminathan & Farquharson, 2018) is beneficial. The results of this study support this methodology, demonstrating its effectiveness in addressing phonological processes in children with DLD in educational settings. However, it is proposed that future studies should investigate the effect of session duration and dosage, i.e., the number of trials per target in each session, to enhance the effectiveness of the intervention.

It is important to consider the results of this study with caution, as it is a pilot study. Nonetheless, the findings are promising for speech-language therapy practitioners, especially given that achieving adequate speech levels in children with DLD before school entry is a necessary goal, and one often unmet (Rvachew & Rafaat, 2014). Therefore, it is valuable to have a path for progress. However, for more comprehensive improvements, it would be beneficial to design intervention programs from a perspective that simultaneously addresses phonological difficulties and other language dimensions.

Limitations

As this is a pilot study, it lacked a control group and did not utilize an optimal intervention dosage, which might have influenced the final results. The literature suggests that a dosage of fewer than 50 trials in a 30-minute session has limited effectiveness (Farquharson et al., 2022). While the study maintained adequate frequency, adhering to the parameters of distributed practice (5 weekly sessions), the duration of each session was shorter than recommended.

It would be advantageous to expand on these results through further research with experimental designs that control for intervention dosage, include a control group, and allow for more robust statistical analyses to determine the impact of such interventions.

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