

## Review articles

# Stuttering intervention in children: an integrative literature review

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## ABSTRACT

**Purpose:** to describe intervention methodologies implemented in recent years in stuttering children.

**Methods:** a search was performed for empirical articles on interventions in stuttering children aged 2.5 to 7 years. The search was carried out in Embase, WOS, Pubmed, and Scopus, considering articles published between January 2014 and June 2020.

**Literature Review:** 11 articles were selected out of the 1,099 retrieved. Different approaches were observed, of which the Lidcombe program showed the most evidence. Most studies were conducted on English-speaking children and participants were assessed regarding linguistic and non-linguistic aspects. All studies considered parental involvement in the intervention. No investigation took measurements for more than 24 months. Individual interventions predominated.

**Conclusion:** good therapeutic results were found in all reviewed interventions. Research comparing two types of treatments did not find one to be superior to the other.

**Keywords:** Stuttering; Child, Preschool; Therapeutics; Childhood-Onset Fluency Disorder; Speech Disorders

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## INTRODUCTION

The World Health Organization (in the International Classification of Diseases)<sup>1</sup> and the American Psychiatric Association (in the Diagnostic and Statistical Manual of Mental Disorders)<sup>2</sup> classify stuttering as a neurodevelopmental disorder. It is defined as a change in fluency, characterized by speech interruptions, also known as disfluency. These interruptions are involuntary<sup>3</sup> and can manifest as repeated sounds, syllables, or monosyllables; prolonged sounds; blocks; avoided or substituted words; and excessively strained words. Such manifestations are not ascribed to any other speech, voice, or intellectual development disorder, nervous system damage, or sensory change. Speech manifestations, at times, accompany speech-related physical movements and negative feelings and attitudes<sup>4</sup>.

This speech fluency disorder begins in childhood and can persist into adulthood<sup>5</sup>. According to the International Classification of Functioning, Disability, and Health, the concept, assessment, and treatment of this change are based on structures and/or functions; thus, it can manifest differently in the person's activities and participation. It is also greatly influenced by environmental and/or personal factors<sup>6</sup>.

Stuttering may have an early onset, around 18 months old, though it occurs more frequently in preschool age. Stuttering is present in approximately 1% of adults and 5% of children, with a recovery index of 80% of cases<sup>7</sup>. Similar results were found in another study that indicates spontaneous early childhood recovery in about 75% of cases 4 years after stuttering onset<sup>8</sup>.

There is a current tendency in both the literature and clinical practice toward early intervention. This is probably due to factors such as the progress of the condition, possible functional changes in the brain, and the probability of success when intervention occurs in the initial stages of the disorder, preventing stuttering to become chronic<sup>9,10</sup>.

The literature describes different intervention strategies and methods. Some authors recognize two intervention methods (the direct and indirect ones)<sup>11,12</sup>, while others recognize three (adding the combined method to the other two)<sup>13</sup>. In indirect methods, therapists aim to minimize family concerns and stress and understand their feelings and then help parents or caregivers change how they interact with children, implementing behaviors and settings (or environments) that make their speech fluency easier – for instance, speaking

more slowly with them and respecting each person's turn to speak<sup>14</sup>.

Direct methods include therapies in which children learn to change or adjust their speech in a therapist-child interaction. Lastly, the combined methods, as the name suggests, involve interventions that combine aspects of direct and indirect therapies<sup>12</sup>.

These methods encompass some widely-known types of intervention, namely: RESTART-DCM<sup>15-17</sup>, Lidcombe Program (LP)<sup>18</sup>, and the integrated treatment approach<sup>19</sup>. Literature reviews focused on stuttering intervention, such as the ones by McGill et al. (2019)<sup>19</sup>, Baxter et al. (2016)<sup>20</sup>, Nye et al. (2013)<sup>21</sup>, Herder et al. (2006)<sup>22</sup>, and Bothe et al. (2006)<sup>23</sup>, refer to one or more of them. Although the topic of these reviews is stuttering intervention, none of them meets the objective of the present review.

There is a consensus on the benefits of preschool treatment, as this population responds better to the treatment than schoolers, adolescents, and adults<sup>24</sup>. Nonetheless, no up-to-date literature review focusing on this age group and addressing in depth intervention methods was found.

Hence, the present study aimed at describing intervention methods implemented in stuttering children in recent years.

## METHODS

### Research strategy

The first step taken to reach the study objective was to define the research question, which was as follows: "What speech-language-hearing intervention methods/procedures are used in stuttering preschoolers?". Then, the descriptors, inclusion and exclusion criteria, and databases for the search were defined. After the articles had been selected from the databases, their references were reviewed, which provided one more article.

Having obtained the final articles, their information was extracted and organized in Excel spreadsheets, with previously defined data columns, namely: language in which the program was carried out, research objective, participant data, specifications of assessments used to measure intervention effectiveness, specifications of the treatment/program or method used, information on the application modality (individual or group), intervention frequency, and research conclusions.

Based on this systematized record, the data were analyzed to present the findings.

## Database search

This integrative literature review included articles published between January 2014 and June 2020 (when this research began). The databases used were Embase, WOS, PubMed, and Scopus. The following three concepts were defined to centralize the search more precisely: age of the subjects (children), treatment, and pathology being treated (stuttering). For each of these three concepts, MeSH terms that represented them were included, namely: “infant”, “child”, “pediatrics”, “stuttering”, “therapeutic”, and “rehabilitation”, using the Boolean operators “AND” and “OR” correspondingly. Also, the search format for each database was met. The search was conducted in June 2020.

After obtaining the basis for analysis, a single author removed duplicated articles. The following stages – exclusion of articles by title reading, then abstract reading, and lastly full-text reading – were carried out independently by two researchers. Before proceeding to the subsequent stages, the researchers discussed the differences to reach a consensus and decide whether the article in question should be included in the following stage or excluded.

Afterward, the references in the selected articles were verified by one of the researchers.

The inclusion and exclusion criteria for selecting the articles were as follows:

### Inclusion criteria

Original research articles published in scientific journals between January 2014 and June 2020.

Studies should include at least one study group with five or more children.

The intervention presented should be used in stuttering children aged 2.5 to 7 years.

Sample stuttering children could have the following diagnoses: Attention-deficit/hyperactivity disorder (ADHD), language disorder, and other speech disorders.

Sample subjects could speak any language, as long as the article was published in English, Spanish, and/or Portuguese.

### Exclusion criteria

Book chapters, case studies, literature reviews, webpages, congress books, expositions, and publicization in other communication media were excluded.

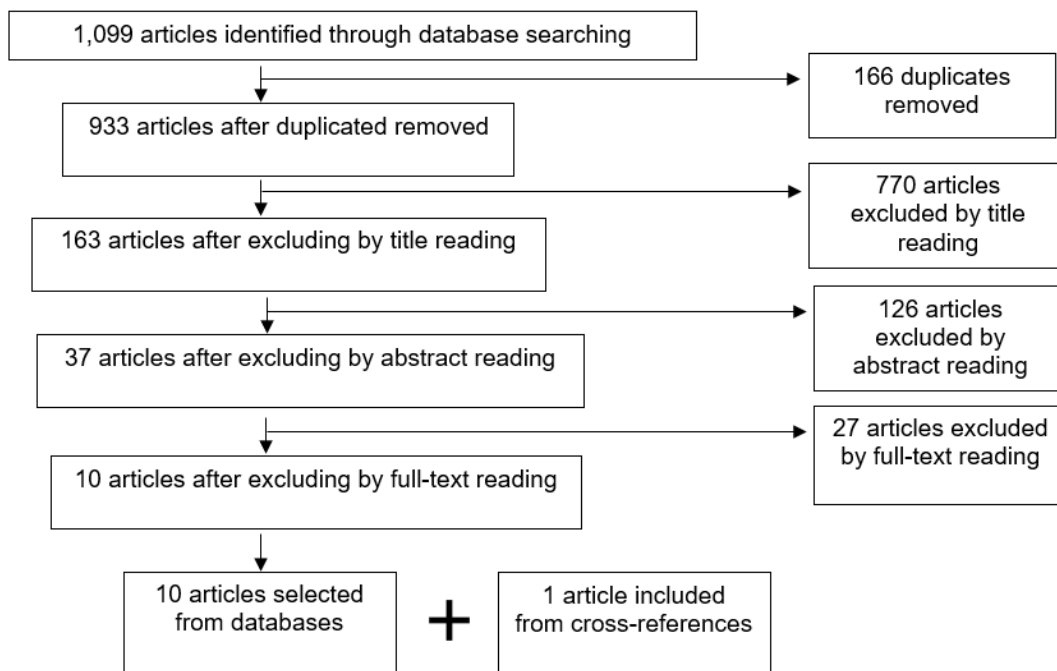
Sample stuttering children could not have any of the following diagnoses: Autism spectrum disorder (ASD), Down syndrome, epilepsy, or any other condition not mentioned in the inclusion criteria.

Research published in a language other than English, Spanish, or Portuguese.

## LITERATURE REVIEW

Altogether, 1,099 articles were retrieved from the databases, of which 166 were removed for being duplicated. Then, 770 were excluded by title reading; 126, by abstract reading; and 27, by full-text reading. Thus, 10 articles remained from the database search. Lastly, another article was included after reviewing the bibliography of the selected articles. Further details are presented in Figure 1 and Table 1.

The selection process is summarized in Figure 1, below:



**Figure 1.** Article selection flowchart

The selected articles are shown in detail in Table 1, per database from which they were retrieved:

**Table 1.** Distribution of selected articles per database from which they were retrieved

	Embase	WOS	PubMed	SCOPUS
(Infant OR Child OR pediatrics) AND (Stuttering) AND (Therapeutic OR rehabilitation)	25, 26, 27		12, 13, 26, 27, 28, 29, 30, 31, 32	13, 27, 29
Other sources	33			

The information obtained from the analyzed articles (which are identified with an asterisk in the References) is summarized in Tables 2 and 3.

**Table 2.** Description of selected studies

Authors (Year) Language	Objective	Participants	Assessment	Number and moment of assessments
Arnett et al. (2014) <sup>27</sup> English	To investigate the effectiveness and efficiency of the standard LP treatment in comparison with the group approach to the same program.	54 children randomly allocated into 2 groups: - Control group (individual approach): 27 children: 10 were 3.0 - 3.11 years, another 10 were 4.0 - 4.11 years, and 7 were 5.0 - 5.11 years old. - Experimental group (group approach): 27 children: 13 were 3.0 - 3.11 years, 12 were 4.0 - 4.11 years, and 2 were 5.0 - 5.11 years old.  The group approach had a rotating design so there were three parent-child pairs per group visit.	- The professional's hours per child by stage 2. - Number of visits to the clinic and weeks until stage 2. - %SS obtained from two 10-minute speech samples. - Parent-reported SR. - Final questionnaire: at the end of stage 1, the parents answered a questionnaire on their experience with the treatment and satisfaction with the service. They classified the items on a 9-point scale, in which 1=totally disagree and 9=totally agree. They could also write down additional comments.	Three moments: Before randomization, 9, and 18 months after randomization.
Donaghy et al. (2015) <sup>26</sup> English	To observe the contribution of parental self-correction verbal contingencies in LP. 38 pairs distributed into 2 groups: - Experimental group: 19 parent-child pairs receiving LP, but with no self-correction verbal contingencies. - Control group: 19 parent-child pairs receiving LP as proposed. Children were 2.10 to 5.10 years old. - Number of visits to the clinic. - Number of weeks taken to reduce stuttering by 50%. - %SS. - SR. Three moments: initial, when %SS had decreased by 50% when progress had been observed for 3 consecutive weeks.			
de Sonnevile-Koedoot, Stolck et al. (2015) <sup>12</sup> Dutch	To compare the effectiveness of LP direct treatment with RESTART-DCM indirect one in stuttering preschoolers in an 18-month follow-up.	199 children randomly allocated into 2 groups: - LP treatment: 98 children; 41 were 3 years, 39 were 4 years, and 18 were 5 to 6 years old (one child was 2.11 years at inclusion). - RESTART-DCM treatment: 100 children; 37 were 3 years, 31 were 4 years, and 32 were 5 to 6 years old.	- Percentage of children who did not stutter 18 months after beginning the therapy. - %SS. - SR (8-point scale). - Professional- and child-reported stuttering severity rate (8-point scale for professionals and 4-point scale for children). - Parental assessment of their children's health-related quality of life - Children's attitude toward speech (KiddyCAT). - Emotional and behavioral problems (Child Behavior Checklist)	Five moments: At the beginning of the study, 3, 6, 12, and 18 months after beginning the treatment.
Guitar et al. (2015) <sup>33</sup> English	To investigate the duration and results of LP applied to a new sample and compare it to the original sample published by Miller and Guitar (2009). To investigate predictive factors of the duration and results of LP, combining data from both samples.	29 children divided into 2 groups: - New sample: 14 children aged 3.4 to 6.2 years. - Original sample: 15 children aged 2.5 to 5.9 years.	- %SS. - Stuttering severity instrument-3 (SSI-3)	Three moments: Pretreatment, during the treatment, and in the long run, approximately 2 years after finishing LP stage 1 (median of 26 months).

Authors (Year) Language	Objective	Participants	Assessment	Number and moment of assessments
de Sonnevle-Koedoot, Bouwman et al. (2015) <sup>30</sup>  Dutch	To determine the incremental cost-effectiveness and cost-utility of LP in comparison with RESTART-DCM for stuttering preschoolers.	199 children randomly allocated into 2 groups: - LP treatment: 98 children; 41 were 3 years, 39 were 4 years, and 18 were 5 to 6 years old (one child was 2.11 years at inclusion). - RESTART-DCM treatment: 100 children; 37 were 3 years, 31 were 4 years, and 32 were 5 to 6 years old.	- %SS obtained from 3 conversational speech samples. - NNT: mean number of patients who need to be treated for one patient to be benefitted. - Health-related quality of life. - Direct and indirect costs measured with cost questionnaires.	Five moments: At the beginning of the study, 3, 6, 12, and 18 months after beginning the treatment.
McCulloch et al. (2016) <sup>29</sup>  English	To compare LP treatment in children that attended a student-led clinic with previously published references regarding LP treatment not conducted in a student-led clinic.	40 patients.	- %SS - SR - Duration of the therapy.	Two moments: Initial and final assessment.
Bridgman et al. (2016) <sup>31</sup>  English	To compare LP results in in-person visits and teletherapy in early stuttering.	49 children randomly allocated into 2 groups: - Clinic: 24 children aged 3.1 to 5.11 years. - Teletherapy: 25 children aged 3.0 to 5.5 years.	- %SS - SR	Three moments: Pretreatment, 9, and 18 months after beginning LP treatment.
Sawyer et al. (2017) <sup>32</sup>  English	To investigate the effects of training on reducing the AR of caregivers of stuttering children, on the dysfluency of the children, on the AR of children and caregivers, and the RLT of children and caregivers.	17 mother/father-child pairs. The children were 31 to 66 months old.	- Percentage of stuttering dysfluencies in children per 100 syllables was assessed. - AR measured in syllables per second. - Latency time. - In home interaction, parents were expected to record the date, description of the activity, and comments or feelings.	Three moments: At the beginning of the first session, a sample of the caregiver-child interaction was taken. In the third session, samples of caregiver-child interactions were taken – for the first one, in the beginning, they were asked to “interact as usual”; then, after feedback on this interaction, they were asked to talk slowly and relaxed for the second sample.
Ferdinands et al. (2018) <sup>28</sup>  English	To determine whether stuttering severity correlates with parental satisfaction with their children's fluency in LP treatment. To demonstrate that parental satisfaction is not smaller in either teletherapy or in-person therapy in LP clinic.	49 children randomly allocated into 2 groups: - Clinic: 24 children aged 3.1 to 5.11 years. - Teletherapy: 25 children aged 3.0 to 5.5 years.	- %SS - SR - Parental satisfaction with child fluency (PSCF), based on the answer to the question: “Are you satisfied with your child's current level of fluency?”. The answers were measured on a 10-point Likert scale.	Three moments: Pretreatment, 9, and 18 months after beginning LP treatment.
Millard et al. (2018) <sup>13</sup>  English	To explore the effectiveness of the Palin PCI therapy in a large cohort of stuttering children	48 children aged 2.5 to 7 years.	- %SS. - The children's communicative attitudes (KiddyCAT). - Parental perception of stuttering and degree of impact with Palin parental rating scale.	Four moments: At the beginning of the therapy, 3, 6, and 12 months after beginning the therapy.
Druker et al. (2019) <sup>25</sup>  English	To explore the effects of approaching self-regulation as a component in stuttering treatment on both the children's fluency and the parents' and children's psychosocial results.	28 pairs distributed into 2 groups: - Experimental group: 14 caregiver-stuttering child pairs, who received fluency therapy with a resilience component. The children were 3 to 6 years old, with a mean of 4.25 years. - Control group: 14 caregiver-stuttering child pairs, who received only the fluency therapy. The children were 3 to 6 years old, with a mean of 4.44 years.	- Stuttered Severity Rating for children. - Parenting and Family Adjustment Scales for parents, though it analyzes both parents and children. - The Parenting and Family Adjustment Scales applied to parents. - The effortful control subscale - Curtin Early Childhood Stuttering Resilience Scale.	Two moments: Pre- and post-treatment.

Captions: LP: Lidcombe Program / %SS: percentage of stuttered syllables / SR: Parent-reported stuttering severity rate / NNT: number needed to treat /AR: articulation rate / RLT: response latency time / PCI: parent-child interaction

**Table 3.** Description of selected studies (continued)

Authors (Year) Language	Treatment/program or methodology employed	Individual/group	Frequency	Conclusion/results
Arnott et al. (2014) <sup>27</sup> English	Lidcombe program In group LP (adapted), the groups had up to 4 children with their parents in weekly visits, as in standard LP. Before attending the first group visit to the clinic, the children and parents in this group attended an individual preliminary training session. In treatment stage 2, clinical visits were individual for all participants.	Individual and group	Each clinic visit lasted 45 to 60 minutes for both study groups. Both groups had a median of 18 clinic visits until stage 2. The control group took a median of 25 weeks, and the experimental group, 29 weeks until stage 2.	Group LP treatment is an effective alternative to the individual model. Results showed that children treated in groups needed half the professional's hours to complete stage 1 than those treated individually. Parents responded favorably to the group model; professionals who applied the treatment found it more tiresome, but also more gratifying.
Donaghy et al. (2015) <sup>26</sup> English	Lidcombe program	Individual	The control group took a median of 11 clinic visits and 13 weeks, and the experimental group took a median of 9 visits and 11 weeks to decrease stuttering by 50%, with no statistical differences between the groups.	All participants in both the study and control groups reduced stuttering by 50%, which was stabilized or further reduced after 3 weeks. This study showed no significant differences in the number of clinic visits and weeks taken to reduce stuttering by 50% in both study groups.
de Sonnevile-Koedoot, Stolk et al. (2015) <sup>12</sup> Dutch	Lidcombe program RESTART-DCM	Individual	- LP: the treatment of the 98 children lasted a mean of 22.2 sessions (standard deviation: 11.2; median: 21).  -RESTART-DCM: the treatment of the 97 children lasted a mean of 19.5 sessions (standard deviation: 10.3; median: 17).	The direct treatment decreased stuttering faster in the first 3 months of intervention, though the difference was no longer significant by 18 months. LP had slightly better scores in most of the other secondary result measures, though with no significant differences between the treatment focuses. By 18 months of follow-up, both treatments are approximately equal in developmental stuttering intervention; both are commendable.
Guitar et al. (2015) <sup>33</sup> English	Lidcombe program	Individual	LP clinic visits to complete stage 1 ranged from 4 to 32, with a mean of 16.8 and a median of 15 visits.	Stuttering frequency decreased significantly from pretreatment to 2 years after beginning the treatment. Children with more frequent and severe stuttering take longer in LP. Pretreatment %SS and sex are long-term statistical predictors of stuttering treatment results. LP effectiveness is independent of the research being carried out by the developers of the program.
de Sonnevile-Koedoot, Bouwman et al. (2015) <sup>30</sup> Dutch	Lidcombe program RESTART-DCM	Individual	During the 18-month follow-up: - The LP group had a mean of 22.2 treatment sessions (98 children). - RESTART-DCM group had a mean of 19.5 treatment sessions (97 children).	Effect and cost differences between LP and RESTART-DCM were small, slightly in favor of LP – which is a good alternative to RESTART-DCM in Dutch primary healthcare.
McCulloch et al. (2016) <sup>29</sup> English	Lidcombe program	Individual	Stage 1: Median of 19 visits in 25 weeks. stage 2: Median of 7 visits (ranging from 1 to 22) in 45.5 weeks (ranging from 16 to 120).	No differences were reported in patients who completed LP stage 1 regarding the decrease in stuttering severity or the severity scales. Stage 1 lasted slightly longer for patients who received the treatment in the student-led clinic.



Authors (Year) Language	Treatment/program or methodology employed	Individual/group	Frequency	Conclusion/results
Bridgman et al. (2016) <sup>31</sup>  English	Lidcombe program	Individual	- Clinic: median of 25 weeks and 23 sessions to complete stage 1 (37 children). - Teletherapy: median of 25 weeks and 20 sessions to complete stage 1 (37 children).	In pretreatment, stuttering severity was similar in both groups; after 9 and 18 months, no difference in severity was found between them (%SS).  SR is associated with the number of sessions, which increases by 13% for each unit of severity in the LP scale.  There is no difference in the number of clinic visits and weeks to complete LP stage 1, which is equally effective and economically feasible in clinic and teletherapy. However, there was a significant difference in session duration (in minutes) by 18 months; the teletherapy group took 17% less time than the clinic group.
Sawyer et al. (2017) <sup>32</sup>  English	The therapist instructed caregivers to use slow and relaxed speech, elongating vowels while maintaining suprasegmental patterns. First, a model was given for caregivers to imitate, practicing through reading and conversation, to continue doing so as they played with the children. Then, the therapist gave the necessary feedback. Caregivers were asked to continue the activity at home.	Individual	One 1-hour session a week for 3 weeks in the clinic. Caregivers were to practice at home 3 to 5 times a week, 5 to 10 minutes at a time. It was practiced a mean of 6.7 times a week.	Caregivers decreased their AR after training.  Most children increased their fluency measured in % of stuttering dysfluencies in the last two samples.  No statistically significant relationship was found between caregivers' reduced AR and children's decreased stuttering dysfluencies. Neither is there a significant relationship between AR and RLT.
Ferdinands et al. (2018) <sup>28</sup>  English	Lidcombe program	Individual	- Clinic: median of 25 weeks and 23 sessions to complete stage 1 (37 children). - Teletherapy: median of 25 weeks and 20 sessions to complete stage 1 (37 children).	Parental satisfaction with their children's fluency is parallel to decreased severity.  Teletherapy is not different from clinic sessions in terms of effectiveness and efficiency; the same tendency was found for both methods regarding decreased stuttering severity and increased parental satisfaction with their children's fluency.
Millard et al. (2018) <sup>13</sup>  English	Palin PCI therapy	Individual	One session per week in the clinic, for 6 weeks; then, 6 weeks for home bonding with parents.	All variables had improved results, which were maintained 1 year after the treatment.
Druker et al. (2019) <sup>25</sup>  English	Beilby stuttering therapy Curtin Early Childhood Stuttering Resilience Program	Individual	23 children with 12 sessions in 12 uninterrupted weeks; 3 children with 12 sessions in 13 weeks; and 1 child with 12 sessions in 14 weeks.	Stuttering severity decreased in both treatment groups.  Emotional and behavioral problems decreased, and resilience increased in stuttering children whose parents received the additional resilience component in therapy. A significant improvement in parental practices was found in this group.  No changes in emotional and behavioral problems were found in children of the group that received only fluency therapy.

Captions: LP: Lidcombe program / %SS: percentage of stuttered syllables / SR: Parent-reported stuttering severity rate /AR: articulation rate / RLT: response latency time / PCI: parent-child interaction



The intervention methods used in stuttering children and mentioned in the selected articles are briefly described below to meet the study objective and present to readers a reference mark of the type of therapy reported in each study.

As shown in Tables 2 and 3, six types of interventions were found in the 11 articles, namely: RESTART-DCM, Palin parent-child interaction therapy (Palin PCI), LP, Beilby stuttering therapy (BST), Curtin Early Childhood Stuttering Resilience Program, and an unnamed intervention approaching the parents' discourse.

RESTART-DCM is based on the demands and capacities model (DCM), addressing four dimensions (motor, linguistic, socioemotional, and cognitive) that contribute to developing stuttering. It aims to diminish the environmental and/or self-imposed demands and enhance the children's and families' capacities to speak more fluently<sup>15,16</sup>. This treatment counts with a detailed assessment aiming to positively change the environment and the children's functioning to attenuate the speech fluency disorder. The therapy has three stages; in the first one, there is an effort to decrease demands either self-imposed or generated by people in the children's communicative context. The second stage aims to increase the children's capacities to speak fluently, while still diminishing the communicative demands addressed in the first stage. Lastly, if necessary, the third stage focuses directly on improving speech fluency<sup>17</sup>. Parents are instructed to do the tasks at home 15 minutes a day, for at least 5 days a week<sup>12</sup>.

Palin PCI is a detailed assessment program addressing both qualitative and quantitative variables. It identifies components that affect the children's fluency, thus developing a customized attention plan considering the children's environmental and emotional linguistic needs and strengths to promote their fluency. This program teaches parents how to manage their children's stuttering, which gives them a central role in the intervention. The therapy consists of an initial stage with six once-a-week visits to the clinic and 6 weeks for home bonding. The parent-child interaction strategies are practiced in short periods referred to as "special moments". After finishing the initial stage, the advancements are assessed. If stuttering has not diminished, the therapist suggests incorporating a direct intervention into the sessions, in which the child participates more actively to change their speech<sup>13</sup>.

LP is an operant conditioning treatment, in which therapists teach parents or caregivers (co-therapists) two aspects: verbal contingencies and severity scales.

Parents must have a daily special time for interaction with their children and carrying out contingencies, commenting particularly when the children speak with and without stuttering. Moreover, the adults quantify daily the children's stuttering with a 0-to-9 scale, in which 0 represents no stuttering and 9, extremely severe stuttering; hence, the progress of the treatment can be observed (in previous versions of the program, the scale ranged from 1 to 10, using the same criteria)<sup>18</sup>.

The program has two stages; in the first one, adults and children attend therapy once a week, while carrying out the treatment daily at home. This routine is maintained until stuttering significantly diminishes or disappears altogether. The second stage is that of maintenance, in which attendance to the clinic and frequency of the adults' comments decrease, while fluency is maintained. This stage may last for approximately 1 year<sup>18</sup>.

BST is a combined direct and indirect treatment used at the Curtin University Stuttering Treatment Clinic. The direct part includes verbal contingencies aiming for the children's fluent speech, whereas the indirect one combines aspects of the PCI therapy and DCM<sup>25</sup>.

Curtin Early Childhood Stuttering Resilience Program is a therapy that uses techniques reported in resilience research. It approaches the children's capacity to manage and control their behavioral responses to the surroundings (in areas such as independence, responsibilities, establishing limits, and so forth), thus impacting their fluency. The authors of the program also developed a scale to measure it<sup>25</sup>.

Lastly, though not giving it a specific name, a piece of research mentioned a therapy focused on teaching parents how to speak more slowly and relaxed to influence their children's fluency<sup>32</sup>.

More specifically, analyzing the results obtained from the 11 studies, six of them (54.5%) studied LP alone, two (18.1%) compared LP with RESTART-DCM, one (9%) compared BST with Curtin Early Childhood Stuttering Resilience Program, one (9%) studied Palin PCI therapy, and one (9%) presented an intervention to teach parents to speak more slowly and relaxed to influence their children's fluency.

Hence, 72.7% of research shows evidence regarding LP, which was favorable in all cases. The large presence of LP evidence was also observed in previous reviews, such as the ones by McGill et al. (2019)<sup>19</sup>, Baxter et al. (2016)<sup>20</sup>, and Nye et al. (2013)<sup>21</sup>. In comparison with the other programs, this remains the most solid one in terms of scientific evidence<sup>34</sup>.

Euler et al. (2021)<sup>35</sup> point out the following possible explanation for the greater presence of LP evidence: that other types of therapies (e.g., treatments to change and model stuttering) are mainly used in adolescents and adults. Nevertheless, They can be used in preschoolers as well, which is evident in approaches such as those by Yaruss et al. (2006)<sup>36</sup>, Shenker & Santayana (2018)<sup>37</sup>, and Mini-KIDS<sup>38</sup> – which is why it is surprising that more recent evidence meeting the inclusion criteria was not found regarding the application of these strategies.

The authors of the present research agree with that pointed out by Trajkovski et al. (2011)<sup>24</sup> regarding the limited evidence from clinical trials for stuttering treatment in comparison with the number of recommendations and intervention strategies suggested in various media. In this regard, stuttering therapies need to be constantly developed and researched. This is a contingent and constantly changing issue; after studies had been retrieved for this review, evidence for various therapies continued to be published. For instance, Subasi et al. (2021)<sup>39</sup> studied LP intervention, and Euler et al. (2021)<sup>35</sup> assessed the effectiveness of a fluency modeling group treatment with 6-to-9-year-old children. Although this last study does not directly approach preschoolers, it highlights the need for constant updates in this area.

The present review did not find articles addressing stuttering interventions with auditory technology and feedback. This agrees with the findings by Baxter et al. (2016)<sup>20</sup>, who did find such an approach, but only in children 8 years or older.

As for the participants' language, this review found that nine (81.8%) of the analyzed studies were conducted with English-speaking children, while the other two (18.2%) had Dutch-speaking children – revealing an absence of studies with preschoolers who speak other languages. This was likewise observed in other previous reviews in the area, such as the ones by McGill et al. (2019)<sup>19</sup>, Herder et al. (2014)<sup>22</sup>, Baxter et al. (2016)<sup>20</sup>, and Nye et al. (2013)<sup>21</sup>. For instance, none of these found any research on the topic with Spanish- or Portuguese-speaking children.

The participants' age in the studies ranged considerably from 2.5 to 7 years. No research subgrouped subjects as suggested by Guitar<sup>14</sup>, who refers to “younger preschool children” those 2 to 3.5 years old, and “older preschool children” those 3.5 to 6 years old. The author describes various manifestations of stuttering and types of therapies according to the age

range. Therefore, from this standpoint, it would make sense to distinguish different groups of preschoolers.

Concerning the assessments in the intervention programs, seven (63.6%) studies used parent-reported severity scales. LP proposes a 1-to-10-point scale (currently, 0 to 9), in which therapists and parents discuss the values given to children to calibrate the caregivers' scores with the therapists' scores. This scale is a valid and reliable tool regarding the information on the children's performance outside the clinic – therefore, it should be used even in therapeutic contexts where LP<sup>14</sup> is not applied, as seen in the syllable-timed speech program<sup>24</sup>.

Six studies (54.5%) used scores in non-linguistic areas – e.g., parental perception of their children's health-related quality of life, the children's attitude toward speech, emotional and behavioral issues, and so forth. This is both coherent with the definition of the condition presented in the introduction and greatly relevant from the perspective of stuttering as a complex and multidimensional disorder<sup>40</sup> – which not only affects communication but also often accompanies other emotional, social, family, academic, and occupational manifestations, impacting the quality of life of people who suffer from this problem<sup>41</sup>. Hence, stuttering assessment and intervention are important in all dimensions.

Regarding assessments, it is also interesting that 100% of the studies considered the percentage of stuttered syllables as one of the ways to measure progress. This is the most indicated quantitative measure in the literature<sup>42</sup>. In light of the above paragraphs, this is another measure to be considered; it was not the only one used in treatments in any of the cases.

Regarding the number of assessments, 18.2% of the studies occurred in two moments; 54.5%, in three moments; 9.1%, in four moments; and 18.2%, in five moments – which made it possible to observe treatment progress in different periods. This agrees with a rather important characteristic of this condition, which is its fluctuation in each person<sup>14,24</sup>. Therefore, adequate assessments considering various moments are particularly significant. The latest assessment took place 24 months after beginning therapy<sup>33</sup>, revealing a lack of follow-up and long-term observation of therapeutic achievement maintenance in all said programs. This factor may be addressed in future research.

The number of sessions can be analyzed more precisely by separating studies that used LP<sup>12,26-31,33</sup>

from the other ones. Research using LP had a median of 16 to 25 sessions and weeks in the clinic to finish the first stage. As for the other programs, it is difficult to generalize because they ranged widely from 3 to 19 sessions, depending on the program. Nonetheless, regardless of duration, all treatments had positive results for participants.

Some studies compared interventions to find whether one was superior to the other. This was the case of Sonnevile-Koedoot et al. (2015)<sup>30</sup> and Sonnevile-Koedoot et al. (2015)<sup>12</sup>, who compared LP with RESTART-DCM. The results of neither of them allow a definite conclusion on one's program superiority over the other – which agrees with previous findings in the literature, as Franken & Laroës (2017)<sup>17</sup> compared LP with the DCM program and reached similar conclusions.

No research in the present review compared groups with and without intervention. On the other hand, Herder et al. (2006)<sup>22</sup>, who conducted a systematic review analyzing 12 articles, found six of them comparing a group submitted to treatment with another that did not receive any treatment. Even though the said review was not centered only on children, the conclusions point to the benefits of interventions on stuttering people, as there were statistically significant differences in the progress between groups that received and did not receive the intervention. Another six articles compared treatments and indicated that no treatment is significantly superior to the other in terms of results, which agrees with what was reported in the above paragraph.

As previously mentioned, all studies in the present review had positive results for stuttering children. Hence, a question arises: Why do different intervention methods have likewise favorable results in the same type of patients? Herder et al. (2006)<sup>22</sup> and Millard, Zebrowski & Kelman (2018)<sup>13</sup> tried to answer this question, pointing out that the possible explanation is more related to the similarities than differences in the various interventions. In the case of preschoolers, among other possibilities, they usually include parents in the therapy, leading them to spend more time interacting with their children and reducing the linguistic demand and anxiety in the interaction. Seemingly, parental participation in therapy is a critical factor to facilitate and maintain fluency in preschoolers<sup>37</sup>.

Considering treatment duration and effectiveness, it is possible to agree with the recommendation made by Herder et al. in 2006<sup>22</sup> that no type of intervention would be effective for all patients. Individual analysis of

the patients' needs and beliefs are necessary to make decisions. Therefore, approaching different therapeutic options positively provides treatment alternatives to children when no progress is found with a given type of intervention<sup>43</sup>.

Another factor to point out is the treatment modality, which was individual in 10 studies (90.9%). This approach helps identify characteristics and individualize and adapt the intervention to each person's needs, influencing the success of the therapy<sup>44</sup>. On the other hand, the only study (9.1%) that compared standard LP treatment with a group approach with the same program concluded that group LP treatment is an effective alternative to the individual model. There is also a tendency toward conducting treatments in clinics (90.9%). Nevertheless, one study (9.1%) showed that applying LP via teletherapy is not different from doing so in a clinic in terms of effectiveness and efficiency. This finding is greatly important because it presents an option to receive this treatment, agreeing with what was demonstrated by McGill et al. (2019)<sup>19</sup>, who point out that live video telepractice using LP or integrated focuses seems to be a promising approach to treat stuttering.

## CONCLUSION

Articles addressing interventions in stuttering children were described from different perspectives. The methods found in this review were RESTART-DCM, Palin PCI therapy, LP, BST, Curtin Early Childhood Stuttering Resilience Program, and an intervention approaching the parents' discourse.

It was found that the various types of stuttering interventions conducted by speech-language-hearing therapists have good results in stuttering children. Hence, it is recommended that stuttering children seek speech-language-hearing therapists familiar in depth with this type of speech change to receive evidence-based treatment.

In agreement with the described evidence, interventions in preschoolers should consider parents and caregivers. Moreover, adequate approaches to stuttering preschoolers should address not only speech aspects but also emotional, social, and functioning ones, in different contexts.

The assessment of sample subjects in most studies included severity scales, parent rating scales, aspects of the subjects' dimensions other than speech, and assessments in three or more moments.

This review observed that LP is the treatment with the most evidence. However, articles that compared treatments did not find one program to be superior to the other.

Individually applied therapies predominate, and there is great variability in the duration of the various therapies.

No studies in languages other than Dutch and English were found. Further in-depth studies should be conducted to support the evidence-based practice of interventions in stuttering preschoolers, especially in languages that have not been addressed yet.

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