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# Parent–child interaction therapy in the treatment of children who stutter: a single-subject longitudinal study

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## Abstract

**Background** The study aimed to investigate the efficacy of the indirect home-based program, including parent–child interaction therapy (PCIT), in reducing the severity and degree of stuttering in young children to be used as a treatment program for young children who stutter.

**Methods** A longitudinal multiple single-subject study was conducted on 16 Arabic-speaking Egyptian children aged 4–7 years who stutter. All parents and children were evaluated during the first clinic visit to assess stuttering and to start the clinic-based therapy. After six weeks, a follow-up was done. After three months of the home-based therapy program, a re-assessment of the degree and severity of stuttering was done using the Bloodstein classification of stuttering severity and Stuttering Severity Instrument-3 (SSI3).

**Results** Mean SSI3 pre-therapy was 17.5 and decreased to 11 post-therapy. Before therapy, most cases were moderate stuttering 68.8%, 25% were mild, and 6.3% were severe; after treatment, most cases became mild stuttering (75%), 12.5% became very mild, and 12.5% became moderate stuttering according to SSI3 scores, also mean Bloodstein pre-therapy was II and decreased to I post-therapy.

**Conclusion** An indirect home-based program, including PCIT, efficiently reduces the severity and degree of stuttering in young children and justifies its use as a treatment program for children who stutter.

**Keywords** PCIT, Stuttering in young children, Indirect therapy, Dysfluency disorders

## Background

Stuttering is characterized by repeating syllables, words, and phrases, along with prolonged sounds or pauses, often accompanied by negative emotions such as embarrassment and anxiety [1]. It typically emerges between ages 2 and 4 [2]. The prevalence is around 5% in preschool children and 1% in adults [3].

Most researchers investigating stuttering now agree that a single-factor theory cannot explain stuttering. Stuttering is thought to be caused by various factors, including language, genetics, neuro-anatomical and neuro-physiological differences, speech-motor control, and environment-related factors. These factors have all been linked to the development and progression of stuttering [4–10].

Stuttering affects more than just a person's speech characteristics, resulting in potentially long-term behavioral and social challenges and impaired quality of life. In addition, more than 90% of parents of children who stutter (CWS) have reported emotional distress secondary to their children's stutter, including anxiety, self-blame, guilt, sadness, and uncertainty about their children's future [11].

Numerous studies suggest that the overall severity of stuttering in its early stages is not a reliable predictor of

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long-term persistence [4]. Research shows that a significant reduction in disfluencies within one year of onset strongly indicates recovery [4]. Children at risk for persistent stuttering may exhibit a faster articulatory rate [12, 13]. Furthermore, two studies have identified a clear familial pattern in the likelihood of stuttering persistence or recovery [6, 14].

Modifying parents' interaction styles can enhance their effectiveness in managing parent–child interactions and supporting fluency development in children [11]. Early intervention strategies focus on altering the communication environment to reduce stuttering, with evidence supporting the adjustability of parental interaction styles [15].

It is hypothesized that parental pressure, whether consciously or unconsciously, may increase the risk of stuttering in children. On the other hand, parents who use fluency-promoting strategies may help regulate the speech environment, potentially lowering the likelihood of disfluencies [16, 17].

A study by Costa et al. found that increased effort to speak and negative family attitudes correlated with a higher likelihood of a stuttering diagnosis. These negative family attitudes may also contribute to developing a negative self-perception in the child regarding their speech [18].

Treatment programs for children who stutter are divided into direct (e.g., Lidcombe program) and indirect (e.g., PCIT) approaches. Direct programs involve specific speech modifications, while indirect programs emphasize changes in parental interaction styles to foster fluency [3].

Despite evidence supporting the Lidcombe program's effectiveness, concerns exist among professionals regarding its potential to increase anxiety by overly focusing on the child's speech [19].

Certain Phoniatricians have reservations regarding the direct approach to treatment. For instance, some experts worry that excessive focus on the child's speech could potentially induce anxiety, which might exacerbate stuttering [19]. Ongoing debates and concerns about whether drawing attention to stuttering in young children could intensify its severity and negative impact on their awareness and self-confidence [20].

Parent–Child Interaction Therapy (PCIT) comprehensively views stuttering, acknowledging genetic and neurological factors as primary causes. It recognizes language, communication, psychological, speech motor skills, and environmental influences in shaping stuttering's onset, severity, and long-term impact [21].

PCIT aims to establish a foundation for confident communication, irrespective of stuttering persistence, fostering a positive communication attitude in children and a supportive stance toward stuttering within families. Involving both parents, the therapy enhances constructive interactions to promote fluency, addresses parental anxiety, and supports the child's self-confidence and behavior [21].

The study aimed to investigate the efficacy of indirect home-based program, including parent–child interaction therapy (PCIT), in reducing the severity and degree of stuttering in young children to be used as a treatment program for children who stutter.

## Methods

This study is a multiple single-subject longitudinal study conducted on 16 randomly selected Arabic-speaking Egyptian children who stutter aged 4–7 years, attending the Phoniatric unit's outpatient clinic at Mansoura University Hospital from June 2021 to June 2022. The IRB of the Faculty of Medicine accepted this study (MS.21.06.1553). Consent is taken from the parents of the participating children in the study.

The sample size was measured using the G power program. Provided that from a previous study [1]. The alpha error level is 5%, while the confidence interval is 95%. The beta error level is 10%, while the study's statistical power is 90% So, the sample size will be 11 at least. To make up for participants who will not respond or drop out during the study, we will increase the sample size by 10%. So, the sample size will be 13. The study excluded children with prior language or speech therapy, those with neurological or psychological disorders, and those with visual, hearing, or cognitive impairments.

The study was conducted in three phases: At the initial clinical visit, after six weeks of home-based therapy, and after three months. At the initial clinical visit, all children were evaluated for stuttering assessment by (1) history taking and collection of basic data including age of parents, education, no of family members, contact time with the child, and socioeconomic status; (2) subjective evaluation of language; (3) auditory perceptual assessment (APA); visual perceptual assessment (VPA); documenting the APA of speech through recording of a speech sample.

The severity of stuttering was graded using the Bloodstein classification of stuttering (BLS) [2], which considers the child's avoidance behaviors and awareness. Bloodstein categorized stuttering into four degrees of severity: BLS I (very mild stuttering), BLS II (mild stuttering), BLS III (moderate stuttering), and BLS IV (severe stuttering).

### BLS I (very mild stuttering)

The child was unaware of his/her stuttering symptoms. Stuttering is episodic and occurs for periods of weeks/months between long intervals of normal speech. It

appears when the child is excited or upset or under conditions of communicative pressure. The dominant symptom is repetition, especially whole-word repetition that appears at the beginning of a sentence. Stuttering affects only a small part of speech (pronouns, conjunctions, prepositions).

#### BLS II (mild stuttering)

The child is aware and considers him/herself a stutterer, but s/he is not annoyed and has little or no concern about his stuttering. It is chronic, with few (if any) intervals of normal speech. It increases chiefly under excitement or when the child speaks rapidly. Speech behaviors such as IPDs, prolongations, and blocks predominate, whole word repetition are no longer common, and stuttering appears in every word of the sentence, affecting the significant parts of speech (nouns, verbs, adjectives, adverbs).

#### BLS III (moderate stuttering)

The child is aware, annoyed, and sensitized. Stuttering comes and goes mainly in response to specific situations (such as in the classroom, speaking to strangers, or using the telephone). Certain words or sounds are regarded as more difficult. Word substitutions and circumlocution appear occasionally—no avoidance of social and speech situations, with little or no evidence of fear or embarrassment.

#### BLS IV (severe stuttering)

The child was fully aware and suffering, Vivid fearful anticipations of stuttering. Feared words, sounds, and situations; very frequent word substitutions and circumlocution appear; avoidance of speech situation with evidence of fear and embarrassment.

The assessment of stuttering severity utilized the SSI-3, a widely used behavioral tool that measures severity across preschool-aged children, school-age individuals, and adults [3]. It assesses stuttering in terms of Frequency (stuttered syllables percentage), Duration (average duration of the three longest stutters), and Physical Concomitants (distracting sounds, facial grimaces, head movements, and extremity movements) [4]. Severity levels for preschool children based on SSI-3 total scores are categorized as Very mild (scores 6–10), Mild (scores 11–20), Moderate (scores 21–27), Severe (scores 28–35), and very severe (scores 36 and higher).

The parent–child training program comprised three main components: (1) Education and counseling, where parents learned about communication and stuttering, reduced worries about the speech of their children, and understood the value of supportive responses to stuttering; (2) Communication modification training, which taught parents strategies to support their child's fluent speech development; (3) Review and re-assessment, where parents were evaluated on their use of treatment strategies and their impact on the child's fluency.

The training program involved four sessions (two sessions per week) for parents. It recommended a 5-min playtime individually with the child, scheduled between three to five times per week. This playtime aimed to provide a relaxed, one-on-one setting for parents to practice targeted interactions, which included strategies like using comments instead of questions, following the child's lead in play, reducing parental speech rate, enhancing listening, taking fewer or shorter turns, modeling relaxed speech, increasing pause time between turns to alleviate communication pressure, and minimizing demands for speech. The Parents were encouraged to apply these strategies learned during clinic-based therapy sessions at home.

Parent interaction strategies include following the child's lead during play or conversation, allowing ample time for the child to respond or finish speaking, and increasing pauses between turns. Additionally, parents are encouraged to slow their speech rate to match the child's, maintain eye contact to show attentiveness, and use shorter, less complex sentences to align with the child's language level. Achieving a balance between comments and questions, ensuring questions are appropriate for the child's abilities, and advising teachers to reduce speech demands at school or nursery are also crucial components of these strategies.

After six weeks of home-based therapy**,** the patients were followed up at the clinic. Parents were counseled to spend more time with their children doing playing activities, practicing free play at home, and applying learned interaction strategies at home. After three months of home-based therapy**,** another follow-up was done at the clinic by measuring the degree and severity of stuttering using the BLS classification and the stuttering severity instrument (SSI3).

During this period of six weeks of home-based therapy followed by a three-month interval, follow-up assessments were conducted face-to-face at our unit. These visits ensured the parents' adherence to the therapy plan and evaluated the child's speech progress.

#### Statistical analysis

The data were coded, processed, and analyzed using IBM SPSS (version 24 for Windows): descriptive statistics were used to describe the personal and clinical characteristics of the sample. Qualitative data were presented by frequency tables (Numbers and percentages). Quantitative variables: The normality of data was tested with a one-sample Kolmogorov–Smirnov test, and central

**Table 1** Demographic data of the study population

| **Age in months** | **58.5 ± 11.2** |
|---|---|
| Sex | |
| Male | 10 (62.5%) |
| Female | 6 (37.5%) |
| Age of mother | 31.3 ± 4.9 |
| Age of father | 37.7 ± 4.9 |
| No of family members | 4.3 ± 0.7 |
| Education of parents | 16.6 ± 4.4 |
| Socioeconomic status | |
| Low | 4 (25%) |
| Moderate | 12 (75%) |

indices and dispersion presented the data: Mean ± Standard deviation (SD) for normally distributed variables and median and range (Minimum – Maximum) for non-normally distributed variables.

An independent t-test tested the relationship between normally distributed continuous variables. The Mann–Whitney test was used to test the association between non-normally distributed variables. Paired variables were compared using the Wilcoxon test. Spearman correlation is used to correlate ordinal and normally distributed data; the correlation coefficient (0–0.4) indicates weak correlation, (0.4–0.6) indicates moderate correlation, and (0.6–0.8) indicates strong correlation.

Level of significance: The results were considered significant for all the statistical tests when the error probability was less than or equal to 5% ($p \leq 0.05$).

## Results

The study included sixteen cases aged 58.5 ± 11.2 months; 10 were males, and six were females. The mean age of parents was 31.3 ± 4.9 years for the mothers and 37.7 ± 4.9 years for the fathers.

The mean education of both parents was 16.4, which indicates that most cases had secondary (general and technical of 3 or 5 years). Socioeconomic status was expressed according to the socioeconomic status scale in Egypt. SES was moderate for 12 cases and low for 4 (Table 1).

The socioeconomic status scale for health research in Egypt includes seven domains with a total score of 84. The classification based on the total score is as follows: Class I (High social standard = 64–84), Class II (Middle social standard = 43–63), Class III (Low social standard = 22–42), and Class IV (Very low social standard ≤ 21). The domains assessed include the Education and Cultural domain, Occupation domain, Family domain, Family Possessions domain, Home Sanitation domain, and Health Care domain.

The mean age of onset of stuttering was 41.8 ± 7.5 months, and the mean duration was 12.5 months, with a minimum of one month and a maximum of 38 months. Median SSI3 pre-therapy was 17.5 with a minimum of six and a maximum of 25 (4 cases were mild stuttering, 11 cases were moderate, and one case was severe). Median SSI3 post-therapy was 11 with a minimum of four and a maximum of 21 (two cases became very mild, 12 cases became mild, and two cases became moderate). The stuttered syllables percentage (SS %) in pre-therapy was 9.5% ± 4.6%, the median was 9% and became 4.6% ± 3.3%, and the median was 4% in post-therapy (Table 2).

The median Bloodstein degree (BL) in pre-therapy was 2 (moderate) (four cases (25%) were BL I (mild), eight cases (50%) were BL II (moderate), and four cases (25%) were BL III (severe). The median Bloodstein degree (BL) in post-therapy became 1 (thirteen cases (81.25%) were BL I (mild); three cases (18.75%) were BL II (moderate), and no cases were BL III(severe).

The median contact time of the parents with their children was 7.5 h, with a minimum of 2 h and a maximum of 16 h. Nine parents (56.3%) were committed to the therapy and seven were not (43.7%) (Table 2).

The family history of stuttering was positive in 5 cases (31.3%) and negative in 11 cases (68.7%).

Significant improvement was found in stuttering severity and degree in post-therapy evaluations. The median SSI3 was 17.5 pre-therapy and decreased to 11 post-therapy; the *p*-value was less than 0.001. The median BL was two pre-therapy and decreased to 1 post-therapy; the *p*-value was 0.001 (Table 3). There was a significant difference between the percentage of stuttered syllables pre- and post-therapy; median SS% pre-therapy was 9% and decreased to 4% post-therapy; the *p*-value was 0.001.

There was a significant positive correlation between the severity of stuttering measured in SSI 3 and the degree of stuttering measured in BL in pre- and post-therapy evaluations. The *p*-value was 0.037 in pre-therapy evaluations and 0.045 in post-therapy evaluations, which indicates that the higher the SSI3 score, the higher the BL degree and vice versa (Table 4).

It was found that there was no significant correlation in all tested items (age of the patients, mother's age, father's age, number of family members, age of onset of stuttering, duration of stuttering, education score of parents, contact time with father, contact time with mother, contact time both and SES score) (Table 5).

The study group was divided into two groups; the first group was 7 cases with no commitment to the therapy, and the second one with a commitment to the therapy;

**Table 2** Basic data of the study population

| **Age of onset of stuttering in months** | **41.8 ± 7.5** |
|---|---|
| Duration of stuttering means in months (minimum–maximum) | 12.5 (1–38) |
| SSI3 pre-therapy; Median | 17.5 (6–25) |
| SSI3 grades pre-therapy; No & percentage | |
| Mild | 4 (25%) |
| Moderate | 11 (68.8%) |
| Severe | 1 (6.3%) |
| SSI3 post-therapy; Median | 11 (4–21) |
| SSI3 grades post-therapy; No & percentage | |
| Very mild | 2 (12.5%) |
| Mild | 12 (75%) |
| Moderate | 2 (12.5%) |
| SSI% pre-therapy (mean ± SD)<br>median (minimum–maximum) | 9.5% ± 4.6%<br>9% (3%–20%) |
| SSI% post-therapy (mean ± SD)<br>median (minimum–maximum) | 4.6% ± 3.3%<br>4% (1%–13%) |
| BL pre-therapy median (minimum – maximum) | 2(1–3) |
| No. of the cases & percentage | |
| BL I | 4 (25%) |
| BL II | 8 (50%) |
| BL III | 4 (25%) |
| BL post-therapy median (minimum – maximum) | 1 (1–2) |
| No. of the cases & percentage | |
| BL I | 13 (81.25%) |
| BL II | 3 (18.75%) |
| BL III | 0 (0%) |
| Contact time in hours | 7.5 (2–16) |
| Commitment No (%) | |
| No | 7 (43.7%) |
| Yes | 9 (56.3%) |
| Family history No. (%) | |
| Positive | 5 (31.3%) |
| Negative | 11(68.7%) |

Data are expressed as number (%), mean ± SD, median (min–max)

*SSI3* is abbreviation of stuttering severity instrument 3

*BL* is abbreviation of Bloodstein classification of stuttering

there was a significant difference in delta SSI (difference between SSI3 pre and post-therapy), the *p*-value was 0.003 and delta BL classification of stuttering (difference between BL classification pre and post-therapy), *p*-value was 0.008.

There was no significant difference between both groups in terms of SSI3 and BL classification post-therapy; the *p*-values were 0.45 and 0.056, respectively (Table 6).

There was no correlation between a family history of stuttering and SSI3 post-therapy (Table 7).

**Table 3** Comparison between pre-therapy and post-therapy in stuttering severity and degree

| | **pre-therapy** | **post-therapy** |
|---|---|---|
| SSI3 | | |
| Median (min–max) | 17.5(6–25) | 11(4–21) |
| Test of sig. | Wilcoxon $p$ **< 0.001*** | |
| BL | | |
| Median (min–max) | 2(1–2) | 1(1–2) |
| Test of sig. | Wilcoxon $p$ **= 0.001*** | |
| SSI % | | |
| Median (min–max) | 9% (3%–20%) | 4% (1%–13%) |
| Test of sig. | Wilcoxon ***p* = 0.001*** | |

* *P* value < 0.05: significant level \ Wilcoxon Test

**Table 4** Correlation between pre & post-therapy stuttering severity & degree

| | **BL pre-therapy** | |
|---|---|---|
| SSI3 pre-therapy | Correlation Coefficient | *P*-value |
| | 0.525* | 0.037 |
| | BL post therapy | |
| SSI3 post therapy | Correlation Coefficient | *P*-value |
| | 0.507* | 0.045 |

Spearman's correlation was used

* Correlation is significant at the 0.05 level (2-tailed)

**Table 5** Correlation between post-therapy severity and degree of stuttering post therapy vs demographic and basic data

| | **SSI post** | | **BL post** | |
|---|---|---|---|---|
| | **r** | **p** | **r** | **p** |
| Age | 0.07 | 0.77 | −0.36 | 0.16 |
| Mother's age | −0.07 | 0.78 | −0.26 | 0.32 |
| Father's age | −0.009 | 0.98 | −0.11 | 0.66 |
| No of family members | 0.2 | 0.36 | 0.28 | 0.29 |
| Age of onset | −0.24 | 0.35 | −0.16 | 0.53 |
| Duration | 0.3 | 0.2 | −0.08 | 0.74 |
| Education score of parents | −0.06 | 0.8 | −0.27 | 0.3 |
| Contact time father | 0.02 | 0.9 | −0.06 | 0.8 |
| Contact time mother | 0.13 | 0.6 | −0.04 | 0.87 |
| Contact time both | 0.062 | 0.8 | 0.01 | 0.99 |
| SES score | −0.32 | 0.2 | −0.3 | 0.24 |

correlation coefficient

*P* < 0.05: significant level

## Discussion

Before treatment, most cases were moderate stuttering at 68.8%, 25% were mild, and 6.3% were severe; after therapy, most cases (75%) became mild stuttering, 12.5% very mild, and 12.5% moderate stuttering according to

**Table 6** Relation between post-therapy severity & degree of stuttering vs commitment of the parents

| | No Commitment *N* = 7 | Commitment *N* = 9 | *P* value |
|---|---|---|---|
| SSI3 post | 17(4–21) | 11(7–22) | 0.45 |
| BL post | 2(1–2) | 1(1–2) | 0.056 |
| Delta SSI | 2(1–4) | 5(3–12) | **0.003*** |
| Delta BL | 0(0–1) | 1(1–2) | **0.008*** |

Non-parametric Data expressed as median(min–max); test of significance used: Mann Whitney

Parametric data expressed as mean ± standard deviation, test of significance used: student t-test

*SSI3* is abbreviation of stuttering severity instrument 3

*BL* is abbreviation of Bloodstein classification of stuttering

* *P* value < 0.05: significant level

SSI3 scores, also mean Bloodstein pre-therapy was II and decreased to I post-therapy. These results agreed with the result of Millard et al. (2008)[15], which is a study conducted by Millard, S.K., A. Nicholas, and F.M. Cook using parent–child interaction therapy in the treatment of stuttering; the study was conducted on six children, they found that four of the six children participating (S1, S3, S4, S5) showed a significant reduction of their stuttering Frequency by the end of the therapy phase. One child (S2) notably decreased the Frequency of stuttering when working with only one parent, while another child (S6) showed marked improvement upon starting a direct fluency management program. Also, the study agreed with Millard et al. (2009)[22], in which the findings showed a consistent decrease in stuttering among all children who underwent therapy throughout the one-year study period.

The present study's mean stuttering frequency SS% was 9 ± 3.26 and decreased to 4 ± 2.97 after therapy. These results agree with the results of Franken et al. (2005) [23] in the later study, the demand capacity model (DCM), which is indirect therapy, was applied to 12 preschool children, and the results showed a reduction in the means from 7.9% (SD = 7.1) to 3.1% (SD = 2.1).

On the contrary, Franken et al. (2005) [23] found no significant difference between the Lidcombe Program, a direct method for treating stuttering, and the Demands and Capacities Model, an indirect method in preschool-aged children. Thirty children were randomly allocated to receive either Lidcombe Program (LP) or Demands and Capacities Model (DCM) treatment. Stuttering frequencies and severity ratings were assessed before and after the 12-week treatment period. Both treatment groups showed notable decreases in stuttering frequencies and severity ratings.

The Demands and Capacities Model (DCM) of treatment posits that children stutter due to an inability to cope with communicative pressures arising from internal or external demands. Thus, it is suggested that modifying the environment by reducing emotional, cognitive, linguistic, or motoric demands placed on [17] the child can lead to improved fluency, as can the development of the child's capacity to manage these pressures [24]. Consequently, parents, caregivers, and other adults involved in the child's life are often advised to reduce demands by speaking more slowly, using shorter and simpler sentences, pausing more often, asking fewer questions, and avoiding interruptions when speaking [23]. Additionally, they may be advised to lower excitement levels in the home, engage more in quiet activities like playing, reading, or talking while following the child's lead, and refrain from criticizing or correcting the child's speech or behavior [17, 22, 23, 25] PCIT is considered a variation of treatment programs depending on the DCM model [26].

In a cohort study conducted by de Sonneville-Koedoot et al. (2015), [25] One hundred seventy-six preschool children participated, and they underwent either the direct Lidcombe Program or the indirect Demands and Capacities Model of intervention as part of the Rotterdam Evaluation Study of Stuttering Therapy (RESTART-DCM). The study was grounded on the assumption that positively changing the child's environment would reduce stuttering. Children who received and completed the DCM program showed a decrease in Frequency from 6.2% (SD 4.4%)

**Table 7** Correlation between family history and SSI3 post-therapy

| | | | Family history | SSI3 post therapy |
|---|---|---|---|---|
| Spearman's correlation | Family history | Correlation Coefficient | 1.000 | .192 |
| | | *P*-value | . | .477 |
| | SSI3 post therapy | Correlation Coefficient | .192 | 1.000 |
| | | *P*-value | .477 | . |

Correlation is significant at the 0.05 level (2-tailed)

There is no significant correlation between family history and SSI3 post-therapy

(Spearman correlation coefficient= 0.192, *P*= 0.477)

at the beginning of treatment to 1.2% (SD 2.1%) after 18 months, amounting to a 71.4% reduction. Those who received the LP showed a decrease in stuttering severity (% SS) from 5.3% (SD 4.3%) at the beginning of treatment to 1.5% (SD 2.0%), resulting in a 72% reduction. Importantly, no statistically significant difference was observed between the effectiveness of the two treatments.

Parental involvement is essential to treating stuttering in early childhood [27]. Parents play "a critically important role in the therapy process" [28]. Parents play a pivotal role in several therapy programs for younger children [29]. Involving parents of children who stutter (CWS), regardless of their age, provides dual benefits, benefiting both the child and the parents. Specifically, it supports CWS in developing skills like managing emotional reactions [30]. Second, it proposes that programs involving parents extensively may enhance their control over challenging parenting issues and decrease parental anxiety, which are crucial components for achieving positive outcomes [27]. In the present study, nine parents were committed to indirect therapy, and seven were not committed to it. There was a significant correlation between the parents' commitment to treatment and the improvement in stuttering severity and degree, which is due to the importance of the parents in the treatment of stuttering.

In the present study, a significant correlation existed between the severity of stuttering measured in SSI 3 and the stuttering degree measured in BL pre- and post-therapy. This agreed with Khodeir's study [31], in which the relationship between the grade of stuttering severity and scores of ASSI (the stuttering severity instrument for children and adults- Arabic version) was analyzed statistically and showed a significant direct association between them.

In the present study, there was no significant correlation between SSI3 post-therapy and the SES or education of the parents. It is in agreement with several studies [32, 33].

The present study found no correlation between family history and stuttering severity measured in SSI3 post-therapy. These results agreed with Howell, Davis, & Williams's observations [9]. They observed the ratio of persistent and recovered family members in both subgroups was similar. No relation between positive family history and persistence and recovery was noted. It disagreed with two studies that reported a clear pattern of persistence and recovery running down families [6, 14].

## Conclusion

The indirect home-based program, including parent–child interaction therapy (PCIT), efficiently reduces the severity and degree of stuttering in young children and justifies its use as a treatment program for children who stutter.

### Limitations and recommendations

The study's results suggested that PCIT is effective in treating children who stutter. We recommend Implementing indirect therapy in clinical settings through clinician-child interaction as a treatment approach for children who stutter. Future studies should involve larger sample sizes. Additionally, more extended follow-up periods are recommended to gain a comprehensive understanding of the efficacy of PCIT in treating children who stutter. A comparative study with direct programs such as the Lidcombe Program (LP) is also suggested. Also, the study did not explain the improvement in the stuttering severity because of the home-based program or spontaneous recovery; a comparative analysis with a control group of children who do not receive treatment is recommended.

The study is limited by several factors, including a small sample size, which may not adequately represent the broader population of children who stutter (CWS), thus limiting the generalizability of the results. The follow-up period was relatively short, which may not show the long-term effects of the treatment. Furthermore, the assessment of parental commitment was subjective; future research could benefit from utilizing questionnaires to obtain more objective measures.

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Not applicable.

#### Authors' contributions

All authors contributed to the study's conception and design. Material preparation and data collection were performed by M. B. Data analysis was performed by M. B., A. A., and T.A. M.B. and T.A. wrote the first draft of the manuscript, and all authors commented on previous versions. All authors read and approved the final manuscript.

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#### Data availability

All data generated or analyzed during this study are included in this article. Further inquiries can be directed to the corresponding author.

## Declarations

#### Ethics approval and consent to participate

The research procedures were conducted following the principles of the Declaration of Helsinki. The IRB of the Mansoura Faculty of Medicine had approved the study (MS.21.06.1553). The informed verbal consent of the parents of the participating children in the study was obtained, and their data was anonymous and confidential.

#### Consent for publication

Not applicable.

**Competing interests**
We (all the authors) declare no conflicts of interest. The authors have no relevant financial or non-financial interests to disclose.

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