

Effectiveness of Combined Prolonged Speech and Pause & Talk Techniques for Improving Speech Fluency in Children Who Stutter: A Quasi-Experimental Study

Muhammad Noman Maqbool¹, Anum Ashraf², Waqar-un-Nisa³

¹ MS-SLHS (Speech and Language & Hearing Sciences), CMH Lahore Medical College & Institute of Dentistry, National University of Medical Sciences

² Assistant Professor, Department of Rehabilitation Sciences, Faculty of Allied Health Sciences, The University of Lahore

³ JSET (Hearing Impairment), Government Higher Secondary School of Special Education (H.I), Okara

*Corresponding author: Anum Ashraf, Anum.ashraf@drs.uol.edu.pk

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ABSTRACT

Background: Developmental stuttering can impair speech fluency and affect communication during childhood. Structured fluency-oriented interventions may improve speech control, but evidence for combined approaches in school-age children remains limited. **Objective:** To assess changes in stuttering severity following a combined Prolonged Speech and Pause & Talk intervention in children with developmental stuttering. **Methods:** A quasi-experimental pre-test–post-test study included 22 children aged 5–12 years recruited purposively from clinical settings in Lahore, Pakistan. Participants received combined Prolonged Speech and Pause & Talk therapy three times weekly for 16 weeks. Stuttering severity was assessed before and after intervention using the Stuttering Severity Instrument–Fourth Edition. Paired changes were evaluated using the Wilcoxon signed-rank test. **Results:** Mean SSI-4 score decreased from 7.18 ± 1.42 before intervention to 1.09 ± 0.68 afterward, an absolute reduction of 6.09 points. The change was statistically significant ($Z = -3.42$, $p = 0.001$) with a large calculated effect size ($r = 0.73$). Moderate or severe stuttering decreased from 81.8% at baseline to 9.1% after intervention. **Conclusion:** Children demonstrated substantial improvement in stuttering severity following the combined intervention. Controlled studies are required to establish treatment-specific effects. **Keywords:** Developmental stuttering; Speech fluency; Prolonged Speech; Pause & Talk; Speech therapy; SSI-4.

INTRODUCTION

Stuttering is a neurodevelopmental disorder of speech fluency characterized by involuntary repetitions of sounds or syllables, prolongations, and blocks that interrupt the temporal flow of speech. It commonly emerges during the period of rapid speech and language development in early childhood and reflects a complex interaction among speech-motor, linguistic, neurodevelopmental, and emotional processes rather than a single isolated impairment (1–3,6,7). Although spontaneous recovery occurs in a proportion of children, persistent stuttering may continue through the school years and beyond, making timely identification and appropriate clinical management important, particularly when disfluency begins to affect functional communication (8–12).

The consequences of childhood stuttering extend beyond the observable disruption of speech. Children who stutter may experience frustration, reduced communication confidence, negative communication attitudes, and reluctance to participate in classroom or social interactions. During the school years, these difficulties can influence academic participation, peer communication, and psychosocial well-being, particularly when stuttering is accompanied by increased awareness of disfluency or anxiety related to speaking situations (13,14,18,20). Contemporary management therefore considers both the frequency and severity of stuttering and its broader effects on communication and participation. Evidence from

systematic reviews indicates that behavioural and speech-focused interventions can improve fluency-related outcomes in children who stutter, although treatment effects vary according to age, intervention approach, outcome measurement, and methodological quality of the available studies (21,25–28).

Speech-language therapy for developmental stuttering encompasses approaches that modify moments of stuttering as well as strategies intended to establish more controlled and fluent patterns of speech. Fluency-shaping or speech-restructuring approaches typically target features such as speech rate, continuity of phonation, airflow, speech initiation, and coordination among respiratory, phonatory, and articulatory processes (29–32). Such strategies are clinically relevant because developmental stuttering has been associated with differences in the neural and sensorimotor systems involved in speech initiation, timing, and motor control, while its expression may also be influenced by linguistic and emotional demands (33,34,40,43). Treatment approaches that provide children with greater control over speech timing and production may therefore offer a practical means of reducing overt disfluencies while facilitating more comfortable communication (44,45).

Prolonged Speech is a fluency-oriented technique that encourages slower and more continuous speech production through controlled prolongation of speech sounds, particularly vowels, gentle initiation of phonation, and smoother transitions between successive sounds and words. By reducing speaking rate and encouraging more coordinated respiratory, phonatory, and articulatory activity, the technique is intended to decrease abrupt speech initiation, excessive articulatory effort, repetitions, prolongations, and blocks (15,19,22,23,35). Repeated guided practice may also help children develop greater voluntary control over speech rate and continuity. Speech-restructuring approaches form part of the broader range of behavioural interventions used for developmental stuttering, although the strength of evidence differs across specific treatment programmes and age groups (36,39,41,47,53).

Pause & Talk complements this speech-motor approach by introducing deliberate pauses before or during utterances. These pauses provide additional time for speech planning, breathing, and regulation of speaking rate and may reduce the pressure to initiate or maintain speech rapidly (16,17,24,33). The technique also encourages awareness and self-regulation during communication, allowing children to organize utterances and resume speech in a more controlled manner. Because stuttering is influenced by interacting motor, linguistic, and contextual demands, combining strategies that regulate both continuous speech production and the timing of speech initiation may provide a clinically coherent approach for children with developmental stuttering (4,5,37).

Evidence supporting treatment for childhood stuttering has continued to develop, but the literature remains heterogeneous with respect to treatment protocols, participant age, outcome measures, intervention intensity, and methodological quality. Systematic reviews have identified benefits from several non-pharmacological interventions while also emphasizing the limited number of rigorous comparative studies and the need for further evaluation of treatment approaches in school-age children (38,42,45). This limitation is particularly relevant to structured combinations of fluency-oriented techniques because clinically compatible strategies may be used together even when evidence regarding their combined effects remains comparatively limited (46,50,51). Evaluating such approaches using standardized pre- and post-intervention measures may therefore provide useful preliminary evidence for clinical practice and guide subsequent controlled investigations (48,49,52,54).

Accordingly, the present study aimed to assess changes in stuttering severity and speech fluency following a structured intervention combining Prolonged Speech and Pause & Talk techniques in children aged 5–12 years with developmental stuttering. Stuttering severity was evaluated before and after therapy using the Stuttering Severity Instrument–Fourth Edition (SSI-4), with the primary objective of determining whether participants demonstrated a measurable reduction in stuttering severity following the intervention.

MATERIALS AND METHODS

A quasi-experimental pre-test–post-test study was conducted to evaluate changes in speech fluency following a combined Prolonged Speech and Pause & Talk intervention in children with developmental stuttering. The study was conducted in Lahore, Pakistan, and participants were recruited from the Children's Hospital Lahore, Mind Care Clinic, and International Therapy Center. The overall study period extended for nine months, from June 2025 to February 2026, following approval from the Research Ethics Committee.

Children aged 5–12 years with developmental stuttering were recruited using purposive sampling. Both male and female children were eligible for participation. Children with neurogenic stuttering, hearing impairment, intellectual disability, neurological disorders affecting speech or language, or other communication disorders were excluded. A total of 22 children fulfilling the eligibility criteria were included in the study and underwent baseline and post-intervention assessment. The sample size of 22 participants had been determined using an online sample-size calculator.

Stuttering severity was evaluated using the Stuttering Severity Instrument–Fourth Edition (SSI-4), a standardized instrument used to quantify the severity of stuttering by assessing core speech behaviours including the frequency and duration of stuttering and associated physical concomitants. The instrument allows stuttering severity to be classified across categories ranging from very mild to very severe and is applicable to the assessment of children who stutter (7,30–32). SSI-4 assessment was performed at baseline before initiation of therapy and repeated after completion of the intervention, allowing within-participant comparison of pre- and post-treatment stuttering severity.

The therapeutic programme combined Prolonged Speech and Pause & Talk techniques and was delivered under the supervision of a qualified speech therapist. Participants received three therapy sessions per week for 16 weeks. The Prolonged Speech component emphasized slower and more continuous speech production through prolongation of speech sounds, gentle initiation of phonation, maintenance of airflow, and smooth progression between speech segments (19,23,29,35,39,53). The Pause & Talk component incorporated deliberate pauses before and during speech to regulate speaking rate, facilitate speech planning and breathing, and promote controlled resumption of speech (15,16,24,33). Both techniques were used within the structured intervention with the common therapeutic objective of reducing speech disfluencies and facilitating more controlled speech production (5,37,44,45).

Data collection was completed sequentially in three stages. First, each participant underwent baseline assessment using the SSI-4 to determine pre-intervention stuttering severity. Second, participants completed the 16-week combined speech-therapy programme consisting of three sessions per week. Third, the SSI-4 was administered after completion of therapy, and post-intervention scores were compared with baseline values to determine the magnitude and statistical significance of change in stuttering severity.

Data were analysed using IBM SPSS Statistics version 26.0. Participant characteristics were summarized using frequencies and percentages for categorical variables and measures of central tendency and dispersion for continuous variables. SSI-4 pre- and post-intervention scores were summarized descriptively. The Shapiro–Wilk test was used to evaluate the distribution of continuous outcome data. Because the pre- and post-intervention measurements represented paired observations and the outcome distribution was treated as non-normal, changes in SSI-4 scores were evaluated using the Wilcoxon signed-rank test. Statistical significance was established at a two-sided p value of ≤ 0.05 . The magnitude of the pre- to post-intervention change was additionally expressed using an effect-size estimate derived from the Wilcoxon analysis.

RESULTS

All 22 enrolled children completed the baseline and post-intervention assessments and were included in the paired analysis. The sample comprised 14 boys (63.6%) and 8 girls (36.4%). Nine participants (40.9%) were aged 5–7 years, eight (36.4%) were aged 8–10 years, and five (22.7%) were aged 11–12 years.

Table 1. Demographic Characteristics of Participants (N = 22)

Variable	Category	n (%)
Sex	Male	14 (63.6)
	Female	8 (36.4)
Age group	5–7 years	9 (40.9)
	8–10 years	8 (36.4)
	11–12 years	5 (22.7)

Pre-intervention SSI-4 scores had a mean of 7.18 ± 1.42 , compared with 1.09 ± 0.68 after completion of therapy. The absolute reduction in the reported mean score was 6.09 points, corresponding to an 84.8% reduction relative to the baseline mean. Because the pre- and post-intervention measurements represented paired observations and were analysed non-parametrically, the Wilcoxon signed-rank test was used for inferential comparison. The reduction in SSI-4 scores was statistically significant ($Z = -3.42$, $p = 0.001$). Using ($r = |Z|/\sqrt{N}$), the corresponding effect size was 0.73, indicating a large standardized within-participant change.

Table 2. Pre- and Post-Intervention SSI-4 Scores and Paired Statistical Comparison (N = 22)

Outcome	Pre-intervention, Mean $\pm$ SD	Post-intervention, Mean $\pm$ SD	Absolute Mean Change	Relative Change (%)	Z	p Value	Effect Size, r
SSI-4 score	7.18 ± 1.42	1.09 ± 0.68	-6.09	-84.8	-3.42	0.001	0.73

SD, standard deviation; SSI-4, Stuttering Severity Instrument–Fourth Edition. Negative change values indicate lower post-intervention scores. Wilcoxon signed-rank effect size was calculated as ($r = |Z|/\sqrt{N}$), where $N = 22$ paired observations.

The distribution of stuttering severity also shifted toward lower severity categories after treatment. At baseline, 10 children (45.5%) were classified as having moderate stuttering and eight (36.4%) as having severe stuttering, while four (18.2%) were classified as mild and none as very mild. Following the intervention, 12 children (54.5%) were classified as very mild, eight (36.4%) as mild, and two (9.1%) as moderate; no participant remained in the severe category. Thus, the proportion classified as moderate or severe decreased from 18 of 22 participants (81.8%) before therapy to 2 of 22 participants (9.1%) after therapy.

Table 3. Distribution of Stuttering Severity Before and After Intervention (N = 22)

Stuttering Severity	Pre-intervention, n (%)	Post-intervention, n (%)
Very mild	0 (0.0)	12 (54.5)
Mild	4 (18.2)	8 (36.4)
Moderate	10 (45.5)	2 (9.1)
Severe	8 (36.4)	0 (0.0)
Total	22 (100.0)	22 (100.0)

Overall, the quantitative findings demonstrated a marked reduction in the reported SSI-4 scores following the 16-week combined Prolonged Speech and Pause & Talk intervention. The mean SSI-4 score decreased by 6.09 points, and the Wilcoxon signed-rank analysis confirmed that the pre- to post-intervention difference was statistically significant ($Z = -3.42$, $p = 0.001$), with a large calculated effect size ($r = 0.73$). Consistent with the continuous score findings, the severity distribution shifted substantially toward the very mild and mild categories. However, these results represent within-participant pre-post changes in a single quasi-experimental cohort and do not constitute a between-treatment comparison.

DISCUSSION

The present study evaluated changes in stuttering severity among children aged 5–12 years following a 16-week programme combining Prolonged Speech and Pause & Talk techniques. The principal finding was a substantial reduction in the reported SSI-4 score from 7.18 ± 1.42 before intervention to 1.09 ± 0.68 after intervention, representing an absolute mean reduction of 6.09 points. The paired comparison was statistically significant ($Z = -3.42$, $p = 0.001$), with a large calculated effect size ($r = 0.73$). The categorical findings showed a corresponding shift in severity: 81.8% of participants were classified as having moderate or severe stuttering before treatment compared with 9.1% after treatment, while 90.9% were classified as having mild or very mild stuttering at follow-up. Taken together, these findings indicate a marked within-participant improvement in speech fluency following the structured intervention.

The observed improvement is broadly compatible with evidence that structured behavioural and speech-focused interventions can reduce overt stuttering in children, although the strength of evidence varies substantially across treatment approaches and age groups (21,25–28,36,39). A systematic review and evidence map by Brignell et al. found potentially beneficial effects of childhood stuttering interventions but emphasized the limited high-level evidence available for school-age children and adolescents (36). Similarly, Laiho et al. concluded that intervention evidence is strongest for early childhood, whereas evidence for school-age children remains comparatively limited despite promising findings for behavioural and speech-restructuring approaches (28). Evidence specifically addressing school-age children has also identified speech restructuring, operant approaches, and combinations of treatment components among the approaches associated with reductions in stuttering, while emphasizing the need for more rigorous clinical investigation (21,26,37). The present findings therefore add supportive preliminary evidence for an integrated fluency-oriented approach but should not be interpreted as establishing comparative superiority over other stuttering interventions.

A plausible explanation for the observed change is that the two therapeutic components target complementary aspects of speech regulation. Prolonged Speech is intended to facilitate slower, more continuous speech production and greater voluntary control over phonatory and articulatory transitions, whereas Pause & Talk introduces deliberate temporal regulation that may provide additional opportunities for speech planning, respiratory organization, and controlled initiation (15,16,19,22–24,29,33,35). Contemporary models conceptualize developmental stuttering as a multifactorial neurodevelopmental disorder involving dynamic interactions among speech sensorimotor, linguistic, and emotional systems rather than a unitary speech-production deficit (1–3,8,34,43,47). Consequently, an intervention that simultaneously regulates continuity of speech production and timing of speech initiation may plausibly reduce overt disfluency, although the present study did not directly test the neurophysiological or motor mechanisms underlying treatment response.

The magnitude of improvement observed in this study should also be interpreted in the context of the broader evidence for treatment of school-age stuttering. Previous work has described a range of behavioural, fluency-shaping, speech-restructuring, self-regulation, and integrated treatment approaches for developmental stuttering (4–6,11,12,17,18,23,24,26,33,35,37,39,44,45,50,53,54). Although many interventions have demonstrated potentially beneficial changes in fluency, variation in study design, treatment intensity, outcome measurement, age range, and follow-up has limited direct comparison among programmes (21,26,28,36,42,45). These findings reinforce the clinical relevance of the reduction observed in the current cohort while also demonstrating why uncontrolled pre–post results require cautious interpretation.

An important consideration is that reduction in observable stuttering severity represents only one component of successful management. Children who stutter may also experience communication-related anxiety, negative speech attitudes, reduced confidence, stigma, avoidance, and broader effects on social participation and quality of life (10,18,20,27,46,48,49,52). Contemporary clinical perspectives

therefore support evaluation of both observable speech characteristics and the individual's broader communication experience (10,17,27,38). The present study evaluated stuttering severity using the SSI-4 but did not incorporate a separate measure of communication attitude, participation, anxiety, speech-related quality of life, or the child's subjective experience of stuttering. Future evaluations of combined fluency interventions would therefore benefit from multidimensional outcomes that capture both observable speech behaviour and the functional experience of communication.

The structured frequency and duration of therapy may also have contributed to the observed change. Participants received three sessions per week over 16 weeks, providing repeated opportunities to practise the targeted speech strategies. Repetition, structured speech practice, motor timing, pacing, and self-regulation have been incorporated into several approaches to developmental stuttering management (19,22–24,29,35,40,41,44,53). Treatment delivery characteristics may also influence outcome, including therapist guidance, treatment adherence, home practice, and consistency of technique application (12,17,38,42,50). The present findings support continued investigation of structured treatment delivery, but future trials should document session duration, adherence, treatment fidelity, home practice, therapist standardization, and the relative contribution of individual treatment components to permit more precise replication and interpretation.

Several strengths of the study should be recognized. A clearly defined paediatric age range was investigated, the intervention was delivered over a structured 16-week period, and the same standardized stuttering outcome framework was used before and after treatment. The analysis appropriately treated the observations as paired, and the Wilcoxon signed-rank test demonstrated a statistically significant pre–post difference accompanied by a large calculated effect size. The continuous outcome was also supported by a substantial shift in the reported severity distribution, providing convergent descriptive evidence of improvement.

The findings nevertheless require interpretation within the limitations of the quasi-experimental design. The sample was small and recruited purposively from selected clinical settings in Lahore, which limits external generalizability. Most importantly, the absence of a concurrent untreated or alternative-treatment control group prevents the observed improvement from being attributed exclusively to the combined intervention. Maturation, repeated exposure to assessment, regression toward the mean, concurrent influences, and other time-dependent factors cannot be excluded. The study also evaluated immediate post-intervention outcomes without longer-term follow-up; consequently, maintenance and generalization of the improvement beyond the treatment period remain uncertain. Long-term treatment studies and reviews have similarly emphasized the importance of follow-up when evaluating persistence of fluency gains (12,42). Treatment adherence and fidelity were not available as analytical variables, and the study did not include multidimensional psychosocial outcomes. These limitations are consistent with broader methodological concerns in the childhood stuttering intervention literature (26,28,36,45).

The clinical implication of the findings is therefore not that the combination of Prolonged Speech and Pause & Talk has been established as superior or definitively effective, but that children in this cohort demonstrated substantial improvement following a structured programme incorporating these techniques. Existing evidence supports continued investigation of fluency shaping, speech restructuring, pacing, self-regulation, and combined behavioural approaches while acknowledging variability in treatment response and evidence quality (5,19,23,24,29,35–39,44,45,50,53). The magnitude and consistency of the observed pre–post change justify further investigation using adequately powered controlled studies, clearly specified treatment protocols, standardized fidelity assessment, multidimensional outcomes, and longer-term follow-up. Comparative research could additionally determine whether combining the two techniques provides incremental benefit beyond either technique delivered alone.

CONCLUSION

Children with developmental stuttering demonstrated a substantial and statistically significant reduction in reported SSI-4 scores following the 16-week combined Prolonged Speech and Pause & Talk intervention, accompanied by a marked shift from moderate and severe toward mild and very mild stuttering categories. These findings support the potential clinical value of the structured combined approach for improving speech fluency; however, because the study used an uncontrolled quasi-experimental pre-test–post-test design, the observed improvement should be interpreted as a within-participant change rather than definitive evidence of treatment-specific causality.

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