

Response Cost Intervention Program for Kannada-Speaking Preschool Children who Stutter: Case Series

Divya Seth, Santosh Maruthy

Department of Speech-Language Sciences, All India Institute of Speech and Hearing, Mysore, Karnataka, India

Abstract

Introduction: Stuttering is reported to be highly prevalent in both children and adults, and has always drawn the attention of the clinicians and researchers. A vast body of literature exists on the intervention of stuttering in adults. However, research in the case of children who stutter (CWS) has gained momentum in the recent past. Research investigations in the past and clinical anecdotes have proven the potential benefits of early intervention. However, only a handful of the techniques have been explored. Response cost (RC) treatment is a widely adopted clinical approach with some positive evidence. The current study explored the effectiveness of RC treatment in preschool CWS. **Methods:** Participants were five children who stuttered in the age range of 3–6 years. Spontaneous speech samples of all children were recorded both pre- and post-treatment. Recorded samples were analyzed for percentage of syllables stuttered (%SS), parent and clinician severity ratings, stuttering severity instrument (SSI)-4 scores, and naturalness ratings. **Results:** The results revealed a significant decrease in the %SS, severity ratings, and SSI-4 scores, and significant improvement in speech naturalness ratings in all the five participants. **Conclusions:** The study is the first one to document significant clinical improvement following RC intervention in Kannada-speaking preschool CWS. Future investigations with an experimental design, larger sample sizes, and monolingual as well as bilingual participants who stutter and multiple outcome variables are warranted.

Keywords: Children who stutter, efficacy, intervention, stuttering

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INTRODUCTION

The need and advantages of early intervention for children who stutter (CWS) are well documented in literature.^[1-6] However, treatment techniques for CWS appeared relatively late when compared to adults who stutter (AWS). This delay was attributed to a strong belief in spontaneous recovery in CWS.^[7] However, literature reports several psychosocial challenges leading to behavioral, social, and emotional difficulties in CWS as young as 3 years of age.^[8] Speech-associated mal-attitude and stuttering are considered to be sharing a bidirectional or “loop” relationship,^[9] i.e., one reinforces the other. It is suggested that the longer the children continue to stutter, the fewer the chances of spontaneous recovery,^[10] and higher the risk of chronic stuttering.^[11] Thus, early intervention addressing speech and other associated difficulties in CWS would potentially reduce the impact of stuttering and the financial cost to health services.^[1] Further, Onslow and O’Brian^[2] reported that “effective childhood intervention is desirable in

order to obviate the need for speech or anxiety treatment later in life” (p. E113).

Such findings facilitated treatment research in CWS, and over the last three decades, clinical and theoretical research in preschool CWS has gained momentum. Literature on both direct and indirect approaches is available. Two popular indirect approaches are Palin Parent-Child Interaction treatment^[12] and RESTART approach,^[13] proven to be effective in treating young CWS.^[12,14,15] However, majority of the evidence in relation to intervention efficacy and outcomes has evolved from two famous direct intervention programs – the Lidcombe program^[16] and the Westmead program.^[17] Developed at Australian Stuttering Research Centre, Lidcombe program is

Address for correspondence: Ms. Divya Seth,

Department of Speech-Language Sciences, All India Institute of Speech and Hearing, Manasagangothri, Mysore - 570 006, Karnataka, India.

E-mail: 03divyaseth@gmail.com

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a parent-delivered treatment for early stuttering. It is based on the principles of operant conditioning and uses verbal contingencies to reduce stuttering. The efficacy of Lidcombe program for preschool CWS is well established through Phase I,^[18,19] Phase II,^[20-22] and Phase III clinical trials.^[16] Westmead program, also known as syllable-timed speech, demands equal stress across syllables. This approach is based on the difficult-to-test assumption that reducing the linguistic stress would in turn reduce the demands on an individual's speech-motor control system.^[23] Similar to Lidcombe program, Phase I and Phase II clinical trials of Westmead program have reported it to be an effective treatment approach, for children as young as 3–5 years, results of which were maintained at a 12-month follow-up assessment.^[17,23]

In spite of a strong evidence base for these two intervention programs, implication of the same in Indian scenario poses a few challenges. Considering Lidcombe program which primarily uses verbal contingencies, using similar verbal contingencies in Indian languages becomes difficult. While in English we can use words like “smooth” and “bumpy” to describe a child's fluent/disfluent utterances, in Indian languages finding the equivalent words which would be contextually appropriate is difficult. In addition, the educational level of parents will also be a confounding factor and may influence the way the treatment is delivered. Further, due to the cultural environment, most of the parents may prefer treatment to be delivered by a speech-language pathologist than themselves. Thus, a direct implementation of Lidcombe program in an Indian setup is not feasible. In contrast to Lidcombe, Westmead is a clinician-delivered treatment approach. However, it is commonly used with school-age CWS and involves equal stress on each syllable, which in turn alters the prosody and further the naturalness of speech. Altering the prosody during the developmental period might interfere with the development and learning of supra-segmentals of speech. Unlike school-aged children, it might be difficult for preschool children to follow instructions, and this might lead to a prolonged establishment phase. It is observed that not all treatment approaches and techniques have been investigated equally. In light of these findings, response cost (RC)^[24] posits as a potential alternative for the treatment of preschool CWS. Though literature exists on the efficacy of RC intervention in AWS,^[25-28] there is paucity of evidence on the efficacy and outcome of this intervention approach in CWS.

RC is believed to be an attractive alternative to fluency shaping and an effective treatment technique with young children. It does not involve any direct manipulation of the speech characteristics of a child, and thus it is speculated that it may not alter the speech rate and speech naturalness. It is also suggested that it can be easily administered and clinicians can be readily trained. Further, it has a high social validity that has good acceptability by parents. Hegde^[29] investigated the efficacy of RC treatment with ABAB single-subject experimental design^[30] in 43 school-aged CWS and found that the dysfluencies reduced to <2% posttreatment. Moreover,

on a follow-up after 4 years, fluency skills were maintained, and the speech was perceived as normal by the parents. In another study with eight preschool CWS, the dysfluencies were found to have reduced to 17%–5.6% posttreatment from a baseline range of 10%–22%. It was also reported that on withdrawal of the treatment there was a rise in the percentage of disfluencies to around 4.2%, which later reduced to 1.6%–3% on the reinstatement of the treatment.^[31] Although the Hegde studies used experimental designs to rule out the influence of extraneous variables and involved relatively large number of preschool children, there is still a need to establish further evidence in support of RC in treating young CWS. Additionally, there is a need to investigate RC's effects on stuttering in children who speak different languages. Therefore, the present study was designed to assess the treatment efficacy of RC in CWS in Kannada and thus enrich the evidence base for this approach. The primary objective of the study was to assess the change in the percentage of syllable stuttered (%SS), and the severity rating given by the clinician and the parents, from pre- to post-treatment for all the five participants. Another objective was to compare the speech naturalness rating by the clinician pre- and post-treatment.

METHODS

The current research was a case series designed to investigate whether clinically significant improvement will follow the administration of RC treatment with five Kannada-speaking preschool CWS. The single-subject AB clinical design with systematic follow-up was used to assess improvement in stuttering following the response-cost treatment.^[30] The present study can also be considered as the Phase I trial of CONSORT guidelines recommended by American Speech-Language and Hearing Association.^[32] The assessment and intervention was carried out in Kannada language for all participants.

Participants

Five children (3 males and 2 females) in the age range of 3–6 years (mean = 4;5 years, standard deviation = 8.58) participated in the study. The inclusion criteria for the study were as follows: (a) all the participants were native speakers of Kannada, a Dravidian language spoken in the South Indian state of Karnataka; (b) all the children were diagnosed with stuttering based on Stuttering Severity Instrument (SSI)-4; (c) the %SS was at least 3% in speech samples recorded during base rating; (d) none of the participants had undergone any stuttering intervention previously; (e) all participants had age-adequate language, screened using Modified Receptive and Expressive Language Test (3–7 years);^[33] and (f) all participants had age-appropriate articulatory skills assessed using Kannada Diagnostic Photo Articulation Test.^[34] While the pretreatment severity rating was done using the 10-point severity rating scale adapted from Lidcombe program,^[16] naturalness of speech was rated using naturalness rating as given in SSI-4.^[35] Further, they were also screened for any other physical, psychological, neurological, or communication disability apart from stuttering using WHO ICF-CY

questionnaire version 1.B (3–6 years) (2003). The study followed the “Ethical Guidelines of Bio-Behavioral Research Involving Human Subjects”^[36] and was approved by the Ethical Committee of the institute. An informed written consent was obtained from parents of all participants.

Participant 1

Participant 1 was a 5; 6-years-old female. The onset of stuttering was reported to be at 3; 6 years of age. Her mother reported that stuttering had worsened since onset. There was no significant family history reported. Her native language was Kannada, and she was exposed to English both at school and at home. Stuttering was observed in both Kannada and English. Stuttering frequency at base rating was computed as 8.33%SS. Her pretreatment SSI-4 score was 23, based on which she was diagnosed with moderate stuttering. She received a severity rating of 7 from the clinician and 8 from the parent. Clinician gave a speech naturalness rating of 7. The predominant core behaviors of stuttering observed in her were syllable repetitions and dysrhythmic phonations. Among the associated motor behaviors, she exhibited eye blinks, nose flaring and jerky articulatory movements during stuttering.

Participant 2

Participant 2 was a 3; 6-years-old male. The onset of stuttering was reported to be around 2; 6 years of age. His parents reported that there has been no change in his stuttering over this period. No significant family history was reported by the parents. He was a native speaker of Kannada and was exposed to English at school. Stuttering observed was more in Kannada than in English, plausibly because the child spoke the latter language minimally. The %SS at baserating^[24] was 10%. He had a SSI-4 score of 25 pretreatment and was diagnosed with moderate stuttering. Both the clinician and the parent agreed for a severity rating of 8, and clinician gave a speech naturalness rating of 7. The core behaviors observed in his speech were repetitions and dysrhythmic phonations. Further, he had eye blinks and movement of extremities associated with stuttering.

Participant 3

Participant 3 was a female aged 5; 1 years at the start of the study. The onset of stuttering was reported to be at 3 years of age. Her stuttering was reported to be fluctuating over this period. There was no significant family history reported, however her father reported of having fast rate of speech. She was a native speaker of Kannada language, and was exposed to English at school and Telugu in the neighborhood. Stuttering frequency was observed to be higher in Kannada, possibly because she used minimal English in her speech samples. The %SS at baserating for participant 3 was 6.33%SS. She was diagnosed of having mild stuttering with a SSI-4 score of 16. The clinician rated her as 6 on the stuttering severity rating scale, while the parents gave a rating of 4. Further, she received a naturalness rating of 6 by the clinician. The predominant core behaviors exhibited included syllable repetitions, and dysrhythmic phonations. Eye blinks were often associated with stuttering.

Participant 4

Participant 4 was male aged 4; 2 years at the start of the study. The onset of stuttering in him was reported to be around 2; 2 years of age. His mother reported that his stuttering had worsened over time. He was reported to have a positive family history of stuttering on the paternal side. He was a native speaker of Kannada and was not exposed to any other language. The %SS at baserating for him was 10.33%. His SSI-4 score was 21, and he was diagnosed with moderate stuttering. He received a stuttering severity rating of 7 from the clinician and 6 by the parent. Speech naturalness was rated as 6 by the clinician. He majorly exhibited syllable repetitions as core behavior and eye blinks were associated with them.

Participant 5

Participant 5 was a male aged 4; 2 years at the start of the study, and the onset of stuttering was reported to be around 3; 9 years of age. His mother reported that his stuttering had worsened since onset. No significant family history was reported. He was a native speaker of Kannada, and was exposed to English language both at school and at home. Stuttering was found to be more in Kannada than English, possibly due to the minimal English utterances in the speech samples elicited. Usage of English language was restricted to the lexical terms and a few phrases. The %SS at baserating computed for him was 10.33%. He was diagnosed with moderate stuttering with a SSI-4 score of 23. The stuttering severity of participant 5 was rated 8 by the clinician and 7 by the parent. He received a naturalness rating of 7 from the clinician. He had syllable repetitions and dysrhythmic phonations as predominant core behaviors. Among the associated motor behaviors, he exhibited eye blinks and jerky articulatory movements. The details of all the five participants are summarized in Table 1.

Treatment procedures

The first author served as the clinician for all participants and implemented the RC treatment program.^[24] It is a technique based on the principle of operant conditioning, where RC refers to the removal of the earned reinforcer contingent on a response that needs to be reduced or eliminated.^[37] In the context of stuttering, the procedure implies a loss of a reinforcer as a cost to stuttering. The main feature of the procedure is to reinforce fluent utterances with tokens. At the end of the session, the child is allowed to exchange the tokens for a preselected reinforcer. As soon as a stutter is observed, a token is withdrawn.

RC technique^[24] includes three phases: (a) Phase-I – Baserating; (b) Phase II – Establishment of fluency using RC treatment; and (c) Phase III – Maintenance of fluency. Phase I (Baserating) included baseline assessment which was carried out for the initial 2–3 sessions. Phase II was the establishment of fluency, which further comprised of four steps as follows: (i) sentence level; (ii) continuous speech level; (iii) narration level; (iv) conversation level. The treatment began at the sentence level. Fluent productions were modeled and child was encouraged to follow the modeled production. A token was

Table 1: Individual participant information for children who stutter

Participant number	Age (years; months)/gender	Onset of stuttering (years; months)	The family history of stuttering	Pretreatment SSI-4 score	Severity of stuttering based on SSI-4	CSR	PSR	Speech naturalness rating (SSI-4)
1	5; 6/female	3; 6	Negative	23	Moderate	7	8	7
2	3; 6/male	2; 6	Negative	25	Moderate	8	8	7
3	5; 1/female	3; 0	Negative	16	Mild	6	4	6
4	4; 2/male	2; 2	Positive	21	Moderate	7	6	6
5	4; 2/male	3; 9	Negative	23	Moderate	8	7	7

SSI: Stuttering severity instrument, CSR: Clinician severity rating, PSR: Parent severity rating

given for every fluent production, and the same was withdrawn in case of a disfluent production. Once the child achieved a minimum of 95% fluency at sentence level in two to three consecutive sessions, the treatment progressed to the next level. The same criteria were used to move from continuous level to narration level and further to conversation level. Once the child attained 95% or greater fluency at conversation level with a severity rating of 1–2 maintained for two to three consecutive sessions, the Phase II was considered complete and the child was discharged from the treatment. Phase III, the maintenance phase, included three follow-up evaluations scheduled after 1 month, 3 months, and 6 months of discharge.

Speech sampling

All participants were seated comfortably in a quiet room with adequate lighting. Spontaneous speech samples of 500 syllables were obtained from each of the participants at different levels of treatment. The samples were evoked in a play environment where the child was provided with age-appropriate toys and picture materials. Clinician and the parent provided prompts to evoke spontaneous and adequate speech samples. The samples were audio-video recorded using a Sony Cyber-Shot Digital Camera, model W390 for further analyses.

Both within- and beyond-clinic samples were obtained at eight time points (baserating, on completion of each of the four levels, 1-month follow-up, 3-month follow-up, and 6-month follow-up). Within-clinic samples included child's interaction with the clinician and the parent, while beyond-clinic samples included child's interaction at home (referred to as Home 1 and Home 2). A total of 32 (8 time points × 4 samples) samples were to be evoked from each of the participants. However, participant 4 did not return for the 6-month follow-up and thus only 28 samples were obtained from him. Thus, a total of 156 samples (4 participants × 32 samples + 1 participant × 28 samples) were recorded from the five participants. All the participants underwent intensive treatment which comprised of four to five sessions per week, which were of 1-h duration.

The recorded samples were transferred to a personal laptop (HP 15-ay019tu Core i3 5th Gen) and transcribed by the first author using IPA. The transcribed samples were then analyzed for disfluencies using the Yairi and Ambrose^[38] classification of stuttering-like disfluencies.

Outcome measures

The primary outcome measure used was percentage of syllables stuttered (%SS), measured using the standard formula: $[(\text{total number of syllables stuttered} / \text{total number of syllables in speech sample}) \times 100]$ at eight time points. In addition, parent severity rating (PSR) and clinician severity rating (CSR) were included as outcome variables. The severity rating scale used in the study was a 10-point rating scale adapted from the Lidcombe program, where “0” indicates no stuttering and “9” indicates extremely severe stuttering.^[16] The severity rating was done for every session both by the clinician and the parent/caregiver.

The SSI-4 scores were noted pre- and post-treatment. The investigator also rated speech naturalness both pre-and post-treatment using the SSI-4 9-point naturalness rating scale. This rating scale ranges from “1” to “9,” where “1” denotes “*highly natural sounding speech*” and “9” represents “*highly unnatural sounding speech*.” Further, total number of sessions required to attain discharge criteria by each of the participants was also considered.

Reliability analyses

Intra- and inter-judge reliability analysis was carried out for 10% of the data (16 samples) for %SS. These samples were selected randomly from the total pool of 156 samples. For intra-judge reliability, the investigator re-analyzed 10% of the data after a gap of 10 days from the first analysis. Inter-judge reliability was established using the analysis done by another speech language pathologist with a clinical and research experience of more than 5 years in fluency disorders.

RESULTS

The results revealed significant reduction in stuttering for all the five participants. The %SS for all five participants across eight time points in four conditions is summarized in Table 2.

Participant 1

In within-clinic condition, the %SS during the clinician–child interaction for participant 1 reduced from 8.33%SS at baserating to 1.33%SS on completion of the intervention program. Further, on follow-up evaluations the disfluency rates were maintained between 0.00 and 1.67%SS. Similarly, the %SS for within-clinic parent–child interaction at baserating was 6.67%, which reduced to 1.33%SS posttreatment and 0.00–0.67%SS on follow-up. During the two beyond-clinic

Table 2: Stuttering frequency (in percentage of syllables stuttered) at eight assessment points for both within- and beyond-clinic situations

	Baserating	Level 1	Level 2	Level 3	Level 4	1-month follow-up	3-months follow-up	6-months follow-up
P1								
Clinician	8.33	3.33	3.00	3.67	1.33	1.67	0.33	0.00
Parent	6.67	3.00	2.33	1.00	1.33	0.67	0.33	0.00
Home 1	5.91	1.67	3.00	3.00	1.00	2.33	1.00	0.00
Home 2	6.00	1.33	2.33	1.67	0.67	1.33	0.00	0.33
P2								
Clinician	10.00	3.33	2.33	2.66	1.00	0.00	0.33	0.00
Parent	7.00	2.33	2.00	1.67	0.67	0.00	0.33	0.67
Home 1	3.33	3.33	2.51	1.67	1.00	0.00	0.33	0.67
Home 2	5.00	3.00	2.00	1.33	0.33	0.67	0.33	0.33
P3								
Clinician	6.33	2.33	1.67	1.33	0.67	2.00	0.67	1.33
Parent	4.66	1.67	1.67	1.33	0.67	1.67	1.00	1.67
Home 1	4.00	1.33	1.33	1.00	1.33	1.67	0.33	1.33
Home 2	4.66	2.00	0.67	0.67	1.33	1.33	0.67	2.00
P4								
Clinician	10.33	4.33	1.33	1.00	0.00	0.00	0.33	N/A ^a
Parent	7.33	3.33	0.67	0.33	0.67	0.00	0.00	N/A ^a
Home 1	8.67	3.67	1.67	0.67	0.67	0.33	0.00	N/A ^a
Home 2	7.67	4.00	1.00	0.33	0.67	0.00	0.00	N/A ^a
P5								
Clinician	10.33	2.67	1.67	0.00	0.00	0.33	0.67	0.33
Parent	7.33	2.33	1.33	1.00	0.00	0.33	0.33	0.00
Home 1	6.33	3.00	1.33	0.67	0.00	0.33	0.33	0.00
Home 2	8.33	2.33	0.67	1.33	0.00	0.00	0.33	0.00

^aP4 did not report for 6-month follow-up

interactions, the baserating was 5.91%SS and 6.00%SS, respectively. These reduced to 1.00%SS and 0.67%SS posttreatment, and were further maintained at 0.00%SS and 0.33%SS on a 6-month follow-up evaluation. Participant 1 completed Phase II of the treatment program over a span of 23 sessions. Figure 1 depicts the PSR and CSR for participant 1 during the treatment phase across 23 sessions. Significant reduction in both PSR and CSR can be observed in Figure 1. Pretreatment, participant 1 had received a score of 23 on SSI-4, which reduced to a score of 6 posttreatment. He received a naturalness rating of 7 pretreatment; while posttreatment his speech naturalness was rated as 1.

Among the disfluencies observed, syllable and monosyllabic word repetitions were resolved first in participant 1 followed by dysrhythmic phonations. Additionally, her associated motor behaviors were also not observed posttreatment.

Participant 2

In within-clinic condition, during clinician–child interaction, participant 2 had 10.00%SS at baserating which later reduced to 1.00%SS posttreatment. The disfluency rates on follow-up ranged between 0.00 and 0.33%SS. Further, the disfluency rate of parent–child interaction during within-clinic condition was 7.00%SS which reduced to 0.67%SS posttreatment, and ranged between 0.00 and 0.67%SS on follow-ups. Results of beyond-clinic condition revealed the %SS at baserating

to be 3.33%SS and 5.00%SS. These reduced to 1.00%SS and 0.33%SS post-treatment, and 0.67%SS and 0.33%SS on 6-month follow-up. It took 27 sessions for participant 2 to complete the Phase II of the treatment. Figure 2 illustrates the PSR and CSR for participant 2 through the treatment phase, which shows significant reduction in both PSR and CSR. Administration of SSI-4 revealed a score of 25 pretreatment and a score of 6 posttreatment. Further, participant 2 received a naturalness rating of 7 pretreatment and 1 posttreatment.

It was observed that among the disfluencies, syllable and monosyllabic word repetitions were the first ones to reduce and dysrhythmic phonations were the most difficult to resolve. The reduction in disfluency rates were further accompanied by absence of any associated motor behaviors observed pretreatment.

Participant 3

In within-clinic condition, during clinician–child interaction Participant 3 had 6.33%SS at baserating which later reduced to 0.67%SS posttreatment. The disfluency rates on follow-up ranged between 0.00 and 0.33%SS. Further, the disfluency rate of parent–child interaction during within-clinic condition was 4.66%SS which reduced to 0.67%SS posttreatment, and ranged between 1.00 and 1.67%SS on follow-ups. Results of beyond-clinic condition revealed the %SS at baserating to be 4.00%SS and 4.66%SS. These reduced to 1.33%SS posttreatment, and 1.33%SS and 2.0%SS on 6-month

follow-up. Participant 3 took 17 sessions to complete the Phase II of the treatment program. Figure 3 depicts the daily severity rating for participant 3, and a significant reduction in both PSR and CSR is observed through the course of the treatment. SSI-4 score for participant 3 was 16 pretreatment and <4 posttreatment. Further, the speech naturalness was rated as 6 pretreatment and 2 posttreatment.

Similar to the first two participants, even for participant 3 syllable repetitions resolved first followed by the dysrhythmic phonations. Eye-blinks were observed as associated motor behavior pretreatment in participant 3, however no such behaviors were exhibited posttreatment.

Participant 4

In within-clinic condition, the %SS during the clinician-child interaction for Participant 4 reduced from 10.33%SS at

baserating to 0.00%SS on completion of the intervention program. Further, on follow-up evaluations the disfluency rates were maintained between 0.00 and 0.33%SS. Similarly, the %SS for within-clinic parent-child interaction at baserating was 7.33%, which reduced to 0.67%SS posttreatment and 0.00%SS on follow-up. During the two beyond-clinic interactions the baserating was 8.67%SS and 7.67%SS respectively. These reduced to 0.67%SS posttreatment, and were further maintained at 0.00%SS a 3-months follow-up evaluation. Participant 4 did not report for 6-months follow-up. Overall participant 4 needed 20 sessions to complete the Phase II of intervention. Figure 4 illustrates the PSR and CSR for participant 4 through the course of intervention, and significant reduction in both PSR and CSR is observed. Participant 4 received a SSI score of 21 pretreatment, whereas posttreatment it was 0. The naturalness rating according to

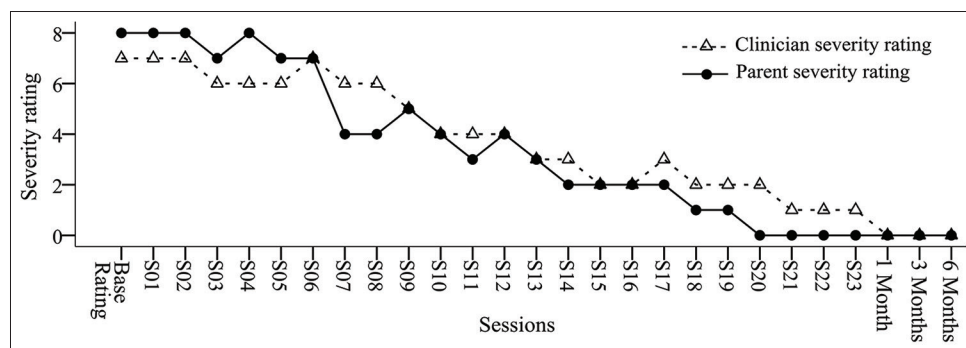


Figure 1: Parent severity rating and clinician severity rating across sessions for participant 1

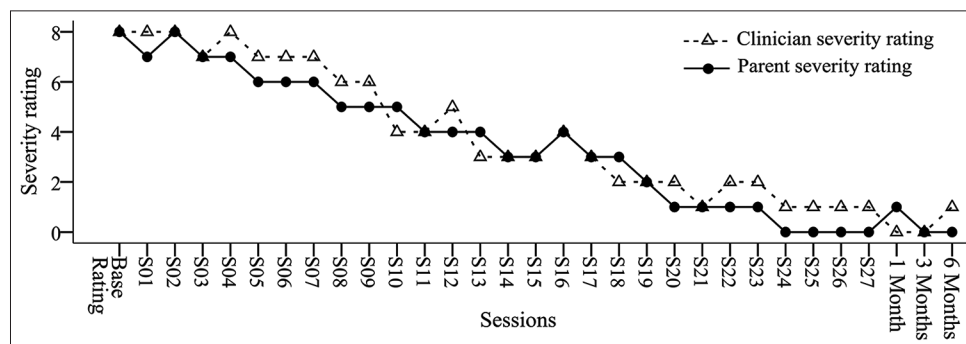


Figure 2: Parent severity rating and clinician severity rating across sessions for participant 2

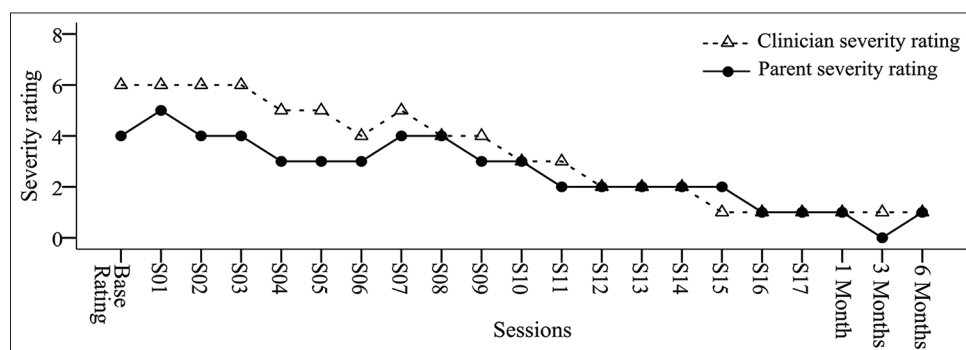


Figure 3: Parent severity rating and clinician severity rating across sessions for participant 3

SSI-4 was 6 pretreatment and 1 posttreatment. No associated motor behaviors were observed posttreatment in participant 4.

Participant 5

In within-clinic condition, during clinician-child interaction Participant 5 had 10.33%SS at baserating which later reduced to 0.00%SS posttreatment. The disfluency rates on follow-up ranged between 0.33 and 0.67%SS. Further, the disfluency rate of parent-child interaction during within-clinic condition was 7.33%SS which reduced to 0.00%SS posttreatment, and ranged between 0.00 and 0.33%SS on follow-ups. Results of beyond-clinic condition revealed the %SS at baserating to be 6.33%SS and 8.33%SS. These reduced to 0.00%SS posttreatment, and was maintained at 0.00%SS on 6-month follow-up. It took 29 sessions for participant 5 to complete the phase II of the treatment program. Through the course of the intervention program, a significant reduction was observed in both PSR and CSR for participant 5 as depicted in Figure 5. Pretreatment SSI-4 score for participant 5 was 23, while the posttreatment score was 0. Speech naturalness rated using naturalness rating scale of SSI-4 was 7 pretreatment and 2 posttreatment.

Similar to other participants, participant 5 experienced difficulty correcting dysrhythmic phonations than syllable and monosyllabic word repetitions. Further, participant 5 did not exhibit any associated motor behaviors post treatment.

Intra- and inter-judge reliability measures

Both intra- and inter-judge reliability measures were carried out for 10% of the data and the results are summarized in Table 3.

The results of reliability analysis revealed that for intra-judge reliability 15 out of 16 samples differed by <1% SS, and 1 out of 16 differed by 1.33%SS. High intrajudge reliability was established with Cronbach's α of 0.99. Similarly, for interjudge reliability measure 14 out of 16 samples were found to differ by <1%SS, while 2 samples differed by 1.40–1.60%SS. Interjudge reliability was found to be high with Cronbach's α of 0.98.

DISCUSSION

The findings of the present study suggest a significant reduction in dysfluencies following the implementation of the RC treatment for all five preschool CWS with near-zero stuttering rates. Further, near-zero stuttering rates were maintained at 6-month follow-up post Phase II. These results are in consensus with the findings of Hegde in school-age^[29] and preschool-age CWS.^[31] These findings are also comparable with other intervention approaches for early intervention like the Lidcombe Program,^[22,39-43] Palin Parent-Child Interaction treatment,^[12,14] and RESTART approach.^[15] The number of sessions required to reach near-zero stuttering rates by the participants in the present study ranged between 17 and 29 with an average of 23 sessions, slightly more than the earlier investigations reporting an average of 13–17 sessions^[20,22,41] for preschoolers. To our knowledge, the study is the first one to document the efficacy of RC in Kannada-speaking preschool CWS.

Higher number of treatment sessions per child could be attributed to the fact that unlike Lidcombe program, where parents deliver the treatment and corrective feedback is

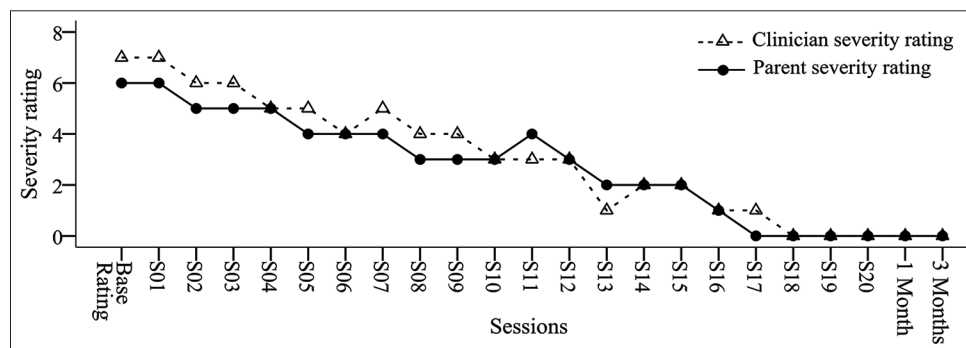


Figure 4: Parent severity rating and clinician severity rating across sessions for participant 4

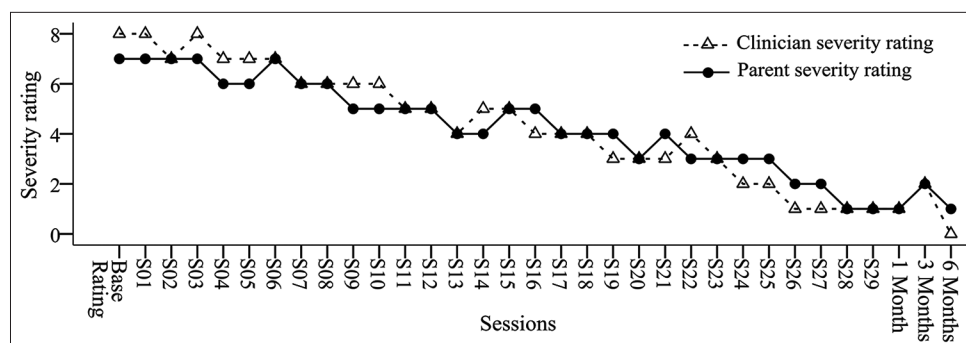


Figure 5: Parent severity rating and clinician severity rating across sessions for participant 5

Table 3: Intra- and inter-judge reliability measures for percentage of syllables stuttered by two independent judges

Sample	Percentage of syllables stuttered		
	Primary judge		Secondary judge
	1 st rating	2 nd rating	
1	0.67	0.40*	1.00**
2	0.00	0.00*	0.00**
3	3.00	3.60*	2.00
4	0.67	0.67*	0.60**
5	2.00	2.20*	2.40**
6	0.67	0.80*	0.80**
7	1.33	1.33*	1.60**
8	1.33	1.40*	1.40**
9	1.33	1.33*	1.20**
10	0.67	0.67*	0.60**
11	1.33	1.20*	1.80**
12	0.33	0.33*	0.40**
13	0.00	0.00*	0.00**
14	0.67	0.67*	1.00**
15	4.00	3.80*	5.20
16	8.33	7.00	7.60**

*A difference of <1%SS between the first and the second rating by the primary rater, **A difference of <1%SS between the ratings of the two raters. %SS: Percentage of syllables stuttered

given through the day, clinicians reinforced fluent utterances with tokens and withdrew them for dysfluencies during the treatment sessions. The parents did not receive any formal training to provide corrective feedback or reinforcers. Further, the amount of time parents would have spent at home to work on the child's speech was negligible. All participants except participant 3 (17 sessions) took more than 20 sessions. Participant 3's early recovery could be attributed to her lower degree of stuttering severity (mild) when compared to all other participants (moderate). Another important observation made was that, though the participants took higher number of treatment sessions compared to the existing literature on preschool CWS, overall duration was lesser. The study conducted intensive sessions, four to five per week, and the establishment phase could be achieved in a span of 4–6 weeks, unlike studies reported in literature where the establishment phase spanned between 12 and 57 weeks.^[44] Thus, the overall treatment duration was lesser, which implies that intensive sessions could bring significant changes in shorter duration. The changes were found to be maintained even at 6-month follow-up, which further validates the findings. It is also speculated that intensive sessions could help control the interference of maturational effects, which often is a confounding factor in such investigations. Future investigations with bigger sample size could consider number of sessions as a factor and subgroup the participants on severity basis.

In addition to the %SS, stuttering severity rating both by the clinician (CSR) and the parents (PSR) were considered

as an outcome variable. The severity rating was carried out for each session to gauge the child's progress and nature of stuttering on a daily basis. It can be inferred from the figures above (1 through 5) that both CSR and PSR reduced significantly from baserating to discharge and follow-up assessments for all the participants. Further, it is observed that CSR and PSR followed similar trajectory for all participants. These findings corroborate with earlier investigations, which considered severity rating as an outcome measure.^[23,41,44,45] Further, they emphasize on the role and need to involve parents in the assessment and intervention process. Parents/caregivers could provide a better judgment for the severity and changes in stuttering as they observe the child's speech over sustained time in multiple and natural settings. Future investigations could include PSR and similar outcome measures which involve parents' evaluation of their child's stuttering, its severity and impact on the child and the significant others. A major concern addressed earlier in the introduction section was the loss of naturalness of speech using fluency shaping techniques. The study hypothesized that the use of RC will not alter the naturalness of speech. Thus, it was considered as an outcome variable in the present study, and the naturalness rating scale given in SSI-4 was used for this purpose. Pretreatment naturalness was found to be affected, and significant improvement in naturalness rating was seen posttreatment for all the five participants, wherein each of them received a rating of 1 or 2. Thus, the findings confirm that RC treatment doesn't alter speech naturalness and could be used as an effective treatment program for preschool CWS. Further, the findings also emphasize the need to include naturalness rating as one of the outcome variables for efficacy studies with CWS.

CONCLUSIONS

The study aimed to investigate the efficacy of RC treatment in Kannada-speaking preschool CWS. Five preschool CWS were recruited for the study. Spontaneous speech samples were evoked from all participants at several time points. The outcomes of the study provide the first documentation of use of RC in Kannada-speaking preschool CWS. The treatment outcomes were positive with significant reduction in disfluencies and severity rating for all participants without altering the speech naturalness. Further, associated motor behaviors were also found to have eliminated once the disfluencies reduced. The findings also highlight the advantages of intensive sessions. The study was a preliminary attempt, carried out with only five subjects. Further research should include single-subject and group experimental designs, and address frequency of treatment sessions, differential effects on monolingual versus bilingual CWS, and multiple outcome measures.

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Conflicts of interest

There are no conflicts of interest.

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