

# Research Paper: Using Syllabic Speech Technique to Decline Stuttering Severity in Persian-speaking School-age Children With Stuttering



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## ABSTRACT

**Introduction:** Studies have shown that Syllable Speech Technique (SST) can be a useful and practical way to achieve stutter-free speech for Children With Stuttering (CWS). In this preliminary study, the use of SST in Persian-speaking school-age CWS was investigated.

**Materials and Methods:** Ten 8- to 11-year-old students with stuttering were entered in the single-group pretest-posttest study as participants. Their speech fluency has been enhanced using SST accompanied by verbal encouragement for stutter-free speech. The percentage of stuttered syllables, stuttering severity, and communication attitude as outcome measures were evaluated in three time points: before the intervention (T0), after the intervention (T1), and one month after the intervention (T2).

**Results:** The children showed significantly better scores on all outcome measures at T1 ( $P \leq 0.004$ ) and T2 ( $P \leq 0.005$ ) compared with T0. There was no significant difference between T1 and T2 ( $P \geq 0.026$ ).

**Conclusion:** The reported benefits of SST in stuttering reduction and speech-related anxiety-relieving of Persian-speaking school-age CWS confirms the feasibility and usefulness of this technique.

**Keywords:** Stuttering, Syllabic speech, School-age children

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## 1. Introduction

**S**tuttering, as a motor speech disorder, is manifested as repetitions, blocks, or prolongations on speech units such as phonemes, syllables, and words [1]. The prevalence of stuttering is nearly 1% [2]. Although about 70% of children naturally recover from primary stuttering before the age of 7 [3], most school-age Children With Stuttering (CWS) need speech therapy programs to reduce the severity of stuttering. As CWS enters primary school and becomes more aware of their speech characteristics, they become frustrated as they receive negative reactions from classmates. More than 80% of school-age CWS are reported to be teased by classmates for stuttering [4]. These children often have a negative attitude towards their verbal communication. Frustration, shame, and hatred are some of the most common feelings experienced with stuttering, and as the child grows into adolescence, these feelings worsen [4]. Researchers have emphasized that if these unpleasant verbal experiences continue, stuttering will become more complex at later ages and can even affect friend-finding and job search [5, 6].

In general, stuttering treatment for CWS can be divided into direct and indirect strategies. Indirect strategies improve the child's communicative verbal environment by slowing down parents' speaking speed, speech turn-taking, and eliminating stressors [1]. In these strategies, the CWS is required to change the rate, rhythm, style, or speech prosody [1]. The importance of direct stuttering treatments for CWS at school age is due to the worsening of stuttering symptoms (e.g. repeats, blocks, or prolongations) and negative experiences at this age. If primary speech dysfluencies in CWS are neglected, there is a risk of adding secondary behaviors (i.e. cognitive, affective, and social problems) to motor stuttering disorders [7]. Therefore, it is necessary to treat the primary speech dysfluencies using fluency-enhancing techniques before the dysfluencies become more complex.

The variability model (V-model) proposes that stuttering occurs when speakers cannot smoothly execute the stressed-syllables of words or sentences as they produce a syllable to the next one with additive oro-motor forces [8]. Rhythmic or Syllabic Speech Technique (SST) is a fluency-enhancing way to eliminate speech dysfluencies in persons with stuttering [9]. In this technique, the words and phrases of sentences have been regularly said in time to rhythmic beats (e.g. This-is-a-car, I-went-to-Teh-ran-ci-ty-with-that). Increasingly, additive stress factors within words and phrases may increase

the linguistic demands, and CWS will overcome speech production difficulties [10]. The SST can almost clear stress contrasts across syllables of words and sentences and convert the speech to a monotonic style of spoken syllables and reform that to stutter-free speech [9]. According to Trajkovski et al., the simple feasibility of this technique can even encourage young CWS to learn and implement its methods [11]. Regardless of the more primary studies, Coppola and Yairi, in a 3-single-subject study design, accomplished a programmed instruction of the SST to decrease the stuttering severity. Although they found that stuttering severity clinically decreased in two children after 6 weeks of treatment, the within-clinic fluent speech did not generalize to daily activities of verbal communication [12]. Andrews et al. investigated the SST with ten school-age CWS. They trained the children and their parents to use a non-programmed treatment format of the SST at a comfortable level of speech rates. Findings demonstrated that nine of the participants showed a significant reduction in stuttering [13]. Researchers have strictly suggested that further studies are needed to investigate the relieving effects of the SST on speech dysfluencies in other languages [14, 15].

The Persian language, a member of the Indo-European family of languages, is spoken by over 100 million people in Iran, Afghanistan, Tajikistan, and other countries [16]. Like the English language, stress can appear in various positions of words in the Persian language. For example, the compound nouns /bâz-kon/, which means "opener" or /pâk-kon/, which means "eraser", are stressed on the final syllable. In contrast, the verb phrases represented by /bâzkon/, which means "open", and /pâkkon/, which means "clean", are stressed on the initial syllable [17]. In detail, research supporting the efficacy of the SST to treat stuttering in non-English speaking school-age CWS is scarce. Although the low effects of this technique on speech dysfluencies in English-speaking CWS is noticeable, to the best of our knowledge in Persian-language, there is no experimental evidence about the effectiveness of the SST on school-age CWS. Therefore, we aimed to determine the effects of the SST on improving the severity and secondary behaviors of stuttering in Persian-speaking school-age CWS based on a single-group pretest-posttest study design.

## 2. Materials and Methods

### Study participants

Participants were ten school-age children (6 boys and 4 girls with a Mean±SD age of 9.18±0.89 years) who suffered from developmental stuttering. All children were

received a diagnosis of stuttering by the first author, who is a Speech and Language Pathologist (SLP) and is experienced in stuttering therapy. He did screening assessments based on the following formula with a 200-syllables speech sample. According to this formula, if the computed dysfluency score was more than 4, the child's speech was known as stuttering [18, 19].

Dysfluency score=[(Part-word repetitions+mono-syllable word repetition)×average repetition units+2×the frequency of blocks and prolongations]

The eligible children for the study were stuttered for more than 12 months before the current research. All children had discontinued speech therapy sessions for at least 6 months before participating in the study. All participants had a normal range of IQ. The children and their families were monolingual and spoke Persian as their preferred language. Table 1 lists the demographic characteristics of the participants in terms of chronological age, gender, characteristics of their stuttering, and histories. Neither of the participants had co-morbidity, except M.R., who was diagnosed with literacy problems and lisp distortion on consonants /s/ and /z/. Eight participants previously had short-term speech therapy courses for the stuttering disorder, but none had the training to speak with the SST manner.

### Study design

The children were studied with a single-group pretest-posttest design. The SST treatment was implemented in three stages (Table 2). During stage 1, the participants and their parents attended the clinic twice a week (one-hourly sessions) to learn the principles and patterns of the SST and familiarize themselves with the task. Imitation and rehearsal were utilized to reach the SST patterns at near natural-sounding speech rate and intonation in stage 2. The parents were asked to reinforce the SST usage at home. They insisted that the children utilize it in daily verbal communication (e.g., book-reading, storytelling, shopping, and driving in the car). Although the efficacy of stuttering treatment on school-age CWS is dependent on the interaction between several factors such as cognitive, linguistic, or motor factors [7, 20], it has been suggested that verbal reinforcement showed some beneficial effects on CWS treatment [21]. Verbal reinforcement was, therefore, presented when the parent and child verbally interacted together and when the child wanted to communicate with others verbally. These reinforcements involved positive sentences, for example, "That was excellent talking!" or "Well done! I think you spoke very smooth". The clinician also trained the par-

ents to use declarative feedback for stuttered moments of speech by asking sentences like "That was a bit stressful word, can you syllabically say that again, robotic manner?". In stage 3, the clinician tried to generalize and transfer the learned methods into the communication-related activities of daily living of the children such as parent-, friends-, or other interlocutors-child verbal interactions. Twelve therapeutic sessions had been held for 1.5 months for the participants.

Outcomes of the study were divided into primary and secondary measures. The percentage of Stuttered Syllables (%SS) and stuttering severity based on the Persian version of the Stuttering Severity Instrument (SSI-3) in the clinic environment was considered the primary outcome measures. Stuttering Severity Rating (SR) based on parents' assessment at home, self-reported speech satisfaction based on the Persian version of Communication Attitude Test (CAT), and speech quality rating based on the teacher-report questionnaire were scaled as the secondary outcome measures. Interclass correlation coefficient reliability of the SSI-3, which evaluated children's stuttering is more than 86% [22].

Measure %SS, an index which is agreed between clinicians as stuttering severity scale [23], was compared at three time points of the study: before the intervention (T0), immediately after the intervention (T1), and one month after the end of the intervention (T2). For calculation of %SS at each section of treatment, we recorded a 3-min spontaneous speech sample of the children from two different situations (within- and beyond-clinical conversation). The .mp3 format of speech samples was audio-recorded using a Sunny JXD/D61 digital sound-recorder (made in China). The children's speech samples were given to a blinded SLP who was experienced in the stuttering assessment. She counted the total number of uttered-syllables, the number of stuttered syllables and then calculated the %SS using the formula 1:

$$1. \%SS = \frac{\text{No. of Stuttered syllables} \times 100}{\text{Total No. of uttered syllables}}$$

The trained parents were obligated to daily document the SR of the child's stuttering using a 8-point severity rating scale where 1=no stuttering, 2=very mild, 3=mild, 4=mild to moderate, 5=moderate, 6=moderate to severe, 7=severe, and 8=extremely severe stuttering. The parents should be quantitatively rated the severity of stuttering-like behaviors. Ultimately, the average score of SR belonged to the first week of treatment, the first week immediately post-treatment, and the last week of one month after treatment were respectively considered

**Table 1.** The participants’ demographic characteristics

Participant	Age (y/m)	Gender	Co-morbidity	Age at Stuttering Onset	Family History	Speech Therapy History
A.K.	10.10	F	N	3.5	N	Y
B.Z.	9.11	M	N	3.5	Y	Y
P.Z.	9.10	M	N	3	Y	Y
H.R.	9.11	M	N	3	N	Y
E.N.	10.10	F	N	4	Y	Y
B.T.	8.02	M	N	3	N	N
H.K.	8.09	F	N	5	N	Y
K.R.	8.03	F	N	3	N	N
M.S.	10.11	M	N	4	N	Y
M.R.	10.05	M	Y	4.5	Y	Y
Mean or Ratio	9.18±0.89	F/M: 4/6	Y/N: 1/9	3.7±0.71	Y/N: 4/6	Y/N: 8/2

M: Male; F: Female; y: year; m: month; Y: Yes; N: No

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as pre-treatment, post-treatment, and follow-up scores for the children’s SR.

The Persian-version of CAT for school-age children is a suitable instrument (with CVR=0.95 and ICC=0.91) that can assess the speech-related attitude of students who stutter [24]. This test includes 35 declarative sentences so that each sentence has a negative or positive

value to evaluate the verbal communication attitude of CWS. If a student say “Yes” to a sentence with a negative value, s/he takes zero point for that sentence, and reversely if that student says “No” to that sentence, s/he takes 1 point. Also, answering “Yes” to a sentence with a positive value would gain 1 point, and answering “No” to that would score zero point. Regarding CAT, a student may receive from 0 to 35 scores regarding her/his verbal

**Table 2.** Protocol of treatment

Steps	Procedures
	Goal: The children and their parents accept the rationale of the SST and learn to utilize it. Instructions.
1	To display and model the concept of cadence and beats. To use a finger tap on the table and utter one syllable per second. To liken the SST manner to “Robot speech.” The children are encouraged by parents within therapeutic sessions.
	Goal: The children generalized the SST to various speech tasks. Instructions.
2	To increase the number of beats per minute to 120 beats per minute (bpm). To perform the SST in reading, answering, and monologue with a model as needed.
	Goal: Increasing the self-regularity and transferring the technique to activities of daily living. Instructions.
3	To design and perform home assignments with optimal bpm rate. To conduct brief beyond-clinic exercises along with supervision by the therapist. To analyze the contingent stuttering during a speech by self. If stuttering occurs, parents supported children but gradually withdraw the SST practice with the children.

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**Table 3.** The percentage of stuttered syllables in three time points of testing

Participants	Time Points of Computing the %SS			Test a,b, P*
	T0	T1	T2	
A.K.	4.7	1.0	1.1	$\chi^2=17.7, P<0.001$ [WSRT: Z=-2.8, P=0.005 for T1 and T2 vs T0, but WSRT: Z=-2.1, P=0.035 for T2 vs T1]
B.Z.	14.0	1.9	1.9	
P.Z.	7.4	1.4	1.5	
H.R.	16.5	3.1	3.6	
E.N.	12.4	1.9	2.8	
B.T.	4.9	0.6	1.0	
H.K.	6.0	0.2	0.5	
K.R.	5.7	0.9	0.9	
M.S.	18.2	4.2	4.0	
M.R.	25.5	4.9	7.3	
Mean±SD	11.5±7.1	2.0±1.6	2.5±2.1	



T0: before the treatment; T1: immediately after the treatment; T2: one month after the end of therapy; Test a,b, Friedman’s test with post hoc Wilcoxon Signed Ranks Test (WSRT).

\*Intra-group comparison; Significance was set at  $P \leq 0.01$

communication attitude. Based on the Persian version of CAT in school-age children, the scores under 11 represent completely negative attitude, the scores from 11 to 19 show negative attitudes, the scores from 20 to 24 indicate moderate attitude, the scores from 25 to 31 indicate positive attitude, and scores above 31 show entirely positive attitude [25]. This test was used to self-rate the participants’ attitudes concerning their verbal communication beliefs and feelings at three sections of the study.

A teacher-report questionnaire (Appendix A), self-structured by the authors, was given to children’s teachers at three sections of treatment (before, immediately, and one month after the end of treatment) to evaluate the social validity of the interventions. Briefly, the social validity of a practical intervention is known as the benefits of a clinical technique to resolve the disorder-induced other problems in everyday life [26]. For example, we assumed that if teachers report that children’s oral school-tasks after stuttering treatments became better, we would then conclude the treatment effects were meaningful and socially is valid. The sum of the scores of the statements was considered as a total score of the teacher-report questionnaire. The range (minimum to

maximum) of the total score of each child on this questionnaire was changeable from 4 to 20.

### Reliability of data

At the end of treatment, the children’s speech samples were given to an assessor for counting the number of total uttered/stuttered syllables, determining the stuttering frequency, and computing the average length of three longest stuttering moments. The assessor was unfamiliar with the purpose of the study, the conditions under which the speech samples were elicited, and the participants’ identity. To more precisely calculate the children’s %SS and the total overall score of SSI-3, the assessor was asked twice at a week interval to score them, and her total of the outcome assessment recordings was selected to confirm intra-rater agreement as to the consistency with which one rater assigns scores [27]. The percentage of intra-rater agreement was computed using the Formula 2, and a score of greater than 90% was taken as acceptable.

$$2. \text{ Intra-rater agreement} = \frac{\text{Agreements} \times 100}{\text{Agreements} + \text{Disagreements}}$$

The percentage of intra-rater agreement of the %SS and the total overall score of SSI-3 was greater than 97%.

All disagreements between the assessor and the authors were resolved by discussion with the first author.

### Statistical analysis

In this study, continuous variables are presented as Mean±SD and discontinuous variables as frequency (or percentage of frequency). If the data distribution using the one-sample Kolmogorov-Smirnov test was not normal, the nonparametric Friedman’s test with post hoc Wilcoxon Signed Ranks Test (WSRT) would be used to determine the within-subjects (the sections of treatment) differences for all independent variables. The level of significance was set at  $P \leq 0.01$  for the data.

### 3. Results

As noted earlier, the current study’s outcome measures were divided into two primary and secondary groups. This section reports the findings related to each outcome measure group. The percentage of stuttered syllables and stuttering severity based on the Persian version of SSI-3 were calculated as primary treatment outcomes. Here, we reported the findings of these outcomes separately.

For each child, %SS scores were calculated at three time points of testing (T0, T1, and T2) exhibited in Table 3. The group Mean±SD of %SS at pre-treatment, immediately post-treatment, and one month after the end of treatment were  $11.5 \pm 7.1$ ,  $2.0 \pm 1.6$ , and  $2.5 \pm 2.1$ , respectively. The Intra-group comparisons showed that the participants had significantly lower %SS at T1 and T2 than T0 ( $P=0.005$ ), but the mean of %SS at T2 was not significantly different with T1 ( $P=0.035$ ).

For each participant, the within-clinic total score of stuttering severity was evaluated by the blinded assessor. The group Mean±SD of stuttering severity at pre-treatment, immediately post-treatment, and one month after the end of treatment were  $17.6 \pm 4.1$ ,  $10.5 \pm 3.0$ , and  $11.7 \pm 3.8$ , respectively. The Intra-group comparisons showed that the participants had significantly lower stuttering severity score at T1 and T2 than T0 ( $P=0.004$ ), but the mean of stuttering severity score at T2 was not significantly different from T1 ( $P=0.026$ ) (Table 4).

The stuttering Severity Rating (SR) according to the parent opinion, self-reported speech satisfaction based on the Persian version of Communication Attitude Test (CAT), and speech quality based on the teacher-report

**Table 4.** The participants’ SSI-3 scores in three time points of testing

Participant	Time Points of Testing The SSI-3			Test a,b, P-Value*
	T0	T1	T2	
A.K.	15	9	9	
B.Z.	17	10	10	
P.Z.	18	9	11	
H.R.	17	11	12	
E.N.	18	11	13	
B.T.	15	9	10	$\chi^2=18.7, P<0.001$ [WSRT: Z=-2.8, P=0.004 for T1 and T2 vs. T0, but WSRT: Z=-2.2, P=0.026 for T2 vs. T1]
H.K.	14	8	8	
K.R.	14	8	8	
M.S.	19	12	16	
M.R.	28	18	20	
Mean±SD	17.6±4.1	10.5±3.0	11.7±3.8	

SSI-3: Stuttering Severity Instrument-third edition; T0: before the treatment; T1: immediately after the treatment; T2: one month after the end of treatment; Test a,b, Friedman’s test with post hoc Wilcoxon Signed Ranks Test (WSRT).

\* Intra-group comparison; Significance was set at  $P \leq 0.01$ .

**Table 5.** The participants' stuttering severity rating in three time points of testing

Participants	Time Points of Testing The SR			Test a,b, P*
	T0	T1	T2	
A.K.	5.4	3.5	3.6	$\chi^2=16.8, P<0.001$ [WSRT: Z=-2.8, P=0.005 for T1 and T2 vs T0, but WSRT: Z=-2.4, P=0.035 for T2 vs T1]
B.Z.	5.6	3.3	3.4	
P.Z.	5.6	2.6	2.5	
H.R.	5.9	3.6	3.6	
E.N.	4.9	3.9	4.0	
B.T.	4.6	3.3	3.4	
H.K.	5.2	4.1	4.1	
K.R.	5.5	4.1	4.2	
M.S.	6.1	4.8	4.9	
M.R.	7.8	5.3	5.5	
Mean±SD	5.7±0.9	3.9±0.8	3.9±0.8	

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SR: Severity Rating; SD: Standard Deviation; T0: before the treatment; T1: immediately after the treatment; T2: one month after the end of treatment; Test a,b: Friedman's test with post hoc Wilcoxon Signed Ranks Test (WSRT).

\*Intra-group comparison; Significance was set at  $P \leq 0.01$

questionnaire were scaled as the secondary outcome measures and reported here.

The stuttering SRs were gathered based on parents' opinions and showed in Table 5. The group mean±SD of the stuttering SR at pre-treatment, immediately post-treatment, and one month after the end of treatment were  $5.7 \pm 0.9$ ,  $3.9 \pm 0.8$ , and  $3.9 \pm 0.8$ , respectively. The Intra-group comparisons showed that the participants had significantly lower SR at T1 and T2 than T0 ( $P=0.005$ ), but the mean of SR at T2 was not significantly different from T1 ( $P=0.035$ ).

All children were asked to self-report their beliefs and attitudes regarding verbal communication using the Persian version of the CAT. The group Mean±SD of CAT scores at pre-treatment, immediately post-treatment, and one month after the end of treatment were  $19.6 \pm 5.4$ ,  $23.7 \pm 3.7$ , and  $23.5 \pm 3.4$ , respectively. The Intra-group comparisons showed that the participants had significantly higher CAT scores at T1 and T2 than T0 ( $P=0.005$ ), but the mean of CAT score at T2 was not significantly different from T1 ( $P=0.414$ ) (Table 6). The minimum and maximum scores of participants' CAT showed that their communication attitude had increas-

ingly inclined to positive degrees from T0 compared to T1 and even T2.

Table 7 presents the descriptive data and Intra-group comparisons for the total score of the teacher-report questionnaire. The group Mean±SD of the total score of the teacher-report questionnaire at T0, T1, and T2 were  $11.1 \pm 2.1$ ,  $14.7 \pm 1.3$ , and  $14.7 \pm 1.6$ , respectively. The analysis also showed that, based on the teachers' opinions, all participants performed significantly better on the verbal and behavioral functions in classroom/school after stuttering therapy and even at one month after treatment.

#### 4. Discussion

The purpose of this preliminary trial study was to assess the effects of the SST on relieving the primary and secondary problems in Persian-speaking students with stuttering. In the present study, the clinician and parents presented the SST accompanied by verbal contingencies for stutter-free speech to the school-age CWS. Andrews et al. previously used a similar therapeutic protocol to reduce stuttering severity and secondary avoidance behaviors in one group of English-speaking school-age CWS. Although their findings revealed a 77% stuttering severity reduction based on %SS and nearly 82% amelioration

**Table 6.** The participants' Mean±SD (Min-Max) of CAT scores in three time points of testing

Participants	Time Points of Testing The CAT			Testa, b , P*
	T0	T1	T2	
A.K.	19	20	20	$\chi^2=16.8, P<0.001$ [WSRT: Z=-2.8, P=0.005 for T1 and T2 vs. T0, but WSRT: Z=-0.8, P=0.414 for T2 vs. T1]
B.Z.	17	22	21	
P.Z.	25	29	28	
H.R.	24	25	26	
E.N.	23	27	26	
B.T.	23	25	25	
H.K.	24	26	26	
K.R.	20	26	25	
M.S.	11	19	20	
M.R.	10	18	18	
Mean±SD (Min-Max)	19.6±5.4 (10-25)	23.7±3.7 (18-29)	23.5±3.4 (18-28)	

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**Abbreviations:** SD, Standard Deviation; Min, Minimum; Max, Maximum; CAT, Communication Attitude Test; T0, before the treatment; T1, immediately after the treatment; T2, one month after the end of treatment; Testa,b, Friedman's test with post hoc Wilcoxon Signed Ranks Test (WSRT).

\*Intra-group comparison; Significance was set at  $P \leq 0.01$

**Table 7.** The participants' Mean±SD (Min-Max) of the total score of the teacher-report questionnaire in three time points of testing

Participants	Time Points of Using The Teacher-Report Questionnaire			Testa,b, P-Value*
	T0	T1	T2	
A.K.	11	15	16	$\chi^2=17.6, P<0.001$ [WSRT: Z=-2.8, P=0.005 for T1 and T2 vs. T0, but WSRT: Z<-0.1, P>0.999 for T2 vs. T1]
B.Z.	12	16	16	
P.Z.	13	15	16	
H.R.	13	15	15	
E.N.	12	15	15	
B.T.	13	16	15	
H.K.	12	16	16	
K.R.	9	14	14	
M.S.	8	13	13	
M.R.	8	12	11	
Mean±SD (Min-Max)	11.1±2.1 (8-13)	14.7±1.3 (12-16)	14.7±1.6 (11-16)	

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SD: Standard Deviation; Min: Minimum; Max:Maximum; T0: before the treatment; T1: immediately after the treatment; T2: one month after the end of the treatment; Testa,b: Friedman's test with post hoc Wilcoxon Signed Ranks Test (WSRT).

\*Intra-group comparison; Significance was set at  $P \leq 0.01$

of avoidance situations from pre-treatment to 12 months post-treatment, some avoidance behaviors remained in the children at the end of the study. They suggested that further studies are needed to investigate the effects of this therapeutic program on the various aspects of children's stuttering [15]. Our findings were consistent with them so that we observed that, like the English-speaking school-age CWS who could have easily reduced %SS, the Persian-speaking school-age CWS could notably eliminate their dysfluencies of speech by using a 1.5-month use of the SST schedule. Except for M.S. and M.R., who had the %SS equal to 4.2% and 4.9% and the mean score of SR equal to 4.8 and 5.3 at T1, all of the children received stutter-free speech at T1 and could maintain this skill at follow up step (T2). Trajkovski et al. reported that their participants, who were three preschool children with stuttering, could accede from 13.0 %SS to 1.0 %SS in controlled speaking situations only after not more than 9 therapeutic sessions of the SST.

Given the low sample size and lack of data regarding the follow-up step in their study, they concluded that future studies are needed to design the trial studies with larger groups of CWS, with a longer period of the SST program, and considering the socio-communicative effects of the technique as the outcome measures [14]. Zamani et al., however, conducted a multiple baseline design of a preliminary study to investigate the effectiveness of the SST program on improving stuttering-like dysfluencies in three Persian-language children with Down syndrome aged below 15 years. Although this fluency-enhancing technique could alter stuttering-like behaviors from phonemic tonic-spasm to simple word repetition, their score of stuttering severity did not significantly decrease at post-treatment [28].

The mean SSI-3 score for the children at three time points of testing was the other index that considered the primary consequence of treatment. The findings showed that the SST program could positively influence the participant's fluency of speech. Although, we did not observe a significant change in the score of stuttering severity of children with Down syndrome who uses the SST [28]. The present findings are corroborative evidence for the benefits of the SST to alter the prosodic characteristics of speech school-age CWS from plosive and stressful ways to monotonic and unstressed stutter-free style of speech. Decreasing the severity of stuttering-like dysfluencies is the first target of stuttering therapy in children [9]. Gains in the mean scores of SSI-3 and %SS were observed in the participants supporting the feasibility of the SST in school-age CWS and indicated that this tech-

nique could be an effective way to deduce the severity of stuttering behaviors for school-age CWS.

Since stuttering therapy must have a comprehensive approach to all stuttering-induced problems (e.g., cognitive, affective, or social problems), the primary improvements of the participants had been confirmed by parent-report SR, self-report CAT, and teacher-report questionnaires. The findings revealed that all participants increasingly reached a comfortable level of satisfaction of verbal communication and stuttering severity reduction at T1 and even T2 compared with T0. The parents, teachers, and their children reported that control of stuttering behaviors could help eliminate symptoms of speech-related anxiety after passing the treatment phases. Although a review of the literature showed no creditable information to report the social validity of the SST program, the current result is consistent with other studies [13, 15, 29]. These researchers reported that the SST as a fluency-shaping technique is an enjoyable, simple, and cost-efficient procedure to immediately make a fluent speech and self-respect in the school-age CWS. Finally, this trial study without a control group showed that a simple procedure of the SST accompanied by verbal reinforcements could easily lead to notable and stable stutter-free speech in Persian-speaking CWS.

## 5. Conclusion

This study clarified that the SST program could decrease stuttering severity and positively improve the attitude of verbal communication in Persian-speaking school-age CWS.

## Ethical Considerations

### Compliance with ethical guidelines

The research was approved by Ahvaz Jundishapur University of Medical Sciences, Iran (grant reference number: PHT-9744). The regional ethics committees approved the current study protocol (Registration Code: IR.AJUMS.REC.1397.721).

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### Authors' contributions

All authors equally contributed to preparing this paper.

**Conflict of interest**

The authors declared no conflict of interest.

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**Appendix A.** Questionnaire on teachers’ reports

By this short-questionnaire, you can report the student’s verbal and behavioral functions in the classroom/school. Please use the following scale to rate each statement from 1 to 5.

Items	Scoring					Total Score
	1	2	3	4	5	
The student engages herself/himself to answer the oral questions in the class.						
The student is inclined to contribute to the team works (such as sports, theater, song group) at school.						
The student can successfully do book-reading or read the written composition in front of the class.						
The student is comfortable when s/he wants to question or speak to the teacher.						

**JMR**