Efficacy of the Arabic Modified Fluency Shaping Program in the treatment of stuttering

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Background
The goal of fluency-shaping approaches is not to modify stuttering but rather to completely replace it with fluent speech. This is achieved by applying a range of fluency-controlling techniques, usually implemented within a slow-speech framework, which fundamentally changes the way that respiration, phonation, and articulation are coordinated for speech.
Aim
The present study aimed at evaluating the efficacy of the Arabic Modified Fluency Shaping Program as a valuable treatment approach for Egyptian stutterers.
Patients and methods
The study design was a prospective longitudinal experimental controlled one.

The present work was carried out on 100 stutterers of both sexes in the age range of 8–20 years. The participants were divided into two groups: the study group and the control group.

A multidimensional assessment protocol was used for all participants. It included elementary diagnostic procedures (personal interview, visual perceptual assessment, and auditory perceptual assessment), clinical diagnostic aids (Stuttering Severity Instrument for Children and Adults-Arabic version, speech rate, psychometric evaluation, and assessment of feelings and attitudes using speech performance self-reported questionnaire), and additional instrumental measures (spectrographic assessment and Visi Pitch).

Therapy program: Participants in the study group were trained using the Arabic Modified Fluency Shaping Program.
Results
The study group achieved better outcome with the therapeutic program regardless of the age of the patient at the time of therapy. There was marked reduction in mean total score of Stuttering Severity Instrument for Children and Adults-Arabic version in the study group and was 1.48, 1.66, and 2.12, respectively, during post-therapy, first follow-up, and second follow-up evaluations compared with 25.36 during the pretherapy evaluation. As regards spectral analysis, there were higher post-therapeutic values for voice onset time, vowel duration, syllable duration, and shorter sentence duration. As regards Visi Pitch, there were lower post-therapeutic values for percent voiced and percent pause and a higher value for the percent unvoiced, which denotes improvement. The results of speech performance self-reported questionnaire showed an increase in patient's satisfaction with speech and trust in their abilities as a speaker; there was also a decrease in avoidance of speaking situations and speaking on the phone after therapy.
Conclusion
The results of this study indicated the efficacy of the Arabic Modified Fluency Shaping Program in rehabilitation of stuttering. The presented program provides participants with strategies that significantly improve their speech behavior and their attitudes toward speech.

Keywords:
cognitive therapy, fluency shaping, spectrographic assessment, stuttering; treatment of stuttering

Introduction

Fluent speech is the ability to talk with continuity, at a sustained rate, and without effort. Stuttering is a complex disorder of communication, which may encompass not only surface disruption of fluency but also social and emotional elements [1].

Stuttering affects 1% of the population [2]. Although there have been recent advances in exploring the effect of the genetic and neural influences on stuttering, the etiology and pathophysiology of the disorder remain poorly defined. The speech characteristics of stuttering are proposed to be the result of an atypical brain mechanism caused by the interaction of genetic and environmental variables [3]. It is widely known that most young children recover from stuttering; those who continue to stutter usually experience a resultant negative impact on their quality of life [4].

Treatment for stuttering is a controversial issue for clinicians and has posed a challenge in the field of speech and language pathology for decades [5]. There are many treatments for stuttering; within this behavioral paradigm, two distinctive approaches emerged. The first approach is stuttering modification, which consists of identifying and modifying moments of stuttering to desensitize one to stuttering behaviors and confront the fears of stuttering. Having confronted their pathology, therapy recipients were taught to voluntarily produce stuttering episodes in an easier and less tense manner, similar to normally occurring mild speech disruptions, in an effort to 'control' the involuntary pathology [6].

The second approach is fluency shaping, which consists of a complete retraining of all speech output with the goal of eliminating overt stuttering behaviors (i.e. repetitions and prolongations of speech sounds) [6]. The goal of fluency-shaping therapy is to increase fluent responses systematically until the patient replaces stuttering moment with fluent speech, or achieves fluency by altering speech pattern [7].

The importance of evaluating the outcome of speech treatment for scientific, economic, and social reasons is widely recognized. Given the large body of literature on the evaluation of stuttering treatments, stuttering seems to be one of the disorders in which the quality of existing and newly proposed treatments can easily and reliably be assessed [8].

Efficacy has been defined as the extent to which a specific intervention, procedure, regimen, or service produces a beneficial result under ideally controlled conditions when administered or monitored by experts [9]. It is critical that standards are adopted for evaluating treatment outcomes so that significant variations in outcomes can be reliably identified. On the whole, studies should focus on identifying specific therapy procedures that contribute the most to successful treatment outcomes as well as variables that are responsible for treatment failures [8].

The Arabic Modified Fluency Shaping Program was developed by Rifaie [10], who also investigated its effectiveness, and this was the first step in the Arabic field to develop such program. The result obtained proved the effectiveness of the therapy program in the treatment of stuttering. However, further studies have to be performed on a large number of patients to prove its efficacy and long-term effectiveness [10].

The aim of this study was to prove the efficacy of the Arabic Modified Fluency Shaping Program as a valuable treatment approach for Egyptian stutterers.

Patients and methods
Patients
This study was conducted on 100 stutterers who were divided into two groups:

(1) The study group (group 1) (*n*=50): this group included patients between the age of 8 and 20 years who were trained using the Arabic Modified Fluency Shaping Program.
(2) The control group (group 2) (*n*=50): this group included patients between the age of 8 and 20 years who did not receive therapy sessions due inability to attend regular therapy sessions as they resided in remote areas or received therapy sessions for less than 1 month as they withdrew, and patients on waiting list.

The participants were recruited among cases attending the Phoniatric Clinic at El-Demerdash Hospital of Ain Shams University who fulfilled the inclusion criteria and agreed to participate in the study. Informed consent was obtained from all participants of the study. The study was approved the ethical committee in the hospital.

Inclusion criteria were as follows:

(1) Suffering from developmental stuttering.
(2) Having language aptitudes coping with his or her chronological age.
(3) Average intelligence.

Exclusion criterion was as follows:

(1) Presence of other speech or language disorders.

Methods

The following assessment protocol was used for all participants in both groups (study and control) before therapy, at the end of the therapy program, 6 month after the end of the therapy program, and 1 year after the end of the therapy program.

(1) Elementary diagnostic procedures:
   (a) Personal interview and complete assessment of history and vocal tract, ear, nose, and throat examination.
   (b) Visual perceptual assessment (VPA): the patient was carefully observed to notice eye contact and involuntary movements (in the face, head, and extremities).
   (c) Auditory perceptual assessment (APA): this is to determine the severity of stuttering. Speech was estimated for the presence or absence of the following symptoms: repetitions (R), intraphonemic disruptions (IPDs), prolongations (P), and blocks (B).
(2) Clinical diagnostic aids:
   (a) Documentation of APA using the voice recording.
   (b) Measuring speech rate (number of words per minutes).
   (c) Assessment of stuttering severity using the 'Stuttering Severity Instrument for Children and Adults-Arabic version (ASSI)' [11].
   (d) Psychometric evaluation using the Stanford Binet Intelligence Scale (4th ed.) [12].
   (e) Assessment of feelings and attitudes using a speech performance self-reported questionnaire derived from Boberg and Kully [13] for the study group before and after the therapy program.
(3) Additional instrumental measures were performed:
   (a) Spectrographic analysis of the patient's speech was performed using the Kay PENTAX Real-Time Spectrogram Program (model 5129; PENTAX of America Inc., New Jersey). The patients were asked to pronounce a sentence and the following data were studied: sentence duration (s); voice onset time (VOT) (ms) for /t/, /k/, /d/, /g/, and /b/; and vowel duration (VD) (ms) for the vowels: /æ/, /i/, and /u/. Syllable duration was measured by adding the VOT of /t/ to the VD of /æ/.
   (b) Visi Pitch using Visi Pitch model 6095/6097 (Kay Elemetrics Corporation, New Jersey). The patients were asked to pronounce a sentence, and then the data were statistically analyzed and the following were obtained: % voiced, %unvoiced, and %pause.

Therapy program

This therapy program was developed by Rifaie [10], and was labeled Rifaie Fluency Shaping Program. However, in 2012, the program was modified by the addition of cognitive therapy throughout its five phases and named the Arabic Modified Fluency Shaping Program.

The program design includes five major phases:

(1) Preparing for fluency:

   Goal: To prepare the patient for the therapy process.

   Method: By explaining about stuttering and fluency.
(2) Distinguishing fluency from stuttering:

   Goal: To teach the patient to recognize the difference between fluent speech (with easy dysfluency) and stuttering.

   Method: By identifying dysfluencies and stuttering in his or her own speech and clinician's speech.
(3) Establishing fluency:

   Goal: To teach the patient to use slow easy speech (smooth, flowing manner, without interruption of continuity of utterance) in structured activity.

   Method: Using slow rate of speech, by stretching all syllables in utterance, with light articulatory contact, and easy onset of phonation. The participant will formulate words, phrases, and sentences using slow easy speech following clinician's model in structured tasks, including a picture description activity, a picture board and memory activity, a sentence completion activity, a what if activity, a problem solving activity, a thinking problem activity, a what's wrong activity, and expressing preference activity.
(4) Desensitizing to fluency disruptors therapy:

   Goal: To teach the patient to be aware of possible disruptors of fluency and to cope with these pressures without losing his or her fluency.

   Method: By introducing possible verbal and nonverbal noises, movements, interruptions,

changing locations, time pressure, competitions, and combined disruptors. These fluency disruptors are introduced gradually while performing the tasks previously performed.

(5) Transferring fluency:

Goal: To teach the patient to transfer low easy speech from structured tasks to real-life situations.

Method: By training on different pragmatic items that occur in real life such as explaining, describing, warning, directing, announcing, etc.

The participant practices with the clinician acting real-life situations in the clinic, using these pragmatic items. The participant then is asked to practice the same tasks with family members or with a friend, and then in real-life situations. The clinician continues to model slow easy speech, be a good listener, and adds fluency disruptors from now and then.

(6) Maintaining fluency:

Goal: To help the patient to maintain the use of slow easy speech while systematically decreasing the frequency of direct therapy contact.

Method: By systematically decreasing the frequency of direct therapy contacts. Apply a variety of training at sessions that are widely separated as one session per week for 1 month, then once every month for 6 months, then once every 3 months for 6 months, while maintaining home activities, that are also reduced gradually to 'as needed' basis.

Cognitive therapy

During all phases of the program, participants are helped to identify and challenge negative thoughts through cognitive restructuring.

Cognitive restructuring was used, in which patients were encouraged to recognize disturbed sets of thoughts and attitudes relating to their speech, and to deal with the soundness of those to produce and use more adaptive alternatives.

During therapy sessions, patients were asked to keep daily diaries of feelings to record harmful thoughts and beliefs related to their speech. Subsequently, they were asked to rate these beliefs. These beliefs were then challenged by probabilistic thinking; thereafter, they were asked to re-rate these beliefs.

Statistical analyses

The collected data were revised, coded, tabulated, and introduced to a PC using statistical package for the social sciences (SPSS 15.0 for Windows, 2001; SPSS Inc., Chicago, Illinois, USA). Data were presented and suitable analysis was performed according to the type of data obtained for each parameter.

The statistical tests used in this thesis are as follows: one-way analysis of variance, paired *t*-test, Student's *t*-test, Pearson's correlation coefficient (*r*) test, and least significant difference test.

Results

This study was carried out between September 2012 and October 2015. This study was conducted on 100 patients, 85 male and 15 female, between the age of 8 and 20 years. The study group (*n*=50) included 43 male and seven female patients with a mean age of 13.73±3.8 years; stuttering severity in the study group ranged from very mild to severe. The control group (*n*=50) included 42 male and eight female patients with a mean age of 14.20±3.8 years. Stuttering severity in the control group ranged from mild to very severe. Each participant in the study group received 65±3 individual therapy sessions during the therapy program, distributed as half an hour session twice weekly.

Table 1 shows descriptive data of the study group and the control group. An overall 86% of the study group was right-handed and 14% was left-handed, whereas 80% of the control group was right-handed and 20% was left-handed. As regards family history of stuttering, it was positive in 28 and 30% of participants in the study group and the control group, respectively, and negative in 72 and 80% of participants in the study group and the control group, respectively. There was a

Table 1 Descriptive data of the study group and the control group

	Study group	Control group
Handedness		
Right	43 (86.0)	40 (80.0)
Left	7 (14.0)	10 (20.0)
Family history		
Positive	36 (72.0)	35 (70.0)
Negative	14 (28.0)	15 (30.0)
Consanguinity		
Positive	37 (74.0)	34 (68.0)
Negative	13 (26.0)	16 (32.0)
Age of onset of stuttering		
Rang	2.5–4.6	2.5–4.5
Mean	3.39	3.42

Table 2 Comparison between the study group and the control group as regards auditory perceptual assessment

APAs	Group	Range	Mean	SD	t	P value
Pretherapy						
IPDs	Study	0–3	1.22	0.82	1.25	0.1
	Control	0–3	0.70	0.65		
R	Study	1–3	2.3	0.54	1.3	0.1
	Control	1–3	2.46	0.65		
P	Study	0–3	1.54	0.68	1.3	0.1
	Control	1–3	1.72	0.64		
B	Study	1–3	1.80	0.67	0.41	0.68
	Control	1–3	1.86	0.70		
Post-therapy						
IPDs	Study	0–1	0.06	0.24	7.6	0.000
	Control	0–2	0.70	0.65		
R	Study	0–1	0.08	0.27	25.9	0.000
	Control	1–3	2.44	0.64		
P	Study	0–1	0.02	0.14	19.9	0.000
	Control	1–3	1.76	0.62		
B	Study	0–1	0.04	0.20	18.12	0.000
	Control	1–3	1.80	0.70		
F1						
IPDs	Study	0–1	0.06	0.24	7.6	0.000
	Control	0–2	0.70	0.65		
R	Study	0–2	0.10	0.36	23.01	0.000
	Control	1–3	2.38	0.70		
P	Study	0–1	0.02	0.14	18.9	0.000
	Control	1–3	1.76	0.66		
B	Study	0–1	0.06	0.24	18.7	0.000
	Control	1–3	1.86	0.70		
F2						
IPDs	Study	0–1	0.08	0.27	6.9	0.000
	Control	0–2	0.68	0.65		
R	Study	0–2	0.20	0.49	23.81	0.000
	Control	1–3	2.44	0.64		
P	Study	0–1	0.04	0.20	18.3	0.000
	Control	1–3	1.72	0.64		
B	Study	0–1	0.14	0.35	15.8	0.000
	Control	1–3	1.92	0.75		

APA, auditory perceptual assessment; B, block; F1, first follow-up (6 months after the end of the therapy program); F2, second follow-up (1 year after the end of the therapy program); IPDs, intraphonemic disruptions; P, prolongation; R, repetition. $P<0.05$, significant. $P>0.05$, nonsignificant.

positive history of consanguinity in 26 and 32% of participants in the study group and the control group, respectively, and a negative history of consanguinity in 74 and 68% of participants in the study group and the control group, respectively. The mean age of onset of stuttering was 3.39 and 3.42 in the study group and the control group, respectively.

As regards APA (Table 2), there were no statistically significant differences as regards IPDs, R, P, and B between the study group and the control group during pretherapy evaluation. It also shows a lower mean IPD, R, P, and B in the study group compared with the control group after therapy, at first follow-up, and at

second follow-up evaluations, and the difference was statistically significant.

Table 3 shows that, with regard to VPA, there were no statistically significant differences as regards eye contact and involuntary movements in face and extremities between the study group and the control group during pretherapy evaluation. It also shows a lower mean value of eye contact and involuntary movements in face and extremities in the study group compared with the control group after therapy, during first follow-up, and during second follow-up evaluations, and the difference was statistically significant.

Table 4 shows no statistically significant difference between the mean speech rate in the study group and the control group during pretherapy evaluation. However, there was a higher mean speech rate in the study group compared with the control group during post-therapy, first follow-up, and second follow-up evaluations, and the difference was statistically significant.

Results of ASSI are shown in Table 5. This table shows that during the pretherapy evaluation there was a statistically significant difference between the two groups as regards frequency of stuttering in spontaneous speech and reading, with a higher mean in the control group. However, there was no statistically significant difference between the study group and the control group as regards the mean length of moment of stuttering and associated movements and total score of ASSI.

During post-therapy, first follow-up, and second follow-up evaluations, there was a lower mean frequency of stuttering in spontaneous speech and reading, length of moment of stuttering, associated movement, and total score of ASSI in the study group compared with the control group, and the difference was statistically significant.

The result showed improvement across all items of the ASSI in the study group compared with the control group during post-therapy, first follow-up, and second follow-up evaluations, and the difference was statistically significant.

As regards sentence duration, there was a lower mean sentence duration among patients in the study group compared with the control group during post-therapy, first follow-up, and second follow-up evaluations (Table 6).

Table 3 Comparison between the study group and the control group as regards visual perceptual assessment

VPAs	Group	Range	Mean	SD	t	P value	Significance
Pretherapy							
Eye contact	Study	0–3	1.44	0.81	2.4	0.012	NS
	Control	0–3	1.84	0.74			
Involuntary movements (face)	Study	0–3	1.36	0.66	2.1	0.011	NS
	Control	0–3	1.74	0.76			
Involuntary movements (extremities)	Study	0–3	1.72	0.78	1.6	0.062	NS
	Control	0–3	1.44	0.93			
Post-therapy							
Eye contact	Study	0–1	0.16	0.37	15.8	0.000	S
	Control	1–3	1.84	0.74			
Involuntary movements (face)	Study	0–1	0.04	0.20	18.9	0.000	S
	Control	1–3	2.10	0.76			
Involuntary movements (extremities)	Study	0–1	0.12	0.33	10.1	0.000	S
	Control	0–3	1.44	0.93			
F1							
Eye contact	Study	0–1	0.16	0.37	15.8	0.000	S
	Control	1–3	1.84	0.74			
Involuntary movements (face)	Study	0–1	0.04	0.20	18.9	0.000	S
	Control	1–3	2.10	0.76			
Involuntary movements (extremities)	Study	0–1	0.12	0.33	10.1	0.000	S
	Control	0–3	1.44	0.93			
F2							
Eye contact	Study	0–1	0.16	0.37	15.8	0.000	S
	Control	1–3	1.84	0.74			
Involuntary movements (face)	Study	0–1	0.04	0.20	18.9	0.000	S
	Control	1–3	2.10	0.76			
Involuntary movements (extremities)	Study	0–1	0.12	0.33	10.1	0.000	S
	Control	0–3	1.44	0.93			

F1, first follow-up (6 months after the end of the therapy program); F2, second follow-up (1 year after the end of the therapy program); S, significant; VPA, visual perceptual assessment.

Table 4 Comparison between the study group and the control group as regards speech rate

Speech rates	Group	Range	Mean	SD	t	P value
Pretherapy	Study	55–100	83.28	12.69	1.9	0.06
	Control	55–98	78.61	11.18		
Post-therapy	Study	68–116	96.72	12.86	7.5	0.000
	Control	55–98	78.61	11.18		
F1	Study	70.5–120.5	100.37	13.13	8.9	0.000
	Control	55–98	78.61	11.18		
F2	Study	72–125	103.24	13.62	9.8	0.000
	Control	55–98	78.61	11.18		

F1, first follow-up (6 months after the end of the therapy program); F2, second follow-up (1 year after the end of the therapy program). $P < 0.05$, significant. $P > 0.05$, nonsignificant.

There were higher post-therapeutic spectrographic values as regards VOT (Table 7), VD (Table 8), and syllable duration (Table 9) among patients in the study group compared with the control group during post-therapy, first follow-up, and second follow-up, and the difference was statistically significant.

With reference to the Visi Pitch analysis, there was a lower mean %voiced and %pause in the study group compared with the control group during post-therapy, first follow-up, and second follow-up evaluations, and the difference was statistically significant. There was also a high mean %unvoiced in the study group compared with the control group during post-therapy, first follow-up, and second follow-up evaluations, and the difference was statistically significant (Table 10).

Table 11 shows that there was a higher mean for speech rate and lower mean for sentence duration and syllable duration in the first follow-up evaluation compared with post-therapy evaluation, and the difference is statistically significant. However, there was no statistically significant difference in the mean

Table 5 Comparison between the study group and the control group as regards Stuttering Severity Instrument for Children and Adults-Arabic version

ASSIs	Group	Range	Mean	SD	t	P value	Significance
Pretherapy							
Spontaneous speech	Study	14–38	25.82	6.08	3.9	0.000	S
	Control	15–41	30.72	6.17			
Reading	Study	10–33	20.54	6.04	4.9	0.000	S
	Control	14–39	26.50	6.06			
Length of moment of stuttering	Study	1–5	3	0.81	1.9	0.07	NS
	Control	2–5	3.40	0.81			
Associated movements	Study	0–11	5.90	2.05	0.8	0.44	NS
	Control	3–11	6.22	1.87			
Total score	Study	16–33	25.36	3.44	1.9	0.06	NS
	Control	21–34	26.84	2.93			
Post-therapy							
Spontaneous speech	Study	0–2	0.42	0.46	39.8	0.000	S
	Control	19–42	31.88	5.64			
Reading	Study	0–1	0.20	0.40	34.2	0.000	S
	Control	13–38	27.60	5.70			
Length of moment of stuttering	Study	0–1	0.20	0.40	29.1	0.000	S
	Control	2–5	3.40	0.81			
Associated movements	Study	0–4	0.48	1.07	21.3	0.000	S
	Control	3–11	6.22	1.87			
Total score	Study	0–9	1.48	3.01	60.0	0.000	S
	Control	21–34	26.84	2.93			
F1							
Spontaneous speech	Study	0–3	0.40	0.68	38.7	0.000	S
	Control	19–41	31.68	5.77			
Reading	Study	0–3	0.28	0.64	33.6	0.000	S
	Control	11–37	27.20	5.71			
Length of moment of stuttering	Study	0–1	0.20	0.40	29.1	0.000	S
	Control	2–5	3.40	0.81			
Associated movements	Study	0–4	0.48	1.07	21.3	0.000	S
	Control	3–11	6.22	1.87			
Total score	Study	0–12	1.66	3.44	60.0	0.000	S
	Control	21–34	26.84	2.93			
F2							
Spontaneous speech	Study	0–5	0.62	1.32	39.7	0.000	S
	Control	18–42	31.64	5.46			
Reading	Study	0–4	0.50	1.11	34.4	0.000	S
	Control	12–36	27.30	5.55			
Length of moment of stuttering	Study	0–1	0.22	0.42	25.5	0.000	S
	Control	2–5	3.40	0.81			
Associated movements	Study	0–4	0.48	1.07	21.3	0.000	S
	Control	3–11	6.22	1.87			
Total score	study	0–15	2.12	4.23	46.7	0.000	S
	Control	21–34	26.84	2.93			

ASSI, Stuttering Severity Instrument for Children and Adults-Arabic version; F1, first follow-up (6 months after the end of the therapy program); F2, second follow-up (1 year after the end of the therapy program); S, significant.

for VOT, %voiced, %unvoiced, and %pause during the first follow-up evaluation compared with post-therapy evaluation.

Table 12 shows that there was higher mean speech rate and lower mean for sentence duration, syllable duration, and VD in the second follow-up evaluation compared with first follow-up evaluation, and the difference was statistically significant. There was no statistically significant difference in mean VOT, % voiced, %unvoiced, and %pause during second follow-up evaluation compared with first follow-up evaluation.

Table 13 shows that there was a lower mean IPD, R, P, and B in the study group during post-therapy, first follow-up, and in second follow-up evaluations compared with pretherapy evaluation, and the

Table 6 Comparison between the control group and the study group as regards sentence duration

Sentence durations	Group	Range	Mean	SD	t	P value
Pretherapy	Study	5.8–9.6	7.77	0.89	1.8	0.08
	Control	5.9–9.7	7.30	0.99		
Post-therapy	Study	4–6.5	4.94	0.60	12.2	0.000
	Control	5.7–9.8	7.34	1.02		
F1	Study	3.7–5.8	4.58	0.50	15.1	0.000
	Control	5.6–9.8	7.32	1.01		
F2	Study	3.6–5.5	4.25	0.40	18.2	0.000
	Control	5.8–9.7	7.35	1.0		

F1, first follow-up (6 months after the end of the therapy program); F2, second follow-up (1 year after the end of the therapy program). $P<0.05$, significant. >0.05, nonsignificant.

difference was statistically significant. As regards VPA, there was a lower mean for eye contact and involuntary movements in the face and extremities during post-therapy, first follow-up, and in second follow-up evaluations compared with pretherapy evaluation, and the difference was statistically significant. Carefully looking at the ASSI we can see a marked reduction in its mean during post-therapy, first follow-up, and in second follow-up evaluations compared with pretherapy evaluation, and the difference was statistically significant.

Table 14 shows that the participants of the study group were divided into three age groups:

(1) The first group (group 1) (n=19) included patients between 8 and 11 years and 11 months of age (late childhood).
(2) The second group (group 2) (n=18) included patients between 12 and 17 years and 11 months of age (adolescence).
(3) The third group (group 3) (n=13) included patients between 18 and 20 years and 11 months of age (adulthood).

There wasno statistically significant difference in mean ASSI for the three groups during pretherapy, post-therapy, first follow-up, and second follow-up evaluations. There was marked improvement in mean ASSI scores for the three age groups, and there was no statistically significant difference in this improvement of mean ASSI for the three age groups.

Assessment of feelings and attitudes of participants in the study group (before therapy and after therapy) was carried out using speech performance self-reported questionnaire. The results of this questionnaire (Table 15) showed that only 2% of the cases were satisfied and 0% was highly satisfied with their speech before therapy. However, after therapy, 82% of the cases were satisfied and 16% were highly satisfied.

Before therapy 36% of the patients reported that they preferred to stay silent when situation necessitates speaking. However, none of them reported such feeling after therapy. It also shows that only 2% of participants considered themselves as stutterers after therapy compared with 88% before therapy.

After therapy, 98% of the participants trusted in their abilities as a speaker, compared with only 22% before therapy.

An overall 34% of the participants reported that they avoid speaking on the phone either completely (14%) or sometimes (20%). Interestingly, none of them reported avoiding speaking on the phone after therapy.

As regards their feelings during speech, the table shows that after therapy 12% of the patients reported feeling fear during speaking compared with 58% before therapy.

The table also shows that 20% of the patients reported that they feel irritable during speaking after therapy compared with 66% before therapy.

Only 2% of the patients reported that they feel depressed during speaking after therapy compared with 28% before therapy.

None of the patients reported that they feel bashfulness during speaking after therapy compared with 34% before therapy.

Discussion
Fluency-shaping therapy has been shown to be an effective and efficacious approach to stutterers; however, researchers have recommended that further research should be conducted to confirm the efficacy [14], and to make continued advancements in evidence-based research [14].

Table 7 Comparison between the study group and the control group as regards voice onset time

VOTs	Group	Range	Mean	SD	t	P value
Pretherapy						
/t/	Study	48.3–80.7	67.2	8.7	3.3	0.001
	Control	40.5–77.7	60.8	10.2		
/k/	Study	35.3–76.7	67.9	8.2	2.7	0.008
	Control	40.5–70.7	56.6	7.6		
/d/	Study	39.8–63.7	50.4	6.46	1.4	0.1
	Control	40.9–62.7	52.2	5.50		
/g/	Study	36–61	47.06	5.89	0.5	0.5
	Control	32.3–57.6	49.28	5.57		
/b/	Study	33.6–57.6	44.57	5.74	0.5	0.5
	Control	31.5–59.8	45.33	7.68		
Post-therapy						
/t/	Study	56.6–90.6	73.70	8.4	6.7	0.000
	Control	40.5–77.4	60.90	10.3		
/k/	Study	45–82.9	66.67	9.0	7.1	0.000
	Control	40.5–70.2	56.68	7.7		
/d/	Study	44.4–67.7	56.32	6.05	3.6	0.000
	Control	40.9–62.3	52.14	5.46		
/g/	Study	42.2–64.4	52.70	5.12	3.8	0.000
	Control	32.7–57.6	49.38	5.53		
/b/	Study	40.8–61.4	50.06	5.36	2.78	0.000
	Control	31.8–59.7	45.11	7.44		
F1						
/t/	Study	56.9–90.9	73.7	8.3	6.9	0.000
	Control	40.5–77.6	60.7	10.2		
/k/	Study	44.6–83	66.62	9.0	7	0.000
	Control	40.5–70.2	56.78	7.75		
/d/	Study	44.5–67.4	56.53	5.90	3.7	0.000
	Control	40.9–62.8	52.20	5.52		
/g/	Study	42.8–64.9	52.86	5.09	3.6	0.000
	Control	32.4–57.7	49.28	5.57		
/b/	Study	40.7–60.9	50.03	5.27	2.64	0.000
	Control	31.5–60	45.27	7.46		
F2						
/t/	Study	56.6–90.6	73.55	8.28	6.7	0.000
	Control	40.5–77.8	60.96	10.39		
/k/	Study	45.3–96.2	67.09	9.77	6.7	0.000
	Control	40.5–70.7	56.91	7.87		
/d/	Study	44.3–68	56.71	6.05	3.9	0.000
	Control	40.9–62.4	52.13	5.50		
/g/	Study	42.5–64.4	52.52	4.97	3.6	0.000
	Control	32.6–57.7	49.32	5.56		
/b/	Study	40.4–60.4	49.88	5.23	2.53	0.000
	Control	40.6–59.6	44.46	9.25		

F1, first follow-up (6 months after the end of the therapy program); F2, second follow-up (1 year after the end of the therapy program); VOT, voice onset time. $P < 0.05$, significant. $P > 0.05$, nonsignificant.

The Arabic Modified Fluency Shaping Program was developed by Rifaie [10], who also investigated its effectiveness, and this was the first step in Arabic field to develop such program. In her study, Rifaie [10] applied a range of measures (including subjective and objective measures) on a small group of Egyptian stutterers, and then the program was applied on those stutterers who were re-evaluated by the same measures

after the end of the therapy program. The result obtained proved the effectiveness of the therapy program in the treatment of stuttering. However, further studies have to be performed on a large number of patients to prove its efficacy and long-term effectiveness.

The present study aimed at evaluating the efficacy of the Arabic Modified Fluency Shaping Program as a valuable treatment approach for Egyptian stutterers.

In the present study, both subjective and objective methods of assessment were used for assessment of efficacy. Subjective tests such as the perceptual assessment were formulated in a rating scale to be a quasiobjective one. The results obtained showed that the therapy program led to improvement in all parameters and the improvement of all perceptual scores, auditory and visual (subjective), went hand in hand with improvement of ASSI, spectrographic analysis, and Visi Pitch (objective). It indicates stability of the results. This improvement was associated with improvement of patients' attitudes toward their fluency.

The sample included participants in late childhood, adolescents, and adults. In the study group, age at the time of treatment was not an obstacle against performing the therapy sessions, all ages understood the instruction given and followed it, being previously motivated by the cognitive therapy. Our results showed that improvement following the therapy program was seen among all age groups of participants, proved by the nonsignificant difference in the degree of improvement among the three age groups during post-therapy, first follow-up, and second follow-up evaluations among all age groups of participants, which prove that the program can be used for all age groups.

As regards APA, the study group showed a significant improvement in all assessment tasks, reading, reciting, and spontaneous speech, in comparison with the control group. The scores of all core behaviors were significantly improved. As regards VPA including eye contact and involuntary movement in face and extremities, there was marked improvement in the study group during post-therapy, first follow-up, and second follow-up evaluations, and this was correlated to the result of the ASSI.

ASSI was used in the assessment of stuttering severity because it is suitable for the Arabic environment socially, linguistically, and culturally. It offers a holistic way of evaluating the severity of stuttering. There was marked increase in the fluency and a statistically significant decrease in stuttering severity in the study group after

Table 8 Comparison between the study group and the control group as regards vowel duration

Vowel durations	Group	Range	Mean	SD	t	P value
Pretherapy						
/æ/	Study	87.7–151.7	120.15	18.76	0.59	0.55
	Control	99.5–150.9	122.11	13.78		
/i/	Study	85.5–150.8	118.89	18.54	0.21	0.83
	Control	97.5–145.8	119.58	13.19		
/u/	Study	83.7–148.7	117.52	17.97	0.50	0.62
	Control	96.6–143.6	115.97	12.71		
Post-therapy						
/æ/	Study	170.8–220.3	195.12	12.45	27.8	0.000
	Control	99.6–150.6	122.25	13.70		
/i/	Study	167.6 216.4	190.06	12.35	28.4	0.000
	Control	97.9–145.3	118.44	12.78		
/u/	Study	168.6–209.7	184.84	10.60	29.5	0.000
	Control	96.6–143.6	115.99	12.63		
F1						
/æ/	Study	165.6–215.3	190.24	12	26.4	0.000
	Control	99.7–150.9	122.17	13.72		
/i/	Study	161.9–211.7	184.72	11.64	27.4	0.000
	Control	97.9–145.8	118.52	12.85		
/u/	Study	162.8–205.3	180.29	10.61	27.5	0.000
	Control	96.5–143.8	116.19	12.58		
F2						
/æ/	Study	161.2–213.5	187.22	11.80	25.3	0.000
	Control	99.7–150.9	121.93	13.87		
/i/	Study	159.4–208.9	182.41	11.58	26.0	0.000
	Control	97.8–145.7	118.33	12.97		
/u/	Study	160.7–203.8	177.97	10.35	26.5	0.000
	Control	96.4–143.4	115.98	12.74		

F1, first follow-up (6 months after the end of the therapy program); F2, second follow-up (1 year after the end of the therapy program). $P<0.05$, significant. $P>0.05$, nonsignificant.

Table 9 Comparison between the study group and the control group as regards syllable duration

syllable durations	Group	Range	Mean	SD	t	P value
Pretherapy	Study	159–220.4	187.39	17.65	1.2	0.2
	Control	148.8–214.1	182.91	17.01		
Post-therapy	Study	242.8–285.9	268.82	10.85	30.1	0.000
	Control	148.9–213.9	183.15	16.94		
F1	Study	238.3–280.2	264.0	10.42	28.8	0.000
	Control	148.9–214.1	182.73	16.98		
F2	Study	237.7–278.2	260.77	10.52	27.5	0.000
	Control	148.9–214.3	182.89	17.01		

F1, first follow-up (6 months after the end of the therapy program); F2, second follow-up (1 year after the end of the therapy program). $P<0.05$, significant. $P>0.05$, nonsignificant.

therapy, which was also maintained during the first follow-up and second follow-up evaluations. The results confirm the findings that fluency-shaping therapy has clear positive effects on the speech of individuals with stuttering. The results, in particular, are in line with the findings of Onslow *et al.* [15], Harrison and Onslow [16], and O'Brian *et al.* [17] in that the fluency-shaping therapy is effective in reducing dysfluency. This result also indicates that fluency attainment is independent of severity of stuttering or age at the time of treatment; this result supports that of Boberg and Kully [13].

The speech rate of the study group increased significantly from pretherapy to post-therapy condition and continues to increase in the first follow-up and second follow-up. This is attributed to increase in fluency. This increase in speech rate despite using slower rate during training can be attributed to improvement in fluency and disappearance of time-consuming dysfluency moments and also attributed to the fact that, during therapy, after the patient became fluent, there was a gradual increase in the rate of speech while maintaining the other fluency-enhancing techniques such as easy onset of voice, light articulatory contacts, and managed breath support.

Table 10 Comparison between the study group and the control group as regards Visi Pitch

Visi Pitch	Group	Range	Mean	SD	t	P value
Pretherapy						
%Voiced	Study	29.3–68.6	38.4	6.7	1.3	0.1
	Control	28.6–46.6	36.9	4.0		
%Unvoiced	Study	18.6–53.6	34.6	3.7	2.7	0.007
	Control	17.6–47.7	31.9	5.6		
%Pause	Study	31.5–59.6	42.92	7.43	0.38	0.70
	Control	30.6–58.6	42.36	7.32		
Post-therapy						
%Voiced	Study	15.8–45.8	30.5	6.4	6.4	0.000
	Control	28.6–36.9	37.6	4.3		
%Unvoiced	Study	35.7–55.7	41.3	3.5	9.8	0.000
	Control	17.7–48.6	32.0	5.6		
%Pause	Study	6.4–17.4	11.2	2.5	27.9	0.001
	Control	30.3–58.8	42.2	7.3		
F1						
%Voiced	Study	15.9–45.8	30.8	6.3	4.8	0.000
	Control	4.5–46.6	36.9	6.3		
%Unvoiced	Study	35.3–55.6	41.4	3.6	9.3	0.000
	Control	17.6–48.8	32.2	5.8		
%Pause	Study	6.7–18.7	11.3	2.6	28.1	0.001
	Control	30.4–58.4	42.3	7.3		
F2						
%Voiced	Study	15.6–45.9	30.7	6.4	6.3	0.000
	Control	28.6–47	37.7	4.3		
%Unvoiced	Study	34.3–55.3	41.2	3.7	9.2	0.000
	Control	17.7–48.4	32.3	5.7		
%Pause	Study	6.8–19.3	11.3	2.9	2.9	0.000
	Control	30.2–58.6	42.4	7.3	7.3	

F1, first follow-up (6 months after the end of the therapy program); F2, second follow-up (1 year after the end of the therapy program). $P<0.05$, significant. $P>0.05$, nonsignificant.

Table 11 Correlation between post-therapy and first follow-up in the study group as regards speech rate, sentence duration, syllable duration, voice onset time, vowel duration, and Visi Pitch

	Post-therapy (mean±SD)	F1 (mean±SD)	t	P	Significance
Speech rate	96.7±12.8	100.3±13.1	14.8	0.000	S
Sentence duration	5.3±0.6	4.8±0.6	20.3	0.000	S
Syllable duration	268.8±10.8	263.9±10.4	18.9	0.000	S
VOT					
/t/	73.7±8.4	73.7±8.3	0.7	0.5	NS
/k/	67.9±8.2	68.6±9.0	0.9	0.3	NS
/d/	56.3±6.0	56.5±5.8	0.5	0.5	NS
/g/	52.6±5.1	52.8±5.0	0.7	0.4	NS
/b/	50.0±5.3	50.0±5.2	0.4	0.6	NS
Vowel duration					
/æ/	195.1±12.4	190.2±12.0	18.4	0.000	S
/i/	190.0±12.3	184.7±11.6	8.7	0.000	S
/u/	184.8±10.6	180.2±10.6	22.1	0.000	S
Visi Pitch					
%Voiced	30.5±6.4	30.8±6.3	1.2	0.2	NS
%Unvoiced	41.3±3.5	41.4±3.6	0.6	0.5	NS
%Pause	11.2±2.5	11.3±2.6	0.8	0.3	NS

F1, first follow-up (6 months after the end of the therapy program); S, significant; VOT, voice onset time.

Fluent speech requires speakers to efficiently coordinate oral–facial muscles and the vibration of vocal folds, and these skills are often lacking in people who stutter (PWS). Such incoordination can result in speech disruptions and compromising articulatory stability. This phenomenon may be observed in acoustic measurements; through further examination of stops in context, VOT measures may

Table 12 Correlation between first follow-up and second follow-up in the study group as regards speech rate, sentence duration, syllable duration, voice onset time, vowel duration, and Visi Pitch

	F1 (mean±SD)	F2 (mean±SD)	*t*	*P*	Significance
Speech rate	100.3±13.1	103.2±13.6	12.6	0.000	S
Sentence duration	4.8±0.6	4.4±0.5	13.9	0.000	S
Syllable duration	263.9±10.4	260.7±10.5	12.7	0.000	S
VOT					
/t/	73.7±8.3	73.5±8.2	1.9	0.06	NS
/k/	68.6±9.0	68.3±9.0	0.3	0.7	NS
/d/	56.5±5.8	56.7±6.0	0.8	0.4	NS
/g/	52.8±5.0	52.5±4.9	1.5	0.1	NS
/b/	50.0±5.2	49.8±5.2	1.9	0.06	NS
Vowel duration					
/æ/	190.2±12.0	187.2±11.7	12.2	0.000	S
/i/	184.7±11.6	182.4±11.5	12.2	0.000	S
/u/	180.2±10.6	177.9±10.3	4.3	0.000	S
Visi Pitch					
%Voiced	30.8±6.3	30.7±6.4	1.9	0.05	NS
%Unvoiced	41.4±3.6	41.2±3.7	1.8	0.07	NS
%Pause	11.3±2.6	11.3±2.9	0.7	0.4	NS

F1, first follow-up (6 months after the end of the therapy program); F2, second follow-up (1 year after the end of the therapy program); S, significant; VOT, voice onset time.

Table 13 Correlation between pretherapy, post-therapy first follow-up and second follow-up in the study group as regards auditory perceptual assessment, visual perceptual assessment, and Stuttering Severity Instrument for Children and Adults-Arabic version

	Pretherapy		Post-therapy		F1		F2		*F*	*P* value	Significance
	Mean	SD	Mean	SD	Mean	SD	Mean	SD			
APA											
IPDs	1.22	0.82	0.06	0.24	0.1	0.2	0.08	0.27	82.93	0.001	S
R	2.30	0.54	0.08	0.27	0.1	0.4	0.20	0.49	379.63	0.001	S
P	1.54	0.68	0.02	0.14	0	0.1	0.04	0.20	220.65	0.001	S
B	1.80	0.67	0.04	0.20	0.1	0.2	0.14	0.35	239.89	0.001	S
VPA											
eye contact	1.44	0.81	0.16	0.37	0.16	0.37	0.16	0.37	87.72	0.001	S
Involuntary movements in face	1.36	0.66	0.04	0.20	0.04	0.2	0.04	0.20	168.33	0.001	S
Involuntary movements in extremities	1.72	0.78	0.12	0.33	0.12	0.33	0.12	0.33	154.33	0.001	S
ASSI	25.36	3.44	1.48	3.01	1.7	3.4	2.12	4.23	714.91	0.001	S

APA, auditory perceptual assessment; ASSI, Severity Instrument for Children and Adults-Arabic version; B, block; F1, first follow-up (6 months after the end of the therapy program); F2, second follow-up (1 year after the end of the therapy program); IPDs, intraphonemic disruptions; P, prolongation; R, repetition; S, significant; VPA, visual perceptual assessment.

shed further light on articulatory instability in PWS [18]. Consequently, fluency gains during therapy are attributed to fluency-enhancing techniques used during the therapy program. These techniques could be facilitating greater coordination within and between speech subsystems of respiration, phonation, and articulation, resulting in decreased stuttering.

Acoustic analysis have been found to be informative because it affords quantitative analysis that carry potential for subsystem (respiratory, laryngeal, and articulatory) description and for determining the correlates of perceptual judgment.

The results of this study are consistent with a previous research indicating that stuttering therapy alters the acoustic properties of stutterers' fluent speech concomitant with a reduction in stuttering frequency [19].

As regards sentence duration there was a lower mean sentence duration among patients in the study group compared with the control group during post-therapy, first follow-up, and second follow-up. This is attributed to increase in their fluency and increased speech rate.

Present study showed a higher post-therapeutic value in VD. This may be attributed to the fact that the patients participating in the therapeutic program were required to produce easy onset of phonation, prolong syllables, make a gentle transition between sounds, and reduce the articulatory tension. The increase in VD

Table 14 Correlation between participants of the study group as regards stuttering severity during pretherapy, post-therapy, first follow-up and second follow-up evaluations

ASSIs	Pretherapy	Post-therapy	F1	F2
G1 (8–11 years and 11 months) (n=19)				
Mean	24.26	1.21	1.21	2.05
SD	4.07	2.88	2.88	2.88
G2 (12–17 years and 11 months) (n=18)				
Mean	26.00	1.50	1.67	1.78
SD	3.14	2.90	3.29	3.61
G3 (18–20 years) (n=13)				
Mean	26.08	1.85	2.31	4.46
SD	2.56	3.53	2.69	5.31
F	1.593	0.167	0.382	0.174
P value	0.214	0.847	0.685	0.841
Significance	NS	NS	NS	NS

ASSI, Stuttering Severity Instrument for Children and Adults-Arabic version; F1, first follow-up (6 months after the end of the therapy program); F2, second follow-up (1 year after the end of the therapy program); G1, first group; G2, second group; G3, third group.

post-therapeutically is in agreement with the result of Riley and Ingham [20] and Abo Ras et al. [21], who found a significant increase in VD after therapy. They speculated that the increased VD allows more time for speech motor planning and that stuttering is reduced moderately as a byproduct of longer VD. However, this is in contrast to the results of Brown et al. [22], who reported that the acoustic signal of all participants was altered following treatment. However, no consistent pattern of change was observed.

VOT is defined as the time between the release of the oral constriction for plosive production and the onset of vocal fold vibrations. It is an objective temporal acoustic parameter reflecting motor speech control. VOT is particularly important, given that VOT is an index of the coordination between laryngeal and supralaryngeal systems and the coordination between these systems has been hypothesized to play an important role in stuttering [23].

The findings of the present study indicate that both voiceless and voiced VOT duration significantly increased following therapy. These results are in agreement with the findings of Abo Ras et al. [13] and Santosh and Savithri [24], who found an increased duration of VOT post-therapeutically compared with pretherapy conditions reported in their study. However, it does not agree with the results of Onslow et al. [15], who found that VOT decreased from pretherapy to post-therapy condition. In contrast, Robb et al. [25] showed results that VOT was stable from pretherapy to 2-month follow-up after therapy. These widespread contradictory results can be explained by the use of multiple

small samples of speech that by their very nature are subject to both linguistic influence and the dialectical pattern and speech rate of the speaker. The post-therapy increase in VOT reported in the present study in the study group may be attributed to the practice of smooth articulatory movement between sounds and the light contacts of articulators during stops and production of fricative sounds. During first follow-up and second follow-up evaluations, there were changes in the mean value of VOT. Nevertheless, these changes did not reach statistically significant level compared with post-therapy evaluation, which indicate that the participants continue to use the skills they leaned during the therapy program. These results are correlated to those of the ASSI that showed maintenance of the participants' fluency gain.

The Visi Pitch result in this study found that the percent pause decreased significantly in the study group, with high percentage of improvement. This result indicated a decrease in blockage duration and is a sign of improvement. This result is in agreement with the result of Shoeib [26] and Abo Ras et al. [21]. In the present study, the study group showed higher post-therapeutic values of the voiceless%, and lower post-therapeutic values of the voiced%. This can be also attributed to instructing participants to prolong syllables, lightly articulate voiced sounds, and produce easy onset of phonation. There was no statistically significant difference in the mean for %voiced, % unvoiced, and %pause during first and second follow-up evaluations compared with post-therapy evaluation. These results are correlated with those of the ASSI that showed maintenance of the participants' fluency gain, and indicate that the participants continue to use the skills they leaned during the therapy program.

In fluency-shaping approaches, secondary stuttering symptoms, including speech-related fears and anxieties, are not treated as it is assumed that these will disappear as the person who stutters learns to speak fluently. These methods are known to produce fluency in the low-stress contexts of the speech clinic while being ineffective in stressful 'real-life' situations outside of the speech clinic. These secondary stuttering symptoms can not only have an adverse impact on patient's ability to communicate but also interfere with their progress in therapy [27]. Therefore, there was a need to address these issues in treatment to ensure the effectiveness of treatment. Cognitive restructuring tasks have been selected on the basis of a comprehensive analysis of the literature from cognitive psychology as being effective for helping people

Table 15 Results of the speech performance questionnaire in the study group before and after therapy

Responses	Number of patients [N (%)]	
	Before therapy	After therapy
Satisfaction with speech		
Highly satisfied	0 (0)	8 (16.0)
Satisfied	1 (2.0)	41 (82.0)
Dissatisfied	36 (72.0)	1 (2.0)
Highly dissatisfied	13 (26.0)	0 (0)
Current rating of speech fluency		
Terrific	0 (0)	9 (18.0)
Very good	0 (0)	21 (42.0)
Good	1 (2.0)	19 (38.0)
Bad	35 (70.0)	1 (2.0)
Very bad	14 (28.0)	0 (0)
Your evaluation of your speech		
Excellent	0 (0)	12 (24.0)
Good	1 (2.0)	31 (62.0)
Acceptable	2 (4.0)	6 (12.0)
Bad	31 (62.0)	1 (2.0)
Very bad	16 (32.0)	0 (0)
Currently I consider myself a stutterer		
Yes	44 (88.0)	1 (2.0)
No	6 (12.0)	49 (98.0)
I have skills to control my stuttering		
Yes	1 (2.0)	49 (98.0)
No	49 (98.0)	1 (2.0)
speech seems normal with skills to control stuttering		
Yes	1 (2.0)	49 (98.0)
No	49 (98.0)	1 (2.0)
I avoid speaking in public		
Yes	14 (28.0)	0 (0)
No	33 (66.0)	49 (98.0)
Sometimes	3 (6.0)	1 (2.0)
Current evaluation of stuttering		
Very severe	12 (24.0)	0 (0)
Severe	13 (26.0)	0 (0)
Moderate	18 (36.0)	1 (2.0)
Mild	6 (12.0)	7 (14.0)
Very mild	1 (2.0)	42 (84.0)
I prefer to be silent when situation necessitates speaking		
Yes	16 (32.0)	0 (0)
No	32 (64.0)	50 (100.0)
Sometimes	2 (4.0)	0 (0)
I have skills to speak fluently		
Yes	1 (2.0)	49 (98.0)
No	49 (98.0)	1 (2.0)
speech seems normal with skills to speak fluently		
Yes	1 (2.0)	49 (98.0)
No	49 (98.0)	1 (2.0)
Now I feel like a normal speaker		
Yes	1 (2.0)	49 (98.0)
No	49 (98.0)	1 (2.0)
I trust in my abilities as a speaker		
Yes	11 (22.0)	49 (98.0)
No	39 (78.0)	1 (2.0)
I keep speaking regardless of the listener's reaction		
Yes	29 (58.0)	50 (100.0)
No	21 (42.0)	0 (0)

(Continued)

Table 15 (*Continued*)

Responses	Number of patients [N (%)]	
	Before therapy	After therapy
I feel a better future is expected if I speak fluently		
Yes	49 (98.0)	50 (100.0)
No	1 (2.0)	0 (0)
When I speak I feel		
Fear	29 (58.0)	6 (12.0)
Irritable	33 (66.0)	10 (20.0)
Guilt	1 (2.0)	1 (2.0)
Depressed	14 (28.0)	1 (2.0)
Bashfulness	17 (34.0)	0 (0)
Feebleness	1 (2)	0 (0)
Incompetence	2 (4)	0 (0)
All of the above feelings	15 (30.0)	0 (0)
None of the above feelings	0 (0)	18 (36.0)
My speech affects my image in front of others		
Yes	39 (78.0)	38 (76.0)
No	11 (22.0)	12 (24.0)
Stuttering will affect my future in a negative way		
Yes	42 (84.0)	47 (94.0)
No	8 (16.0)	3 (6.0)
I care for the listener's reaction to my speech		
Yes	20 (40.0)	8 (16.0)
No	30 (60.0)	42 (84.0)
I avoid speaking on the phone		
Yes	7 (14.0)	0 (0)
No	33 (66.0)	50 (100.0)
Sometimes	10 (20.0)	0 (0)

change their reactions to difficulties they face in their lives [28].

The aim of using cognitive restructuring is to develop positive attitudes toward communication, reduce avoidance, improve social skills, develop the ability to manage fear and anxiety, and deal with negative listener reactions. In the current study, assessment of participants of the study group as regards feelings and attitudes was carried out using a speech performance self-reported questionnaire before and after the end of the therapy program. This questionnaire was used as a measure other than reduction in stuttering severity, which also indicated benefits for participants following treatment. The results of this assessment showed an increase in patient satisfaction with their speech and trust in their abilities as a speaker. This was accompanied by a decrease in their avoidance of speaking situation. There was also improvement as regards patient's feelings during speech such as fear, irritability, bashfulness, guilt, and depression. It is evident that cognitive therapy in isolation may not consistently result in changes to fluency. However, by combining cognitive therapy with fluency-shaping therapy, stuttering can be reduced and it can help contribute

to improvement in self-confidence and overall sense of wellbeing [29].

The results showed improvements in both the avoidance and participants' feelings during speech, and positive effect on participant's attitude toward their speech. Furthermore, in line with our results, Blood [30] reported that by incorporating cognitive restructuring into fluency-shaping therapy, the potential for relapse may be minimized.

Long-term efficacy of the therapy program has been investigated by re-evaluation of the study group at 6 months (first follow-up) and 12 months (second follow-up) using the same assessment protocol. Although treatment procedures were stopped, the results of the long-term evaluation were satisfactory. This result is in agreement with reports that have provided data in the short or medium term efficacy of fluency-shaping therapies, as well as some reports that provided evidence of treatment effects at periods longer than 2 years after treatment [16,29].

Bloodstien [31] described 12 stringent criteria that a therapy program must meet before it can be considered completely successful. Our study met seven of these 12 criteria that Boloodstien mentioned which are as follows: (i) the effectiveness of the therapy program on a representative group of stutterers, (ii) the objective measures of speech that were used to demonstrate result, (iii) the alleviation of the stutterer fears and individual's self-concept as a stutterer as proved by the result of the questionnaire, (iv) the program continuing to be successful after the initial wave of enthusiasm had died away as it has been show effective on a previous study, (v) presence of a suitable control group, (vi) the stability of the results has been demonstrated with long-term follow-up that lasts for 1 year after the end of the therapy program, (vii) repeated evaluations and adequate speech samples.

Limitation of our study includes the use of questionnaires on the participant's perspective on his fluency with the lack of inclusion of naive listeners for formal speech naturalness ratings. In fact, any limitations are attributed to the inherent complexities of stuttering research because of the multidimensional factors that are not easily generalized to the heterogeneous population of people who stutter.

Conclusion
In the current study, the participants achieved speech, free of obvious struggle, and had changed their impression of themselves and were able to manage their dysfluent moments with the skills acquired throughout the intervention. The presented program provides participants with strategies that significantly improve their speech behavior and their attitudes toward speech. The participants in this study showed significant gains on all subjective and objective clinical measures of stuttering severity and attitude change. Improvement in fluency is associated with changes in values of spectrographic analysis and Visi Pitch values. These results indicate the efficacy of the Arabic fluency-shaping program in rehabilitation of stuttering.

Conflicts of interest
There are no conflicts of interest.

References
1 Ward D. *Stuttering and cluttering: frameworks for understanding and treatment*. New York: Psychology Press; 2008.
2 Boyle CA, Boulet S, Schieve LA, Cohen RA, Blumberg SJ, Yeargin-Allsopp M, *et al.* Trends in the prevalence of developmental disabilities in US children, 1997–2008. Pediatrics 2011; 127:1034–1042.
3 Bohland JW, Myers EM, Kim E. An informatics approach to integrating genetic and neurological data in speech and language neuroscience. Neuroinformatics 2014; 12:39–62.
4 Craig A, Blumgart E, Tran Y. The impact of stuttering on the quality of life in adults who stutter. J Fluency Disord 2009; 34:61–71.
5 Yaruss JS, Coleman C, Hammer D. Treating preschool children who stutter: description and preliminary evaluation of a family-focused treatment approach. Lang Speech Hear Serv Sch 2006; 37:118–136.
6 Kalinowski J, Saltuklaroglu T. The road to efficient and effective stuttering management: information for physicians. Curr Med Res Opin 2004; 20:509–515.
7 Salihovikj N, Junuzovikj L, Duranovikj M, Ibrahimagikj A, Beganovikj L. Stuttering therapy for a child at intermediate stuttering level. J Spec Educ Rehab 2009; 10:41–51.
8 Thomas C, Howell P. Assessing efficacy of stuttering treatments. J Fluency Disord 2001; 26:311–333.
9 Last JM. A dictionary of epidemiology. New York: Oxford University Press; 1983.
10 Rifaie N. Evaluation of therapy of Arabic speaking stutteres using Rifaie Fluency Shaping Program (R.F.S.P.). Benha Med J 2003; 20:699–711.
11 Rifaie N. Arabicizing and standardizing the stuttering severity instrument (SSI) on the Arabic environment. Ain Shams Med J 1999; 50:907–914.
12 Melika L. Stanford Binet Intelligence Scale (4th Arabic version). 2nd ed. Cairo: Victor Kirolos Publishing; 1998.
13 Boberg E, Kully D. Long-term results of an intensive treatment program for adults and adolescents who stutter. J Speech Hear Res 1994; 37:1050–1059.
14 Prins D, Ingham RJ. Evidence-based treatment and stuttering – historical perspective. J Speech Lang Hear Res 2009; 52:254–263.
15 Onslow M, Costa L, Andrews C, Harrison E, Packman A. Speech outcomes of a prolonged-speech treatment for stuttering. J Speech Hear Res 1996; 39:734–749.
16 Harrison E, Onslow MJ. Early intervention for stuttering: the Lidcombe programme. In: Conture E, Curlee R, editors. Stuttering and related disorders of fluency. 2nd ed. New York: Thieme Medical Publishers Inc.; 1998. 55–75.
17 O'Brian S, Onslow M, Cream A, Packman A. The Camperdown Program: outcomes of a new prolonged-speech treatment model. J Speech Lang Hear Res 2003; 46:933–946.

18 Smith A, Sadagopan N, Walsh B, Weber-Fox C. Increasing phonological complexity reveals heightened instability in inter-articulatory coordination in adults who stutter. J Fluency Disord 2010; 35:1–18.

19 Metz DE, Samar VJ, Sacco PR. Acoustic analysis of stutterers' fluent speech before and after therapy. J Speech Hear Res 1983; 26:531–536.

20 Riley GD, Ingham JC. Acoustic duration changes associated with two types of treatment for children who stutter. J Speech Lang Hear Res 2000; 43: 965–978.

21 Abo Ras Y, El-Maghraby R, Madkour W. Outcome of stuttering therapy on Egyptian school-aged children using the Speak Freely Program. Egypt J Otolaryngol 2015; 31:188–195.

22 Brown S, Ngan E, Liotti M. A larynx area in the human motor cortex. Cereb Cortex 2008; 18:837–845.

23 Auzou PC, Özsancak RJ, Morris M, Jan F, Eustache J, Hannequin D. Voice onset time in aphasia, apraxia of speech and dysarthria: a review. Clin Linguist Phon 2000; 14:131–150.

24 Santosh M, Savithri SR. Efficacy of prolonged speech therapy in persons with stuttering: perceptual measures. JAIISH 2007; 26:18–22.

25 Robb MP, Lybolt JT, Price HA. Acoustic measures of stutterers' speech following an intensive therapy programme. J Fluency Disord 1985; 3:169–179.

26 Shoeib RM, The use of Visi-Pitch in management of stuttering [MS thesis]. Phoniatric Unit, Faculty of Medicine, Ain Shams University; 1996.

27 Healey EC, Trautman SL, Susca M. Clinical applications of a multidimensional approach for the assessment and treatment of stuttering. Contemp Issues Commun Sci Disord 2004; 31:40–48.

28 Rapee RM, Wignall A, Psych M, Hudson JL, Schniering CA. Treating anxious children and adolescents: an evidence-based approach. Oakland, CA: New Harbinger Publications Inc.; 2000.

29 Beilby JM, Byrnes ML, Yaruss JS. Acceptance and Commitment Therapy for adults who stutter: psychosocial adjustment and speech fluency. J Fluency Disord 2012; 37:289–299.

30 Blood GW. A behavioral-cognitive therapy program for adults who stutter: computers and counseling. J Commun Disord 1995; 28:165–180.

31 Bloodstein O. A handbook on stuttering. 5th ed. San Diego, CA: Singular Publishing Group Inc.; 1995.