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The effect of fluency training on interpreter trainees' speech fluency, comprehensibility, and accentedness

An experimental study

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Fluency, comprehensibility, and accentedness are considered important parameters of interpreting quality but have rarely been studied systematically in training programs of interpreting. Therefore, the present study was set up to investigate the effect of fluency training on speech fluency, comprehensibility, and accentedness of interpreter trainees. Two groups of interpreter trainees at a university in Iran took part in the study, receiving the same amount of instruction and practice (12 hours over 4 weeks). The experimental group ($N=30$) spent 33% of the time (i.e., 4 of the 12 hours in the training program) on dedicated fluency strategy training, encouraging the memorization, repetition, and retelling of audio and video materials. The remaining 67% was spent on training general speaking skills. The control group ($N=30$) were only taught general speaking skills in the training program but received no dedicated fluency training. Systematic interviews were run to assess the interpreter trainees' speech fluency, comprehensibility and accentedness, which were judged independently by three expert raters at three moments of testing, i.e., pretest, immediate posttest, and delayed posttest (one month later). The findings revealed that the fluency training significantly enhanced the interpreter trainees' fluency, and to a lesser extent the students' comprehensibility but had only a marginal effect on accentedness. The pedagogical implication would be that awareness training on speech fluency in EFL settings be included in interpreting training programs.

Keywords: speech comprehensibility, accentedness, speech fluency, fluency training, interpreter trainees

1. Introduction

Listeners' judgments of L2 speech in various global constructs include spoken fluency, comprehensibility, and accentedness as indicators of L2 speakers' oral proficiency (Derwing & Munro, 2015). The main goal of many English as foreign language (EFL) learners is to be fluent in the target language so as to be capable to transfer their thoughts smoothly and easily in different contexts. Communication should ultimately be smooth, automatic, and fast. Fluency is generally perceived to refer to the flow and smoothness of speech delivery (Koponen & Riggensbach, 2000). Fluency is determined by a speaker's linguistic knowledge and the use of that knowledge, and by the speed of access to and control over the available linguistic forms and syntactic devices (e.g., Foster, 2020; Hanzawa, 2021; Lennon, 1990).

Fluency has been found to affect EFL/ESL speech comprehensibility (Derwing et al., 2004; Iwashita et al., 2008; Kang et al., 2010; Thomson, 2015). One intervention method that can be applied to boost EFL learners' fluency is task repetition, which is the repeated performance of tasks that share some of the same pragmatic purpose or purposes and some of the same content (e.g., Ahmadian & Tavakoli, 2011; Bygate, 2001, 2018; de Jong & Perfetti, 2011; Lambert et al., 2017; Thai & Boers, 2016; Yu & van Heuven, 2013, 2017, 2021). When EFL students are suggested to repeat the same tasks, the relevant aspects of schematic and content memory are activated and remembered while doing the first task, more cognitive resources can be finally applied for allocating attention to formulating linguistic forms accurately (Fukuta, 2016). The subsequent task performance is further boosted by the lexical, and syntactic encoding processes activated during the first task performance, resulting in fluency development.

Accentedness (i.e., phonological nativelikeness) has been operationalized as perceived nativelikeness (Abrahamsson & Hyltenstam, 2009; Saito, 2021; Saito & Plonsky, 2019). The term refers to how closely second language speech approximates the phonological norm of native speakers (i.e., how native speakers of a language perceive the degree of nativelikeness in L2 speakers) (Hyltenstam, 2012). Nonnative accent may also compromise a speaker's interpersonal evaluations, employment opportunities, credibility, and vocational competence (e.g., Cargile, et al., 2010; Carlson & McHenry, 2006; Noor, 2017), which renders it imperative to reduce nonnative accent as much as possible for interpreter trainees.

The literature reflects a growing amount of theoretical discussion that fluency serves as a crucial element of speaking proficiency (e.g., Foster, 2020). The effect of fluency instruction on speech comprehensibility and accentedness has not been examined, even though further studies have been encouraged by scholars (e.g., Saito, 2021; Suzuki, 2020; Thai & Boers, 2016). Therefore, the present study

is set up to explore the effect of fluency training on interpreter trainees' speech fluency, as well as their comprehensibility, and accentedness in the context of Iran.

1.1 Fluency

Second language fluency has three domains including, cognitive fluency, utterance fluency, and perceived fluency (Segalowitz, 2010). Segalowitz defines *cognitive fluency* as the efficiency of the operation of the cognitive mechanisms underlying performance, and the ability to efficiently mobilize and integrate the underlying cognitive processes responsible for producing utterances. *Utterance fluency* deals with the measurable aspects of fluency in uttered speech such as speed, pausing and hesitation, and *perceived fluency* reflects the inferences listeners make about speakers' cognitive fluency based on their perception of the speech that they hear. Lennon (1990) subdivided fluency into broad and narrow fluency. Broad fluency is equivalent to general language proficiency and covers appropriate choice of vocabulary, grammatical correctness and complexity of speech production. Narrow fluency is limited to temporal measures, such as length and number of pauses and the number of hesitations (e.g., *I uh enjoy movies*) and repetitions (e.g., *I enjoy I enjoy movies*). Narrow fluency specifically addresses (1) the use of silent and filled pauses, (2) the speed of delivery of the speech and (3) the use of hesitations and/or corrections (Bosker et al., 2013; Lennon, 1990).

Scholars generally agree that fluency is a complicated and multifaceted construct, often difficult to assess and define (Lennon, 1990; Segalowitz, 2010). Instructors think of fluency in Lennon's (2000) broad sense of global second language (L2) proficiency, which is not necessary to be taught but emerges naturally as a result of successful learning of L2 structures (Tavakoli & Hunter, 2018). Research in EFL/ESL speech fluency is increasing because of the crucial role it plays in manifesting the development of communicative ability. When EFL students expand their L2 repertoire and promote to a higher proficiency level, their language use gets more automatic and they generally develop speech production with higher fluency (Skehan, 2009, 2015). The notion of fluency has been found to correlate positively with the speaker's proficiency level, and it is, therefore, a construct to be used for assessing L2 proficiency (Fulcher, 2003), and it is included in the rating scales of TOEFL and IELTS.

Efforts have been made to elaborate the notion of fluency, and to recognize methods of assessing it reliably. Skehan's (2009) perspective on measuring fluency, and Segalowitz's (2010) model for fluency are two successful attempts that have broadened our horizon of the notion fluency. These studies provided the field with more valid and reliable indices of fluency. Some researchers (e.g.,

Kahng, 2014; Kormos, 2006) in the field have reported that fluency can be measured using indices of speed, breakdown and repair (i.e., how fast a speaker talks; how much pausing disrupts the flow of speech, and how much repair is used to correct, reformulate and restore L2 utterances). There is robust evidence, which shows fluency deals with communicative adequacy in language assessment (de Jong et al., 2015; Revesz et al., 2016), influences raters' perspectives of L2 capability (Prefontaine et al., 2016), and predicts proficiency (Iwashita et al., 2008; Revesz et al., 2016).

Research on fluency instruction has mostly been done on its short-term effects and not on longer-term development. Short-term effects on fluency can be elaborated by planning and repetition while longer-term impacts may need proceduralization and automatization (de Jong & Perfetti, 2011). Research has proposed that classroom language methods develop fluency in targeted perspectives. For instance, repeating the speaking tasks has revealed fewer instances of repair and breakdown disfluencies (Foster & Hunter, 2016). Spending some time on pre-speaking tasks, and not starting the tasks immediately, has shown to improve fluency (Skehan & Foster, 1999). There are some procedures that theoretically affect the process of fluent production. Pre-task planning (Yuan & Ellis, 2003) and task repetition (Bygate & Samuda, 2005) are appropriate strategies to improve speech fluency by freeing up attentional resources. For instance, task repetition helps learners' selection of words, morphemes, and grammatical structures.

1.2 Accentedness and speech comprehensibility

Accentedness refers to the degree to which a person's speech sounds different from the speech patterns of a particular language or dialect (Yenkimaleki, 2017). It is often associated with second language acquisition and can be influenced by factors such as pronunciation, intonation, and rhythm. For interpreter trainees, accentedness can play a role in their overall language proficiency and communication effectiveness. While having an accent is not necessarily a negative aspect, it can affect the comprehensibility of their speech, especially when interpreting for others (Yenkimaleki & van Heuven, 2018).

In the context of interpreter training, it is important for trainees to develop clear and intelligible speech to ensure effective communication. This involves not only improving their language skills but also working on pronunciation, intonation, and other aspects of speech production. Interpreter training programs typically provide instruction and practice in improving accents and developing more native-like speech patterns. Trainees may receive feedback from instructors or engage in exercises that focus on specific aspects of pronunciation or intonation.

The goal is to enhance their ability to be understood by others while interpreting (Reithofer, 2020).

It is worth noting that while reducing accentedness can improve speech comprehensibility, it is not always necessary for successful interpretation. Skilled interpreters can still convey meaning effectively even if they have a noticeable accent. However, minimizing accentedness can enhance their overall performance and help them adapt to different contexts and audiences (Setton & Dawrant, 2016). Accentedness and speech comprehensibility are interconnected but distinct concepts (Derwing & Munro, 2005; Saito & Akiyama, 2017) for EFL students. While accentedness refers to deviations from native-like pronunciation, speech comprehensibility encompasses various aspects of language proficiency that contribute to effective communication. EFL students should strive for improved speech comprehensibility while acknowledging and embracing their unique accents (Yenkimaleki & van Heuven, 2021).

Comprehensibility refers to the listeners' perception of the ease or difficulty with which they can make out a speaker's meaning and intentions, often measured by a rating on a Likert scale (Derwing & Munro, 1997; Isaacs & Thomson, 2013; Munro & Derwing, 1995). Comprehensibility cannot be located only with either the speaker or the listener (Zielinski, 2006). Some qualities of the speaker's vocal behavior, such as speed and pronunciation, will have an impact, as will qualities of the listener, such as experience and attention. Thus, successful communication relies on the efforts of both parties. Therefore, a given sample of speech must not simply be recognized as universally comprehensible; it is crucial to consider for whom a speech sample is comprehensible, and in what contexts (Lindeman & Subtirelu, 2013; Yenkimaleki & van Heuven, 2018, 2022).

1.3 Motivation of the present study

As reviewed above, researchers (e.g., Ahmadian & Tavakoli, 2011; Derwing et al., 2004; Iwashita et al., 2008; Kang et al., 2010;) stated that fluency is a crucial element of speaking proficiency (de Jong & Perfetti, 2011; Foster, 2020; Thomson, 2015; Yenkimaleki et al., 2023). Furthermore, scholars (e.g., Saito, 2021; Suzuki, 2020; Thai & Boers, 2016) encourage that future studies should be directed to investigations of fluency instruction, and measure its impact on both speech comprehensibility, and accentedness. Therefore, the present study was set up to shed more light on this issue by investigating systematically the effect of fluency training on interpreter trainees' speech fluency, comprehensibility, and accentedness.

The following research questions were raised:

- RQ1. *Does fluency training enhance the L2 speech fluency of interpreter trainees?*
- RQ2. *Does fluency training have a positive effect on interpreter trainees' speech comprehensibility?*
- RQ3. *Does fluency training have a positive effect on interpreter trainees' accentedness?*
- RQ4. *How do improved fluency and improved accentedness (if any) contribute to improved comprehensibility of interpreters' speech performance?*

In this context it is important that we realize that acquiring (narrow) fluency in a foreign language is a means rather than a goal. Ultimately, the speaker wants to be understood by their interlocutor. Better narrow fluency (i.e., fewer false starts and repetitions, fewer hesitation markers and an articulation rate that is optimally fits the listener's processing capacities) and reduction of foreign accentedness will render a speaker easier to understand. In our study, we replace one-third of a routine curriculum (as administered to the control group) intended to improve the students' EFL speaking skills by a dedicated module that targets the specific improvement of narrow fluency. The dedicated module does not pay special attention to pronunciation, so that we do not expect the students to develop a more native-like pronunciation in EFL as a result of the treatment.

In light of the above, we hypothesize that fluency training will enhance the (narrow) speech fluency of interpreter trainees (e.g., de Jong & Perfetti, 2011; Foster, 2020; Thomson, 2015) but will not affect their accentedness. Moreover, we hypothesize that the improved narrow fluency, if it should be found, will render the interpreters more comprehensible.

2. Method

2.1 Participants

The primary participants in this study were 60 Persian-speaking undergraduate students at the University of Applied Sciences in Tehran, Iran. None of them had studied or lived abroad. They had learned English in secondary school for four years, with two hours of lessons per week. In university, they had studied English language for five semesters before participating in the program at the University of Applied sciences. They agreed to take part in the project by signing an informed consent form. The mean TOEFL (paper-based version) scores for these students is around 540 (Yenkimaleki & van Heuven, 2016, 2018). The mean age of students was 22, and their age range was between 20 and 25 years ($SD=1.44$).

They had passed the entrance exam for the Translation and Interpreting Department. The students were randomly grouped into two classes of 30 with an equal division between male and female students (i.e., 15 male and 15 female students per group). One group (experimental group) was assigned to dedicated fluency training, while the second group served as a control group.

Three raters were involved in the experiment. Two of them were native speakers of Persian, and one was an American native speaker. We wanted to have at least one native speaker as a rater to add to the quality of the assessment, since in some cases native speakers can better recognize the nuances of fluency (Yenkimaleki & van Heuven, 2021). Judgements by native and non-native raters need to be consistent with each other. Ekmekçi (2016) as well as Zhang and Elder (2014) concluded that native and non-native English language instructors display almost identical rating behavior in assessing EFL students' oral proficiency. The first step in our data analysis will be to check whether this is also the case in our study.

The first rater has specialized in pronunciation training for EFL learners. He has some ten years' experience in teaching and research in this area. He wrote his PhD dissertation on this topic in the Netherlands but never lived in an English-speaking country. The native instructor obtained an MA in Linguistics from the University of Arizona, USA. He had studied linguistics and had worked as an instructor of English as a foreign or second language for fifteen years at the time the experiment was conducted. The third rater spoke Persian as his native language, and had the same professional qualifications as the first rater. He has done his PhD project at the University of Essex, in the United Kingdom, and successfully defended his doctoral dissertation there.

2.2 Materials and procedures

2.2.1 Materials to be rated for fluency

The participant's fluency in English as a foreign language was assessed by a panel of three expert judges at three different moments. For the assessments, speech materials were elicited and recorded from the participants. Participants were asked to speak impromptu on familiar topics by asking them the answer five open-ended, descriptive questions. The researchers, by consulting with each other, had decided on a set fifteen appropriate questions before the program started. The questions were descriptive in nature so that no reasoning or otherwise cognitively challenging skills were required of the students when answering them, e.g., *What does the campus at the University look like?* Five questions were then randomly chosen for the pretest session, five for the immediate posttest, and five for the delayed posttest (see Appendix 1 for a listing of the questions). To

ensure equal conditions for all participants, the fifteen questions were recorded by a single near-native speaker of English, and used later to elicit the participants' responses.

Following the procedures outlined by Bosker et al. (2013) and Yenkimaleki et al. (2023), each participant in each test was asked to produce approximately one minute of speech in English while answering each of five prerecorded successive questions made audible to them over headphones in an AAD language laboratory (seating 15 students). The participants' speech was recorded directly onto a digital computer (44,100 Hz; 16 bit) on 15 separate tracks through individual, table-mounted microphones.

One-hundred-eighty speech fragments of approximately five minutes (e.g., 810 minutes altogether) were recorded over the three moments of testing. Since we noticed no change in delivery over the course of the speech fragments, only the initial parts (of approximately 60 seconds) recorded from each speaker were later presented to raters (see Section 2.4), thereby keeping the rating task within manageable proportions.

2.2.2 Training materials

The students watched some parts of the *Friends* comedy series 2002–2004 in twelve sessions. For audio files, the students listened to Zapp English Podcasts (upper intermediate level).¹ The book *Interchange*, fifth edition (2017), supplied additional training material for control and experimental groups. In fluency training, *English Short Stories* by Richards (2016) was used to make the students read and retell the stories.

2.3 Treatment

The participants took part in the program for 12 sessions (60 minutes per session) during four weeks (i.e., 12 hours in all). The general organization of the teaching program is shown in Table 1, separately for the control group and the experimental group.

Students in each of the two groups listened to the instructor's explanations about the contents of the materials before listening to audio tracks and/or movies. This was the pre-speaking stage (i.e., 10 minutes in each session), in which the instructor prepared the students to speak, e.g., by talking about the topic of the materials in audio tracks/movies, creating motivation for the listening materials, elaborating on the specific critical vocabularies and the language structure of the materials. The students also received guidance in doing speaking skills tasks/exer-

1. <https://zappenglish.com/audio/english-audio/zapp-english-listening>

Table 1. Activities and time spent (minutes) by two groups of participants in the experiment. For details see text

Activity	Group	
	Control	Experimental
Listening to instructor explanations/guidance	180	180
Audio tracks / movies & discussion	540	300
Fluency training		240
Total time spent	720	720

cises. In all sessions, the instructor monitored and explained problematic issues raised during practicing and doing the exercises.

The experimental group spent 240 minutes less time on these tasks; during the time freed-up this way, they received dedicated fluency strategy training (one hour per week total), doing practical exercises in memorizing short stories, retelling them, and repeating phrases and sentences. The students were asked to memorize in different sessions some stories from *English Short Stories* (Richards, 2016) and retell them in class to the students. In some cases, students were also asked to repeat exact sentences from these stories. They were instructed to use fillers instead of pausing and to avoid false starts and repetitions when retelling the stories. The students subsequently practiced the strategy of not repeating and reformulating the sentences in their presentations. When retelling the stories, the students were instructed to avoid producing incomplete sentences. The instruction and practice went through the following stages:

1. Students received instructions on how to avoid repeating previously produced speech (e.g., repetition) and how to use fillers (e.g., when the students needed to pause during their short story telling).
2. The students were taught how to avoid producing incomplete sentences and leaving a word or phrase unfinished (i.e., suppress false starts). This was then practiced, e.g., by having the students discuss open-ended questions).
3. The students’ attention was also drawn to the deteriorating effect of replacing one word or phrase with another word on the fluency of their speech (e.g., in the practice of dialogue role plays); they were instructed to use fillers instead of pausing and to avoid replacement in their task-based narration, except if it could lead to more accurate speech.
4. The students did some practical tasks and were reminded of disfluency features (e.g., in the practice of discussion board game).

5. The negative effect of repetition and reformulation on the fluency of speech was explained once more (e.g., in the presentation practice by the students), and the need to use fillers was re-emphasized.

The goal of this strategy training, based on Cohen (1998), is to strengthen students and allow them to take control of the learning process. The goals of strategy training are to develop learners' strategy systems, autonomy, and self-direction and self-evaluation (Cohen, 1998), which all underlie the process of language learning. The students received explicit explanations as to how different strategies can be employed to improve speech fluency. Disfluency features, including repetition, false starts, reformulation, and replacement were briefly introduced to the learners by providing explicit definitions of each feature and examples, showing how these phenomena make their speech disfluent. The students were subsequently informed how to avoid such features. The students also became familiar with some common fillers used by native speakers in their pauses during the speech, e.g., *you know*, *and that sort of thing*, *as far as I can see*, *something you might call...*, etc.

The control group received routine exercises, asking them to listen to authentic movies/audio tracks in American English and to discuss issues brought up in the movies/audio tracks for a total of 540 minutes. Students practiced speaking tasks with no explicit mention of, or attention to, fluency.

2.4 Assessment

Three raters evaluated the speech fluency, comprehensibility, and accentedness of the students in pretest (e.g., one week before the treatment), immediate posttest (e.g., one week after the program ended), and delayed posttest (e.g., one month after the program ended).

The raters were instructed to pay attention to aspects of fluency (as in Bosker et al., 2013; Derwing et al., 2004; Rossiter, 2009), comprehensibility and accent (Derwing & Munro, 1997). When no instructions are given prior to the rating, raters will use their own definition of what constitutes fluency to judge the speaking samples (Cucchiaroni et al., 2002; Kormos & Dénes, 2004). The raters were instructed to pay attention to these aspects in one session before the evaluation of the students' speech. Written instructions, presented on their computer screen, asked raters to judge the speech fragments on overall fluency, comprehensibility and accentedness. In order to avoid the interpretation of fluency in the broad sense (i.e., overall speaking proficiency), raters were instructed *not* to rate the items in this broad interpretation. Instead, raters were explicitly asked to base

their judgments on (1) the use of silent and filled pauses, (2) the speed of delivery of the speech and (3) the use of hesitations and/or corrections.

To perform their task, raters downloaded a zip-file containing 180 recordings of 1 minute of speech in quasi-random order over speakers, groups and moment of testing, such that immediately succession of files produced by the same speaker was excluded. The file names were coded so that the raters could not know the identity of the individual speaker, the group they belonged to, or the moment the recording was made. The raters listened to the sequence of audio files on their own computer using their own headphones in the privacy of their own office, and entered their scores during the 10-second pause following each audio file. Raters were instructed to take frequent breaks, as often as they liked but never in the middle of a file.

Raters judged three aspects of the participant's speech using 9-point scales. The three scales were for Fluency (1=very disfluent, 9=very fluent), Comprehensibility (1=very difficult to understand, 9=very easy to understand), and Accentness (1=very strong nonnative accent, 9=perfectly native accent). Raters were explicitly allowed to use one decimal if they felt a need to differentiate between speakers in a more fine-grained fashion. This makes the rating scale practically equivalent to a percentage scale. The raters entered their scores in an excel sheet while listening to the recordings. The sheet listed the code numbers of the passages in the rows in the order in which they were presented, and the three scales in the columns in the fixed order (from left to right) Fluency-Comprehensibility-Accentedness.

3. Results

The first step in the statistical analysis of the data was to check the agreement among the three expert raters. Table 2 shows the mean scores given by each of the three raters for the criteria Fluency, Comprehensibility and Accentness. This information is given for the experimental and control groups separately, as well as for the two groups combined.

Table 2 shows that there is no systematic difference in the leniency of the raters, and that the raters are in excellent agreement with each other, with Cronbach's agreement coefficient (α) typically at $\alpha > .980$. In the case of Comprehensibility, the agreement is slightly lower but only for the experimental group (which is then reflected also when the groups are combined), but the agreement never drops below $\alpha = .850$. In light of these results, we decided to compute the mean ratings across the three experts, and conduct all further statistical analyses on the aggregated ratings.

Table 2. Mean scores for Fluency, Comprehensibility and Accentedness given by expert raters R1, R2 and R3 for performance of control and experimental groups separately and combined. Cronbach’s alpha is specified as the measure of interrater agreement

Criterion	Control group				Experimental group				Groups combined			
	R1	R2	R3	α	R1	R2	R3	α	R1	R2	R3	α
Fluency	6.15	6.02	6.17	.981	7.38	7.40	7.35	.986	6.76	6.71	6.76	.989
Compreh.	6.28	6.28	6.26	.976	6.73	6.64	6.71	.850	6.50	6.46	6.48	.916
Accent	5.42	5.29	5.28	.985	5.28	5.32	5.29	.988	5.35	5.30	5.28	.985
Mean	5.95	5.86	5.90		6.46	6.45	6.45		6.20	6.16	6.17	

Figure 1 shows the mean ratings for each of the three rating criteria (Fluency in panel A, Comprehensibility in panel B, Accentedness in panel C) for the control and experimental groups as a function of the Time of testing. The error bars represent the 95% confidence interval of the means.

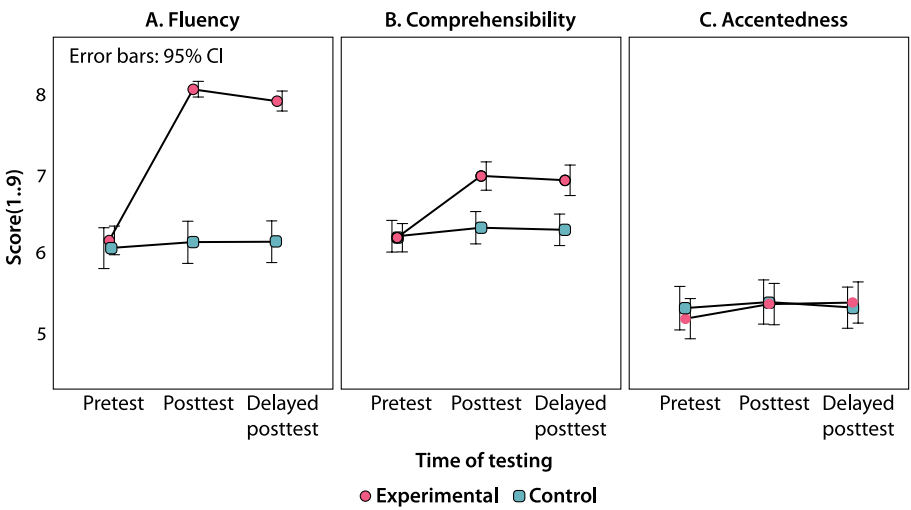


Figure 1. Score (scales from 1 to 9 = best) at three times of testing obtained by control and experimental groups. Rating criteria are in separate panels. Errors bars represent the 95% confidence intervals of the means

Visual inspection of Figure 1 shows that the experimental group did not differ from the control group in the pretest on any of the three dimensions, i.e., Fluency (panel A), Comprehensibility (panel B) and Accentedness (panel C). The experimental group then gained some 2 full points on the Fluency scale from 1 to 9 immediately after the treatment, and lost little in the delayed posttest, while no

effect of the treatment is seen for the control group. Comprehensibility ratings of the experimental group also improved after the treatment but less than the Fluency ratings. Again, the control group shows no effects. Accentedness ratings remained the same for both groups throughout the period of testing. In the remainder of this section, we will present these effects more precisely and test the statistical significance of the differences observed.

The results were analyzed statistically by a Repeated Measures Analysis of Variance (RM-ANOVA), for each criterion separately. Time of testing (Pretest, Immediate posttest, Delayed posttest) was entered as a within-subjects factor, while Group (Control, Experimental) was a between-subjects factor. The details of the RM-ANOVA and the subsequent post-hoc comparisons ($\alpha = .050$, with Bonferroni correction for multiple comparisons) of the three times of testing are given in Table 3. Partial eta squared ($p\eta^2$) is reported as the effect size.

The assumption of sphericity was violated for the RM-ANOVA for two of the three criterion scales. Therefore, we applied the Greenhouse-Geisser correction of the degrees of freedom before we determined the significance of main effects and interactions. As a result of this correction, the degrees of freedom for the within-subjects factor, interaction and error variance are lower and non-integer than the nominal values.

Table 3. Summary of effects and interactions found in RM-ANOVA for three dependent variables. Significant effects are bolded. Conditions P, I, D are listed in ascending order; '<': Significant contrast, '=': Contrast is insignificant

	RM-ANOVA						
Criterion	Effect/interaction	df1	df2	<i>F</i>	<i>p</i>	$p\eta^2$	Post hoc
Fluency	Time	1.436	83.304	615.0	<.001	.914	P < D < I
	Group	1.000	58.000	80.0	<.001	.900	
	Time × Group	1.436	83.304	520.3	<.001	.583	
Comprehensibility	Time	1.943	112.665	116.0	<.001	.667	P < D < I
	Group	1.000	58.000	10.7	.002	.156	
	Time × Group	1.943	112.665	69.8	<.001	.546	
Accentedness	Time	1.768	102.540	32.4	<.001	.358	P < I = D
	Group	1.000	58.000	.0	.863	.001	
	Time × Group	1.768	102.540	16.6	<.001	.222	

P: Pretest, I: Immediate posttest, D: Delayed posttest

Since the interaction between Time of testing and Group was significant for all three dependents, we performed additional separate ANOVAs on the main effect of Group obtained in the Pretest, the Immediate posttest, and the Delayed posttest. Similarly, we examined the effects of Time of testing separately for the two groups by oneway RM-ANOVAs. Insightful derived measures are the Gain (i.e., the difference) from Pretest to Immediate posttest, and the subsequent Loss from Immediate to Delayed posttest. The descriptive and inferential statistics of the additional ANOVAs are specified in Table 4.

For Fluency (RQ1), the main effect of Time of testing was highly significant. All three moments differed significantly from each other in the post hoc analysis of contrasts in the order Pretest, Delayed posttest, Immediate posttest ($P < D < I$). The effect of Group was also significant, as was the Time $\times$ Group interaction. Importantly, there was no significant difference between the two groups in the pretest (i.e., prior to the intervention), which is what we would expect given that the groups were randomly selected. The experimental group gained significantly more between Pretest and Immediate posttest than the control group, while the subsequent loss was not significant. Both groups gained significantly after the intervention, but the gain obtained by the experimental group, of close to 2 full points on the 9-point scale, was significantly larger than that of the control group (a gain of one-tenth of a point). No subsequent loss was incurred by the control group but the experimental group lost a significant amount of fluency between immediate and delayed posttest, but still did better in the posttest than before the intervention.

Table 4. Means and standard deviation of ratings (scales from 1 to 9 = best) obtained by two groups of participants at three points in time. Gain (from pretest to posttest) and subsequent Loss (from posttest to delayed test) are specified

Group		Posttest					Within-subjects ANOVA			
		Pretest	Immed.	Delayed	Gain	Loss	$F(2, 58)$	p	$p\eta^2$	Post hoc
A. Judged Fluency										
Control	Mean	6.06	6.13	6.14	.08	-.00	9.6	<.001	.249	$P < I = D$
	SD	.69	.71	.71	.11	.11				
Experimental	Mean	6.15	8.06	7.92	1.91	.15	632.4	<.001	.956	$P < D < I$
	SD	.48	.27	.34	.39	.18				
Between-Subjects ANOVA	F	.37	192.4	154.3	768.9	2.7				
	df_1, df_2	1,58	1,58	1,58	1,57	1,57				
	p	.537	<.001	<.001	<.001	.103				
	$p\eta^2$	.007	.768	.727	.931	.046				

Table 4. (continued)

		Posttest					Within-subjects ANOVA			
Group		Pretest	Immed.	Delayed	Gain	Loss	$F(2, 58)$	p	$p\eta^2$	Post hoc
B. Judged Comprehensibility										
Control	Mean	6.21	6.32	6.29	.11	.03	14.9	<.001	.339	P < D = I
	SD	.54	.55	.53	.12	.07				
Experimental	Mean	6.19	6.97	6.91	.77	.05	101.6	<.001	.778	P < D = I
	SD	.48	.48	.52	.36	.32				
Between-Subjects ANOVA	F	.02	24.3	21.2	98.8	.1				
	df1,	1,58	1,58	1,58	1,57	1,57				
	df2									
	p	.886	<.001	<.001	<.001	.774				
	$p\eta^2$	.000	.295	.267	.634	.001				
C. Judged accentedness										
Control	Mean	5.30	5.38	5.31	.08	.07	9.4	.001	.246	P = D < I
	SD	.74	.75	.70	.18	.13				
Experimental	Mean	5.17	5.35	5.37	.18	-.02	31.9	<.001	.524	P < I = D
	SD	.68	.70	.70	.15	.11				
Between-Subjects ANOVA	F	.53	.02	.13	11.1	9.3				
	df1,	1,58	1,58	1,58	1,57	1,57				
	df2									
	p	.470	.887	.717	.002	.003				
	$p\eta^2$	.009	.000	.002	.163	.141				

C: Control, E: Experimental (dedicated fluency training)

P: Pretest, I: Immediate posttest, D: Delayed posttest

The configuration of effects and interactions found for Comprehensibility (RQ2) are similar to those seen for Fluency but the effect sizes are smaller. Correction of degrees of freedom was not needed but applied nevertheless. Time of testing was a significant effect. The mean in the Pretest score was significantly lower than in the Delayed posttest which did not differ significantly from the slightly larger Immediate posttest score ($P < D = I$). Also, the effect of Group and the Time $\times$ Group interaction reached significance. Again, there was no significant difference between the groups prior to the intervention. Both groups gained from Pretest to Immediate posttest but the .8 gain was significantly larger for the experimental group than the .1 gain obtained by the control group. The subsequent loss in the Delayed posttest was insignificant for both groups.

Although Time of testing was a significant main effect for the Accentedness ratings (RQ3), no significance was found for the overall difference between the two groups. The within-subjects factor Time of testing was a relatively small effect

but significant nevertheless, as was the Time $\times$ Group interaction. There was no difference in Accentedness between the groups prior to the treatment. Both groups were judged to be slightly less accented in the Immediate posttest, with a significantly greater improvement (.2 point) for the experimental group than for the control group (.1 point). Moreover, the experimental group remained at the same level in the Delayed posttest, while the control group lost its gain (for details see Table 4).

In sum, the control and experimental groups performed equal on all three rating scales prior to the treatment. The experimental group benefited strongly from the intervention and gained much more fluency and comprehensibility than the control group. The improvements seen did not decline much after one month. Effects of the fluency training on degree of Accentedness were marginal (.1 point difference in gain between experimental and control group) and are probably due to maturation rather than the result of the dedicated fluency training.

Research question RQ4 asks about the relationships among the three variables measured in this study. Conceivably, improved (judged) fluency may also make the speaker more comprehensible. However, learning to speak more fluently does not necessarily render the speaker less accented. Conceptually, fluency and accentedness are independent properties of a speaker, and an improvement in either of these properties may make the speaker more comprehensible. These hypothetical dependencies can be quantified in terms of correlations between the properties Fluency gain, Comprehensibility gain and Accentedness gain. Table 5 presents the correlation matrix. Pearson correlation coefficients were computed over all 60 triplets of observations.

Table 5. Pearson’s *r* correlation matrix of Gain variables in experiment. *N*=60 per cell. Probabilities are based on one-tailed testing

Gain in (judged)	Gain in (judged)	
	Comprehensibility	Fluency
Fluency	$r=.760$ $p<.001$	
Accentedness	$r=.230$ $p=.039$	$r=.433$ $p<.001$

The results show that the Gain in Fluency is fairly strongly correlated with a gain in Comprehensibility but only moderately correlated with a gain in Accentedness. The correlation between gained Accentedness and gained Comprehensibility is weak and only marginally significant.

We used multiple linear regression to predict the gain of (judged) Comprehensibility of our speakers from the gain in their (judged) Fluency and (judged) Accentedness. In stepwise mode, with a probability of F at $p \leq .05$ to enter a predictor as the inclusion criterion, only gained Fluency could be entered, while gained Accentedness did not meet the inclusion criterion in the second step. The single predictor accounted for 57% of the variance in the Gain of Comprehensibility (adjusted $R^2 = .571$).

4. Discussion

This study seeks to determine the effect of fluency training on speech fluency, comprehensibility, and accentedness of interpreter trainees, and was guided by four research questions. These were: (RQ1) Does fluency training enhance the speech fluency of interpreter trainees? If so, (RQ2) Does fluency training positively impact interpreters' comprehensibility and (RQ3) accentedness? Our results revealed that the fluency training significantly enhanced the Iranian interpreter trainees' speech fluency in English as a foreign language, with close to 2 points more on the fluency scale from 1 to 9 than the gain found for the control group. RQ1 can therefore be positively answered. Moreover, the training program also enhanced the students' speech comprehensibility. Although the gain (.7 point better for the experimental group than the control group) was smaller than for Fluency, it was still highly significant, so that also RQ2 can be answered positively. Finally, the fluency training only marginally impacted the students' native-like pronunciation (i.e., developing less/no foreign accent), with a .1-point better gain for the experimental group, so that leave the answer to RQ3 undecided. RQ4 asked whether better fluency would also yield better comprehensibility. Our results indicate that this is indeed the case. A larger gain in (judged) fluency was matched with a larger gain in comprehensibility. However, the very small gain in nativeness of accent did not contribute to the gain in comprehensibility.

The results of our study converge with Bygate (2001); Derwing et al. (2004); Iwashita et al. (2008); Kang et al. (2010); Ahmadian and Tavakoli (2011); de Jong and Perfetti (2011); Thomson (2015); Thai and Boers (2016), and Lambert et al. (2017), who all reported that fluency training had a positive influence on students' speech fluency. Also, it has been stated that fluency is correlated with comprehensibility (Thomson, 2015). More specifically, breakdown fluency (Derwing et al., 2004; Kang et al., 2010) and repair fluency (Iwashita et al., 2008) are related with the comprehensibility of speech. Our results are consistent with Saito (2021); Saito et al. (2020), and Flege and Bohn (2021), who pointed out that accentedness is resistant to change because its main component – segmental accuracy – is subject

to gradual, extensive, and individually different learning patterns, so that no noticeable effects of dedicated fluency training can be expected on pronunciation. If it were the students' accentedness we wanted to reduce, intensive and targeted pronunciation training is required, addressing segmental and prosodic aspects of the EFL student's perceptual representation and production of the sound patterns of English, and awareness of the differences between the L1 and the L2 (e.g., Yenkimaleki & van Heuven, 2019).

Additional to practical tasks for enhancing speech fluency, the students in this study also received fluency strategy training. Procedural knowledge (i.e., knowledge of how) is different from declarative knowledge (i.e., knowledge of what). Declarative knowledge covers knowledge of word forms and encyclopedic knowledge, and of explicit grammatical or phonological rules, and it is commonly slower to apply. It needs more attention and cognitive resources than procedural knowledge. As procedural knowledge is processed fast and in parallel with other mechanisms and since it puts less of a burden on the limited resources of working memory, it is more appropriate for fluent speech. The declarative/procedural categorization is widely agreed on in cognitive psychology and neuroscience (e.g., Anderson et al., 2004) and has been found useful in second language acquisition (e.g., de Jong, 2005; Ferman et al., 2009). The argument is that in fluent L2 speech, procedural knowledge is mostly employed in the encoding phases of language production and in articulation, while declarative knowledge deals with retrieval of lexical items and their syntactic information, and conceptualizing and monitoring of the utterances (Kormos, 2006).

The retrieval speed of words and phrases increases with repeated practice. Formulaic sequences emerge because of the creation and strengthening of new chunks. Language use may also cause the construction of new production rules and the collapsing of production rules into larger ones. It is necessary to have repeated practice for these collapsed production rules so that these will compete with and ultimately replace their parent production rules (de Jong & Perfetti, 2011).

Consciousness as awareness is helpful in that it emphasizes the crucial role of noticing the important aspects and thereby better appreciating the instructional opportunities (Schmidt, 1994; Seifoori & Vahidi, 2012). Karmilloff-Smith (1986) acknowledges the facilitative role of awareness in enhancing restructuring by making the newly learned materials more available, which facilitates their transformation and recombination. The employment of fluency strategy training accompanied with practical tasks in memorization of short stories, retelling them, and repetition of phrases and sentences for fluency training, boosted the speech fluency and comprehensibility of interpreter trainees. The fluency strategy train-

ing in the present study can be associated to facilitative role of training awareness (Schmidt, 1994; Yenkimaleki & van Heuven, 2018, 2021, 2023).

Research on the assessment of L2 fluency has examined how ratings of speech fluency can be elaborated (e.g., Bosker et al., 2013; Derwing et al., 2004; Lennon, 1990). Speech rate and aspects of pausing were reported as good predictors of ratings on fluency. Furthermore, articulation rate (Bosker et al., 2013; Yu & van Heuven, 2013), measures of mean length of run (Cucchiari et al., 2002; Kormos & Dénes, 2004; Lennon, 1990; Yu & van Heuven, 2013, 2017, 2021), repetitions (Bosker et al., 2013; Lennon, 1990), and repairs (Bosker et al., 2013; Yenkimaleki, 2017, chapter 7) have been proposed (and found) as predictors of fluency ratings.

Fluency is the learners' capacity to mobilize their inter-language systems to communicate information in different contexts (Skehan, 2014). Breakdown fluency is assessed according to the number and length of pauses when the performance is mostly disrupted (Skehan, 2014), while repair fluency, or disfluency, shows four measures of reformulation, replacement, repetition, and false starts. Because of the crucial role of fluency, scholars assessed both the repair fluency and the breakdown fluency of the students' speech production. Nattinger and DeCarrico (1992) proposed that L2 students who learn to deploy idiomatic fillers appropriately, (e.g., *you know*) are capable to plug what would otherwise be noticeable breaks in the flow of their speech.

It is not entirely clear, at this moment, what relationship should be presupposed between fluency and comprehensibility of a speaker. In the present study, the relationship was found to be essentially linear and monotonic: the better the judged fluency, the better the speaker's judged comprehensibility. The literature shows that a speaker's fluency is rated more favorably as articulation rate is faster and when hesitations, interruptions, false starts and repetitions are avoided. However, in exceptional cases, a speaker's rate of delivery may be so fast that the listener cannot process the incoming information adequately. It seems reasonable, therefore, to assume a quadratic function (U-shape or parabola) underlying the relationship between fluency (speaking rate) and comprehensibility (Yenkimaleki, 2017, chapter 7). In future studies of interpreters, we will ask raters to separately estimate perceived speaking rate on the one hand, and the adequacy of the speaker's fluency on the other. This will allow us to differentiate between (monotonically) increasing speaking rate and optimality of the speaker's fluency – sometimes referred to as the pleasantness of the interpreter's 'Pace' (e.g., Sawyer, 2004).

Finally, it is good to remind ourselves that being judged a fluent speaker should not be the primary concern for an interpreter. Highest priority should be given to the interpreter's comprehensibility. No matter how fluent the interpreter may be, if they cannot be comprehended, all efforts are in vain. Our results show

that the speakers' gain in narrow fluency was matched with a gain in judged Comprehensibility, while a gain in Accentedness did not add an independent contribution to the gain in Comprehensibility.

5. Conclusion

Overall, the findings of this study revealed that the fluency training significantly improves the interpreter trainees' speech fluency. The fluency training also boosted students' speech comprehensibility, which we interpret as an indirect effect: the comprehensibility improved as a result of the student's better fluency. The intervention did not positively impact the students' accentedness (i.e., it did not lead to less accented L2 speech on the part of the students in the experimental group). Prior studies contributed to our knowledge of influencing factors of fluency in speech perception and production skills; however, the effect of fluency training on students' speech comprehensibility and accentedness had not been investigated systematically. Our findings suggest that more intensive fluency training may also enhance the students' L2 speech comprehensibility.

To enhance students' speech fluency and thereby comprehensibility, training awareness about the crucial role of fluency, practical tasks on the production and perception skills in EFL settings should be emphasized. However, this does not imply that students must mimic native-language accents. L2 speech can be intelligible even if L2 speakers have a (mild) non-native accent. Training programs should help students to understand a wider range of non-native Englishes as well (Rose, 2020). Improvement in speech fluency and comprehensibility requires eclectic and holistic instruction sensitive to the variety of speakers' L1 backgrounds and their major targeted listener groups (Yenkimaleki & van Heuven, 2023).

A limitation of this study was that we did not have access to a large number of interpreting trainees to investigate the effect of fluency training on students' speech fluency, comprehensibility and accentedness. Future studies can be run with a large number of participants to verify the results of this study.

The impact of L2 fluency training and its effect on speech comprehensibility and accentedness is under-studied. It is, therefore, recommended that future studies examine how fluency training influences speech comprehensibility and accentedness with different language pairs in other contexts to verify the generalizability of the findings.

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Appendix 1. Interview questions

1. How do you accomplish tasks when under a tight deadline? Provide an example.
2. Describe the campus at your university.
3. Describe a long-term project you managed. How did you make sure everything was running smoothly?
4. Sometimes, it's almost impossible to get everything done on your to-do list. What do you do when your list of responsibilities becomes overwhelming?
5. Tell about a time you set a personal goal for yourself. How did you ensure you would meet your objectives and what steps did you take?
6. Can you describe a presentation that you led that went well?
7. Which approaches do you use to build positive relationships with classmates?
8. Describe a moment where you had to resolve a conflict in a work environment. How did you approach it?
9. Have you ever had to share an idea that your classmates did not support? Were you able to convince them of its validity?
10. Can you talk me through a situation where you had to share negative information with a friend?
11. Can you give an example of a situation where you demonstrated exceptional verbal communication skills?
12. How vital are non-verbal communication skills with classmates?

13. Have you ever had to communicate with a classmate who was not comfortable with verbal communication? Which methods did you use?
14. You're given a choice between sending an email to a team member and setting up a video call with them to explain that you've made a mistake. Which do you choose?
15. An important event is scheduled for next week. How would you remind others of it?

El efecto del entrenamiento de fluidez en la fluidez del habla, la comprensibilidad y el acento de los aprendices de intérprete: Un estudio experimental

Resumen

La fluidez, la comprensibilidad y el acento se consideran parámetros importantes de la calidad de la interpretación, pero rara vez se han estudiado sistemáticamente en los programas de formación en interpretación. Por lo tanto, el presente estudio se creó para investigar el efecto del entrenamiento en fluidez sobre la fluidez del habla, la comprensibilidad y el acento de los aprendices de intérprete. En el estudio participaron dos grupos de estudiantes de interpretación de una universidad de Irán, que recibieron la misma cantidad de instrucción y práctica (12 horas en 4 semanas). El grupo experimental ($N=30$) dedicó el 33% del tiempo (es decir, 4 de las 12 horas del programa de capacitación) a entrenamiento dedicado a la estrategia de fluidez, fomentando la memorización, repetición de materiales de audio y video. El 67% restante se destinó a la formación de habilidades generales para hablar. Al grupo de control ($N=30$) solo se le enseñaron habilidades generales de expresión oral en el programa de capacitación, pero no recibió capacitación específica en fluidez. Se realizaron entrevistas sistemáticas para evaluar la fluidez del habla, la comprensibilidad y el acento de los aprendices de intérprete, que fueron juzgadas de forma independiente por tres evaluadores expertos en tres momentos de la prueba, es decir, prueba previa, prueba posterior inmediata y prueba posterior tardía (un mes después). Los hallazgos revelaron que el entrenamiento en fluidez mejoró significativamente la fluidez de los intérpretes en formación y, en menor medida, la comprensibilidad de los estudiantes, pero solo tuvo un efecto marginal sobre el acento. La implicación pedagógica sería que la capacitación en concientización sobre la fluidez del habla en entornos de inglés como lengua extranjera se incluya en los programas de capacitación en interpretación.

Palabras clave: comprensibilidad del habla, acentuación, fluidez del habla, entrenamiento de fluidez, estudiantes de interpretación

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