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Citation

Yenkimaleki, M., & Heuven, V. J. J. P. van. (2019). The relative contribution of computer assisted prosody training vs. instructor based prosody teaching in developing speaking skills by interpreter trainees: an experimental study. *Speech Communication*, 107, 48-57. doi:10.1016/j.specom.2019.01.006

Version: Publisher's Version

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Downloaded from: <https://hdl.handle.net/1887/3721991>

Note: To cite this publication please use the final published version (if applicable).



The relative contribution of computer assisted prosody training vs. instructor based prosody teaching in developing speaking skills by interpreter trainees: An experimental study [☆]

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ARTICLE INFO

Keywords:

Prosody

Computer assisted prosody training (CAPT)

Instructor based prosody teaching (IBPT)

Speaking skills

English as a foreign language (EFL)

ABSTRACT

The present study investigates the relative contribution of computer assisted prosody training (CAPT) vs. instructor based prosody teaching (IBPT) on developing speaking skills by interpreter trainees. Three groups of student interpreters were formed. All were native speakers of Farsi who studied English translation and interpreting at the BA level at the University of Applied Sciences in Tehran, Iran. Participants were assigned to groups at random. No significant differences in speaking skills could be established between the groups prior to the experiment. The control group listened to authentic audio tracks in English and discussed their contents, watched authentic English movies and did exercises based on these tasks for developing speaking skills. The first experimental group spent part of the time on theoretical explanation of, and practical exercises with, English prosody by an instructor. The second experimental group instead spent part of the time on English prosody instruction and practice through the Accent Master software for Farsi speakers (Bo & Bo 2005). The total instruction time was the same for all three groups, i.e. 12 h. Students then took a posttest in speaking skills. The results showed that the second experimental group (CAPT) performed better than the other groups in developing speaking skills. These results have pedagogical implications for curriculum designers, interpreter training programs, and all who are involved in language study and pedagogy.

1. Introduction

An important role of prosody in speech processing is that it guides the division of the continuous stream of speech into smaller units that can be processed separately. Prosody allows the listener to find sentence boundaries, phrase boundaries and sometimes even word boundaries. The listener needs these boundaries in order to reduce the number of competing representations of the incoming structures he has to entertain in working memory (e.g. Van Heuven 1994; Gussenhoven 2015). Prosody is a safety catch for the native listener. The native listener will trust prosodic information more than poorly defined segments because experience has taught the native listener that prosody is more robust against noise and distortion than segmental information (Van Heuven 2008, 2017). This principle works for the understanding of native speech in noise, for filtered speech, and for distorted native speech. But the strategy will fail when the speech is foreign accented. For this reason it is important for non-native speakers with poor-quality segments to

at least get the prosody right (Van Heuven 2008; Cutler and McQueen 2014). Native English listeners will search the wrong part of their mental lexicon if the foreign speaker misstresses the word (Van Heuven 2017) and the result will often be that word recognition fails.

An important point to consider is that the importance of prosody teaching for learners of English as a foreign language (EFL) should differ depending on the learner's L1. If the prosodic system of English and that of the L1 are rather similar, there is less need to teach prosody. If the systems are quite different, then prosody teaching will be crucial (e.g. Yenkimaleki and Van Heuven 2016b, M. 2018). This is the case for Farsi and English, since word stress is fixed in the vast majority of vocabulary in Farsi but it is complex and weight sensitive in English. Also, the rhythmic structure in Farsi is syllable timed and in English it is stress timed (for details of prosody differences between English and Farsi see Yenkimaleki 2016).

Pronunciation-related issues such as comprehensibility, non-native accent, word stress and sentence stress in English language teaching are

[☆] The authors thank Dr. Hossein Moradimokhles of Seyyed Jamaledin Asadabadi University, Iran, for his invaluable assistance in running the experiment in situ.

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crucial to many questions in applied linguistics. A systematic investigation of how technological tools can be incorporated in solving these issues for EFL learners from different language backgrounds would therefore be of interest to a vast group of language learners. Some studies (e.g. Kawai and Hirose 2000; Cauldwell 2002; Hardison 2004; Kaltenboeck 2002; Levis and Pickering 2004; Levis 2007) into computer-assisted pronunciation teaching suggest that technological tools can be effective in addressing the pronunciation problems of students. But none of these studies compared the relative contribution of computer assisted prosody teaching (CAPT) with instructor based prosody teaching (IBPT) systematically, specifically the important issue of speaking and listening skills for interpreter trainees.

The present study begins by examining the importance of prosody training in developing speaking skills for interpreter trainees. Next, we review different studies about CAPT and its merits and demerits for pedagogical purposes in teaching prosodic features. We also discuss some key studies on explicit teaching of prosody by instructors in recent years. In our research, we address the issue of prosody training in developing speaking skills for interpreter trainees: whether training can be effective if it is done through CAPT or if it is done by instructors (IBPT). In doing so, we offer suggestions that policy makers and practitioners should observe and understand in the choice of effective methods in teaching prosody for interpreter trainees.

2. Review of related literature

The foundation for effective verbal communication is a comprehensible level of pronunciation. Adams-Goertel (2013) states that prosodic feature awareness training can improve the EFL students' pronunciation skills so as to speak in a more native-like fashion (e.g., prosody, stress timing, peak alignment) and more fluently (frequency and duration of pauses). Adams-Goertel's literature survey concludes that it is necessary to incorporate prosody teaching in meaningful communication tasks in order to enhance the development of EFL learners' pronunciation skills.

Instructors rarely have the proficiency or time to check and correct each student's pronunciation consistently. Computers can correct the pronunciation of the learners on an individual basis so that the learners do not have to worry about awkward repetition in front of others and can practice their pronunciation individually, as many times as they like. Several studies have supported the use of speech technology programs for EFL learners (De Bot and Mailfert 1982; De Bot 1983; Weltens and De Bot 1984; Molholt 1988; Leather 1990; Anderson-Hsieh 1992, 1994; Pennington and Esling 1996; Levis and Pickering 2004; Levis 2007, Qian et al., 2018) though few studies have systematically evaluated the effectiveness of this approach (Hardison 2004).

Computers can provide individualized instruction, frequent practice through listening discrimination and focused repetition exercises, and automatic visual support which illustrates to the learners how closely their own pronunciation approximates model utterances (Levis 2007). In a foreign language teaching environment in which few instructors receive adequate training in teaching pronunciation (Murphy 1997; Burgess and Spencer 2000; Kawai and Hirose 2000; Brechtkeutz et al., 2002; MacDonald 2002; Yenkimaleki 2016, 2017a, M. b; M. 2018; Yenkimaleki and Van Heuven 2016a, M. b, c, d, e; M. 2018, 2019), and in which little class time appears to be available for focused work on pronunciation because of emphasis given to other skills, computer assisted prosody training (CAPT) seems tailor-made to meet a critical need (Levis 2007). De Bot (1983) investigated visual pitch feedback with EFL students in the Netherlands. Auditory-visual versus auditory-only feedback were investigated. The amount of training for the students was one vs. two sessions of 45 min. After a sentence was made audible, the pitch contour was displayed and learners imitated the sentence. Their pitch contours then appeared on the display below the target for visual comparison. Participants could repeat the process as many times as they liked. Three teachers of English rated these productions for quality on a

5-point scale. De Bot concluded that auditory-visual feedback was significantly better than auditory-only for EFL learners.¹

Different technological tools and studies into how various features of pronunciation might best be taught have illustrated the importance of CAPT. A variety of pronunciation-related issues have been investigated, including general pronunciation quality (Seferoglu 2005); speech rate, fluency, and liveliness (Hincks 2005); vowels and consonants (Lambacher 1999; Wang & Munro 2004; Neri et al. 2006); vowel lengthening and pitch accents (Kawai and Hirose 2000); intonation (Chun 1998; Cauldwell 2002; Kaltenboeck 2002; Hardison 2004; Levis and Pickering 2004); and English stress timing (Coniam 2002). Most of these studies show that CAPT through logical application can be both effective and flexible in addressing pronunciation instruction (Levis 2007).

Bongaerts et al. (1997) point out that several factors contribute to the success of EFL speakers: (1) a high motivation to achieve accent-free pronunciation, (2) unlimited access to native English speech, and (3) intensive training in perception and production of the target language. Computer assisted prosody training (CAPT) could be an ideal instrument for the attainment of near-native pronunciation. CAPT has several important practical features that make it advantageous in classroom settings (Pennington 1999; Neri et al., 2002). CAPT allows users to follow personalized lessons, at their own pace, and practice as often as they like (Felps et al., 2009). Murray (1999) concluded that CAPT users are more comfortable practicing pronunciation in a private setting, where they can avoid anxiety and embarrassment. Moreover, CAPT users are also more likely to practice when and where it is convenient (Felps et al., 2009).

Some of the technologies incorporate Automatic Speech Recognition (ASR) (e.g., FLUENCY (Eskenazi and Hansma 1998), ISLE (Menzel et al., 2000), and Talk to Me (Auralog 2002); these products are able to provide users with objective and consistent feedback (Felps et al., 2009). This type of pronunciation training software offers students individual access to practically unlimited and realistic target language input through different channels and provides individualized feedback automatically (Neri et al., 2002).

In spite of its advantages, the CAPT technology remains controversial for several reasons (Pennington 1999). Neri et al. (2002) point out that many commercial products have ignored the pedagogical value of technological tools for the sake of novelty of them. For instance, a product may provide a display of the learners' utterance (e.g., a speech waveform) against that from a native speaker (Felps et al., 2009). These visualizations are not only difficult to interpret for non-specialists but are also misleading: two utterances can have different acoustic representations despite having been pronounced correctly (Felps et al., 2009). Another issue would be the limitations of ASR technology when used for diagnosing pronunciation errors and evaluating pronunciation quality (Neri et al., 2003). The inherent variability of foreign-accented speech makes CAPT a challenging domain for ASR. Felps et al. (2009) pointed out that ASR errors frustrate and mislead the learner, and also undermine their trust in the CAPT tool (Levy 1997; Wachowicz and Scott 1999).

Not only has CAPT faced some pedagogical and technological difficulties, there is also the issue of instructor preparedness. Levis (2007) observed that, pedagogically, a significant gap often exists between CAPT applications and goals supported by current pronunciation theory and pedagogy, such that CAPT applications may actually be traditional, drill-oriented pedagogy in disguise. Although researchers have strongly advocated that pedagogy should be based on empirical

¹ However, the auditory-visual condition did not differ significantly from auditory-only when the introductory part of the visual feedback with a brief written explanation of the most important differences between the sentence melodies of Dutch and English was presented before the start of the training. This suggests that the theoretical explanation – with schematic drawings – contributed more to the students' learning than the visual feedback per se (De Bot 1982; Van Heuven 1983).

findings (e.g., Derwing and Munro 2005), such a grounding is not often seen in CAPT application tools. Moreover, application tools that are imbedded in theory (e.g., Streaming Speech) are far and few between (Levis 2007). Technological tools are often not grounded in theoretical elaboration of pronunciation teaching (Pennington 1999), nor do they provide assessment tools to measure improvement of the users.

Levis (2007) observes that CAPT tools often suffer from technological difficulties in giving learners adequate, accurate feedback and from an inability to provide accurate and automatic diagnosis of pronunciation errors. Moreover, most instructors are not proficient enough to make effective use of applications because of both a lack of training in pronunciation teaching and in the use of technology (Levis 2007). Neri et al. (2002) maintain that CAPT applications can be effective if the designers of CAPT tools emphasize the appropriate pedagogical goals for the job they need to do. Neri et al. (2002) suggested two crucial reasons why CAPT principles should be developed. First, CAPT applications do not show any evidence of such principles, and second, existing CAPT principles often do not appear to have been formulated with pronunciation in mind. Generally, pronunciation teaching is subject to two overlapping foci, i.e. accuracy and intelligibility (Levis 2005). Intelligibility refers to that quality of a speaker or a spoken utterance that enables listeners to recognize the linguistic units (such as words) in the order in which the speaker produced them. Comprehensibility, on the other hand, refers to whether listeners understand the message communicated by a speaker (Munro and Derwing 1999). Accuracy orientation in pronunciation was the assumption that all possible vowel and consonant sounds in the target language should be learnt. For most adult language learners such accuracy is not possible and in some cases it frustrates adult EFL learners (Munro and Derwing 2006).

3. Main aim and research question

In our research we study the relative contribution of computer assisted prosody training (CAPT) vs. instructor based prosody teaching (IBPT) to developing speaking skills by interpreter trainees. The participants in the research, students of interpreting and translation, are native speakers of Farsi (New Persian) who have learnt English as a foreign language. Given that interpreter training curricula should use the most effective methods for teaching prosody, as part of developing the students' speaking skills, it is important to know whether training time is better spent on CAPT than on human instruction. The results of the present study may guide the next generation of interpreter training programs.

Concretely we asked the following research question: *Which one of two methods of prosody training yields better English speaking skills for Farsi-English interpreter trainees given the same amount of training time: CAPT or IBPT?*

At this stage we prefer not to suggest specific hypotheses as to which of these methods will be more effective. This will depend on the working languages, the expectations the students have about the technological tools in different countries and the proficiency of instructors in faithfully observing the rules and guidelines of the specific method of instruction when teaching prosodic features.

4. Method

4.1. Participants

A total of 48 interpreter trainees were chosen randomly to participate in this study. All participants were undergraduate students at University of Applied Science in Tehran, Iran. None had studied or lived abroad at that point in their training. They were randomly divided into three classes of 16 students (8 male and 8 female students per group). The participants were native speakers of Farsi within an age range of 19–23 years. Assignment to groups was done on a random basis but care was taken to ascertain that the English proficiency level in each group

was the same on average. Participants were matched post hoc in the criterion of English proficiency at the start of the experiment. Distribution between genders was perfectly equal. All participants qualified for the entrance exam for the translation & interpreting department, which means that the population we aim at is very homogenous.

They participated in all sessions of the training program. Ethical approval to involve these participants in the experiments was obtained. All the participants agreed to take part in the research project (informed consent).

4.2. Materials

In this study, we made use of a Farsi edition (the version specifically designed for Persian EFL learners of English based on the differences between Persian and English phonological/prosodic features) of the Accent Master software (Bo and Bo 2005). This software has advanced lessons which focus on English prosody training (such as word stress, sentence stress, intonation) and different activities based on these pronunciation features. This program has special features such as videos of an authentic American speaker, a visual comparison of the melody (also called pitch trace) of model utterance and the student's imitation, which enables the learners to see their output in comparison to those of the model speakers, and video instructions for advanced lessons. The pitch traces give the students quick and objective feedback. Sentences for training purposes were selected such that they (a) contained familiar vocabulary only (as determined by examining instruction materials), (b) had functional value for interpreter trainees, (c) embodied several exemplars within familiar semantic domains such as food, student life, travel, etc., (d) were relatively short so to facilitate retrieval from short-term memory, and (e) were structurally varied (e.g. statements and questions). Accent Master comes in 21 different versions, each targeting users with a specific native-language background, such as Arabic, German, Korean, Polish, and so on. Accent Master embraces a contrastive approach to pronunciation teaching: it pays special attention to those sound structures in the target language (American English) that would create a problem for learners. Which sound structures these are depends in the learner's native language. For Farsi learners of English syllable structure (consonant clusters) and the tense-lax contrast in the English vowels are a special problem. Getting the word stress on the right syllable is another aspect that is predictably problematic for Farsi learners of English. These points are specifically addressed in the Farsi module.

4.3. Procedure

At the beginning of the program all the participants took a pretest (see below for details) of English speaking skills so that their basic level of speaking skills could be assessed before they received any type of training. Three experts (age range of judges 36–46 years) independently evaluated each interpreter trainee's speaking skills through conducting a systematic interview both for pretest and the posttest. Two of the judges had studied abroad (received their PhD out of Iran, one in UK and one in the Netherlands). The third judge had acquired his expertise exclusively in Iran. Selection of the judges was based on their first language (i.e. Farsi), professional and academic background, as well as their willingness and availability to participate. The judges were experienced instructors in interpreting studies.

The control group received routine exercises, asking them to listen to authentic audio tracks in English (speakers had American accents) and to speak about the issues brought up in the audio tracks (such as politics, social issues and scientific findings) (see appendix 4 for a sample training program). The instructor-based prosody teaching group spent less time on these tasks; during the remaining time slot they received awareness training of English prosody in the form of theoretical explanation (see Yenkimaleki 2017a for a detailed description of the training program and appendix 2 in the present paper for a sample training

Table 1
Four evaluation criteria used in the quality judgment of speaking skills. Maximum scores add up to 20.

Rating criteria	Scores
Comprehensibility	0..5
Accentedness	0..5
Word stress	0..5
Sentence stress	0..5

program) by the instructor and practical exercises (listening to audio tracks which exemplified the role of word stress, rhythm, sentence stress and intonation in changing meaning in English) for 20 min during each training session. The exercises were chosen in such a way that the interpreter trainees would become aware of the importance of stress at the word and sentence level in perception and production of messages (first noticing the differences and then practicing the English forms to make the production skill automatic).

The CAPT group received prosody training through the Accent Master software for 20 min during each training session. The participants took part in the program for 12 sessions (60 min per session) during four weeks, i.e. 12 h in all (see Appendix 3 for a sample training program).

Following the last training session all interpreter trainees took the posttest. Both pretest and posttest consisted of interviews that were run systematically by three lecturers (see above). The questions were descriptive in nature so that world knowledge of the students would not be involved in answering the questions, e.g., *Describe the campus of the University*. The same questions were asked to all the participants (students were in different rooms and they could not communicate with each other about the questions). The questions in the pretest and posttest were different to rule out repetition effects. The ten questions for pretest and posttest of the study had been agreed on by the three raters before the start of the program. Five questions (out of ten questions) were randomly chosen for the pretest and five questions for the posttest. The interviewers used a speaking assessment sheet which addressed four components: comprehensibility, accentedness, correct use of word stress and correct use of sentence stress. The raters expressed their judgements on four scales (comprehensibility, accentedness, word stress and sentence stress), with each scale receiving a score between 0 and 5, which added up to a maximum of 20 points, as illustrated in Table 1. The same raters evaluated the speaking skills of interpreter trainees both for pretest and posttest. Excluding the first author, the raters did not know that the second rating served as a posttest. The other two raters had not been the students' instructors.

5. Results

The three expert raters were in excellent agreement in their judgements of the speaking skills of the 48 participants in the pretest and posttest. Cronbach's alpha computed on the overall scores given by the raters was as high as 0.912, while the coefficient never dropped below 0.904 when one rater was left out. On the strength of this finding all further analyses of the pretest and posttest scores were done on the ratings after averaging over the three experts.

Table 2 shows the scores obtained by the interpreter trainees on the pretest and posttest. These scores are the sum of the rating components defined in Table 1. The scores range theoretically between 0 and 20. The individual trainees' scores range between 11.8 and 19.2. The differences in scores on the pretest between three groups are very small and statistically insignificant, $F(2, 45) < 1$. At the start of the intervention, therefore, we may safely assume that the three groups were equal in their overall speaking skills. At the end of the intervention, however, the scores on the posttest differed substantially, depending on the group, i.e. on the type of instruction and training the participants had received.

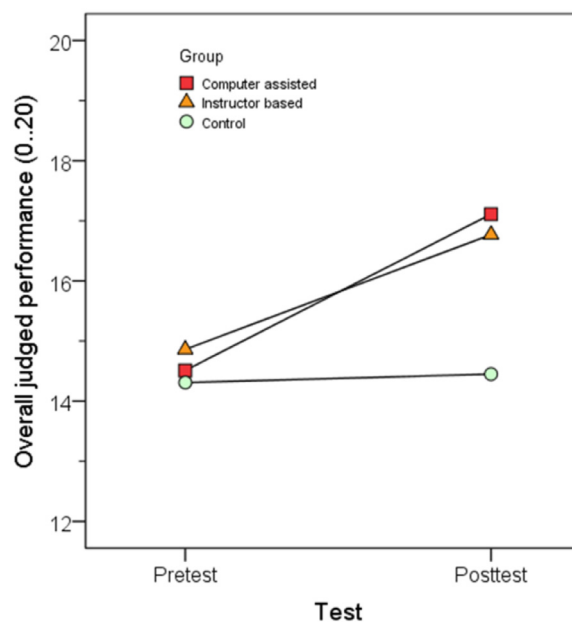


Fig. 1. Overall scores on pretest and posttest obtained by control group and experimental groups (computer assisted prosody training CAPT and instructor based prosody teaching IBPT).

The correlation between the individual pretest and posttest scores across all 48 participants was $r = 0.938$ ($p < .001$). Given this high correlation we decided to evaluate the statistical significance of the differences in posttest scores between the three participant groups by a repeated measures oneway analysis of variance (RM-ANOVA) after matching the participants in the three groups on the basis of their pretest scores. Degrees of freedom were Huyhn-Feldt corrected whenever the assumption of sphericity was violated. The RM-ANOVA revealed a significant effect of group, $F(2, 45) = 4.92$ ($p = .031$, $\eta^2 = 0.734$).² If the training should be beneficial, we expect the experimental groups to outperform the control group in the posttest.

The overall scores obtained in the posttest were roughly the same as those obtained in the pretest for the control group. In fact, the mean score obtained by the control group had improved 0.14 of a point, while the instructor prosody teaching group had gained 1.91 points. The second experimental group, with computer assisted prosody training (CAPT), obtained a score of 17.11 points, which is a gain of 2.6 points improvement vis-à-vis the pretest. The effect of group on the posttest scores was statistically significant by the RM-ANOVA $F(2, 45) = 30.63$ ($p < .001$). Bonferroni corrected post-hoc analyses, however, revealed that the IBPT and the CAPT groups differed significantly from the control group but not from each other. These effects and interactions are visually summarized in Fig. 1.

Table 3 shows the results of posttest scores for each rating scale separately. These scores are broken down by the three groups of participants, i.e. control, instructor based prosody teaching (IBPT), computer assisted prosody training (CAPT).

The differences between the three groups of participants were tested by a series of oneway RM-ANOVAs with the same design as the analysis of the overall posttest scores (see above). In terms of comprehensibility and accentedness, the CAPT group did better than the IBPT group, which in turn outperformed the control group. On the component scales of word stress and sentence stress, IBPT group did better than the CAPT group but the advantage of the IBPT group over the CAPT group is not

² In the specification of the degrees of freedom associated with the effect (df1) and error term (df2), however, we report the uncorrected integer values as in 'F(2, 45)'.

Table 2

Overall quality rating of speaking skills in the pretest and posttest (on a scale between 0 and 20). Mean ratings and SD are listed for participants in control group and two experimental groups.

Group		Pretest					Posttest				
		Compr.	Accent.	Word stress	Sentence stress	Total score	Compr.	Accent.	Word stress	Sentence stress	Total score
Control	Mean	3.73	3.60	3.40	3.56	14.31	3.73	3.54	3.63	3.60	14.56
	SD	0.67	0.54	0.57	0.59	2.26	0.67	0.56	0.54	0.57	2.23
IBPT	Mean	3.88	3.81	3.58	3.58	14.86	3.98	4.05	4.32	4.35	16.77
	SD	0.60	0.64	0.53	0.49	2.19	0.65	0.66	0.46	0.46	2.08
CAPT	Mean	3.64	3.62	3.52	3.57	14.35	4.40	4.31	4.23	4.16	17.11
	SD	0.61	0.58	0.55	0.50	2.19	0.36	0.45	0.42	0.45	1.65

Table 3

Components of posttest scores of speaking skills, as well as overall posttest scores (“Total”), obtained by three groups of participants. F-ratio, probability p and effect size (η^2) and the results of Bonferroni post-hoc comparisons are specified. Groups are in ascending order of judged quality; pairs within curly brackets do not differ significantly.

Rating scale	Contr	IBPT	CAPT	F(2, 45)	p	η^2	Bonferroni
Comprehensibility	3.73	3.98	4.40	5.33	.008	.343	{Con, IBPT} < CAPT
Accentedness	3.54	4.05	4.31	7.59	.001	.322	Con < IBPT < CAPT
Word stress	3.63	4.32	4.23	9.99	< 0.001	.228	Con < {CAPT, IBPT}
Sentence stress	3.60	4.35	4.16	9.58	< 0.000	.249	Con < {CAPT, IBPT}
Total	14.50	16.70	17.10	32.49	.009	1.14	Con < IBPT < CAPT

significant. Overall, the CAPT group and IBPT group did significantly better than the control group; the advantage of CAPT group over IBPT group is not significant.³

6. Discussion

The results show that, first of all, both computer assisted prosody training and instructor based prosody teaching have a positive effect on the students’ speaking skills. Secondly, computer assisted prosody training yields significantly better speaking skills than devoting the same amount of time to prosody teaching by the instructor.

Prosodic cues are among the first utilized by children to bootstrap their language acquisition (Wanner and Gleitman 1982; Whalley and Hansen 2006). Sensitivity to the prosodic properties of speech explains infants’ preferences for infant-directed speech with exaggerated prosodic features (Werker et al., 1994). Prosodic cues facilitate language acquisition by helping segment speech into words, phrases, or syllables, informing syntactic structure, and emphasizing content words and salient information (Whalley and Hansen 2006). These advantages could be extended to adult foreign language learning. The larger gain booked by the experimental groups over the control group in this study can be used to support Whalley and Hansen’s claim about the importance of prosody for language learning.

Several studies confirm that learners enjoy using technology in foreign language learning and that they prefer using technology over more traditional methods and materials (e.g. Golonka et al., 2014). Technology makes learners be more engaged in the process of learning, and have a more positive attitude towards learning. Moreover, students perceive the use of computers as an innovative and attractive learning method (Casado and García 2000). This difference in attitude might at least partially explain the better performance of interpreter trainees who had computer assisted prosody training (CAPT) in this study. In the absence of any formal debriefing data this explanation must remain speculative.

CAPT can reduce learner anxiety by providing a non-judgmental, independent learning environment (Kongrith and Maddux 2005). Online audio and visual multimedia resources can promote interest and

motivation in foreign languages. For example, video clips that combine text, image, and music are teaching materials that can stimulate students’ emotional and cognitive areas in the process of learning. Parks et al. (2001) argued that students who received a CAPT and project-based language course expressed higher motivation and attitudes towards learning foreign language than students of other classes who were either taught via projects only (or were aided by information and communication technology tools or used none of these). Online learners may develop improved attitudes toward the second language and its culture (Kongrith and Maddux 2005). In particular, CAPT enables learners to connect to other cultures effectively when visiting and experiencing the culture of another country is not possible. These factors could be other reasons of why CAPT contributed a lot in developing speaking skills for Farsi-English interpreter trainees in this study.

Speech processing software such as Praat, a free and readily available open-source piece of software, can assist language learners by generating a visual representation of the students’ utterance on a computer screen for comparison with a similar representation of a native model utterance. The software does this by recording sound samples and drawing, among other things, the visual pitch contour of the utterances. To facilitate the use of visual feedback on various aspects of pronunciation, such as the realisation of vowels, consonants, and speech melodies, end-user friendly scripts (streamlined and automated routines) can be programmed in Praat by experts and used in the classroom by end users (both teachers and students) requiring no special computer skills. Such scripts can be used to teach prosodic features, such as intonation. Scripts are also available that evaluate English learners’ pronunciation (i.e. express a performance score based on the difference between the native model and the student’s approximation of it), measure improvement over time, and to pinpoint each individual student’s problems efficiently (e.g. Le and Brook 2011). It would be an agenda for future to investigate systematically the usage of software for (visual) feedback in developing speaking skills for interpreter trainees. Future research also can move towards blended teaching of prosody, in which instructors teach explicitly the theoretical issues of prosody and ask the students to do the exercises and assignments practically by using computers out of the class.

7. Conclusion

This study investigated the effect of computer assisted prosody training (CAPT) vs. instructor based prosody teaching on developing speaking skills by interpreter trainees. The results showed that the teaching of prosody had a significant positive effect on the enhancement of speaking

³ An alternative analysis, based on the individual gain of each participant obtained between pretest and posttest, was also performed. The gains (difference scores) can be tested by a oneway ANOVA for uncorrelated samples. The effects obtained were slightly larger (for all scales) than those of the RM-ANOVA on just the posttest, but qualitatively the same.

skills. The results also revealed that prosody training through CAPT improves speaking skills of interpreter trainees more than instructor based prosody teaching. The findings are in line with Lambacher (1999), Neri et al. (2006), Wang & Munro (2004), who maintained that CAPT can be both effective and flexible in addressing pronunciation instruction. This finding also supports Cutler et al. (1997) who suggested that the prosodic structure of an utterance plays a major role in speech perception. We suggest that in the given circumstances where only limited curricular time is available for instruction and practice, a wise educational choice would be to lend priority to computer assisted prosody training and practice of prosodic features of the target language in developing speaking skills. It makes eminent sense, therefore, that knowledge (or awareness) of the prosodic features of working languages makes a fundamental contribution to developing speaking skills.

But, this does not mean that instructor based prosody teaching should be abandoned in developing speaking skills. Our results do show a significant contribution of instructor based prosody teaching to the

development of speaking skills. In some academic settings CAPT application tools suffer from difficulties in giving learners adequate, accurate feedback. CAPT systems have shown, on some occasions, an inability to provide accurate and automatic diagnosis of pronunciation errors. Moreover, some instructors are not able to make effective use of applications because of both a lack of training in pronunciation and in the use of technology.

The pedagogical implications of the present study could be applied to interpreter training programs. The learners' first language should be taken into account in the curriculum of interpreter training by policy makers (if source and target language differ prosodically, then, then learners should have prosody training). The current instructors in different academic settings for interpreter training should update their knowledge of the importance of prosodic features for speech communication and of the advantages of CAPT application tools in prosody training.


Appendix 1. Individual scores and ratings

Group	Partic.nr.	Pretest					Posttest				
		Compr.	Accent	Word stress	Sentence stress	Total score	Compr.	Accent	Word stress	Sentence stress	Total score
Control	1	4.70	4.30	4.50	4.50	18.00	4.80	4.40	4.50	4.60	18.30
Control	2	4.80	4.00	4.40	4.30	17.50	4.80	4.00	4.20	4.20	17.20
Control	3	4.40	4.20	4.20	4.20	17.00	4.40	4.20	4.30	4.10	17.00
Control	4	4.50	4.00	4.10	4.00	16.60	4.50	4.10	4.10	4.10	16.80
Control	5	4.20	4.10	3.60	4.10	16.00	4.20	4.00	4.20	4.00	16.40
Control	6	4.20	4.00	3.50	3.90	15.60	4.00	4.00	4.10	3.90	16.00
Control	7	4.00	4.30	3.00	4.00	15.30	4.00	4.30	3.70	4.00	16.00
Control	8	3.90	4.00	3.10	4.00	15.00	3.90	3.00	3.10	4.00	15.00
Control	9	3.50	3.40	3.00	3.10	13.00	3.50	3.30	3.70	3.50	14.00
Control	10	3.30	3.10	3.00	3.00	12.40	3.30	3.10	3.60	3.00	13.00
Control	11	3.10	3.00	3.20	3.00	12.30	3.10	3.00	3.20	3.20	12.50
Control	12	3.30	3.00	3.00	2.90	12.20	3.30	3.00	3.10	3.00	12.40
Control	13	3.10	3.20	3.00	2.90	12.20	3.00	3.20	3.10	3.00	12.30
Control	14	3.00	3.10	2.80	3.20	12.10	3.10	3.10	2.90	3.10	12.20
Control	15	2.80	3.20	3.00	3.00	12.00	2.80	3.20	3.30	2.70	12.00
Control	16	3.00	2.80	3.00	3.00	11.80	3.00	2.80	3.00	3.20	12.00
	Mean	3.73	3.60	3.40	3.56	14.31	3.73	3.54	3.63	3.60	14.45
IBPT	1	4.80	4.70	4.20	4.20	17.90	4.80	4.70	4.80	4.70	19.00
IBPT	2	4.60	4.80	4.30	4.10	17.80	4.80	4.90	4.70	4.60	19.00
IBPT	3	4.80	4.50	4.20	4.00	17.50	4.80	4.70	4.60	4.80	18.90
IBPT	4	4.40	4.40	4.00	4.00	16.80	4.70	4.90	4.70	4.50	18.80
IBPT	5	4.60	4.00	4.00	4.00	16.60	4.20	4.70	4.70	4.80	18.40
IBPT	6	4.00	4.40	3.80	3.80	16.00	4.40	4.50	4.50	4.60	18.00
IBPT	7	4.00	4.10	3.90	4.00	16.00	4.50	3.90	4.70	4.70	17.80
IBPT	8	3.90	4.00	4.00	3.90	15.80	4.30	4.60	4.40	4.30	17.60
IBPT	9	3.80	3.90	3.50	3.80	15.00	4.00	4.00	4.70	4.60	17.30
IBPT	10	3.50	3.60	3.40	3.50	14.00	3.60	3.40	4.30	4.70	17.00
IBPT	11	3.30	3.00	3.40	3.30	13.00	3.50	4.00	4.50	4.60	16.60
IBPT	12	3.00	3.20	3.20	3.20	12.60	3.50	3.50	4.00	4.00	15.00
IBPT	13	3.60	3.00	3.00	3.00	12.60	3.20	3.30	4.00	3.50	14.00
IBPT	14	3.20	3.20	2.90	3.00	12.30	3.10	3.20	3.70	4.00	14.00
IBPT	15	3.20	3.20	2.80	2.80	12.00	3.20	3.30	3.50	4.00	14.00
IBPT	16	3.50	3.00	2.70	2.80	12.00	3.10	3.20	3.40	3.30	13.00
	Mean	3.88	3.81	3.58	3.58	14.86	3.98	4.05	4.32	4.35	16.77
CAPT	1	4.50	4.50	4.30	4.30	17.60	4.90	4.80	4.80	4.70	19.20
CAPT	2	4.60	4.00	4.40	4.00	17.00	4.80	4.90	4.70	4.60	19.00
CAPT	3	4.30	4.20	4.40	4.10	17.00	4.80	4.70	4.70	4.60	18.80
CAPT	4	4.20	4.30	4.10	4.40	17.00	4.70	4.80	4.60	4.50	18.60
CAPT	5	4.20	4.40	4.20	4.00	16.80	4.70	4.70	4.50	4.50	18.40
CAPT	6	4.00	4.00	3.30	3.70	15.00	4.70	4.50	4.50	4.30	18.00
CAPT	7	4.00	3.80	3.40	3.80	15.00	4.60	4.70	4.30	4.40	18.00
CAPT	8	3.90	3.80	3.50	3.80	15.00	4.50	4.40	4.40	4.30	17.60
CAPT	9	3.40	3.70	3.30	3.60	14.00	4.50	4.20	4.30	4.40	17.40
CAPT	10	3.00	3.10	3.10	3.30	12.50	4.30	4.40	4.20	4.10	17.00
CAPT	11	3.20	3.10	3.00	3.00	12.30	4.20	4.30	4.10	4.20	16.80
CAPT	12	3.00	3.20	3.10	3.00	12.30	4.00	3.70	4.20	4.10	16.00
CAPT	13	3.00	3.00	3.20	3.00	12.20	4.00	3.90	3.90	3.80	15.60
CAPT	14	3.00	3.20	2.80	3.00	12.00	4.00	3.70	3.60	3.70	15.00
CAPT	15	3.00	3.00	3.10	3.10	12.00	3.90	3.70	3.60	3.30	14.50
CAPT	16	3.00	2.70	3.20	3.10	12.00	3.80	3.60	3.40	3.20	14.00
	Mean	3.64	3.62	3.52	3.57	14.35	4.40	4.31	4.23	4.16	17.11

Appendix 2. One sample of instructor (I.) based prosody teaching (IBPT) training program

Time	Opening	Monitor/Feedback
5 mins.	Greetings with the students. Asking some question based on previous discussions to get feedback to see how things are going with the program	
30 mins.	<p>Activities</p> <p>Playing audio tracks and asking students to talk about their contents. Proposing a situation and asking students to discuss the issues in pairs. Concluding a pair work activity (students discussed a controversial issue and one of them stated the result of their discussion) . Role plays. Short speeches by students. Observation activities: students observe something and present their observation to class.</p> <p>Prosody awareness training</p> <p>Prosodic theory: I. explained to the students that change of stress in English would result in different interpretations. Prosodic practice: Marking syllables: I. played a list of words and had learners count syllables and mark which syllables were stressed. Examples: Words: <i>deport, demarcation, campsite, cardiologist, carnival, catastrophe, cavalry, champion, charger, cheery, chowder.</i> Sentences: I. asked learners to mark pauses, sentence stresses, linking phenomena, and intonation changes; practice these reading aloud. Examples: <i>The increased pressure within the muscle compresses nerves and blood vessels. The players had swelling in their triceps. I was just kind of shocked this was happening to us. The students said they did not take any body building supplements. We believe it was a strenuous workout, but we don't believe it was excessive. That's used so commonly by athletes of all ages.</i></p> <p>Homework</p> <p>Observe the campus today, write a brief summary and present it to class.</p>	I. moved around the class and helped students when needed.
20 mins.		I. asked students to mark the syllables on work sheet and hand in for assessment. I asked some students to read the words/ sentences aloud again to see how much in practice they were able to produce the correct stress patterns of words and sentences.
5 mins.		I. instructed the students to do this observation outside the classroom and present it to the class the next session.

Appendix 3. One sample training program for CAPT group

Time	Opening	Monitor/Feedback
5 mins.	<p>Opening Greetings with the students. Asking some question based on previous discussions to get feedback to see how things are going with the program</p>	
30 mins.	<p>Activities Playing audio tracks and asking students to talk about their contents. Proposing a situation and asking students to discuss the issues in pairs. Concluding a pair work activity (students discussed a controversial issue and one of them stated the result of their discussion) . Role plays. Short speeches by students. Observation activities: students observe something and present their observation to class.</p>	<p>I. moved around the class and helped the students when needed.</p>
20 mins.	<p>The Figure below is a screenshot of the prosody training part of the program, e.g. word stress, sentence stress and different activities based on these pronunciation features. Some examples: Words: PHOtograph, phoTOGraphy, communiCAtion, imPORtant, Sentences: 1. If we underSTAND each other, that's communiCAtion. What DIFFerence does it make? 2. English words are DIFFICULT / because the PRONUNCIATION / is sometimes different from the SPELLING. 3. I didn't take the TEST yesterday. 4. I didn't take the test yesterday.</p> 	<p>Students were asked to do these exercises for prosody awareness in laboratory by themselves. They had a choice to practice and repeat on specific exercises. I. moved around the laboratory and monitored the students in working with different tasks and helped them in case they asked some questions.</p>
5 mins.	<p>Homework Observe the campus today, write a brief summary and present it to class.</p>	<p>I. instructed the students to do this observation outside the classroom and present it to the class at the next session.</p>

Appendix 4. One sample training program for control group

Time	Opening	Monitor/Feedback
5 mins.	Greetings with the students. Asking some question based on previous discussions to get feedback to see how things are going with the program	
50 mins.	Activities Playing audio tracks and asking students to talk about their contents. Proposing a situation and asking students to discuss the issues in pairs. Concluding a pair work activity (students discussed a controversial issue and one of them stated the result of their discussion). Role plays. Short speeches by students. Observation activities: students observe something and present their observation to class. Homework	I. moved around the class and helped the students when needed.
5 mins.	Observe the campus today, write a brief summary and present it to class.	I. instructed the students to do this observation outside the classroom and present it to the class at the next session.

Supplementary material

Supplementary material associated with this article can be found, in the online version, at doi:[10.1016/j.specom.2019.01.006](https://doi.org/10.1016/j.specom.2019.01.006).

References

- Adams-Goertel, R., 2013. Prosodic elements to improve pronunciation in English language learners: a short report. *Appl. Res. English Lang.* 2, 117–128.
- Anderson-Hsieh, J., 1992. Using electronic visual feedback to teach suprasegmentals. *System* 20, 51–62.
- Anderson-Hsieh, J., 1994. Interpreting visual feedback on suprasegmentals in computer assisted pronunciation instruction. *CALICO J.* 11, 5–22.
- Auralog, 2002 Talk to Me. http://www.auralog.com/en/Individuals_talktome.htm.
- Bo, L., Bo, S., 2005. *Accent Master*, Farsi edn. Computer software, New York Retrieved from <http://www.accentmaster.com/>.
- Bongaerts, T., van Summeren, C., Planken, B., Schils, E., 1997. Age and ultimate attainment in the pronunciation of a foreign language. *Studies Second Lang. Acquisition* 19, 447–465.
- Bot, K.de, 1982. Visual Feedback of Intonation. Doctoral dissertation, Catholic University of Nijmegen.
- Bot, K.de, 1983. Visual feedback of intonation I: effectiveness and induced practice behavior. *Lang. Speech* 26, 331–350.
- Bot, K.de, Mailfert, K., 1982. The teaching of intonation: fundamental research and classroom applications. *TESOL Q.* 16, 71–77.
- Breitkreutz, J., Derwing, T., Rossiter, M., 2002. Pronunciation teaching practices in Canada. *TESL Canada J.* 19, 51–61.
- Burgess, J., Spencer, S., 2000. Phonology and pronunciation in integrated language teaching and teacher education. *System* 28, 191–215.
- Casado, J., García, M., 2000. Consideraciones didácticas sobre la enseñanza de lenguas [Didactic considerations on language teaching]. *Didáctica (Lengua y Literatura)* 12, 67–89.
- Cauldwell, R., 2002. Streaming Speech: listening and advanced pronunciation for advanced learners of English. In: *Talking Computers, Proceedings of the IATEFL Pronunciation and Computer Special Interest Groups*, pp. 18–22.
- Coniam, D., 2002. Technology as an awareness raising tool for sensitizing teachers to features of stress and rhythm in English. *Lang. Awareness* 11, 30–42.
- Chun, D., 1998. Signal analysis software for teaching discourse intonation. *Lang. Learn. Technol.* 2, 74–93.
- Cutler, A., McQueen, J.M., 2014. How prosody is both mandatory and optional. In: Caspers, J., Chen, Y., Heeren, W., Pacilly, J., Schiller, N.O., Zanten, E.van (Eds.), *Above and Beyond the segments: Experimental linguistics and Phonetics*. John Benjamins, Amsterdam, pp. 71–82.
- Cutler, A., Dahan, D., Donselaar, W.van, 1997. Prosody in the comprehension of spoken language: a literature review. *Lang. Speech* 40, 141–201.
- Eskenazi, M., Hansma, S., 1998. The fluency pronunciation trainer. In: *Proceedings of the STiLL Workshop on Speech Technology in Language Learning*. Dundee, pp. 77–80.
- Felps, D., Bortfeld, H., Gutierrez-Osuna, R., 2009. Foreign accent conversion in computer assisted pronunciation training. *Speech Commun.* 51, 920–932.
- Golonka, E.M., Bowles, A.R., Frank, V.M., Richardson, D.L., Freynik, S., 2014. Technologies for foreign language learning: a review of technology types and their effectiveness. *Comput. Assisted Lang. Learn.* 27, 70–105.
- Gussenhoven, C., 2015. Suprasegmentals. In: Wright, J.D. (Ed.), *International Encyclopedia of the Social & Behavioral Sciences*, 2nd ed., Vol. 23. Elsevier, Oxford, pp. 714–721.
- Derwing, T., Munro, M., 2005. Second language accent and pronunciation teaching: a research-based approach. *TESOL Q.* 39, 379–397.
- Hardison, D., 2004. Generalization of computer-assisted prosody training: quantitative and qualitative findings. *Lang. Learn. Technol.* 8, 34–52.
- Heuven, V.J. van, 1983. Boekbespreking van: C. L. J. de Bot 'Visuele feedback van intonatie, proefschrift KU Nijmegen' [Book review of: C. L. J. de Bot 'Visual feedback of intonation, dissertation, Catholic University Nijmegen']. *Toegepaste Taalwetenschap in Artikelen* 17, 226–254.
- Heuven, V.J. van, 1994. Introducing prosodic phonetics. In: Odé, C., Heuven, V.J. van (Eds.), *Experimental Studies of Indonesian prosody*. Vakgroep Talen en Culturen van Zuidoost-Azië en Oceanië, Leiden University, Semaian 9. Leiden, pp. 1–26.
- Heuven, V.J. van, 2008. Making sense of strange sounds: (mutual) intelligibility of related language varieties. A review. *Int. J. Humanities Arts Comput.* 2, 39–62.
- Heuven, V.J. van, 2017. Prosody and sentence type in Dutch. *Nederlandse Taalkunde* 22, 3–29, 43–46.
- Hincks, R., 2005. Measures and perceptions of liveliness in student oral presentation speech: a proposal for an automatic feedback mechanism. *System* 33, 575–591.
- Kaltenboeck, G., 2002. Computer-based intonation teaching: problems and potential. In: *Talking Computers, Proceedings of the IATEFL Pronunciation and Computer Special Interest Groups*, pp. 11–17.
- Kawai, G., Hirose, K., 2000. Teaching the pronunciation of Japanese double-mora phonemes using speech recognition technology. *Speech Commun.* 30, 131–143.
- Kongrith, K., Maddux, C.D., 2005. Online Learning as a Demonstration of Type II Technology: second-Language Acquisition. *Comput. Schools* 22, 97–110.
- Lambacher, S., 1999. A CALL tool for improving second language acquisition of English consonants by Japanese learners. *Comput. Assisted Lang. Learn.* 12, 137–156.
- Le, H.T., Brook, J., 2011. In: *Using Praat to Teach Intonation to ESL Students*. Hawaii Pacific University TESOL Working Paper Series, 9, pp. 2–15.
- Leather, J., 1990. Perceptual and productive learning of Chinese lexical tone by Dutch and English speakers. In: Leather, J., James, A. (Eds.), *In: New Sounds*, 90. University of Amsterdam, Amsterdam, pp. 72–97.
- Levis, J., 2005. Changing contexts and shifting paradigms in pronunciation teaching. *TESOL Q.* 39, 369–378.
- Levis, J., 2007. Computer technology in teaching and researching pronunciation. *Ann. Rev. Appl. Linguistics* 27, 184–202.
- Levis, J., Pickering, L., 2004. Teaching intonation in discourse using speech visualization technology. *System* 32, 505–524.
- Levy, M., 1997. *Computer-assisted Language Learning: Context and Conceptualization*. Clarendon Press, Oxford University Press, Oxford, New York.
- MacDonald, S., 2002. Pronunciation-views and practices of reluctant teachers. *Prospect* 17 (3), 3–18.
- Menzel, W., Herron, D., Bonaventura, P., Morton, R., 2000. Automatic detection and correction of non-native English pronunciations. In: *Proceedings of the STiLL Workshop on Speech Technology in Language Learning*. Dundee, pp. 49–56.
- Munro, M., Derwing, T., 2006. The functional load principle in ESL pronunciation instruction: an exploratory study. *System* 34, 520–531.
- Munro, M., Derwing, T., 1999. Foreign accent, comprehensibility, and intelligibility in the speech of second language learners. *Lang. Learn.* 49, 285–310.
- Murray, G.L., 1999. Autonomy and language learning in a simulated environment. *System* 27, 295–308.
- Molholt, G., 1988. Computer-assisted instruction in pronunciation for Chinese speakers of American English. *TESOL Q.* 22, 91–111.
- Murphy, J., 1997. Phonology courses offered by MATESOL programs in the United States. *TESOL Q.* 31, 741–764.
- Neri, A., Cucchiari, C., Strik, H., 2003. Automatic speech recognition for second language learning: how and why it actually works. In: *Proceedings of the 15th International Congress of Phonetic Sciences*. Barcelona, pp. 1157–1160.
- Neri, A., Cucchiari, C., Strik, H., 2006. Selecting segmental errors in L2 Dutch for optimal pronunciation training. *Int. Rev. Appl. Ling.* 44, 357–404.
- Neri, A., Cucchiari, C., Strik, H., Boves, L., 2002. The pedagogy-technology interface in computer assisted pronunciation training. *Comput. Assisted Lang. Learn.* 15, 441–467.
- Pennington, M., 1999. Computer-aided pronunciation pedagogy: promise, limitations, directions. *Comput. Assisted Lang. Learn.* 12, 427–440.

- Parks, S., Huot, D., Hamers, J.F., Lemonnier, F.H., 2001. Apport des conceptions pédagogiques et de l'utilisation des TIC dans l'apprentissage de l'anglais et du français [Contribution of pedagogical concepts and utilization of ITC in the teaching of English and French]. In: Lemonnier, F.H., Duquette, L. (Eds.), *L'impact de l'utilisation de l'ordinateur et des nouvelles technologies dans l'apprentissage des langues*. Les Cahiers scientifiques 97. ACFAS, Montréal, pp. 107–124.
- Pennington, M.C., Esling, J.H., 1996. Computer-assisted development of spoken language skills. In: Pennington, M.C. (Ed.), *The Power of CALL*. Athelstan, Houston, TX, pp. 153–189.
- Qian, M., Chukharev-Hudilainen, E., Levis, J., 2018. A system for adaptive high-variability segmental perceptual training: implementation, effectiveness, transfer. *Lang. Learn. Technol.* 22, 69–96 doi:10.1257/44582.
- Seferoglu, G., 2005. Improving students' pronunciation through accent reduction software. *Br. J. Edu. Technol.* 36, 303–316.
- Wachowicz, K.A., Scott, B., 1999. Software that listens: it's not a question of whether, it's a question of how. *CALICO J.* 16, 253–276.
- Wang, X., Munro, M.J., 2004. Computer-based training for learning English vowel contrasts. *System* 32, 539–552.
- Wanner, E., Gleitman, L., 1982. *Language acquisition: The state of the Art*. Cambridge University Press, Cambridge.
- Weltens, B., Bot, K.de, 1984. Visual feedback of intonation II: feedback delay and quality of feedback. *Lang. Speech* 27, 79–88.
- Werker, J., Pegg, J., McLeod, P., 1994. A cross-language investigation of infant preference for infant directed communication. *Infant Behav. Dev.* 17, 323–333.
- Whalley, K., Hansen, J., 2006. The role of prosodic sensitivity in children's reading development. *J. Res. Reading* 29, 288–303.
- Yenkimaleki, M., 2016. Why prosody awareness training is necessary for training future interpreters. *J. Edu. Human Dev.* 5, 256–261. doi:10.15640/jehd.v5n1a26.
- Yenkimaleki, M., 2017a. Effect of Prosody Awareness Training On the Quality of Consecutive Interpreting Between English and Farsi. LOT, Utrecht.
- Yenkimaleki, M., 2017b. Developing listening comprehension skills by interpreter trainees through prosody teaching: does methodology make a difference? *PEOPLE: Int. J. of Social Sci.* 3, 26–42. doi:10.20319/pijss.2017.32.2642.
- Yenkimaleki, M., 2018. Implicit vs. explicit prosody teaching in developing listening comprehension skills by interpreter trainees: an experimental study. *Int. J. English Lang. Linguistics Res.* 6, 11–21.
- Yenkimaleki, M., Heuven, V.J. van, 2016a. Explicit teaching of segmentals versus suprasegmentals: which would yield better listening comprehension skills for interpreter trainees? An experimental study. *Br. J. English Ling.* 4, 11–22.
- Yenkimaleki, M., Heuven, V.J. van, 2016b. Effect of prosody awareness training on the performance of consecutive interpretation from Farsi into English: an experimental study. *Asia Pacific Trans. Intercultural Studies* 3, 1–17. doi:10.1080/23306343.2016.1233930.
- Yenkimaleki, M., Heuven, V.J. van, 2016c. Prosody teaching matters in developing speaking skills for Farsi-English interpreter trainees: an experimental study. *Int. J. English Lang. Linguistics Res.* 4, 82–91.
- Yenkimaleki, M., Heuven, V.J. van, 2016d. Effect of explicit teaching of prosodic features on the development of listening comprehension by Farsi-English interpreter trainees: an experimental study. *Int. J. English Lang. Teaching* 4, 32–41.
- Yenkimaleki, M., Heuven, V.J. van, 2016e. The effect of prosody teaching on developing word recognition skills for interpreter trainees: an experimental study. *J. Adv. Ling.* 7, 1101–1107.
- Yenkimaleki, M., Heuven, V.J. van, 2018. The effect of teaching prosody teaching on interpreting performance: an experimental study of consecutive interpreting from English into Farsi. *Perspectives* 26, 84–99 doi:10.1080/0907676X.2017.1315824.
- Yenkimaleki, M., Heuven, V.J. van, 2019. Prosody instruction for interpreter trainees: does methodology make a difference? An experimental study. *Across Lang. Cultures* (accepted).