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The efficacy of segmental/suprasegmental vs. holistic pronunciation instruction on the development of listening comprehension skills by EFL learners

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ABSTRACT

The present study investigated the efficacy of segmental/suprasegmental vs. holistic pronunciation instruction in the development of listening comprehension skills by EFL learners, using a pre-test post-test design. Six groups of 20 intermediate EFL learners at a university in Iran took part in the study, all groups receiving the same amount of instruction (10 hours over 5 weeks). The control group listened to/viewed authentic audio recordings and movies in English, discussed their contents, and completed a variety of listening comprehension tasks but received no pronunciation instruction. Four experimental groups completed similar activities but during one third of the teaching time (20 minutes per class), received an explanation of segmental or suprasegmental features followed by production-focused or perception-focused practice. The final experimental group received holistic pronunciation instruction with mixed perception/production-focused practice for 20 minutes during each hour-long class. Versions of Longman's TOEFL English proficiency test (paper-based) were used to assess listening comprehension at pre-test, immediate post-test and delayed post-test. The findings revealed that the holistic pronunciation instruction enhanced the listening comprehension skills of Iranian EFL learners more than separate segmental or suprasegmental training, with either perception or production-focused practice.

KEYWORDS

Segmental; suprasegmental; holistic pronunciation instruction; listening comprehension skills

1. Introduction

By listening comprehension (sometimes called just 'listening', e.g. Poelmans 2003) we refer to the complex process of decoding an auditory (or audio-visual) speech input and transforming it to a reconstruction of the communicative intentions of the speaker. A necessary but not sufficient intermediate stage in the transformation process is the recognition of (a sufficient number of) words in the order in which they were spoken (e.g. Denes and Pinson 1963; Gooskens and Van Heuven 2021; Smith and Nelson 1985). Listening comprehension skills enable foreign-language (FL) learners to make sense of language input and facilitate the emergence of other language skills (Vandergrift and Goh 2012; Yenkimaleki and Van Heuven 2016). Listening comprehension involves a complicated set of subskills which range from perception of sound waves to the integration of meaning, and requires the interaction between top-down and bottom-up cognitive processes, which, in turn, are mediated by attention and memory mechanisms.

Listening comprehension is a conscious process in which listeners use different types of cues, from the context and their previous knowledge, to assign meaning to the input (O'Malley and Chamot 1989). The present research investigates experimentally, the relative efficacy of pronunciation instruction focusing discretely on either segmentals or suprasegmentals, or on both aspects in an integrated fashion (holistic pronunciation instruction) on the development of listening comprehension skills in the case of Iranian EFL university learners.

The traditional view was that L2 listening comprehension naturally improves inductively, and develops automatically through exposure to L2 speech in the classroom (Clement 2007). However, Cutler (2001) pointed out that L2 listeners exploit different heuristic procedures when segmenting L2 speech, and these processing procedures are initially dictated by the structure of a learner's L1. They are typically applied automatically to the L2 even though they are often inefficient. It has thus been argued that listening comprehension skills in an L2 demand awareness training of prosodic features in different aspects of the listening process (Berne 2004; Chamot 2004; Graham et al. 2011; Oxford 1993, 2002; Yenkimaleki et al. 2021).

Evidence has accumulated, for example, that correctly placed word stress is important for word recognition in English, for native and non-native listeners alike (Cutler 2012; Field 2005). Further, given that Hahn (2004) has shown that *incorrect* use of sentence stress compromises the comprehensibility of non-native English, we might conversely expect L2 listeners to benefit if they know how to use the communicative information provided by *correct* sentence stress in English. Van Wijngaarden (2001) has shown that speech recognition in Dutch was negatively affected (a 3-dB raising of the speech reception threshold) for Dutch native listeners when the stimulus materials, whether spoken by native Dutch or non-native English-accented speakers, were artificially monotonised, thus highlighting the importance of prosody to comprehension. Keskin et al. (2019) have also reported that L1 listening comprehension by Turkish primary schoolers suffered when all prosodic information was removed from a Turkish spoken text, at least when the questions required inferential listening (though not when literal content questions were asked). Luu et al. (2021), concluded that prioritising prosody by using techniques such as listening to low-pass filtered audio, repetition in synchrony with body movements, and speech shadowing, enhance the English listening comprehension skills of Vietnamese college freshmen. Earlier, Yenkimaleki (2017) found that explicit teaching of prosody and raising the learners' awareness of prosodic differences through formal teaching was found to have a positive effect on the understanding of English speech by nonnative listeners. However, *the extent* to which pronunciation instruction – and indeed *what kind* of pronunciation instruction – helps learners of English as a foreign language (EFL) improve their L2 listening comprehension skills is still an open question.

Various researchers in applied linguistics have argued that explicit prosody teaching is important for developing EFL learners' listening comprehension skills (see Lord 2005; Pennington and Ellis 2000; Yenkimaleki and Van Heuven 2016), while others have emphasised segmental training (see Pennock and Vickers 2000). Zielinski (2008), however, has argued that viewing segmental and suprasegmental features as separate entities is a false dichotomy and that we should instead take a holistic approach to pronunciation teaching if the aim is to enhance listening comprehension. In the context of this debate, the present study set out to examine the relative efficacy of exclusive segmental or suprasegmental vs. holistic (or integrated) pronunciation instruction on the development of listening comprehension skills in the case of Iranian EFL learners at university. These learners are presumed to experience difficulties in perception of some features of English phonology due to phonological differences between English and Persian.

1.1. Pronunciation instruction

Pronunciation instruction (PI) in the FL classroom commonly puts emphasis on the differences between learners' L1 and L2 phonological systems with regards to phonemic inventories, articulation of analogous phones, grapheme–phoneme correspondences, and phonological processes (Kissling

2018; Venkatagiri and Levis 2007; Yenkimaleki and Van Heuven 2019). Moreover, pronunciation instruction typically includes perception and production practice in the form of phoneme discrimination and identification exercises (Kissling 2018; Yenkimaleki and Van Heuven 2020; Zheng et al. 2020). These exercises have been considered to facilitate acquisition of target-like L2 pronunciation (Elliott 2003; Pardo 2004; Saito and Plonsky 2019; Yenkimaleki 2019). Instruction helps learners gain explicit knowledge to support their performance on certain types of tasks, e.g. listening comprehension skills (Sakai and Moorman 2018; Venkatagiri and Levis 2007; Yenkimaleki and Van Heuven 2016). The report about the conflicting evidence of the putative benefits of pronunciation instruction may be due to differences in research design (e.g. reading from the word lists versus spontaneous speech tasks), instructional approaches (e.g. traditional pronunciation drills versus acoustic analysis of speech), and learning contexts (e.g. input-rich L2 settings versus relatively input-poor FL settings). Moreover, a number of other factors influence the effectiveness of instruction, including the developmental readiness of learners, the particular L2 speech elements targeted, L1/L2 language pairs, and time on task (Pardo 2004; Yenkimaleki 2019). Therefore, when assessing the effectiveness of pronunciation instruction in developing listening comprehension skills, it is important to limit the scope of analysis and define precisely for whom and under what conditions the instruction is being gauged (Kissling 2013).

According to Flege's Speech Learning Model (SLM), target-like perception of the L2 is a necessary requirement to target-like production. This suggestion is based on some of the empirical research relating perception to production in different language pairs (Akerberg 2005; Hwang 2011). SLM suggests that to fully acquire L2 sounds students must first perceive subtle phonetic differences between L2 sounds and similar sounds in the L1 as they take place in a variety of phonetic environments, at which point students can make new phonetic categories for L2 sounds and then finally produce the L2 sounds in target-like ways (Flege 1995). However, there is some evidence incompatible with the predictions of SLM, namely that learners may produce contrasts they cannot perceive (Goto 1971) and may show different acquisitional patterns in the perceptual and productive skills (e.g. Eckman et al. 2011). Munro (2008) also holds that perception underlies production.

Most instructors spent less than five percent of their class time on pronunciation instruction (Foote et al. 2011). Instructors' insufficient training could be a possible explanation for the lack of pronunciation practice in class. The reason could be that EFL instructors often have a limited knowledge of the English sound system and may not have received sufficient training in how to teach it (Baker 2011; Yenkimaleki and Van Heuven 2016).

A longstanding discussion has been about whether it is more crucial to teach segmental or suprasegmental features as a priority in pronunciation instruction. Two opposing perspectives come out from this debate: some researchers claim that suprasegmentals should be given priority in pronunciation instruction as they have a greater effect on intelligibility (e.g. Tanner and Landon 2009; Yenkimaleki and Van Heuven 2021), whereas some others state the opposite (e.g. Jenkins 2002). Zielinski (2015), however, approaches this discussion differently by challenging the premise that segmental and suprasegmental features are independent entities. She points out that the two features are both crucial and should not always be viewed separately.

1.2. Suprasegmentals

Traditionally, pronunciation materials or curricula start from small segmental elements (e.g. vowels and consonants) and move towards larger suprasegmental features (e.g. stress at sentence level, intonation). However, such a linear approach has been questioned for not paying attention to 'the bigger picture'; students may find it difficult to perceive how the different elements fit together in utterances. The instructor might, for example, start by explaining that the syllable is central to pronunciation and that the combination of syllables, each containing a vowel, creates the typical rhythmic patterns of English with its alternating stress-unstress pattern. A connection could also be shown between the rhythmic structure of English and vowel quality, and the fact that stressed vowels are

clearer and longer than unstressed vowels, which are typically reduced to schwa. This, in turn, could make learners aware of the need to hear and produce stress patterns accurately (Pennington and Rogerson-Revell 2019). Some have argued in response that suprasegmentals should be given the priority as they have a greater impact on intelligibility. Fraser (2001) for instance, proposed that the order in which pronunciation features should be taught should be based on how they affect the comprehensibility of the student's speech. She pointed out that native listeners rely on suprasegmentals much more than on segmental features and that incorrect stress patterns will render the speaker's utterance unintelligible even if the speaker pronounces the vowels and consonants correctly. This perspective is confirmed by Chela-Flores (2001) and Tanner and Landon (2009), who reiterate that suprasegmental features deserve to be given attention as they have more impact on intelligibility and therefore are more relevant to L2 learners' immediate pronunciation needs.

The importance of appropriate suprasegmental production for speech intelligibility has been supported by research. Kang et al. (2010), drawing on 26 speech samples obtained from the iBT TOEFL Practice Online test, found that 'suprasegmental features alone can collectively account for about 50% of the variance in proficiency and comprehensibility ratings.' Moreover, Isaacs and Trofimovich (2012) suggest that word stress was the most salient feature differentiating ESL speakers of different proficiency levels. Research has also accumulated showing that suprasegmental-based PI may be more effective than segmental-based instruction in developing listening comprehension skills (e.g. Yenkimaleki and Van Heuven 2016). Similar results were also concluded in Gordon and Darcy (2016), who stated that only the group trained in suprasegmentals showed enhancement in the intelligibility of their speech. This may be because, as the scholars pointed out, suprasegmental-based PI involved real communicative contexts, while segmental-based PI remained on an isolated lexical level. That said, the researchers still propose that suprasegmental instruction may be more effective in short-term PI interventions in developing listening comprehension skills (e.g. Yenkimaleki and Van Heuven 2020).

1.3. Segmentals

The importance of accurate segmental production to speech intelligibility has been highlighted by research. To study the intelligibility of segmental elements produced by Mandarin-L1 EFL students, Rogers and Dalby (2005) itemised a minimal-pairs probe list. They concluded that 76% of the variance in speakers' intelligibility can be accounted for by seven phonemic category features. Bent et al. (2007) also found that accurate production of vowels, as well as consonants in the word-initial position, significantly correlates with intelligibility. Similar results also were reported in Saito's (2011) study with Japanese learners of English. Saito (2011) stated that eight specific segments, i.e. /æ, f, v, θ, ð, w, l, ɪ/, significantly improved EFL learners' intelligibility for native speakers (NSs) of English. Studies investigating the impact of segmental-based PI on intelligibility have shown learning gains for L2 listening comprehension skills in controlled measurement tasks (e.g. Saito 2011) as well as in free constructed responses (Saito and Lyster 2012).

Some researchers (e.g. Jenkins 2000) have argued that pronunciation instruction should be focus on developing speech intelligibility for non-native listeners, since non-native speakers (NNSs) are now frequently interacting with other NNSs using English as a lingua franca (ELF). Jenkins (2000) holds that in the case of NNS-NNS communication, segmentals are more important than suprasegmentals and that NNS's adoption of suprasegmental features such as reductions may even obstruct intelligibility.

Awareness of the segmental differences between English and Farsi could be argued to be conducive to better processing of English input by the Farsi non-native listener (Yenkimaleki and Van Heuven 2021). It should enable the listener to know what specific sounds to expect and what contrasts are relevant for word recognition in the target language. In this case, one could argue that awareness of features of English prosody is largely redundant and will only occasionally yield benefits. These are most likely to be in the area of word stress, where there is a contrast between

the two languages, since Farsi has fixed penultimate stress and English has a highly variable word stress pattern (Yenkimaleki 2016).

1.4. Holistic pronunciation instruction

The debate about whether PI should prioritise segmental or suprasegmental features reflects an assumption that segmental and suprasegmental features should be seen as separate entities. Zielinski (2008, 2015), however, points out that it is generally difficult to differentiate problematic or non-target like features as either segmental or suprasegmental. She proposed the two-way nature of intelligibility that both the speaker and the listener play a role when the utterance is rendered unintelligible. From the speaker's perspective, the emphasis is on *how* the words were pronounced and *why* they were produced like that; from the listener's point of view, the focus shifts towards what the listeners misheard and what misled them. Depending on the perspective from which the feature is analysed, the speaker's pronunciation feature that reduces intelligibility can be categorised differently. Zielinski (2015) provides an example which is the categorisation of a Mandarin L1 speaker's pronunciation feature of epenthesis – adding an extra sound, usually a schwa, to the end of an English word. Excluding the complications of categorising the pronunciation deviations as either segmental or suprasegmental, Zielinski (2015) holds that the segmental/suprasegmental dichotomy ignores the possible interaction between the two features as interactive components of an integrated system. It can be this interaction that influences intelligibility. This perspective resonates with what Weismer and Martin (1992) point out that 'modifications of segmental elements may influence not only the perception of those particular segments but also the perception of the rhythmic structure of the utterances as a whole.' Therefore, instead of discussing whether it is more crucial to teach segmental or suprasegmental features, it may be more reasonable to look at both of them 'as part of an integrated and interactive system where the production of one can influence the other' (Zielinski 2015).

1.5. Research focus

As shown in the above review, some researchers have argued for explicit prosody teaching (Lord 2005; Pennington and Ellis 2000; Yenkimaleki and Van Heuven 2016, 2020) while others emphasise segmental training (Pennock and Vickers 2000) in the development of EFL students' listening comprehension skills. However, Zielinski (2008) has suggested a holistic approach is preferable and that the segmental/suprasegmental dichotomy is unhelpful. Therefore, the present study set out to examine the relative efficacy of pronunciation instruction focusing discretely on segmentals or suprasegmentals, or holistic pronunciation instruction on the development of listening comprehension skills in the case of Iranian EFL university learners. We asked the following research question: which of three types of explicit pronunciation instruction – segmental training, prosody training or holistic pronunciation instruction – will have the greatest impact on listening comprehension skills for Iranian EFL learners? Following Zielinski (2008, 2015), we hypothesise that holistic pronunciation instruction will enhance listening comprehension skills more than separate focus on either segmental or suprasegmental features.

2. Method

2.1. Participants

The participants of this study were 120 students of applied chemistry and industrial engineering at Bu-Ali Sina University. No participants reported any hearing problems or learning disabilities. None of them had experience of living in an English-speaking country before participating in the training programme. They had studied English in (junior and senior) high school for seven years for three hours per week. All of them were female students in the first year of their study at BA level. Their

age range was between 18–21 years, and their first language was Persian. They were randomly assigned to one of six groups. The main goal of the L2 English course they were taking was to develop their listening comprehension skills, and the classes consisted of listening comprehension practice.

2.2. Ethics

We received approval for the present study from the ethics committee of the Department of Modern Languages of Bu-Ali Sina University. All the participants agreed to take part in the research project based on informed written consent and received a small amount of money for their participation.

2.3. Groups

Six groups of 20 students were formed. The control group devoted ten sessions of one hour to listening comprehension exercises. The five experimental groups received similar input to the control group but during 40 minutes only. During the remaining 20 minutes of each class, four of the experimental groups received 10 minutes of explicit teaching on either segmental or prosodic properties of English, followed by 10 minutes of practice focusing on either the perception or the production of the features covered. The fifth experimental group received holistic instruction on segmental and prosodic properties of English followed by mixed practice of production and perception of the features presented. The total instruction time was 10 hours for all six groups, i.e. two sessions of one hour per week over five weeks. The first author, who is specialised in pronunciation training for EFL students and did his PhD in this area, was the instructor for all six groups. We will refer to the five experimental groups as Segmental-Perception, Segmental-Production, Prosody-Perception, Prosody-Production, and Holistic pronunciation instruction.

2.3.1. Control group

The control group (CON) undertook routine listening exercises. They listened to authentic movies/audio recordings in American English without subtitles or captions. Interesting, and in some cases humorous, recordings were chosen, covering a variety of topics including politics, social issues, and scientific findings. Only good quality audio files with clear-voiced speakers were used. The students discussed the content and issues raised in these recordings. They also undertook intensive listening tasks, followed by detailed comprehension questions such as inferring the meaning of unknown words.

Prior to viewing/listening, the instructor typically introduced the topic, and got students to think about it, and brainstormed relevant vocabulary. If necessary, he presented a short list of keywords occurring in the movie/audio recording that students might be unfamiliar with, illustrating their meaning in disambiguating sentences. The instructor then played the movie clip/audio recording first for general comprehension to allow students to get the main idea, and subsequently, replayed it several times for the students to grasp details. The pause button was used as needed to focus on sections students had difficulty in understanding. The same procedure was followed in each of the 10 lessons.

2.3.2. Experimental groups

2.3.2.1. Segmentals. The segmental instruction started with 'listen and repeat', the most common method of teaching pronunciation in English. The instructor demonstrated a problematic target sound (e.g. vowels or consonants) or contrast between them in minimal pairs, i.e. words that differ in only one phoneme such as *back* and *pack* (consonants) or *pick* and *peck* (vowels), and asked the students to repeat the pair after him. When teaching a long word with multiple syllables, the instructor started with the final syllable of the word and had his class repeat it. He then added the penultimate syllable and the class repeated after him. The instructor worked backwards in this

manner until the students were able to pronounce the entire word correctly. The next exercise was 'isolation': the instructor asked the students to isolate a particular sound from others. Instead of presenting a certain sound as part of a complete word in English, the instructor simply pronounced the target sound repeatedly. The students then said it along with him repeatedly, focusing on the small nuances in the correct pronunciation and also engraining the sound pattern into their minds. This was followed by work, which focus attention on a single sound contrast illustrated by two words, e.g. *rat* and *rate*. In 'record and replay' students' pronunciations were recorded and played back to them to encourage detailed perception of target sounds. Students then compared a recording of a native speaker with the recording of their imitation. The aim here was to help them develop a more objective understanding of their actual pronunciation in order to be able to make it more accurate. Finally, 'tongue twisters' were used to challenge students' pronunciation as part of a relaxed and fun classroom activity.

2.3.2.2. Prosody. The prosody instruction proceeded as follows. First, students received information about the prosodic features of English, i.e. elaboration on the functions of prosodic features in perception of the message (e.g. Piske 2008; Yenkimaleki and Van Heuven 2018). Students then engaged in 'speech shadowing'. Authentic audio recordings of a single native English speaker of up to 5 minutes in duration were selected from, for example, zappenglish.com. Students were able to choose a topic that they were already familiar with, and of interest to them. They then listened to the recording once to get used to the speaker, paying attention to the speaker's rhythm, accent, and pace. They then 'shadowed' the speaker, i.e. repeated immediately after the speaker in continuous fashion for about 30 seconds at a time. They could pause the recording, try again, and even record themselves and listen back to their own versions. This was to help students focus on how English speakers modulate speed, use intonation, and blend words together in connected speech. In further activity focusing on sentence stress, the instructor gave the students a transcript of a recording that had been used in class and played a very short extract, asking students to mark sentence stress on the transcript. The instructor then discussed the kinds of words that received stress in English. Students then looked at the transcript of a later passage and tried to predict which words would receive sentence stress, with the instructor subsequently playing the passage for them to check. A further exercise involved the instructor playing a fairly short listening extract, sometimes several times over, with students writing down the key (stressed) words they heard. In small groups, the students then had to try and recreate the text of the recording which they would finally compare with the original.

2.3.2.3. Production-focused vs. perception-focused practice. During the last 10 minutes of each class, the segmental and suprasegmental experimental groups received either production-focused or perception-focused practice. The production-focused practice groups repeated phrases including the target features, following the instructor's modelling of target-like pronunciation. This production practice was done first together by the students, and then individually as each student was encouraged, in turn, by the instructor. The students received feedback on their pronunciation. Target-like pronunciations were rewarded with a head nod. After non-target-like pronunciations, the instructor repeated the phrase again twice, once slowly and once at a natural speed, then asked the student to try again. If a student could not produce a target-like phrase after multiple attempts, the instructor replied with an encouraging 'almost'.

The perception-focused practice groups listened to target language speech that highlighted the target features while filling in blanks on partial transcriptions. They then received feedback on this activity. The audio recordings were interviews and descriptive texts included as part of the textbook materials from *Person to Person: Communicative Speaking and Listening Skills* (Richards et al. 2005).

2.3.2.4. Holistic pronunciation instruction. The instructor followed the same procedure for teaching segmentals and prosody as explained above. He spent 20 minutes each session on explanation of

English segmentals *and* prosody, and then engaged students in production-focused and perception-focused practice of English segmentals and prosody. The difference with the discrete segmental and prosody groups was that in the latter, the instructor spent more time on training and students had longer to practise (see [Table 1](#) for details). For instance, the holistic pronunciation group received training and practice of segmentals combined with perception-focused practice for a total of 50 minutes, while the segmental/perception-focused group did this for a total of 200 minutes.

2.4. Tests

In the current study, we tested students' listening comprehension skills at three different times: before the experimental intervention (pre-test), immediately afterwards (immediate post-test) and one month afterwards (delayed post-test). All three tests were (different) versions of the listening comprehension skills test from the standard Longman's TOEFL English proficiency test (paper-based version).¹ We chose the TOEFL listening comprehension test because it is easy to administer, is standardised, and has several equivalent versions, thus making it ideal for pre-test, immediate and delayed post-test experimental designs. It uses a multiple-choice format of 50 items with four alternatives each. This reduces the influence of guessing to 25%. TOEFL is a well documented, reliable and valid test to measure the listening comprehension skills of EFL learners. It has 30 questions about short conversations, 8 questions about longer conversations, 12 questions about lectures or talks. The test does not ask about the recognition of single words. It always addresses the global meaning of larger pieces of continuous speech. In a recent publication we used the TOEFL test as means of testing how much prosodic properties of the spoken items contribute to the overall test results. The use of contrastive sentence stresses and de-accentuation of referents introduced in the immediately preceding context are implemented in the TOEFL materials and serve to assess the contribution of sentence prosody to the testee's comprehension of the input speech (see Yenkimaleki et al. 2021). Two indicative examples of the test would be the following test items:

- (1) Woman: I've got to get over to the chemistry lab. There are only a couple more hours until the lab closes, and I still got a lot more to do.
Man: So you HAVen't finished the lab assignment yet.
(Here, capitalized HAV indicates contrastive sentence stress on the auxiliary verb)
- (2) Someone shot the servant of the actress who was on the balcony.

In (1), prosody reveals the earlier assumption on the part the man that the woman had already done her lab assignment. In example (2), prosodic means are employed by the speaker to indicate that the relative clause *who was on the balcony* modifies the actress not the servant.

Table 1. Summary of activities and total time spent (minutes) by six groups.

Activity	Group					
	CON.	EXP. Segmental Perception	EXP. Segmental Production	EXP. Prosody Perception	EXP. Prosody Production	EXP. Holistic instruction
Audio/movies and discussion	500	300	300	300	300	300
Listening to instructor explanations/guidance	100	100	100	100	100	100
Segmental teaching/ Perception-focused		200				50
Segmental teaching/ Production-focused			200			50
Prosody teaching/ Perception-focused				200		50
Prosody teaching/ Production-focused					200	50
Total time spent	600	600	600	600	600	600

All versions of the test have been tuned to the same level of difficulty, as explained by the documentation that goes with these tests.²

3. Results

Figure 1 presents the listening comprehension scores obtained at the three moments of testing (converted to percentages) for each of the six groups of participants. The raw data underlying the figure are given in Appendix.

Table 2 shows the mean scores and the standard deviation for the 18 data points in Figure 1. The table also specifies the gain the participants made from the pre-test to the immediate post-test, expressed as the difference in score at T2 minus the T1 score. In the far right column, we list the loss the participants incurred between T2 and the subsequent delayed post-test at T3. Here, a negative value implies a score at T3 which is lower than at T2.

A one-way ANOVA with Group as a fixed factor was used to check for equality in listening comprehension skills across the six groups. The small differences among the six groups do not yield any significant effect, $F(5, 114) < 1$ ($p = .969$, $\eta^2 = .008$). We then analysed the data by means of a repeated measures Analysis of Variance (RM-ANOVA), with Moment of testing (3 levels) as a within-subjects factor and instruction Group (6 levels) as a between-subjects factor. The effect of Moment of testing is significant, $F(2, 228) = 507.1$ ($p < .001$, $\eta^2 = .816$). A post-hoc analysis of differences (with Bonferroni correction for multiple comparisons, $\alpha = .05$) shows that the pre-test scores (mean = 70.0) are significantly lower than the scores obtained in the two post-tests (immediate = 75.3, delayed = 75.0), which do not differ significantly from one another. The overall effect of instruction Group is insignificant, $F(5, 114) < 1$ ($p = .283$, $\eta^2 = .053$). Crucially, however, the Moment-by-Group interaction is significant, $F(10, 228) = 28.9$ ($p < .001$, $\eta^2 = .559$). The post-hoc analysis on the gain (between T1 and T2) and subsequent loss (between T2 and T3) shows that the gain is significant for all six groups, even for the Control group, while no significant loss was incurred in the delayed post-test for any of the groups.

Given the significant interaction between Moment of testing and instruction Group, we analysed the difference between the pre-test and the immediate post-test separately by performing a one way ANOVA on the gain between T1 and T2. The gain differed significantly across groups, $F(5, 114) = 43.0$ ($p < .001$, $\eta^2 = .654$). The post-hoc analysis shows that the gain for the Control group

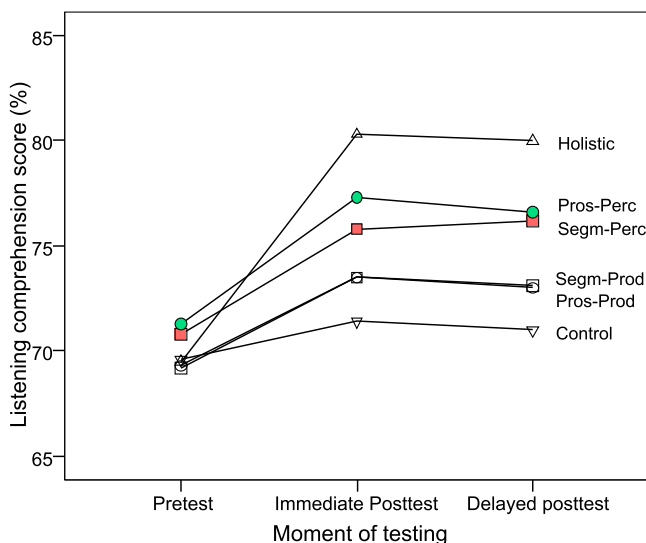


Figure 1. Listening comprehension score (% correct) at three moments of testing for all six groups ($n = 20$ per group).

Table 2. Mean listening comprehension score and standard deviation by moment of testing and instruction group.

Instruction Group		T1 Pre-test	T2 Immediate post-test	T3 Delayed post-test	Gain Δ T1..T2	Loss Δ T2..T3
Control	Mean	69.6	71.4	71.0	1.8	-0.4
	SD	9.1	9.1	9.2	1.3	1.7
Segmental-Perception	Mean	70.8	75.8	76.2	5.0	0.4
	SD	8.8	9.1	9.3	1.9	1.5
Segmental-Production	Mean	69.2	73.5	73.1	4.3	-0.4
	SD	9.6	9.0	9.3	1.5	1.4
Prosody-Perception	Mean	71.3	77.3	76.6	6.0	-0.7
	SD	9.3	9.1	9.3	1.7	1.5
Prosody-Production	Mean	69.3	73.5	73.0	4.2	-0.5
	SD	9.2	8.9	9.2	1.3	1.3
Holistic	Mean	69.5	80.3	80.0	10.8	-0.3
	SD	9.4	8.1	8.1	3.6	1.5
All	Mean	70.0	75.3	75.0	5.4	-0.3
	SD	9.1	9.2	9.4	0.9	0.8

(1.8 percentage points) is significantly smaller than what is seen for the other five groups, while the gain for the Holistic group (10.8 points) is significantly larger than for the other groups. The remaining four groups do not differ significantly in terms of gain. The insignificant loss incurred between the immediate post-test and the delayed post-test (mean = .3 point) does not differ between any of the six groups, $F(5, 114) = 1.3$ ($p = .272$, $\eta^2 = .054$).

Summarising, the six groups were equal at the start of the treatment. All experimental groups, obtained significantly better listening comprehension scores on the immediate post-test than on the pre-test, and did not perform more poorly on the delayed post-test. Crucially, the gain between pre-test and the post-test(s) was smallest for the Control group, largest for the Holistic group, and intermediate for the remaining four groups, which did not differ significantly from each other.

4. Discussion

Previous studies have found that prosody instruction can improve EFL learners' listening comprehension skills as long as enough time is allotted to prosody instruction (Lord 2005; Pennington and Ellis 2000; Yenkimaleki and Van Heuven 2016). Prior studies also have found that segmental training (Pennock and Vickers 2000) can enhance EFL learners' listening comprehension skills. The present study aimed to find out which type of explicit pronunciation instruction – segmental training, prosody training, or holistic pronunciation instruction – yields better listening comprehension skills for Iranian EFL learners. Following Zielinski (2008, 2015), it was hypothesised that holistic pronunciation instruction would lead to greater improvement than separately addressing either segmental or suprasegmental features.

The results in the present study revealed that the holistic pronunciation instruction did indeed enhance the listening comprehension skills of Iranian EFL learners more than either segmental or suprasegmental training alone, irrespective of whether practice in these latter groups focused on perception or production. The results of this study are consistent with Zielinski (2008) who argued that the segmental/suprasegmental division stems from the incorrect premise that segmental and suprasegmental features are separate learning goals. Zielinski pointed out that this categorisation is a false dichotomy and argued for a holistic approach to pronunciation teaching instead.

Our data for both the immediate post-test and delayed post-test (see Figure 1) indicate that all the experimental groups improved their listening comprehension skills but that the holistic group outperformed the other experimental groups. It would appear, therefore, that to enhance listening comprehension skills, it helps for students to be aware of the nuances of speech perception that can be acquired through focus on all pronunciation skills, as implemented in our holistic pronunciation

instruction. Therefore, the wise choice for EFL instructors would be to look at both segmentals and suprasegmentals as parts of an integrated and interactive system, both of which are crucial for the EFL students in developing listening comprehension skills. We would argue that the superior performance by the holistic pronunciation instruction group in developing listening comprehension skills is due to their addressing all the interactive components of a system. In line with Yenkimaleki and Van Heuven (2021), we would argue that increased conscious attention in training students to enhance their pronunciation perception skills, through the teaching of formal rules, noticing the differences, providing constructive feedback, and reflective activities, can help improve listening comprehension skills.

Listening to speech in a non-native language is inherently 'noisy', since the target-language input speech does not match the deep-rooted expectation pattern of the non-native listener (Cutler 2012). Native listening, by contrast, is extremely robust and can deal with highly deficient speech input. However, when segmental information deviates by more than a critical amount from the native norm and word and sentence prosody is defective, speech recognition and understanding are bound to break down (Cutler 2012). Drawing the non-native listener's attention to the specific characteristics of target language prosody and segmentals, by explicitly pointing out prosodic differences between the L1 and TL and training on segmentals, should help the non-native listener process TL speech: thus, Iranian learners need to have awareness of *both* English segmentals and prosody. Our research has shown that holistic pronunciation instruction can help here, providing a focus on both English segmentals and prosody along with perception and production-focused practice.

The results of this study suggest some resolution of the longstanding debate on teaching segmental vs. suprasegmental features. Tanner and Landon (2009) claimed that suprasegmentals should be given priority in pronunciation instruction as they have a greater impact on intelligibility whereas others (e.g. Jenkins 2002) claimed the opposite. Our results suggest that segmental and suprasegmental features are best *not* treated as exclusive entities in instruction, at least as far as enhancing listening comprehension skills is concerned. Zielinski (2015) has argued that both these phonological domains are crucial and should not always be considered and taught in isolation from each other. Indeed, pronunciation instruction would be unnecessarily intricate if, for example, every non-target-like feature in a learner's production had to be classified as either segmental or suprasegmental. A fine line can be presumed between segmental and suprasegmental issues for EFL students with different L1 pronunciation systems entrenched since birth. Rather than looking at the acquisition of segmentals and suprasegmentals as different processes, it seems more fruitful to take a holistic view.

Students in an academic setting often receive a limited amount of target language input as compared to those living in the target language country. Metalinguistic awareness of English pronunciation has been reported to have a positive impact on L2 pronunciation (e.g. Mitrofanova 2012; Ramírez Verdugo 2006; Yenkimaleki and Van Heuven 2018, Yenkimaleki et al. 2021), and could compensate to some extent for limited L2 input and use in 'input-poor' L2 learning contexts. We show here that it should also have a positive impact on L2 listening comprehension skills. This does suggest that EFL instructors need some degree of familiarity with their learners' L1 background in order to help them recognise and acquire the English features that they find particularly difficult to differentiate and/or pronounce.

5. Conclusion

The present study investigated the efficacy of segmental/suprasegmental vs. holistic EFL pronunciation instruction in the development of Iranian learners' EFL listening comprehension skills. Overall, the results showed that holistic pronunciation instruction enhanced the listening comprehension skills of Iranian EFL learners more than separate training on either segmental or suprasegmental features. Whether the follow-up practice targeted perception or production had no influence on this result. Knowledge (or awareness) of the prosodic features of a target language appears to contribute to developing listening comprehension skills. In line with our research, we suggest that where

limited curricular time is available for instruction and practice, the better educational choice in terms of developing listening comprehension skills is to adopt holistic pronunciation instruction rather than prioritising either segmental or suprasegmental features.

This study of course has limitations. The participants of this study were exclusively female, since the Nahavand Higher Education Campus at Bu-Ali Sina University has been specified for educating women in Iran. Although there is no reason, *a priori*, to assume that men would respond differently to the various treatments in our study, an additional study should be set up with both genders to verify the generalisability of this study across genders, while at the same time increasing the number of participants. It would also be helpful to replicate our experiment with students from different L1 backgrounds to confirm generalisability of our results in this study. Future studies may also investigate the effects of attention to segmental/ suprasegmental vs. holistic pronunciation instruction on developing EFL students' speaking skills.

Notes

1. <https://www.pearson.ch/LanguageTeaching/Exams/TOEFL/EAN/9780131408838/Longman-Preparation-Course-for-the-TOEFL-Test-The-Paper-Test-Book-and-CD-ROM-with-Answer-Key>.
2. <http://pearson.es/espac%C3%B1a/TiendaOnline/longman-preparation-course-for-the-toefl-test-the-paper-test-with-an>.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Appendix

Participants' scores on the Longman's TOEFL Listening Comprehension test. In each group, participants ($N = 20$ per group) are listed in descending order of the pre-test score. Maximum score = 50. T1: pre-test, T2: immediate post-test, T3: delayed post-test.

Participant	Group/condition																	
	Con			Segm-Perc			Segm-Prod			Pros-Perc			Pros-Prod			Holistic		
	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3	T1	T2	T3
1.	43	44	43	42	44	43	42	44	43	43	45	44	41	44	43	42	44	43
2.	42	44	44	41	43	44	42	43	42	41	44	43	41	43	43	41	45	44
3.	42	43	44	41	43	44	41	44	44	40	44	44	41	42	42	41	44	44
4.	41	40	40	40	43	43	41	43	44	40	43	44	41	43	42	41	43	43
5.	40	41	40	40	43	43	41	42	42	40	43	42	41	42	43	40	45	44
6.	36	37	37	39	43	43	38	40	41	40	43	43	39	41	42	39	44	45
7.	36	37	36	39	42	43	37	38	38	39	43	41	37	39	39	38	44	44
8.	36	37	36	37	40	41	36	37	36	39	42	43	36	37	37	37	43	43
9.	35	36	36	36	39	39	35	38	37	38	40	40	35	37	36	36	42	43
10.	34	35	36	36	39	40	33	36	36	37	40	40	33	36	36	34	42	42
11.	33	34	35	36	37	37	33	35	36	36	39	38	33	35	34	33	41	40
12.	32	33	33	35	38	37	32	34	34	35	37	37	33	36	36	32	40	41
13.	32	33	33	32	34	33	32	35	35	33	36	36	32	35	35	31	39	38
14.	32	33	33	32	32	33	31	33	33	32	33	32	31	34	34	31	36	37
15.	31	31	30	32	34	34	31	34	34	32	34	34	31	33	32	31	37	37
16.	31	33	31	31	33	32	30	32	31	31	35	35	30	32	32	30	36	35
17.	31	31	31	31	33	33	30	32	31	30	33	32	30	32	31	30	35	35
18.	30	31	30	30	33	34	30	33	33	30	34	34	30	32	32	30	36	35
19.	30	31	31	30	34	34	29	31	30	29	33	33	29	31	30	29	34	34
20.	29	30	31	28	31	32	28	31	31	28	32	31	29	31	31	29	33	33