

The Salient Pronunciation Errors and Intelligibility of Turkish Speakers in English¹

Tarik Uzun², Ankara Yildirim Beyazit University, Ankara, Turkey

Abstract

Intelligibility is a critically important aspect for effective oral communication. This study explored salient (important) pronunciation errors and their relative roles in the intelligibility of nonnative speech based on listener judgments. Speech samples, collected from speakers with a Turkish as a native language (L1) background, were presented to listener groups in two consecutive sub-studies. In expert listening sessions, listeners with an academic background in pronunciation research and teaching (N=3) detected salient pronunciation errors via a thinking aloud protocol. During the intelligibility research, native listeners (N=33) transcribed the target words with salient pronunciation errors presented either as individual words isolated from their contexts or in longer utterances. The intelligibility scores were calculated and analyzed to investigate the role of salient pronunciation errors on speakers' intelligibility in English. The findings indicated that mispronunciations of segmentals and incorrect stress placement were the most common error types as detected by expert listeners. Negative transfer was found to be an important factor in such salient errors. According to the results of the intelligibility research, pronunciation errors affected speakers' intelligibility to a certain extent. Segmental errors were the main causes of reduced intelligibility. Moreover, mispronunciations of two sounds that were seen in most error sites, /ə/ and /θ/, seemed to make speech more accented while not seriously affecting intelligibility. Also, errors in strong syllables had a more detrimental effect on intelligibility compared to those in weak syllables.

Resumen

La inteligibilidad es un aspecto importante para una comunicación oral efectiva. Este estudio exploró los errores de pronunciación destacados (importantes) y sus roles relativos en la inteligibilidad del habla no nativa según los juicios de los oyentes. Las muestras de habla, recopiladas de hablantes con antecedentes de turco como lengua materna (L1), se presentaron a grupos de oyentes en dos subestudios consecutivos. En sesiones de escucha experta, oyentes con formación académica en investigación y enseñanza de la pronunciación (N=3) detectaron errores de pronunciación destacados a través de un protocolo de pensamiento en voz alta. Durante la investigación de inteligibilidad, los oyentes nativos (N=33) transcribieron las palabras objetivo con errores de pronunciación destacados presentados como palabras individuales aisladas de sus contextos o en expresiones más largas. Las puntuaciones de inteligibilidad se calcularon y analizaron para investigar el papel de los errores de pronunciación más destacados en la inteligibilidad de los hablantes en inglés. Los hallazgos indicaron que las pronunciaciones incorrectas de los segmentos y la colocación incorrecta del énfasis fueron los tipos de error más comunes detectados por oyentes expertos. Se encontró que la transferencia negativa era un factor importante en tales errores destacados. Según los resultados de la investigación de inteligibilidad, los errores de pronunciación afectaron hasta cierto punto la inteligibilidad de los hablantes. Los errores segmentarios fueron las principales causas de la reducción de la inteligibilidad. Además, la incorrecta pronunciación de dos sonidos que se observaron en la mayoría de los sitios de error, /ə/ y /θ/, parecían hacer que el habla fuera más acentuada sin afectar seriamente la inteligibilidad. Además, los errores en las sílabas fuertes tuvieron un efecto más perjudicial sobre la inteligibilidad en comparación con los errores en las sílabas débiles.

Introduction

In today's globalized world, effective communication in English is a critical skill. Regardless of their first language (L1) backgrounds, second language (L2) speakers of English need to convey their desired messages and understand others successfully in various communication settings. This necessity mainly highlights intelligibility for L2 speakers, and its reflections are observed in second language pronunciation pedagogy and research. According to Levis (2018), intelligibility attracts the interest of researchers in ESL (English as a second language) contexts where the target language is spoken outside the classroom, and in ELF (English as a lingua franca) contexts in which communication usually takes place between nonnative speakers (NNS). In order for research to better connect with pedagogy, it is important to understand the ways intelligibility is affected by non-standard speech features commonly observed in L2 speakers' speech (Zielinski, 2006). With this consideration in mind, this study investigated Turkish speakers' salient pronunciation errors and their relative roles in their intelligibility in L2 English.

Intelligibility

Intelligibility is defined as "the degree of match between a speaker's intended message and the listener's comprehension" (Derwing & Munro, 2015, p.5). Munro (2013) maintains that intelligibility is a result of the

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² uzuntarik@yahoo.com, 0000-0002-9243-963X

interaction of linguistic and nonlinguistic factors that influence the communication of the participants involved. It is clear that the nature of speech intelligibility involves the following participants of communication: speakers and listeners. Levis (2018) highlights this fact and underlines that intelligibility is about both to what extent a speaker is understandable, and if speakers' words are decoded successfully by listeners.

Intelligibility has been a major concern of pronunciation pedagogy within the last few decades due to the changing priorities in teaching. Intelligibility rather than native-like proficiency is regarded as the more reasonable and attainable goal of L2 learning and teaching (Brown, 2001; Levis, 2020; Morley, 1991; Munro, 2008; Seidlhofer, 2011). This preference has to do with the shift from nativeness principle to intelligibility principle. In Levis's (2005, 2020) terms, the former refers to the possibility and desirability of native-like pronunciation and the latter sets an intelligible pronunciation as a suitable goal for learners. This debate mostly reflects on teachers, syllabuses, input, and assessment in L2 learning and teaching (Hodgetts, 2020). In other words, adopting nativeness or the intelligibility principle will naturally affect different pedagogical aspects and procedures. It is also important to bear in mind that teaching with a focus on an intelligible pronunciation requires considerable changes in priorities since instruction needs to target pronunciation features that influence intelligibility the most (Zárata-Sández, 2020).

In addition, intelligibility can be a more meaningful goal for many learners of English due to its practical gains. According to Darcy (2018), for example, enhanced intelligibility is important for social and professional interactions, better job opportunities, and success in higher education in today's world. The potential success of native-like pronunciation as a goal for L2 learners is also questionable because failure is quite likely if the native-like pronunciation is set as a goal for learners (Levis & McCrocklin, 2018; Luoma, 2009). There are risks for teachers as well if the aim is to produce native-like pronunciation in class. According to Munro and Derwing (2011), teachers might avoid teaching pronunciation thinking that native-like pronunciation is not a realistic goal for learners given the limited likelihood for success.

Segmentals vs. suprasegmentals for intelligibility

The relative importance of segmentals (e.g., consonants and vowels) and suprasegmentals (e.g., stress and intonation) in terms of intelligibility in English language teaching (ELT) has attracted researchers' interest. Several researchers found segmentals to be the main source of reduced intelligibility while some others suggested that suprasegmentals are more significant. Im and Levis (2015), for example, found that non-standard vowels and consonants could lead to communication breakdowns and in several studies, vowels were considered to be more important for intelligibility (Bent et al., 2007; Jin & Liu, 2014). Some other researchers, on the other hand, found consonants to be more critical for an intelligible pronunciation (Cunningham, 2009; Deterding, 2013; Deterding & Mohamad, 2016; Jenkins, 2000; Na, 2021; Sewell, 2013).

Another camp of researchers found connections between intelligibility and suprasegmentals, and some of them focused on the role of word stress in particular. For instance, Gallego (1990) analyzed communication breakdowns among university teaching assistants (TAs) whose L1 was not English and discovered that the most common problems in comprehension resulted from errors in word stress. Field (2005) and Richards (2016) found that stress errors related to the incorrect shift of the stress to a syllable on the right in a word would have a detrimental effect on intelligibility. Moreover, Hahn's (2004) findings indicated that correct word stress placement considerably improved the intelligibility of L2 speech and facilitated the communication of nonnative speakers (NNS). Deterding (2013) investigated the causes of misunderstanding in ELF communication and found evidence for the role of unexpected stress placement on intelligibility in English in South-East Asia. Several other studies focused on the link between pronunciation pedagogy and speech intelligibility. For instance, Gordon and Darcy (2016) found evidence for the positive influence of explicit suprasegmental training on the intelligibility of NNS. According to Crowther et al. (2015), teachers need to rethink their teaching priorities and focus on prosody, fluency, and lexical-grammatical targets if they are interested in increasing the communicative effectiveness of their students.

Pronunciation errors and L1 background

NNS tend to speak English with a foreign accent, which can be characterized by its non-standard speech features. As pointed out by Derwing and Munro (2015), L2 speech production contains structural differences in comparison to pronunciation of proficient native speakers (NS), which could potentially result in communication breakdowns in some cases. Such non-standard features in speech production can be called pronunciation errors when compared with native speaker norms. Investigating NNS's pronunciation errors

could yield useful pedagogical implications. According to Levis and Barriuso (2012), determining the types of errors that learners make can be useful for L2 English teaching in class, the teachers can focus on the most frequent and expected errors and improve their time management.

Another possible benefit of studying NNS's pronunciation errors could be the exploration of possible causes of unintelligibility for speakers with specific L1 backgrounds. L1 knowledge is one of the factors that influences L2 acquisition, and this phenomenon is known as 'transfer' (Mitchell & Myles, 2004; Ortega, 2009). Speakers of the same L1 typically make similar substitutions and pronunciation patterns reflecting traces of their L1 phonology (Nation & Newton, 2009). For instance, Cunningham (2009) reported that Vietnamese speakers had modifications in target English sounds due to L1 transfer, which in turn made it a major issue for miscommunication for interlocutors. In his survey study, Saito (2014) examined experienced teachers' opinions on Japanese learners' pronunciation problems with the acquisition of intelligible pronunciation. Teachers thought that pronunciation problems could be generally found in ESL or EFL (English as a Foreign Language) classes and that L1 sound features that are specific to Japanese learners needed to be included in the syllabus.

In a study with Korean speakers of English, Na (2021) found that L2 speakers of English with fewer segmental errors tended to be perceived as more intelligible by native-English listeners. In another study, Jin and Liu (2014) found that Chinese and Korean speakers of L2 English had difficulties mainly with vowel pronunciation, which, according to the researchers, should be taken into consideration for the development of training methods to improve speakers' intelligibility in L2 English. Several other studies aimed to identify common pronunciation errors of English speakers with a Turkish L1 background and finding out the causes of such errors (Arıkan & Yılmaz, 2020; Bayraktaroğlu, 2008; Bekleyen, 2011; Çelik, 2008; Demirezen, 2005, 2008, 2010; Türker, 2010). However, to date, the role of pronunciation errors on the intelligibility and accentedness of Turkish speakers of English have largely remained unexamined.

Based on the author's doctoral dissertation, this descriptive study aims to answer the following research questions:

1. *What are the common pronunciation errors made by speakers with a Turkish L1 background?*
2. *To what extent do pronunciation errors affect speakers' intelligibility in L2 English?*

Method

Speakers, materials and procedure

The stimuli were collected with read-aloud and picture description tasks. Read-aloud tasks were twenty short paragraphs with themes like globalization, the internet, and e-books, and they were excerpted from *Language Leader Upper-Intermediate* (B2-C1 based on CEFR) coursebook (Cotton et al., 2008). Read-aloud tasks were used in this study to control the level of text difficulty and length of the stimuli to be collected. For these purposes, the B2-C1 level was considered the most suitable for speakers who were pre-service English teachers studying in 100% English- medium instruction programs. The paragraphs were kept around 45-50 words and were not modified. Picture description tasks, on the other hand, were aimed at a less controlled speech production. Twenty pictures with a variety of themes like volunteering, migration, and shopping were found via a Google search and used as oral tasks after the piloting phase.

A total of forty speaker tasks were piloted with three English native speaker teachers and ten students enrolled in an English Language Teaching (ELT) program in Turkey. Depending on their feedback, two pictures were replaced with others because of low resolution and lack of detail. Their comments and suggestions also helped to revise the research procedures. One addition was the development of instruction cards for each task type which made it possible for the researcher to give the same instructions to all participants. Teacher participants were also asked about the difficulty level of the tasks. They did not report any inconsistency in this respect.

The speakers chosen to produce the oral samples were third-year students at the ELT programs at two public universities in Turkey (N=16). Thirteen speakers were female and three of them were male with an average age of 21. They were all Turkish native speakers learning English as a foreign language in Turkey. They did not have any previous experience of living or studying abroad. None of the speakers reported any speech disorder. ELT students typically attend intensive English courses for a relatively long period in comparison to other language learners in Turkey. It was assumed that they would provide speech samples with characteristic features of speakers with the same L1 background. Distractor material to be used with the student produced speech were prepared with the help of two American and two British English native

speakers, recruited for the study. They were given the same tasks and their responses were recorded using the same procedures. Three distractors were female and one was male; their average age was 32. The American English speakers were Fulbright English Teaching Assistants at a state university in Turkey and the British English speakers were government officers based in Turkey at the time of data collection.

Speech samples were recorded with a Sony IC Recorder ICD-SX850 in quiet office rooms. Speakers were first asked to fill in the consent and demographic forms in recording sessions. After that, general session rules were explained orally by the researcher, and the task instruction cards were presented. Then, the speakers were requested to select a paragraph randomly and prepare to produce their sample. When they were ready, read-aloud sessions were initiated, and responses were recorded. The same procedure was applied to picture description tasks. Overall, every speaker including the distractors provided a read-aloud and picture description response each, which made a total of forty recordings in the two task types.

The recordings were first used in a preliminary study (Uzun, 2020), in which they were presented to a group of listeners with various L1 backgrounds. The study functioned as an instrument in testing the quality of the recordings, listener responses to the stimuli, and application procedures, which were adopted in the current study along with revealing various results on speech comprehensibility, or “the ease or difficulty a listener experiences in understanding an utterance” (Derwing & Munro, 2015, p. 5).

Listeners

Speech samples once collected and piloted were presented to different listener groups in two consecutive studies. During the expert listening sessions, the first step was the recruitment of the three expert listeners specialized in second language pronunciation. One of these experts was a professor conducting research and teaching second language pronunciation at the university. The second listener was a Ph.D. candidate focused on pronunciation for learning purposes. The third listener was also a Ph.D. candidate, and his research focus was phonetic perception training. All three expert listeners were contacted in person by the researcher at a university in the United States. The listeners’ eligibility for the study was screened through criteria placed in a demographic form. Two of the listeners were male, and one was female. The participants did not speak Turkish nor had lived in Turkey before. None of the participants reported any hearing impairment.

In the second study, with the focus on intelligibility, 33 naive listeners without any training in linguistics, phonetics/phonology or pronunciation were contacted by the researcher via e-mail correspondence, classroom announcements, or personal contacts and invited to participate in individual listening sessions. Listeners’ eligibility for the study was screened through the criteria placed in the demographic form. Based on the demographic information collected, twenty listeners were female (60.6%), and thirteen them were male (39.4%) with a mean age of 21. Concerning their educational background, 26 listeners (78.7%) were undergraduate-level university students at the time of data collection while one was doing a Ph.D. at the same university (3%). Five others were BA graduates (15.1%), and one of them was holding a Ph.D. (3%). All the listeners were native speakers of American English. They did not speak Turkish and had never lived in Turkey before. None of them reported any hearing impairment.

Procedure

The speech samples collected from the speakers were presented to the listener groups in two consecutive studies. The first study involved the expert listener error judgments via thinking aloud using a similar procedure as in Zielinski (2008), and Im and Levis (2015) studies. In the second study, the role of these errors on intelligibility in L2 English was explored via naive listener transcriptions and their agreement rates with the speakers’ actual words. To this end, target words with salient pronunciation errors, as detected by expert listeners, were listened and transcribed by naive listeners. Instances where these transcriptions were in agreement with speakers’ intended words were labeled as intelligible, which enabled further analyses into the intelligibility scores of each target word and the underlying factors affecting intelligibility.

Expert Listening Sessions

In expert listening sessions, each listener was presented with a total of forty recordings (recordings of twenty read-aloud and twenty picture-description tasks). The participants were expected to listen to each recording, detect pronunciation errors, and explain the error regarding its type (i.e., segmental, vowel, consonant, suprasegmental, word stress) via a thinking-aloud protocol. Expert listeners were instructed to listen to each recording on a computer up to three times. The purpose of the first listening was overall understanding, and the listeners were requested not to stop the recordings while listening to them for the first time. During the second listening, the listeners were asked to pause the recording when they detected

a pronunciation error and orally describe it. The third listening was optional, and the participants could listen to a recording for the third time if they needed to do so for a better understanding. The listeners were asked to comment on the identified error and specify the type of it, whether it was a vowel, a consonant, or a word stress error. They were encouraged to express their view and to provide further details about the errors.

The listeners were provided with Sony MDR-P180 model headphones for the sessions. Each session was initiated with a sample task presented to listeners as training material. The expert listening sessions were completed in a total of six different meetings with three listeners. To ensure the reliability of listener judgments, each listener was presented only with twenty recordings in a single session, which were either reading aloud or picture description. The sessions were held in quiet rooms and recorded via Camtasia 3 (2017) software. The researcher was present during all the sessions and monitored the procedures.

The researcher listened to all the meeting records, listed all the pronunciation errors detected by each listener separately, and finally compared the different error lists for agreement. Salient pronunciation errors detected by at least two expert listeners were labelled as “agreed pronunciation errors” and the words that contained them were considered as target words for the investigation. Others, detected only by one listener, or the ones on which there was no consensus about the type of the error were discarded. Besides, despite the instructions provided, the listeners tended to detect grammar and vocabulary errors as well. These errors were also excluded due to the scope of the study. Figure 1 illustrates a session with one of the expert listeners:

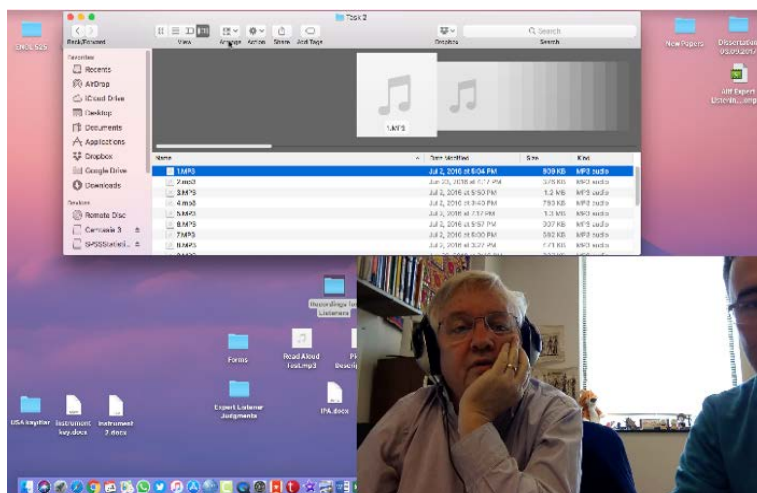


Figure 1: A screenshot from an Expert Listener Session recorded via Camtasia

Expert listeners' agreement patterns were analyzed to make sure all the listeners were on the same page in their judgments. The analyses demonstrated that the agreement pattern between Listeners 1 and 3 was the most common pattern in 51 errors detected. The second most common pattern was seen in 43 instances where all the listeners agreed. Other common patterns, agreements between Listeners 2 and 3, and 1 and 2 were also quite common, as they were observed in 35 and 34 errors respectively. All these examples indicated that listeners generally agreed on their error judgments.

The Intelligibility Research

The Intelligibility Test (see Appendix) was developed by the researcher for the second phase of the research. The words with the pronunciation errors agreed upon by the experts were considered as target words and left blank in each item for listeners to fill out by transcribing what they heard. The items in the instrument were prepared with a step-by-step procedure. Firstly, all agreed pronunciation errors were marked within their contexts. Then, they were turned into either single-word or utterance-length items. The first part of the test, the Words section, contained twelve single words isolated from their original contexts. All the selected words, except for the two by the Distractors, had at least one agreed pronunciation error detected in the contexts where they were originally spoken. This word-level transcription task was created in an attempt to compare the intelligibility scores of single words with that of longer utterances. For the second part, utterances with at least one agreed pronunciation error were marked and analyzed in terms of word count. Then, they were turned into test items as phrases, clauses, or sentences with no more than ten words to facilitate the procedure for the listeners. Phrase and clause boundaries were taken into consideration while paragraph-length recordings were cut into pieces.

It is important to note that not all target words were made into intelligibility test items. Target words from both types of the speaker tasks were included in the instrument. To avoid fatigue or loss of concentration during the implementation of the test, the number of items was limited to 71 which would presumably take around 30 minutes to complete for each listener. In the words section, two items belonged to native speakers (one British and one American English speaker) as distractors. Out of 59 items in the Longer Utterances section, four items were produced by the British and American Distractors to represent two common varieties of English with equal numbers of speech samples. Also, two additional items were placed at the top of each section for training before the actual listening. The distribution of test items in the Intelligibility Test according to speaker profiles is presented in Table 1:

	Turkish Speakers	English Native Speakers	TOTAL
Words	10	2	12
Longer Utterances	55	4	59
TOTAL	65	6	71

Table 1: Distribution of items in terms of speaker profiles

The intelligibility test was piloted with an American English native speaker who completed the whole test in 35 minutes. She did not report any inconvenience about her experience with the instrument. After the piloting phase, the data collection procedure was initiated.

A total of 33 naive listeners participated in the intelligibility research. Listening sessions were held in quiet rooms on a personal computer using Sony MDR-P180 model headphones. The researcher was present in every session and closely monitored the procedure. Listeners first filled out the consent and demographic forms. Then, they were reminded to read the instructions and begin each section of the test with two practice items. After the training, the participants were allowed to start the main parts of the test. It took around 35 minutes for each listener to complete the whole test. The listeners were allowed to listen to each recording up to two times, and the second listening was optional. The listeners were informed that they could move on to the next item if they felt they understood the word in the blank. A brief overview of the participant groups, numbers, profiles, and task types for each sub-study can be found in Table 2:

Phases of the Study	Participant Profiles	N	Task Type
Speaker Sessions	Speakers of English with a Turkish L1 background (N=16) American and British English Native Speakers (N=4) (distractors)	20	Read Aloud Picture Description
Expert Listening Sessions	Expert Listeners	3	Error Detection via Think Aloud
The Intelligibility Research	Naive Listeners	33	Transcription

Table 2: Overview of participant profiles and tasks

Results

Results of the expert listening sessions

It was found that expert listeners agreed on 163 pronunciation errors (See Table 3), and the majority of them were segmental errors (140 errors; 86%). Vowel errors were more common with 82 instances and consonant errors followed with 58 instances. Suprasegmental errors were detected in 21 cases (13%), most of which (17 errors) were word stress errors. Pause and prominence issues were limited in number. The expert listeners also detected errors that were linked with syllable structure in two different words.

Type of Error	Task 1	Task 2	Total	%
	Read Aloud	Picture Description		
SEGMENTALS	79	61	140	86
Vowels	51	31	82	-
Consonants	28	30	58	-
SUPRASEGMENTALS	16	5	21	13
Word Stress	12	5	17	-
Pause and Prominence	4	-	4	-
SYLLABLE STRUCTURE	2	-	2	1
Total	97	66	163	100

Table 3: Distribution of agreed pronunciation errors

In terms of vowels, the most common error was the use of unreduced vowels instead of /ə/. In several errors, speakers tended to pronounce vowels as they are typically pronounced in Turkish, their L1, which implies a possible influence of Turkish orthography, L1 transfer. Based on the expert listener judgments, /ə/ was pronounced as [o] (5 times) as in 'common' ([ˈkəmon] instead of /ˈkəməŋ/), [ʌ] (4 times) as in 'companies' ([ˈkɒmpʌniz] instead of /ˈkəmpəŋiz/) and as [ɛ] (4 times) as in 'recent' ([ˈrɪsɛnt] instead of /ˈrɪsənt/); /ə/ insertion was also observed in some word-initial consonant clusters. In two instances, /ə/ was inserted between /s/ and /t/ and once between /s/ and /p/ (as in 'stage' and 'sportsmen'). L1 influence can be observed in these errors as well since speakers tended to pronounce some of the vowels the way the letters representing them are typically pronounced in Turkish. An example of this type of vowel errors could be seen in the word 'completely,' which was pronounced by the speaker as [kəmplɛtli] instead of /kəmˈpliːtli/.

The expert listener judgments revealed that the mispronunciations of /w/, /v/, /r/, and /θ/ were the most frequent consonant errors. Among these, errors stemming from /w/-[v] substitution was the most common type. In many instances, /w/ was pronounced as [v] (in 8.6% of consonant errors, as in as [ˈreɪlvɛɪz]), and in others, listeners heard /w/ instead of a [v] (3.4%, as in [ˈpɔwɜːti]). One error that the expert listeners generally agreed on was word-final /r/, which was pronounced as a fricative and devoiced [ʃ̥] (18.9%). This could be considered as another example of transfer since /r/ is usually flapped in standard Turkish and pronounced as [ɾ] in word-final position. An example can be observed in the word 'picture,' which was pronounced by a speaker as /ˈpɪktʃəʃ̥/ instead of [ˈpɪktʃəɾ]. The expert listeners described word-initial /θ/ pronunciations as erroneous in 10 words (17.2%), an example of which can be seen in the word 'things' that was pronounced by a speaker as [ˈtɪŋz] instead of /θɪŋz/.

Word stress was the most common source of suprasegmental errors. Speakers seemed to make most errors with three- and four-syllable words. In 10 errors, stress was moved to a syllable on the right in a word, and in 7 others, stress was shifted to a syllable on the left. Also, stress errors mostly stemmed from speakers' failure to manage vowels in stressed and unstressed syllables in English as in the following examples:

	Target Pronunciation		Speaker's Pronunciation
(1)	benefits / bənəfɪts/	⇒	[beˈnɛfɪts]
	→		
(2)	traditional /trəˈdɪʃənəl/	⇒	[ˈtrɛdɪʃənəl]
	←		

In the word 'benefits,' the speaker shifted the stress from the first syllable to the second and pronounced the vowel there as an /ɛ/ instead of a reduced vowel /ə/. Another example was 'traditional,' in which the speaker shifted the stress from the second syllable to the first, unstressed syllable typically pronounced with a /ə/. These examples illustrate that word stress errors were usually commonly accompanied by vowel errors that affected the stress patterns of words, yet the expert listeners considered word stress errors more salient and labelled them. Along with word stress errors, three pause errors (as in *peers' ----- approval* with untimely pause between the words) and one prominence error (as in **the** *most*, stressing the definite article 'the' instead of 'most') were reported.

Some of the errors reported by the expert listeners revealed a lexical tendency. Turkish speakers pronounced loanwords found in both languages, like 'balance' ('balans', [bəlˈlɑns]), 'professor' similar to the ways they are pronounced in Turkish ('profesör' as [profɛˈsɔr] and 'teknoloji' as [tɛknoloˈʒɪ]). These examples illustrate how L1-motivated lexicon can influence pronunciation in L2 speech.

Results of the Intelligibility Research

The listener transcriptions in each part of the test, words and longer utterances, were analyzed separately since words isolated from their contexts were different compared with longer utterances.

Isolated target words

Out of ten words that belong to speakers with a Turkish L1 background, three of them were highly intelligible with 85% and above intelligibility scores. The rest, however, were generally unintelligible to many listeners. The word 'woman' with the /w/ - [v] substitution, for example, was transcribed in agreement with the recording five times only with a 15.1% score. Words with a /θ/ - [t] substitution (seen in the word 'three') and /ɛ/ - [ɪ] (seen in the first syllable of the word 'evolution') errors were more intelligible, yet still under

50%. The /ɛ/ - [ɪ] error should be handled cautiously though as the pronunciation of the word with /i/ can also be acceptable in British English.

Intelligibility scores were even lower in the other four items. For the words 'support' (/ə/ was not pronounced in the first syllable) and 'persuading' (/w/ was not pronounced in the second syllable), transcriptions in agreement with the recordings were seen only once in each case. On the other hand, the words 'are,' and 'cinema' were not intelligible to any listener. Listeners consistently offered 'harsh' and 'arch' for 'are,' which shows that the word-final /r/ pronounced as a fricative and devoiced [ʃ] was heard as a [ʃ] or [tʃ]. Listeners seemed to get even more confused with the multiple-error word 'cinema,' which had a vowel and a stress error. They failed to understand the word, and non-existent words were offered by some of the listeners.

Target words in longer utterances

The intelligibility scores revealed that the words given in context were more intelligible. In the Longer Utterances section, the intelligibility scores dropped below 10% in only five words, and there was no word with a 0% score. Several items were reasonably intelligible to listeners and 29 of them were in the 90-100% range (see Table 4). Words with a 50% intelligibility score and below were placed into the reduced intelligibility group. Three words within the 50-60% range were also included in the same sample for further analysis. In total, the number of items in the reduced intelligibility group was 26.

Percentages (%)	Number of Erroneous Words
90 - 100	29
80 - 89,99	7
70 - 79,99	7
60 - 69,99	8
50 - 59,99	3
49,99 or lower	23

Table 4: Distribution of errors in terms of intelligibility score ranges

The distribution of words with reduced intelligibility indicates similarities with the expert listener error judgments since segmental errors and vowels represented the most common error types in both studies (see Tables 4 and 5). This was followed by consonants and words with multiple errors, two segmental errors in each. Word stress was the most common type again in terms of suprasegmentals:

Type of Error	Number of Words	%
SEGMENTALS	22	85
Vowels	12	-
Consonants	6	-
Multiple Errors (Vowel + Vowel)	2	-
Multiple Errors (Vowel + Consonant)	2	-
SUPRASEGMENTALS	4	15
Word Stress	3	-
Pause	1	-
Total	26	100

Table 5: Error types in the reduced intelligibility group

Segmental errors and Intelligibility in longer utterances

Tense vowels are produced with extra muscle tension than lax vowels (Celce-Murcia et al., 2017), and they are typically longer than their lax counterparts (Carr, 2008). Detailed analyses revealed that five out of twelve vowel errors were related to tense-lax vowel distinction, where tense vowels were pronounced lax (as in 'sheeps' pronounced as [ʃɪps] instead of /ʃɪps/). Also, in four other cases, mispronunciations of diphthongs led to reduced intelligibility. Using unreduced vowels instead of a /ə/, the most frequent vowel error for Turkish speakers, was not a primary cause of reduced intelligibility. It was seen in two reduced intelligibility cases only (one in a multiple error word). Besides these, it is likely that the errors in some words, such as 'e-book' ([ɛ-bʊk] instead of /'i-bʊk/) or 'war' ([wɑr] instead of /wɔr/), were motivated by Turkish orthography. In terms of consonants, mispronunciations of /f/ (twice) (as in 'feature' pronounced as [ˈfɪtʃər]), /s/ (as in 'prices' pronounced as [ˈpraɪzɪz]), and /ð/ (as in 'this is' pronounced as [zɪs ɪz]) led to reduced intelligibility in some words. Words with /θ/ sound errors were generally highly intelligible in

longer utterances. Besides these, three words were in the reduced intelligibility group due to missing sounds, which were not pronounced by the speakers (/n/ missing, as in 'ingredient' pronounced as [ɪnɡrɪdiənt]). Similar to isolated words, sounds that were skipped by the speakers seemed to affect intelligibility negatively as listeners did not compensate for the absence of them in the words. Reduced intelligibility scores were seen in words with multiple errors as well. Out of seven words with multiple errors in the whole test, four of them (e. g., 'download' pronounced as [ˈdʌnlɒd] instead of /ˈdaʊnləʊd/), were in the reduced intelligibility group.

Word stress errors and intelligibility

Three words with word stress errors (out of eleven in the test) were in the reduced intelligibility group. It was found that word stress was shifted to a syllable on the right in all the words. Besides this, errors stemming from incorrect stress placement were accompanied by other segmental and suprasegmental errors at the same time; however, expert listeners only focused on word stress in these words probably due to the salience of the stress error in each. For instance, the word 'obvious' was pronounced as [ɛˈbɪviəs] instead of /ˈɒbviəs/, and the expert listeners agreed that the word stress was incorrectly shifted from the first syllable to the second. As for the erroneous 'maybe Europe,' the expert listeners agreed on a word stress error regarding the word 'Europe' where the speaker incorrectly stressed the second syllable of the word as shown in the example and the transcription below. However, in addition to the word stress error, the speaker likely ended the phrase with a rising intonation without paying attention to the usual stress pattern of the word 'Europe' because of being in different thought groups:

They go to somewhere, **maybe Europe** or somewhere else

[ˈmeɪbi jʊˈrɒp]

Syllabic patterns of reduced intelligibility items

A final analysis was conducted into the error sites of the target words with reduced intelligibility to observe if segmental errors were mostly seen in strong syllables, which are basically stressed syllables. As for isolated words in the first section of the instrument, two target words were monosyllabic, and the rest were multisyllabic. In two multisyllabic words, the segmental error was seen in strong syllables, and in the other, in the syllable that carried secondary stress. In only one case, the stress was on an unstressed syllable, in which the reduced vowel /ə/ was not produced by the speaker. The multiple error word 'cinema' contained a vowel error (/ə/ - [ʌ]) in the second syllable, which also went hand in hand with the stress pattern since the weak second syllable became strong with the exchange of the reduced vowel /ə/ with a full vowel.

For the target words in longer utterances, the relationship between strong syllables and segmental errors became more evident. Out of 26 target words, five were monosyllabic, and they were excluded from the analysis. It was found that speakers made segmental errors in strong syllables in nine words while segmental errors were in weak syllables in only three target words. Out of four multiple error words, three were multisyllabic, and the syllables, where segmental errors were seen, support the argument in this section in general. In the word 'cheating' as discussed above, both segmental errors were seen in the first syllable, which is the strong syllable. In 'balance,' the speaker replaces both vowels with other alternatives, and the reduced /ə/ in the second syllable was replaced with an unreduced vowel sound, which points to a disrupted stress pattern although the expert listeners only identified vowel errors for this particular word.

Discussion

This paper investigated how salient pronunciation errors influence non-native speakers' intelligibility in English with two consecutive studies. The expert listeners' judgments demonstrated that segmentals, and particularly vowels, were the leading sources of pronunciation errors. More specifically, the use of unreduced vowels instead of /ə/ was the most commonly reported segmental error in this study. In many instances, /ə/ was approximated to other unreduced vowels, such as /ʌ/, /ɛ/, or /o/. This finding is in agreement with the results of several other studies conducted with speakers with the same L1 background (see, e.g., Arıkan & Yılmaz, 2020; Bayraktaroğlu, 2008; Demirezen, 2005, 2010; Türker, 2010), in which /ə/ was described as a problematic and challenging sound for Turkish speakers of English. Transfer seemed to be the main reason for pronunciation errors. One common type of L1 transfer was orthographic influence from L1 Turkish. The speakers tended to pronounce English sounds depending on the pronunciations of corresponding letters in L1 Turkish. The orthographic influence was reported as a source of pronunciation errors in some other studies carried out with speakers of Turkish L1 background (see, e.g., Bayraktaroğlu, 2008; Bekleyen, 2011; Çelik, 2008; Erdener & Burnham, 2005; Türker, 2010).

As for consonants, mispronunciations of /w/, /v/, /r/, and /θ/ were the most common errors. Similarly, these consonants were listed among difficult sounds to pronounce for Turkish speakers in other studies targeting speakers with the same L1 background (see, e.g., Arıkan & Yılmaz, 2020; Demirezen, 2005; Türker, 2010). It appears that speakers tended to lose control of the stress patterns of the target words as the number of syllables in each word increased. Vowel errors also seemed to affect speakers' stress placement patterns since they tended to use an unreduced vowel in an unstressed syllable that was a primary cause of such errors. In an attempt to explain Turkish speakers' problems with word stress in English, Bayraktaroğlu (2008) also referred to vowel changes in unstressed syllables because vowels have almost the same quality, quantity, and distribution in stressed and unstressed syllables in Turkish.

Pronunciation errors affected intelligibility to a certain extent in this study and not all errors had an equal role. The results of the intelligibility research demonstrated that vowels, consonants, and word stress errors played roles in reduced intelligibility at varying rates. Isolated words presented in the Words section, the first part of the instrument, became even less intelligible.

Intelligibility scores were lower in this section and some listeners even created non-existent words in their transcriptions for some of them. In the Longer Utterances section, intelligibility scores got slightly higher with many target words fully intelligible to listeners, which suggested that speakers' pronunciation errors did not always impede their intelligibility.

Segmentals, and particularly vowel errors, were the most common sources of reduced intelligibility. This finding was consistent with several other studies that pointed to the role of vowels for intelligibility (see, e.g., Bent et al., 2007; Jin & Liu, 2014). Besides this, some errors stemming from mispronounced segmentals like /ə/ and /θ/ had very limited influence on intelligibility. This result supports Kang and Moran's (2014) view that some errors make speech more accented, but not necessarily unintelligible. Errors stemming from tense-lax vowel substitutions and multiple errors seen in single words led to reduced intelligibility in several words. L1 influence particularly related to orthographic differences between Turkish and English was visible in some words with reduced intelligibility. Besides, vowel and consonant errors were mostly seen in strong syllables, which supports Zielinski's (2008) and Im and Levis's (2015) finding that non-standard production of segmentals in strong syllables had a greater influence on reduced intelligibility.

Almost all suprasegmental errors with reduced intelligibility resulted from word stress issues. In all word stress errors that led to reduced intelligibility, stress was shifted to a syllable on the right in a word, which was a tendency reported in the relevant literature as well (Field, 2005; Richards, 2016). It is obvious that word stress errors had an impact on speakers' intelligibility in English to a certain extent, which makes it an interesting area for further investigation.

Despite its contributions, the current study has some limitations that should be acknowledged. First, the speakers in this study were of Turkish L1 background and the listeners were all American English speakers. The results, therefore, should be handled cautiously taking both the speaker and listener profiles into account. Besides, speaker tasks were of a similar structure and did not involve interaction. This might have contributed to the dominance of segmental errors in the expert listener judgments and reduced intelligibility items in the intelligibility research. As for the listener tasks, the expert listeners might have paid more attention to segmental features in a limited time frame given to them. As suggested by Derwing and Rossiter (2003) segmental errors might be easier to detect since suprasegmentals are not generally represented in English orthography. It can also be hypothesized that the expert listeners could have detected a greater number of suprasegmental errors if they had been specifically asked to analyze recordings with this particular focus.

Conclusion

Overall, this study provided detailed analyses as to how pronunciation errors influence intelligibility. To this end, the study contributed to the field of second language pronunciation by providing empirical findings regarding the intelligibility of the understudied group of Turkish speakers of English. The results demonstrated that different types of pronunciation errors affected Turkish speakers' intelligibility in English differently. This finding supports Levis's (2020) argument on the Intelligibility Principle, which underlines that "not all pronunciation features are equally important for being understood" (p. 5). Some erroneous words were mostly or completely intelligible to native English listeners while some caused serious intelligibility problems.

For this particular group of speakers, segmental errors and vowel errors in particular, were found to be the most common sources of reduced intelligibility. More specifically, incorrect tense-lax vowel substitutions and

multiple error target words were common sources of segmental errors that resulted in reduced intelligibility. L1 transfer seemed to play an important role in pronunciation errors and the target words with reduced intelligibility. Also, segmental errors in strong syllables affected speakers' intelligibility more negatively than errors in weak syllables. As for suprasegmentals, word stress errors were the only sources of reduced intelligibility.

As for pedagogical implications, the results suggest the necessity of setting priorities for pronunciation teaching. Common pronunciation errors, particularly vowel, consonant, and word stress errors due to specific L1 influence, could be addressed more effectively by language teachers working with Turkish learners of English. This goes in line with Levis's (2018) guidelines for intelligibility-based teaching, which suggests prioritizing mispronunciations causing processing difficulties and features that have explicit connections to communication. Munro and Derwing (2015) are also in favour of intelligibility-oriented instruction. In their framework, focus areas include an emphasis on local phonological structures to enhance global intelligibility priorities supported by empirical evidence and theoretical grounds on problems that cannot be resolved on their own, on the coverage of common errors in class, and individualized assessment. Learners' L1-motivated errors and their influence on their communicative effectiveness could be investigated to shape pronunciation pedagogy in different educational contexts. Problem areas can also be taken into consideration in the syllabus and curriculum design procedures aimed at ESL and EFL classes. In doing so, intelligibility, rather than native-speaker norms, should be prioritized. The amount of time spent on segmental instruction can be informed accordingly based on such research-oriented results. Pronunciation classes in teacher education could also be handled with greater care by paying increased attention to speakers' L1 and its impact on their pronunciation and intelligibility in English.

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Appendix

The Intelligibility Test with Answers

In this test, you will be presented a total of 71 recordings. Listen to the recordings in the given order and fill in the blanks with one or more words. You can listen to each recording twice.

The test has two sections: 'Words' and 'Longer Utterances'. Read the instructions carefully and ask the researcher if you have any questions. Do the examples at the beginning of each part before moving on to the actual test. Please write your name and surname before starting the session. Your identifying information will be kept secret and not shared with third parties.

Name and Surname:

SECTION A: WORDS

Write the words you hear in each item. Start with the examples first.

Example 1:teenagers....

Example 2:street.....

You may start if you are ready.

1. produced
2. three
3. support
4. opportunities (NS)
5. evolution
6. woman
7. are
8. conditions
9. cinema
10. traditional
11. bazaar (NS)
12. persuading

SECTION B: LONGER UTTERANCES

Fill in the blanks with the word(s) you hear (one or more words for each blank). Start with the examples first.

Example 3: They are**professional**.... people at the top of their chosen career.

Example 4: The e-book has many other**advantages**....

You may start if you are ready.

13. Between individuals in the same sports
14. The magic ingredient was electronic paper
15. After using them for any length of time
16. There is a lot of inequality involved in globalization
17. And we see some sheeps walking alongside the people
18. There is so much poverty in the world
19. Peer pressure can lead people to do things
20. Polar ice has been shrinking
21. The man and woman are having dinner in a restaurant (NS)
22. Sports stars are worth the money they earn
23. The other is a white hat and a black bag
24. Like any well-known actor or pop star
25. Display technology used for computer screens
26. I think they are refugees
27. And there are some passengers in queue, in line
28. Sports stars do not save lives
29. It also leads to the destruction of natural resources
30. People who are low on confidence and unsure of themselves
31. download everything they need to their e-book
32. Volunteers pick up the garbage and this is the charity organization
33. It has become very common, especially in America **(NS)**
34. This couple focus on just one ... one kind of a television
35. The child achieves above-average results at school
36. There is a girl who is talking on the phone
37. Amount of money earned by top sportsmen and women
38. The most common form of social influence
39. Or really contribute much to the society
40. It means a faster rate of development
41. On balance, it can be said that
42. And students cheating with his friend
43. And which will change lives the most

44. They have to **migrate** their **countries**
45. Electronics **companies** had been working on the e-book
46. And also their **caps** and uniforms are purple
47. Environmentalists have not achieved any **significant** results
48. And there are **check-in** tables
49. Globalisation also **connects** people by means of communication. **(NS)**
50. **In contrast**, some people argue
51. There is a **classroom atmosphere**
52. And maybe they have a **war** in their country
53. She is talking and **laughing** ... in the mobile phone
54. It is **obvious** that there are differences
55. As **well** as text, the e-book can **display** pictures and diagrams.
56. Probably getting their masters, maybe their **doctorates** **(NS)**
57. Globalization **benefits** the rich nations, who **control prices**
58. **Companies** that will be **supplying** medical and scientific e-book files
59. A US invention that is **completely** different
60. More **likely** to seek their **peers' approval**
61. They go to somewhere, **maybe Europe** or somewhere else
62. **Nearly** 75 **thousand square kilometers**
63. Teacher **deals with** another things
64. **It is wrong** to pay sports stars
65. They found the perfect combination of **materials** and **technology**
66. Many people with **poor eyesight** will be able to read
67. **In recent** years
68. To enhance people's **lives** by their **achievements**
69. Usually **defined** as the tendency to think
70. Often **feature** in lists of world's richest people
71. The **professor** gives the diploma to the student