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Research Article

An examination of Turkish EFL teacher trainees' pronunciation knowledge, perception, and production

Ibrahim Halil Topal*
Gazi University

Ismail Fırat Altay
Hacettepe University

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Abstract: With the proliferation of research in recent decades, pronunciation has ceased to be the "Cinderella" of language teaching. However, there are still gaps between research findings and classroom implementations (Olson, 2014). To this end, this classroom-based, experimental study explored pronunciation knowledge, perception, and production among first-year Turkish EFL teacher trainees in the context of a sixteen-week-long undergraduate course. Data were collected through three diagnostic tests. In this regard, eighty participants were pretested before and post-tested after the course. The collected data were examined descriptively and inferentially via the IBM SPPS Version 25. Findings indicated dissimilar levels of rise in knowledge (modest), perception (slight), and production (substantial) performances of teacher trainees. Nevertheless, specific gaps in knowledge and problems with segmental and suprasegmental pronunciation features remained. Results were discussed, pedagogical implications were thoroughly assessed, limitations to the study were recognized, and recommendations for future research were made.

Keywords: knowledge, perception, pronunciation, teacher cognition, teacher training

1 Introduction

The globalized and digitalized world has lifted physical and communicative barriers among people worldwide, expediting intercultural communication (Sorrels & Sekimoto, 2015). English is the global lingua franca in this interconnected world, bridging the linguistic gaps of people with different native languages. English as a worldwide common tongue encompasses many areas, from international business and commerce to language education (Rogerson-Revell, 2007; Sing, 2017). The key to effective communication in these areas lies within diverse skills and competencies that promote intelligible interactions between people from various linguistic backgrounds (Low, 2021). One such asset is intelligible pronunciation because it ensures that speech in a specific language is comprehensible to others (Levis, 2020).

Intelligible pronunciation is articulating words, phrases, and sentences that listeners understand. It encapsulates the perception of individual phonemes and words in connected speech, knowledge of specific phonetic and phonological features, and articulation of sounds accurately (Topal & Altay, 2022). Along with its significance to all people living in a multilingual and multicultural world, it is particularly essential for language teachers for

***Corresponding author:** Ibrahim Halil Topal, E-mail: ibrahimtopal@gazi.edu.tr

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numerous reasons. First, language teachers are role models that students can emulate when using the language and practicing as prospective teachers (Council of Europe, 2001). Similarly, language teachers might be the only language reference or information source in specific language settings (Gallini & Barron, 2001). Additionally, national and international teaching frameworks, including the European Profiling Grid (European Commission, 2011), TESOL/ NCATE Standards for the Recognition of Initial TESOL Programs in P–12 ESL Teachers (TESOL, 2010), Standards for Initial TESOL Pre-K-12 Teacher Preparation Programs (TESOL, 2019), and the General Competencies for Teaching Profession in Türkiye (Ministry of National Education, 2017), entail the acquisition of manifold knowledge, skills, and competencies associated with intelligible pronunciation. Furthermore, non-native language teachers are included in the group whose verbal communication requires increased intelligibility (Morley, 1991). Moreover, research has shown that language teachers lack phonological knowledge, confidence, and practice (Baker, 2014; Low, 2021), have articulation problems with specific pronunciation features (Topal & Altay, 2022; Topal, 2023), and thus need special training in pronunciation (Celce-Murcia et al., 2010). Consequently, they have ignored or paid little attention to pronunciation teaching in their classrooms (Derwing & Munro, 2022). This has also manifested itself in the underrepresentation of pronunciation in teacher education curricula (Darcy, 2018; Munro & Derwing, 2019). All these reasons contribute to the significance of pronunciation research in teacher education contexts for their potential pedagogical and practical implications.

Considering these, this experimental study intended to explore Turkish EFL teacher trainees' levels of knowledge, perception, and production in segmental pronunciation within the scope of an undergraduate course titled Listening and Pronunciation I (L&P I). Despite the availability of research on the pronunciation problems of teacher trainees (Topal & Altay, 2022; Demirezen, 2022), studies that tackle the state of pronunciation based on Turkish EFL teacher trainees' knowledge, perception, and production are scarce. This study is, therefore, expected to contribute considerably to the relevant literature from practical aspects. Based on the findings, the content of the teacher education curriculum could be revised, and special pronunciation training courses could be redesigned.

2 Background

2.1 Pronunciation teaching in Türkiye

Türkiye is one of the countries in the Expanding Circle where English is spoken as a foreign language. In fact, the practice of foreign language teaching dates back more than a century to earlier times in the country (Akyel, 2012). It also adopted the European Union's language policy, the Common European Framework of Reference for Languages (CEFR) (Council of Europe, 2001), in 2004 (Hazar, 2021) as part of its language policies. Foreign language teaching policies are developed by the government and implemented by the Ministry of National Education at primary and secondary education levels and the Council of Higher Education at the tertiary level. The policies and descriptors of the CEFR have been strictly followed when developing language programs for all education levels.

The primary education curriculum analysis reveals an extensive focus on receptive and productive skills, with no clear indication of an intentional focus on pronunciation (Ministry of National Education, 2018a). Similarly, the secondary education curriculum includes minimal pronunciation practice (Ministry of National Education, 2018b). Research in both contexts

indicated almost complete exclusion of pronunciation in primary and poor emphasis in secondary education programs (Topal, 2022). Demanding teaching schedules, crammed classrooms, and teacher/learner demotivation might account for pronunciation disregard in primary and secondary schools. Given the exit level of secondary education is upper-intermediate (B2 in CEFR) (Ministry of National Education, 2018b), it is safe to claim that many learners transition to tertiary education with a much lower proficiency level, let alone a good command of pronunciation.

Learners enrolled in teacher education programs receive two undergraduate courses specifically about pronunciation: L&P I/II (Council of Higher Education, 2018). A careful examination of the course descriptions shows that certain segmental and suprasegmental features (e.g., vowels, consonants, word stress, and intonation) are covered in the L&P I course, and the L&P II touches mainly on listening subskills. In addition, the 2020 authorization of the relevant higher education institutions to make curricular alterations in teacher education programs raised concerns about standardized and quality education across the state and private universities in Türkiye (Topal & Altay, 2022). Previous research in the Turkish EFL context supports the so-far presented concerns and arguments and demonstrates that teacher trainees experience pronunciation-related problems (Kartal & Korucu-Kis, 2020; Demirezen, 2022; Topal & Altay, 2022; Uzun, 2022). On the whole, examining the state of pronunciation in teacher training programs in Türkiye is deemed significant for potential practical and pedagogical implications.

2.2 Teachers' knowledge, perception and production of pronunciation

Examining the state of pronunciation among teacher trainees must encompass knowledge, perception, and production. First, teacher trainees must have the necessary knowledge base for pronunciation instruction. Second, they must be able to perceive the subtle differences between phonemes and sounds of English for better perception as listeners and teachers. Third, teacher trainees must speak intelligibly and thus successfully articulate the phonemes in lexis and context.

Knowledge, based on Shulman's (1986) categorization of content knowledge, refers to the content knowledge of teachers concerning the subject matter of the discipline (i.e., pronunciation), as well as the various ways in which the fundamental ideas and concepts of the discipline are structured to incorporate the facts of the discipline. Therefore, teachers' pronunciation knowledge might be evaluated under teacher cognition, encompassing teachers' knowledge, attitudes, beliefs, and practices (Couper, 2017). The knowledge of pronunciation has widespread coverage in national and international teaching frameworks. For instance, the American Council on the Teaching of Foreign Languages (ACTFL) Standard 2 (Council for the Accreditation of Educator Preparation (CAEP) Principle B) requires teachers to have phonological expertise. In addition, ACTFL Standard 3 (CAEP Principle C) is closely linked to pedagogical content knowledge (Shulman, 1986), requiring teachers to demonstrate specific teaching strategies. Teacher candidates must demonstrate a good command of linguistic structures, language use, and acquisition knowledge across various content areas, aligning with the ACTFL/CAEP (2015) framework. They should also be knowledgeable about phonology and demonstrate professionalism through reflection, self-assessment, and continuous professional development, receptive to remedial training for pronunciation problems. According to the General Competencies for the Teaching Profession (Ministry of National

Education, 2017), teachers must possess advanced theoretical, methodological, factual, and pedagogical content knowledge, particularly in phonological teaching, considering personal experiences and the curriculum, to effectively teach pronunciation.

Speech perception is "the ability to perceive linguistic structure in the acoustic speech signal" (McRoberts, 2008, p. 244). Language learners must be knowledgeable about a language's phonotactic system for successful speech perception. Speech perception and production, according to Darcy et al. (2012), are the two components of pronunciation instruction. Similarly, these are two pronunciation aspects that Pennington and Rogerson-Revell (2019) believe should be incorporated into pronunciation assessment. As reported by Topal (2023), manifold elements, such as "phonetic quality, prosodic patterns, pausing, pacing, and speed of the input" (p. 109), influence speech comprehensibility (Hughes, 2011). Another determinant of speech comprehensibility is the perceived similarity/dissimilarity between languages (Baker & Trofimovich, 2005), suggesting that certain pronunciation aspects depend on observing similar features (Best & Tyler, 2007).

The last construct, speech production, is a complex feedback system in which the nervous system and brain are involved in hearing, perceiving, and processing information (Docio-Fernandez & García Mateo, 2015). Listening (perception) and speaking (production) are the fundamental components of verbal communication because when one speaks in a conversational context, the other listens to the other. Pronunciation is integral to speaking and listening, as these skills act as auditory feedback loops, requiring learners' speeches to be articulated accurately and intelligibly (Reed & Michaud, 2011). Rvachew et al. (2004) demonstrate that improved listening (perception) skills can be effectively transferred to verbal (production) performance. Speech production is also intricately connected with communicative language competence (Hymes, 1972). Linguistic competence is one of its key components and is essential for language users. As reported in CEFR, linguistic competence includes phonological competence, which requires language teachers to teach the target language's phonology and their own competence (Council of Europe, 2001).

All in all, language teachers must possess a good command of pronunciation as part of the qualities (e.g., language proficiency, content knowledge, and professionalism) cited in national/international teaching qualifications and other justifications provided. It might, therefore, be held that having reasonable control over pronunciation encompasses profound knowledge, successful perception, and intelligible production.

2.3 Research on pronunciation in teacher education contexts

Studies have highlighted the importance of intelligible pronunciation in language instruction. Clear and precise pronunciation is essential for successful communication and learner understanding. Teacher mispronunciations can result in learners adopting improper pronunciation patterns (Derwing & Munro, 2015). Research has also revealed some difficulties teachers and trainee teachers encounter when enhancing their pronunciation abilities. These difficulties typically stem from the impact of the teacher's native language and a lack of self-confidence in pronunciation instruction (Levis, 2005; Couper, 2021). The need for dedicated courses or modules on pronunciation in teacher training curricula to effectively prepare educators has additionally been indicated (Topal & Altay, 2022; Topal, 2023). Furthermore, allowing teachers to assess their pronunciation and explore professional development initiatives can result in improved classroom performance (Borg, 2018).

English teacher trainees in Türkiye are offered two courses, L&P I/II, which focus on macro- and micro-listening skills and basic segmental and suprasegmental features of English.

However, these courses do not introduce pronunciation teaching or remedial training on problem-causing sounds, resulting in teacher trainees graduating without a good command of phonology and pronunciation teaching and potentially leading to fossilized pronunciation errors (Demirezen, 2022; Topal & Altay, 2022). Research has also shown that teacher trainees face segmental and suprasegmental problems (Arikan & Yilmaz, 2020; Topal & Altay, 2022; Topal, 2023), suggesting the necessity of remedial training in segmental and suprasegmental features (Demirezen, 2014; Topal & Altay, 2022). In this regard, the English teacher education curriculum requires revisions to the content (e.g., inclusion of problematic sounds for Turkish EFL teacher trainees) and scope (e.g., segmental-suprasegmental focus and listening strategies) of the L&P course.

3 Method

3.1 Research design

This study employed a one-group pretest-posttest experimental research design (Cranmer, 2017). This method involves assessing participants before and after an intervention or treatment to gauge effectiveness. Although commonly employed by educators to evaluate learners' knowledge or programs (Gao et al., 2016; Koller & Stuart, 2016; Cranmer, 2017), it raises concerns about internal validity, particularly regarding history and maturation effects due to the short time interval between pretests and posttests (Knapp, 2016). Despite its limitations, this design is preferred for its ease of use and quick results, especially when it is challenging to create control and treatment groups, as was the case in this study, where participants were voluntarily recruited from three class sections (Section 1, 2, and 3) totaling around 90 teacher trainees.

The study addressed the following main research question, with three sub-questions:

RQ (1): What is the current state of pronunciation among Turkish EFL teacher trainees?

- **(a)** How did the intervention impact the participants' pronunciation knowledge?
- **(b)** How did the intervention impact the participants' perception of pronunciation features?
- **(c)** How did the intervention impact the participants' production of pronunciation features?

3.2 Context and participants

The study was conducted at a prominent state university in Ankara, Türkiye, known for its English Language Teaching (ELT) department, which has trained teachers since 1985. To enroll in the program, candidates must achieve a satisfactory score on the university entrance exam and pass a proficiency exam to exempt themselves from a one-year English preparatory course. The department offers mandatory (75%) and elective (25%) courses in various areas, including field, professional, and general knowledge. Students who complete 180 ECTS credits over eight semesters (within seven years) can earn a Bachelor's degree. This research focused on the first-semester course called L&P I, which teaches students the essential body organs required for accurate pronunciation and effective listening in the target language.

The study used convenience and criterion sampling techniques (Dörnyei, 2007). First-year teacher trainees at the state university's ELT department, who were majors and had taken the L&P I course, were selected as the participants. The voluntary nature of the study resulted in varying participation rates for the diagnostic tests. The total number of participants, with an

average age of 19.43 (for both pretests and post-tests), was 80 first-year ELT students (55 females, 25 males): the test of perception (ToP) (20 females, ten males), test of knowledge (ToK) (20 females, 20 males), and test of production (ToPro) (15 females, five males). Additionally, five native non-native teachers (one male and four female) were selected to serve as raters for the ToPro elicitation paragraph. The average age of the raters was 34 years, with an average teaching experience of 12 years.

3.3 Treatment

The L&P I course (Table 1) was delivered online and aimed to teach fundamental English pronunciation skills, including segmental and suprasegmental features and listening strategies. Participants were expected to understand pronunciation thoroughly, develop confidence in pronouncing problematic sounds, formulate phonetic transcriptions, synthesize diverse phonetic differences, and communicate in English in front of an audience (Topal, 2023). The course utilized *Well Said Pronunciation for Clear Communication* (4th ed.) (Table 2) as the primary teaching material, along with other printed or electronic materials. The course encouraged attendance and participation, with assessments including participation (5%), midterm (%35), journal entry (10%), and final exam (50%). Teacher trainees also participated in self-assessment tasks for pronunciation feedback. The assessments were also conducted online, which was similar to the course. Participants submitted their assignments via Moodle.

Table 1

The Course Schedule

Week	Covered in class
Week 1	Introduction to the course policies and syllabus Does pronunciation matter?
Week 2	Sounds and Letters, International Phonetic Alphabet (IPA) Sounds: Vowels and consonants, consonant and vowel chart
Week 3	Silent Letters in English Vowels: /i/ and /ɪ/, /ʌ/ and /ɑ/ and/or other problematic vowel pairs
Week 4	Consonants: voiceless and voiced sounds Features of consonants: (i) place of articulation, (ii) manner of articulation
Week 5	Consonants Grammatical endings (-s/-es and –ed) Sibilant sounds, Linking consonants to vowels
Week 6	Syllables and word stress Stressed syllables and unstressed syllables Can and can't
Week 7	Word Stress
Week 8	Midterm Exam
Week 9	Word Stress in words with suffixes, Rhythm
Week 10	Thought groups / chunking
Week 11	Focus words (sentence stress/prominence)
Week 12	Final Intonation, non-final intonation
Week 13	Review for intonation, connected speech (linking) Linking consonants to vowels; linking vowel sounds with /w/ or /y/
Week 14	Links between consonant sounds; Linked words with vowels Reduced and dropped vowels
Week 15	Revision
Week 16	Final Exam

As Table 1 shows, the course mainly deals with the suprasegmental features of pronunciation, with four weeks (Weeks 2-5) concerning segmentals. The textbook contents (Table 2) overlap with the course syllabus (Table 1). However, when carefully examined, no specific listening strategies or topics are included in the course book or schedule.

Table 2

The Contents of the Textbook Used in the L&P I

Contents	Page number
Part I: Introduction	
Chapter 1 Your Pronunciation Profile	2
Chapter 2 Overview: Syllables, Stress, and Sounds	7
Part II: Sounds and Syllables	
Chapter 3 Voiceless and Voiced Sounds	18
Chapter 4 Grammatical Endings: *-s/-es* and *-ed*	27
Part III: Stress in Words and Sentences	
Chapter 5 Word Stress in Nouns, Verbs, and Numbers	39
Chapter 6 Stress in Words with Suffixes	51
Chapter 7 Rhythm in Phrases and Sentences	59
Midcourse Self-Evaluation	71
Part IV: Thought Groups and Intonation	
Chapter 8 Thought Groups	73
Chapter 9 Focus Words	80
Chapter 10 Final Intonation	93
Part V: Connected Speech	
Chapter 11 Linking and Sound Change	103
Chapter 12 Consonant Clusters	112
Part VI: Vowel and Consonant Sounds	
Vowel Sounds	
1 Vowel Overview	120
2 /iʸ/ feet - /ɪ/ fit	127
3 /eʸ/ pain - /ɛ/ pen	132
4 /ʌ/ luck - /ɑ/ lock	137
5 /oʷ/ note - /ɑ/ not	142
Consonant Sounds	
6 Consonant Overview	146
7 /θ/ thin - /s/ sin; /θ/ thin - /t/ tin	153
8 /f/ fair - /p/ pair	157
9 /ʃ/ sheet - /s/ seat	162
10 /r/ right - /l/ light	166
11 /v/ very - /w/ wary; /v/ very - /b/ berry	171
Appendices	
Appendix A: Strategies for Independent Learning	A1
Appendix B: Non-Verb Pairs	A2
Appendix C: Words with Omitted Syllables	A4
Appendix D: Guidelines for Word Stress	A4
Appendix E: Guidelines for Focus Words	A7

3.4 Instrumentation

The study used three diagnostic tests prepared and pilot-tested by the researcher to assess the pronunciation knowledge (α=.890), perception (α=.808), and production (Coef_G=0.86) of the course-takers. For the tests of knowledge and perception, a scoring range was established for meaningful and easy interpretation of the test scores. In that sense, test-takers scoring between

the predetermined ranges (i.e., 0-54= not assessable, 55-65=low, 70-80=moderate, and 85-100=high) were assumed to be knowledgeable about pronunciation at a low, moderate, and high level. Similarly, test-takers scoring between the predetermined ranges (i.e., 0-54= not assessable, 55-65=low, 70-80=moderate, and 85-100=high) were assumed to be competent in speech perception.

The researcher created the test of knowledge (ToK) within the context of content knowledge (Shulman, 1986). It comprised three sections and 40 items (30 multiple-choice, ten gap-fill) to assess teacher trainees' general, conceptual, and transcription knowledge. The following extract (Table 3) from the ToK can be provided as an example:

Table 3

Sample Items in the ToK

Test Sections	Example
General knowledge (Multiple choice)	Item 5: Which of the following does NOT play a role in speech production? a. speech muscles b. homorganic clusters c. larynx d. glottis e. resonating cavities
Conceptual knowledge (Gap-fill)	Item 23: ---------- is a regionally or socially distinctive variety of language, identified by a particular set of words and grammatical structures (Dialect)
Transcription knowledge (Multiple choice)	Item 31: Which of the following is the correct phonemic transcription of the bold and underlined letter in "grow**th**"? a. /ð/ b. /ʃ/ c. /tʃ/ d. /ʒ/ e. /θ/

The test of perception (ToPer) included three parts and 50 multiple-choice questions aiming to assess phonemic perception, sound discrimination through minimal pairs, and lexical perception through words with similar sounds. Table 4 shows an example question in the ToPer.

Table 4

Sample Items in the ToPer

Item 1 (Phonemic discrimination): Test-takers hear a sound twice and mark the corresponding option. **a.** /θ/ **b.** /ð/ **c.** /ʒ/ **d.** /tʃ/ **e.** /dʒ/
Item 12 (Sound discrimination): Test-takers hear the pronunciation of one word and are asked to select the corresponding option. **a.** rack **b.** wreck

The test of production (ToPro) consisted of two parts. The first included 40 items aiming to assess pronunciation at the word level, and the second contained an elicitation paragraph (i.e., *Please Call Stella* by Weinberger, 2015) aiming for articulatory competence in context. Test-takers receiving low scores in accentedness and high scores in intelligibility and

comprehensibility were assumed to be proficient in speech production. Examples of the test items in the ToPro are provided in Table 5.

Table 5

Sample Items in the ToPro

Part 1: Lexical production
2. threatening (th in word-initial position)
3. earthquake (th in word-medial position)
4. breadth (th in word-final position)
Part 2: Contextual production
Please call Stella. Ask her to bring these things with her from the store: Six spoons of fresh snow peas, five thick slabs of blue cheese, and maybe a snack for her brother Bob. We also need a small plastic snake and a big toy frog for the kids. She can scoop these things into three red bags, and we will go meet her Wednesday at the train station.

3.5 Data collection and analysis

Before data collection, the approval of the Ethics Committee of the given state university was obtained on 29 June 2021, with the document number E-35854172- 300-0000165768. The researcher contacted the course instructor and obtained consent from the study's teacher trainees and nonnative teachers. Data collection began in the fall semester of the 2021-2022 academic year with diagnostic tests administered as pretests to first-year teacher trainees for the L&P I course, delivered via Google Forms.

Descriptive and inferential analyses were administered on the quantitative data derived from diagnostic tests and nonnative teachers. Experienced nonnative teachers evaluated first-year students' voice recordings using Likert scales for accentedness and comprehensibility and a transcription task for intelligibility. Accentedness refers to how different the speech sounds from the listener's language community (Derwing & Munro, 2005), while comprehensibility assesses the speech's ease of understanding (Munro et al., 2006). Intelligibility concerns whether the listener can fully understand the speaker's message (Munro & Derwing, 1995). The teachers transcribed the speech to assess intelligibility, a method used in previous studies (Munro & Derwing, 1995; Hansen Edwards et al., 2018).

A summary of the procedures for data collection and analysis was presented in Table 6.

Table 6

A Snapshot of the Procedures for Data Collection and Analysis

Instrument	Purpose	Analyses
Test of knowledge	• to assess teacher trainees' general knowledge, conceptual knowledge, and transcription knowledge • to identify the most difficult test items for pronunciation knowledge	• The Wilcoxon Signed Rank • Test-item difficulty
Test of perception	• to assess phonemic perception, sound discrimination • to identify the most difficult sounds for perception	• The Wilcoxon Signed Rank • Test-item difficulty
Test of production	• to assess teacher trainees' accentedness, comprehensibility, and intelligibility at word and contextual levels • to identify the most problematic segmentals	• Expert teacher ratings through Likert scales (for accentedness and comprehensibility) and transcription task (for intelligibility) • Test-item difficulty

3.6 Trustworthiness

The trustworthiness of this study was examined from a rationalistic perspective, wherein two concepts (i.e., validity and reliability) emerge as significant. Fraenkel et al. (2012) define validity as the appropriateness, correctness, meaningfulness, and usefulness of inferences from data determined by the available evidence. On the other hand, reliability refers to the consistency of a research instrument's results when repeatedly used in the same situation (Heale & Twycross, 2015). Of the first type of validity, content validation involves ensuring the adequacy of sampling and the format of an instrument (Fraenkel et al., 2012). In this study, experts examined the diagnostic tests to check the content and format. Construct validity was achieved by clearly defining constructs, formulating hypotheses, logical/empirical testing, and obtaining expert opinions (Fraenkel et al., 2012). Reliability was assessed using correlation coefficient tests through IBM SPSS Version 25. The reliability scores calculated for the ToK (α=.890), ToPer (α=.808), and ToK (Coef_G=0,86) were ideally above .70. The Cronbach alpha coefficient should be greater than .70 for instruments to have a high degree of internal consistency (DeVellis, 2012). Generalizability theory suggests that 0.80 or higher is sufficient for reliability. In brief, it might be asserted that the study's trustworthiness and the validity and reliability of data collection instruments were, by and large, ensured.

4 Findings

4.1 Pronunciation knowledge

The Wilcoxon Signed Rank test revealed a moderate increase (r=.35) in first-year teacher trainees' knowledge after taking the course ($z = -3.241$, $p<0.5$). A micro-analytic examination revealed a statistically significant difference in the ToK sections: conceptual knowledge (Z= -2.721, p=.007) with a medium effect size (r= .35) and knowledge of phonetic transcription (Z= -4.046, p=.000) with a large effect size (r=.52), but an insignificant difference for the general knowledge (Z= -1.854, p=.064). Pretest and posttest ToK scores (70% between 0-54 and 36.7%

between 55-65) suggested that teacher trainees possessed only basic knowledge. This finding concurred with earlier studies reporting that nonnative English teachers and teacher trainees lacked pronunciation abilities and knowledge (Dolmacı & Kılıç, 2021; Gilakjani & Sabouri, 2016). In addition, the ToK item-difficulty analysis indicated that the participants struggled with phonetic-phonological aspects in the pretest (e.g., the place and manner of articulation, vowels, consonants, and phonetic transcription) and the posttest (e.g., place of articulation, speech sounds, vowels, and consonants).

4.2 Pronunciation perception

The Wilcoxon Signed Rank test revealed a minor increase (r =.01) in first-year teacher trainees' levels of speech perception after the course (z = -2.094, p<.05). A micro-analytic examination revealed a statistically significant difference in the ToPer sections: phonemic perception (Z= -2.900, p=.004) with a medium effect size (r= .37) and word recognition (Z= -3.382, p=.001) with a medium effect size (r =.43), but an insignificant difference for sound discrimination (Z= -.046, p=.963). Pretest and posttest ToPer scores demonstrated that the course contributed moderately to phonemic perception and word recognition and barely to sound discrimination. Additionally, the ToPer item-difficulty analysis revealed that the following sounds were difficult to perceive (D= .17 - .53) for the teacher trainees in the pretest: /ʒ/, /ə/, /ʊ/ (Functional loads (F)= 0.00, 0.1089, and 0.0124) (Gilner & Morales, 2010, 2022), word-initial /v/ and /w/, word-final /d/ and /ð/, and word-medial /b/ and /v/ and in the posttest: /ʒ/, /ʊ/, /ɝ/, word-initial /ə/ and /oʊ/, word-initial /v/ and /w/, and word-final /d/ and /ð/. The functional loads (FL) for the contrasting phonemes were 10, 8, 5, and 7, respectively (Brown, 1988). These findings were supported by previous studies (Demirezen, 2005a, 2005b, 2007a, 2010, 2017; Ercan, 2018; Hişmanoğlu, 2009; Hişmanoğlu & Hişmanoğlu, 2011; Kahraman, 2013; Mahzoun & Han, 2019) that found /θ/, /w/, /ʒ/, /ə/, /ʊ/ as problematic sounds. The results also indicated that the participants had more trouble discerning consonants (n=5) than vowels (n=3), which aligns with Lee and Hwang's (2016) research that reported superior differentiation of vowel sounds. The persistence of perceptional problems might suggest the inefficacy or inadequacy of the course for remediation.

4.3 Pronunciation production

The ToPro findings indicated high comprehensibility and low accentedness. This finding contradicted previous study results in the Turkish context (Uzun, 2019, 2021). As per the third construct, intelligibility, the first-year students had almost 60% intelligibility in the pretest and nearly 70% in the posttest. However, this relative ten-percent rise was not statistically significant (p=.798), suggesting no likely contribution of the course to the local intelligibility of the participants. Micro-analytic examination of the ToPro revealed the persistence of certain segmentals (i.e., /θ/, /ə/, /aʊ/, /ɪ/, /æ/, /u/, /ŋ/, and /ɑ/) as problematic sounds for local intelligibility. This finding concurred with previous studies maintaining that consonant and vowel errors might cause lower intelligibility (Saito et al., 2019; Uzun, 2019, 2021). Segmental errors also suggested that these features were not handled well within the course, although included in the syllabus. The analysis of participants' speech samples for global intelligibility (70% in the pretest, 80% in the posttest) showed a moderate contribution of the course (p<.05, r=.045). In addition, specific sounds, such as /θ/, /ð/, /ɑ/, and /æ/ remained problematic for

global intelligibility. Also, the raters reported a lack of connected speech, suggesting a lack of understanding of this concept included in the course book and schedule.

5 Discussion

ToK findings and analyses in the present study indicated the growing need for phonetic-phonological knowledge. Results emphasized the importance of comprehensive understanding and mastery of the target sound structure for language teachers and trainees. Findings further restated the importance of delivering courses that provide theoretical insights into enhancing second language pronunciation, as advocated in earlier research (Thomson, 2012). Teacher trainees with a lower level of knowledge might overlook the importance of pronunciation when teaching, highlighting the necessity for remedial and expert guidance to improve their teaching practices. Therefore, teachers must have a thorough understanding of second language pronunciation development and effective teaching techniques (Thomson, 2012; Baker, 2014). Teachers can create appropriate course material for pronunciation classes by utilizing their knowledge of phonetics and phonology (Pillai, 2017). It is also essential for non-native language instructors to have a thorough understanding and proficiency in the phonological system and pronunciation of the target language (Burgess & Spencer, 2000), highlighting the significance of their knowledge base in this area.

Findings emphasized the importance of teachers' comprehensive knowledge of the target language sound system and theoretical knowledge for second language pronunciation development, supported by previous research (Atli & Bergil, 2012; Thomson, 2012). However, the study found that teacher trainees failed to improve their core phonological knowledge after the L&P I course, possibly because of a lack of content knowledge in the course schedule. Accordingly, mastering the language's phonology and pronunciation becomes crucial for non-native language teachers and teacher trainees if they are to teach pronunciation (Burgess & Spencer, 2000; Topal, 2023).

Concerning pronunciation perception, the study suggested that explicit phonetic instruction could enhance speech perception in second-language learners (Kissling, 2015). However, native language phonetic prompts can impact learners' speech, making it less understandable (Eger & Reinisch, 2019). Additionally, accent familiarity can make speech perception difficult (Perry et al., 2018). The study suggested focusing on mainstream accents like standard British or North American English since they are easily understandable (Richter & Weissenbäck, 2022). However, incorporating nonnative accent analysis in the course to increase teacher trainees' familiarity and awareness of nonnative accents is essential to improve perception levels ultimately.

As for the production of sounds, the results showed that the participants' speech had a low accent and a high level of comprehensibility, thus contradicting previous research findings that indicated a lower level of comprehension among Turkish EFL students (Uzun, 2019, 2021). Although not mainly intended in this study, sounds with higher FL significantly impacted accentedness and comprehensibility, while sounds with lower FL only affected comprehensibility (Munro & Derwing, 2006). The course may have, therefore, moderately impacted accentedness and comprehensibility. However, early studies suggested a task-specific relationship between these constructs (Crowther et al., 2018), suggesting specific tasks in the ToPro might have led to low accentedness and high comprehensibility ratings. The study indicated that lower accentedness and higher comprehensibility ratings might have been due to the strength of a foreign accent (Munro & Derwing, 1995). However, comprehensibility and intelligibility are not necessarily affected.

The ToPro findings also suggested that the ratings of pronunciation and comprehensibility might have been influenced by segmental or suprasegmental features (Saito et al., 2017). However, the study excluded suprasegmentals and did not provide detailed information about them. The raters, who were L2 listeners, may have been more lenient in their ratings due to their language teaching experience and familiarity with speech accents (Saito et al., 2017; Foote & Trofimovich, 2018). The findings also suggested similarities between native and nonnative judgments, although O'Brien (2014) found variations in ratings.

Participants' speech samples were assessed for local and global intelligibility using transcription tasks. Results showed 60% intelligibility in the pretest and 70% in the posttest, with 70% recognizable. However, the Wilcoxon Signed Ranks test showed no significant difference, suggesting no L&P I course contribution to local intelligibility ratings. Specific sounds (/θ/, /ə/, /aʊ/, /ɪ/, /æ/, /u/, /ŋ/, /ɑ/) continued to impede intelligibility, coinciding with previous research (Saito et al., 2019; Uzun, 2019, 2021). It was further revealed that problematic consonants like /θ/ and /ŋ/ had lower FL but were frequently cited as problematic for Turkish EFL teacher trainees (Mahzoun & Han, 2019; Arikan & Yilmaz, 2020; Demirezen, 2022). Additionally, problematic vowels had higher and lower degrees of FL (Gilner & Morales, 2010), suggesting that phonemes with higher FL values might be difficult for intelligibility.

Participants' global intelligibility ratings showed nearly 70% accuracy in the pretest and over 80% in the posttest, indicating high speech intelligibility. The L&P I course moderately contributed to these ratings, but specific sounds (/θ/, /ð/, /ɑ/, and /æ/) hampered it. The study found that problem sounds decreased in intelligibility, decreasing from 10.14% in the pretest to 5.79% in the posttest. Both vowels and consonants were problematic, with /θ/ comprising 1.32% of the consonant system and /ð/ 5.72%. Vowels with higher and lower FL posed intelligibility problems (Topal, 2023).

The ToPro findings further indicated that segmental errors might affect connected speech, which includes sound modifications in words (Alameen & Levis, 2015). Natural speech is connected, not sloppy. Nonnative expert raters in the present study further reported that teacher trainees lacked connected speech. Accordingly, teacher trainees must have intelligible pronunciation to achieve connected speech. However, connected speech is under-researched in Turkish EFL and ELT contexts, with studies focusing on individual segmentals or suprasegmentals. The present study may be one of the earliest studies revealing that trainees lacked connected speech training.

6 Conclusion and recommendations

This study aimed to identify the impact of an undergraduate course on the first-year EFL teacher trainees' pronunciation knowledge, perception, and production. Results showed a moderate rise in knowledge levels after the course, with a significant increase in successful phonetic transcription. The study also found that teacher trainees with low knowledge levels tended to neglect pronunciation in their teaching practices, indicating a need for remedial and expert judgment approaches. The study found that first-year teacher trainees' perception of English sounds was minor, with a moderate rise in phonemic perception and word recognition. The ToPer scores did not predict course grades, suggesting that the course did not significantly impact their performance. The study also revealed that consonants were more problematic for first-year students to perceive than vowels, indicating better discrimination of vowels. It was suggested that perceptual pronunciation training (focusing on problematic sounds) was needed for first-year trainees despite the course's minor contribution to their performance. It was also

suggested that the L&P I course should include various native and nonnative accents to raise awareness and contribute to better speech perception. FL was not the sole criterion for curricular decisions. The study found that participants' speech had high comprehensibility and low accentedness, with a significant contribution from the course for comprehensibility and a minor contribution for accentedness. However, these factors might not be solely attributed to the course, as other variables such as specific tasks, foreign accents, segmentals, and suprasegmentals might intervene (Saito et al., 2017; Crowther et al., 2018). The study also found no potential contribution of the course to participants' local intelligibility, suggesting that the prevalence of vowels over consonants might be the reason for reduced intelligibility. Global intelligibility ratings showed a moderate rise, with a ten-percent change in pretest and posttest scores. The study suggested the incorporation of both segmentals and suprasegmentals to gain higher intelligibility levels for teacher trainees. FL might not be the single factor for including phonemic contrasts in the pronunciation curriculum, as phonemes with high and low degrees of FL were problematic for perception and production (Topal, 2023).

The inclusion of knowledge in the diagnostic tests was based on research, highlighting the importance of a solid knowledge base in pronunciation (Gordon, 2019), the reasons for pronunciation problems being perceptual (Huensch & Tremblay, 2015) and articulatory (Flege & Bohn, 2021). Similar procedures were followed for the perception and production. However, due to the study's scope, the ToPer omitted suprasegmentals. Prospective studies might include suprasegmental features, given their potential impact on speech perception (Yenkimaleki & van Heuven, 2021). In this sense, the *Perception of Spoken English (POSE) Test* (Shewell, 2004) might be used since the test already has this prosodic component. The study further utilized a ToPro with lexical and contextual production tasks, adapting Weinberger's (2015) task for elicitation paragraphs. This approach was used in previous studies (Melnik-Leroy et al., 2022; Mora et al., 2022) and might thus be employed in prospective production tests for teacher trainees. Ultimately, teacher trainees' ToPro performance was evaluated for accentedness, comprehensibility, and intelligibility, with future tests considering fluency, intonation, connected speech, and contextual factors, as suggested by previous studies (Bøhn & Hansen, 2017; Browne & Fulcher, 2017; Euler, 2014).

Several limitations, such as the preference for the adoption of on

e group pretest-posttest research design and the exclusion of suprasegmental pronunciation features, were recognized in the study. However, the justifications for these limitations were made in the method and discussion sections. Nevertheless, prospective researchers might adopt more comprehensive research approaches. In line with the findings, the undergraduate course (i.e., L& P I) should be revised and thus include the elements related to pronunciation knowledge, perception, and production. For instance, a suggested course might tackle content and pedagogical content knowledge of pronunciation. Another course might specifically address the problematic sounds for Turkish EFL teacher candidates. More studies of qualitative and quantitative nature should be conducted on these components of pronunciation competence to make comparisons across diverse language contexts.

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