Studies in Second Language Acquisition, **44** (2022), 1211–1239
doi:10.1017/S0272263121000966

Research Article

MAPPING RESEARCH ON L2 PRONUNCIATION

A BIBLIOMETRIC ANALYSIS

Yusuf Demir *

Selcuk University, Konya, Turkey

Galip Kartal

Necmettin Erbakan University, Konya, Turkey

Abstract
This study reports on a bibliometric mapping analysis of L2 pronunciation research. Analyses on 629 articles published between 1977 and 2020 in 15 prestigious SSCI-indexed applied linguistics journals identified significant research themes and trends, influential authors, documents, and publication sources. The results of the analyses of citation impact, cocitation, and research trends provide valuable insights into understanding the dynamics, evolution patterns, and the intellectual background of L2 pronunciation research, thereby guiding future research and practice.

INTRODUCTION

Pronunciation is a significant component of successful oral communication in an L2. That is, high pronunciation proficiency aids in understanding and being understood, for both native speakers of the target language and L2 learners (Tsai, 2019). That being said, the role of L2 pronunciation instruction and its practices have been influenced by "the whims of the time and the fashions of the day" (Isaacs, 2018, p. 273). In the early methods era, for instance, L2 pronunciation instruction was considered irrelevant by the grammar-translation method (GTM) and similar reading-based and naturalistic approaches. Although the direct method emphasized the importance of effective L2 pronunciation skills, it was not until the introduction of the audio-lingual method (ALM) and oral approach that it was viewed as an essential aspect of L2 teaching. The role of teaching pronunciation was again redefined with the rise of the communicative language teaching (CLT) (Richards & Rodgers, 2014). That is, the "disjuncture between pronunciation and [CLT]" (Isaacs,

We would like to extend our gratitude to the editor and the anonymous reviewers for their invaluable feedback and constructive comments on earlier versions of this article.
*Corresponding author. E-mail: demir.ysf@hotmail.com

© *The Author(s), 2022. Published by Cambridge University Press.*

https://doi.org/10.1017/S0272263121000966 Published online by Cambridge University Press

2009, p.1) became evident. Similarly, teacher cognition studies showed that language teachers lack confidence in teaching L2 pronunciation (Baker, 2011), feel uncertain about how to teach it (Couper, 2017), and as a result, utilize mainly controlled techniques (Baker, 2014). However, it is now evident that L2 pronunciation teaching, which had been identified with the Cinderella imagery in language teaching even before the CLT era (Kelly, 1969), has eventually been invited to the language teaching ball, or at least it does not suffer from "specialists' underappreciations for the possibility of making better connections between CLT and pronunciation teaching" (Levis & Sonsaat, 2017, p. 13–14).

Similar to the trajectory of L2 pronunciation teaching, L2 pronunciation research was once considered as the neglected orphan of SLA studies (Deng et al., 2009), a field that suffered from paradigm shifts, growing pains (Munro & Derwing, 2015), and rampant labeling inconsistencies (Munro & Derwing, 2020). However, following the transparent conjuncture out of the nebulous teaching and research context caused by CLT (Levis & Sonsaat, 2017), L2 pronunciation research has enjoyed a resurgence of interest, making it a rapidly growing field (Isaacs & Trofimovich, 2016; Nagle et al., 2019; Pennington, 2021). The growing interest in L2 pronunciation research and teaching, as expected, has lent impetus to review studies and meta-analyses, a sign of the growth of the field. These review studies have focused on a limited aspect of L2 pronunciation research, such as the effectiveness of L2 pronunciation instruction (Saito; 2012; Saito & Plonsky, 2019; Thomson & Derwing, 2015), the use and role of high variability pronunciation training (Thomson, 2018), and feedback type (Bliss et al., 2018) in L2 pronunciation teaching and learning, the effects of perception training on L2 perception and production gains (Sakai & Moorman, 2018), and the assessment and teaching of comprehensible and nativelike pronunciation in ESL contexts (Saito, 2021).

What is missing in the studies mentioned in the preceding text is an overarching bibliometric analysis lens serving to portray the state of L2 pronunciation research through a holistic and historical framework. Although coverage of relevant studies and synthesis of their findings can be made possible through meta-studies, bibliometric analyses are highly needed to compile and compare vast amounts of quantitative data to unravel the intellectual structure, research patterns, dynamics, and evolution of L2 pronunciation research, coupled with the detection of highly influential authors, references, and publication sources in the field. This kind of analysis is likely to enable academic professionals to stay current concerning research themes and trends and make insightful decisions on research issues that are worthy of investigation. A bibliometric analysis of L2 pronunciation research has the potential to contribute to the field by filling these niches, providing a systematic overview, and visualizing "big data" (Beelen et al., 2017), thus serving as the main springboard for our study. Researchers in an array of education fields have recently shown great interest in bibliometric research (e.g., Gülmez et al., 2021; Heradio et al., 2016). Moreover, several bibliometric studies have already been conducted on the general research field of SLA (Zhang, 2020), applied linguistics (Lei & Liu, 2019), and e-books in EFL teaching (Chen et al., 2021). However, to date, no bibliometric analysis has appeared in the literature for L2 pronunciation research. This gap limits our understanding of the intellectual structure and research patterns of L2 pronunciation research.

With these gaps in mind, the present study applies bibliometric methods to map the L2 pronunciation research field by analyzing L2 pronunciation articles extending over four decades (1977–2020) that were published in distinguished applied linguistics journals

https://doi.org/10.1017/S0272263121000966 Published online by Cambridge University Press

covered by the SSCI index in the Web of Science (WoS) database. While doing so, we mainly drew on citation analysis of impact and cocitation analysis. The former allowed to reveal the impact of authors, publications, and sources in the dataset, whereas the latter, a broader kind of analysis reaching the reference lists of the documents in the dataset, enabled us to create network maps to illuminate the knowledge base of L2 pronunciation research. With such a perspective, we sought answers to the following research questions:

1. What are the featured themes, trends, and documents in L2 pronunciation research?
2. Which are the most influential authors and sources?

METHOD

This study employed the bibliometric method, which entails "the application of mathematical and statistical methods to books and other means of communication" (Pritchard, 1969, p. 349). Having its roots in the field of library and information science, bibliometrics maps the literature in relation to a research field by collecting and quantitatively analyzing the bibliographic data embedded in scientific outputs. Bibliometric analyses can identify research themes and trends as well as scholarly networks based on published documents, major journals, productive authors, countries, research institutions, and keywords (Xiang et al., 2017). In this way, research patterns, dynamics, and characteristics of a particular field or discipline can be explored. As a method for analyzing, monitoring, and measuring scientific production (Gumpenberger et al., 2012), bibliometrics furthers knowledge expansion on a particular research field and establishes connections between pioneering publications, authors, journals, and other features of the field under scrutiny (Vogel, 2014).

In this article, we provide a general and systematic overview of research on L2 pronunciation extending upward of four decades using bibliometric methods. To this end, we grounded our study on two main functions of bibliometric research, that is, performance assessment and science mapping (Van Raan, 2014). The former encapsulates, for example, citation analysis of impact on journals, authors, and countries, whereas the latter involves creating network maps to illuminate conceptual, intellectual, social, historical, and relational features of a knowledge base (Cobo et al., 2011; Small, 1999). In the present study, with a view to identifying the research themes, trends as well as the influential authors, documents, and publication venues that altogether form the schools of thought in L2 pronunciation research, two types of bibliometric analysis were performed: citation analysis of impact and cocitation analysis. Moreover, we visualized the scientific networks to clarify the links between the bibliometric indices, and to depict the evolution and intellectual structure of the field of L2 pronunciation. We also employed the Mann–Kendall trend test, a tool that analyzes time-series data for a monotonic upward or downward trend, to find the potential trends of the key terms in the paper titles, alongside collocation analyses on the paper abstracts to reveal the common cooccurrences of the terms in the paper titles. Adapted from de Oliveira et al.'s (2019) model, the workflow diagram in Figure 1 presents the research macro-steps for mapping the state of the art in L2 pronunciation research explained in the following sections.

https://doi.org/10.1017/S0272263121000966 Published online by Cambridge University Press

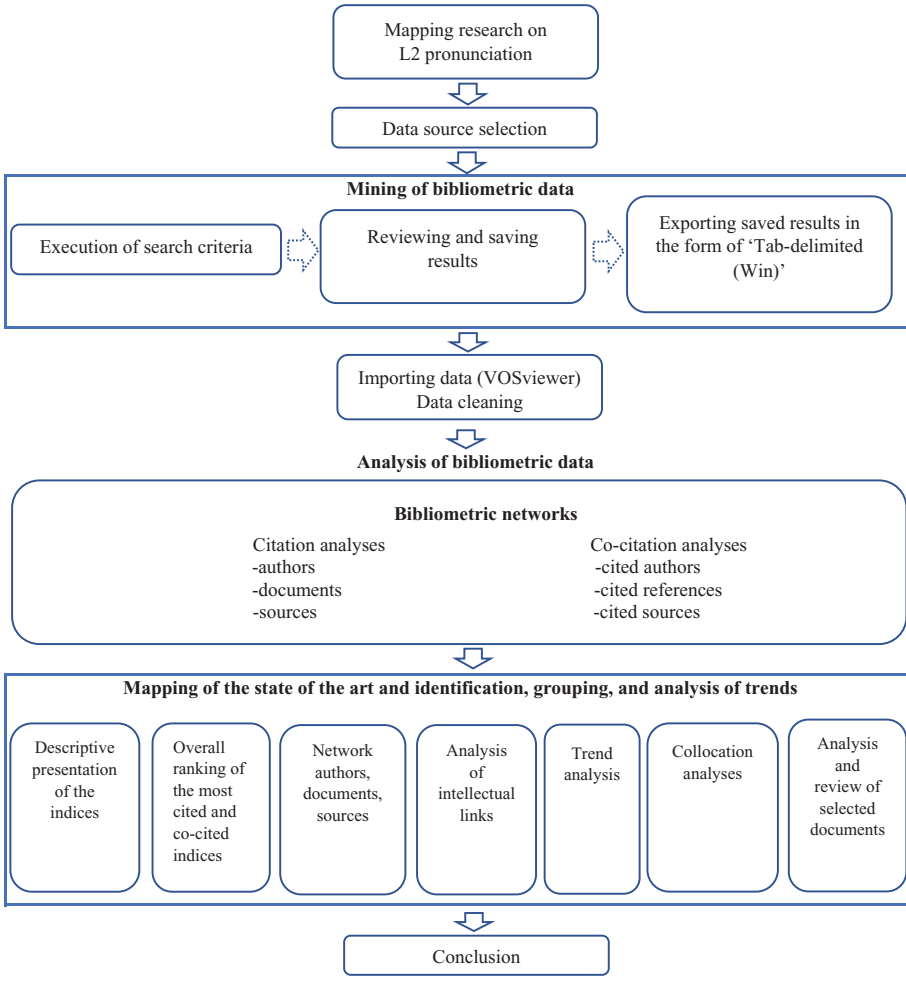


FIGURE 1. Workflow diagram.

JOURNAL SELECTION

The dataset for the study was comprised of L2 pronunciation-oriented articles published in 15 featured SSCI-indexed SLA journals. We resorted to journals as sources of publication on the grounds that they are the primary means of L2 research dissemination as opposed to books or other forms of publication (Plonsky & Derrick, 2016). We predicated our journal selection policy on several motives to compose a representative sample of L2 pronunciation research as a measure of validity (Granda-Orive et al., 2013). The journals in our research focus have come of age over several decades through their statistical rigor and perceived quality. WoS *Journal Citation Reports* (2019), for example, showed that 12 out of the 15 journals were ranked in the Q1 quartile in the subject area of linguistics, and three in the Q2 quartile. All the 15 journals had a 5-year impact factor

https://doi.org/10.1017/S0272263121000966 Published online by Cambridge University Press

(IF) above 1.5, while 13 journals had an IF of more than 1.5 for the 2019 evaluation year (see Table A1 in the Appendix for the journals' IF and 5-year IF scores in the past 5 years).

Eleven of the journals that formed our dataset were among those that were classified as top-tier through SLA professionals' opinions, as reported by VanPatten and Williams (2002). Their list of top 15 journals was also embraced by a number of researchers to reveal different SLA research dimensions (e.g., Gass et al., 2007; Plonsky & Ghanbar, 2018; Zhang, 2020). The journals surveyed in the present study also cover the top seven L2 journals (with the exception of *Journal of Second Language Writing* for topical irrelevance) specified by Egbert (2007) according to quality indicators such as selectivity, mentions, and citation counts. Thirteen out of the 15 journals in our list were also included in both Al-Hoorie and Vitta's (2019) list of 30 representative SLA journals assessed for statistical quality, and the white paper by the University of California Consortium for Language Learning & Teaching (UCCLLT, 2009) published for the departments seeking guidance in the field of applied linguistics, including top journals. Moreover, all the 15 journals were included in Levis and Sonsaat's (2020) list of 27 general SLA journals that regularly publish L2 pronunciation research, in their editorial *Publication Venues for L2 Pronunciation Research.* Accordingly, our major consideration in journal selection was oriented to investigating L2 pronunciation research from the perspectives of mainstream SLA journals. This led us to leave out some specialist journals such as the *Journal of the Acoustical Society of America*, *Journal of Phonetics*, and *Language and Speech* because of their lack of typical focus on second language acquisition, learning, and teaching (ibid.) while also acknowledging their recognized significance in the field. We need to digress here into the *Journal of Second Language Pronunciation* (JSLP), a burgeoning prestigious journal (founded in 2015) that is steered toward understanding L2 phonological learning and building links between L2 pronunciation and other areas of applied linguistics but failed to enter our dataset because of its content not being available in the WoS database. As a result, the insights we derived from (a) the journals' statistical positioning, (b) the publications that discussed and listed influential journals representative of SLA, and (c) the papers that made use of those listed journals to investigate several SLA issues led us to draw from the 15 journals (Figure 2) to obtain the bibliometric data of the field of L2 pronunciation.

DATA RETRIEVAL

The bibliometric data for this study were retrieved from WoS, one of the most widely used library resources (Roemer & Borchardt, 2015). We adopted a top-down approach to data retrieval. In the first place, we searched the publications regarding L2 pronunciation from the WoS Core Collection on the SSCI database by using the following search terms: "pronunciation" OR "comprehensib*" OR "segmental" OR "fluency" OR "accent*" OR "intelligib*" OR "vowel" OR "speech recognition" OR "dialect" OR "speech rate" OR "phonetic*" OR "phonolog*" OR "acoustic" OR "speech production" OR "consonant" OR "voiced" OR "voiceless" OR "auditory" OR "voicing" OR "stress" OR "intonation" OR "suprasegmental" OR "prosod*" OR "rhythm*" OR "articulat*" OR "speech sound" OR "phoneme." The search was conducted on the "Topic" section, which searches title, abstract, author keywords, and Keywords Plus. The search was filtered through the document type of "articles" written in the English language only, for all years, yielding

https://doi.org/10.1017/S0272263121000966 Published online by Cambridge University Press

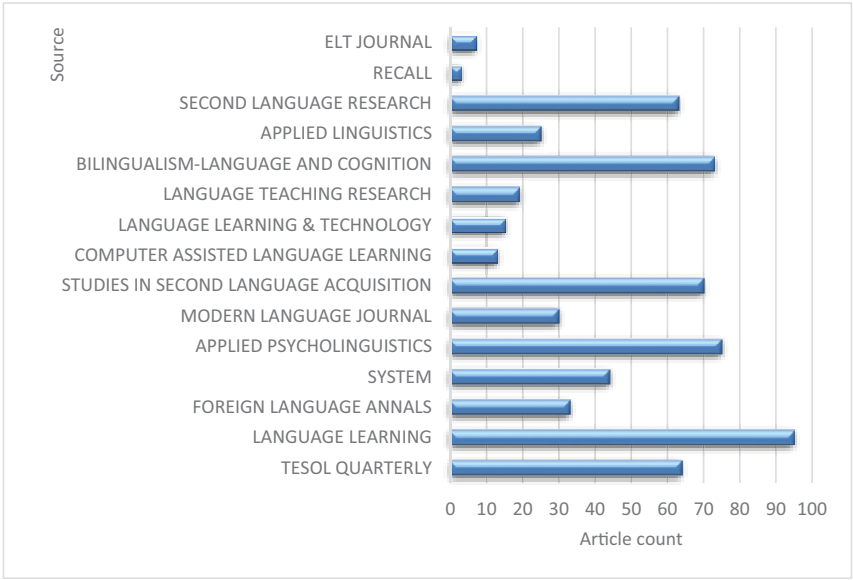


FIGURE 2. Distribution of the L2 pronunciation articles across the journals in the dataset.
Note: Although SSCI started journal indexing as of 1980, there is one article in our dataset covered by SSCI earlier (Parish, C. [1977]. A practical philosophy of pronunciation. *TESOL Quarterly*, *11*, 311–317).

308,645 papers. Next, we excluded the 1,065 papers published in 2021, resulting in 307,580. In what follows, we chose the related WoS categories: Education Educational Research, Education Scientific Disciplines, Education Special, Language Linguistics, Linguistics, and Psychology Educational, which elicited 40,973 articles. Then, from the "Source Titles" menu, we selected the 15 listed journals that left us with 2,095 articles published from 1977 through 2020.

To test the validity of the search strategy, we collaboratively reviewed these articles through a one-by-one manual sifting process (Hernández-Vásquez & Rosselli, 2017). While doing so, we initially reviewed the articles' titles, then their abstracts and research questions/hypotheses in terms of topical appropriateness for the study. The following questions guided us through the process: Do the articles have an initial focus on L2 pronunciation and its related concepts provided in the previously mentioned search terms? Are these concepts essentially covered in the articles? Do any of the research questions of the articles address these concepts, and were therefore analyzed somehow? Do the articles have an L2 focus rather than L1? If we still had some concerns and hesitations in terms of the relevance of an article, we cyclically read the whole text. There were eight papers that posed a dilemma for us. For these papers, we informed an SLA researcher-colleague on the purposes and methodology of our study, and asked her for a third opinion. She also reviewed a random 10% of the articles (N = 63) in terms of topical relevance. As a result of the sifting process, we finally came up with a list of 629 articles (Table A2 in the Appendix) within the body of the 15 journals and gathered the following types of information to conduct bibliometric analyses: paper titles, authors, abstracts,

https://doi.org/10.1017/S0272263121000966 Published online by Cambridge University Press

sources, and references. Figure 2 shows the distribution of the 629 L2 pronunciation articles across the journals.

DATA ANALYSIS

Bibliometric analysis in this study incorporated quantification and knowledge mapping technology. Following data retrieval from the WoS database, we performed network analysis for knowledge mapping through VOSviewer software (Van Eck & Waltman, 2009). Network analysis constructs bibliometric networks and visualizations to reveal the scope and structure of the field in addition to key research clusters (Fahimnia et al., 2015). VOSviewer also serves to identify the link strengths and relationships between authors, documents, and sources (Van Eck et al., 2010). In this study, the network analyses through VOSviewer generated cocitation maps of the references, authors, and sources. Before performing all the analyses, we conducted data cleaning by creating thesaurus files and then embedding them into the VOSviewer interface. By doing so, we were able to avoid coding errors and merge variants of an author name, a source title, or a reference with different spellings into a single unit. To exemplify, we merged "thomson, rı" and "thomson, ron, I" into "thomson, ron" in the VOSviewer output to refer to the same author. Likewise, "stud second lang acq" and "studıes 2 language a" were recoded into "ssla" to represent the same journal.

Citation analysis of impact draws on citation counts to determine the impact of authors, documents, and journals on a given field. Cocitation analysis, a more insightful method for being not restricted to documents residing in a particular dataset (Hallinger & Kovačević, 2019), was also performed in this study to create bibliometric maps of key cited references, authors, and sources. Two items are considered to have a cocitation relationship when they are cited together in a citing item's reference list (Osareh, 1996). Cocitation analysis of cited references identifies the most influential publications in a given research field, the core literature and their links to other documents (Dong & Chen, 2015), and the domain's evolutionary path (Liao et al., 2018), while also serving as a measure of the similarity of these two documents' research or theoretical perspectives (Özçınar, 2015). Author cocitation analysis labels pivotal authors in the field and indicates an intellectual affinity between two authors when they are often cited together in other documents (Small, 1999). This also applies to cocited sources. Source cocitation analysis distinguishes the most important publication sources and ascertains their interconnectedness. Using cocitation analysis information, sources, authors, or documents that are frequently cited together can be grouped in clusters to reveal the intellectual structure of a particular field (Small, 1973). In this study, we opted for cocitation analysis over its alternative bibliographic coupling. This practice has been found in many other bibliometric studies (e.g., Andrews, 2003; Chen, 2018; Shiau et al., 2015). Bibliographic coupling creates maps on the basis of publications in their *citing* modality and cocitation analysis *cited* modality, which makes the former static and the latter a dynamic one (Van Raan, 2014). More specifically, two papers are bibliographically coupled if they have shared references whereas a cocitation link is created between two publications when they are jointly cited by other papers. We did not perform keyword cooccurrence analysis either, as the articles published in the early periods did not include keywords (author keywords started to be included in the WoS database from 1991). Interpretation of

https://doi.org/10.1017/S0272263121000966 Published online by Cambridge University Press

VOSviewer outputs, that is, network visualizations in which each source, author, document, or a term is represented by a node, rests on the following parameters: The stronger the link between two nodes, the thicker the line that displays the link in the visualization of the map (Van Eck & Waltman, 2020). In addition, the size of a node represents its weight. The larger a node is, the higher its weight is. Finally, the nodes with the same color belong to the same cluster.

RESULTS AND DISCUSSION

We organized this section around findings with regard to the research questions: (a) featured themes, trends, and documents, and (b) the most influential authors and sources.

FEATURED THEMES, TRENDS, AND DOCUMENTS

Citation Analysis of Impact: Most Cited Articles

Table A3 in the Appendix provides the citation information of the top 20 most-cited L2 pronunciation articles in the 15 journals across the three periods (1977–1991, 1992–2006, 2007–2020; with 58, 106, and 465 articles, respectively). These articles were adjusted for the time effect and ranked by their normalized citations for the analysis (see also Table A4 in the Appendix for the top 20 most-cited lists ranked by the raw citations received by the articles). A number of most-cited articles in the first period underlay the introduction of some key concepts such as accentedness (e.g., Anderson-Hsieh & Koehler, 1988; Flege, 1981; Patkowski, 1990; Thompson, 1991; Van Els & De Bot, 1987), comprehensibility (e.g., Gass & Varonis, 1984; Smith & Bisazza, 1982), intelligibility (e.g., Eisenstein & Verdi, 1985; Fayer & Krasinski, 1987), and the perception and production of some L2 sounds (e.g., Bohn & Flege, 1990; Borden et al., 1983; Werker, 1986). Naturally, some of these highly cited articles paved the way for the foundation of some related concepts of L2 pronunciation. For instance, intelligibility was conceptualized afterward by Munro and Derwing (1995a), at the same time delineating comprehensibility and accentedness. Later on, intelligibility was introduced as a principle in its own right by Levis (2005) that has since then significantly guided L2 pronunciation teaching and research. Some of the most-cited studies in this period also made significant contributions to the field of L2 pronunciation by presenting alternative hypotheses or building on former theoretical arguments to shed light on, for example, interlanguage phonology (e.g., Eckman, 1981; Hodne, 1985), interlanguage phonetics (Flege, 1980), and the critical period hypothesis (e.g., Flege's Phonological Translation Hypothesis, 1981). The high citation numbers of these theory-oriented studies imply that the first period served as a rotator to adapt some general SLA theories to phonetics and phonology.

In the second period, the focus on foreign accents and intelligibility became more transparent (e.g., Derwing & Munro, 2001; Field, 2005; Hahn, 2004; Koster & Koet, 1993; Munro et al., 2006). Especially Munro and Derwing's (1995a) highly influential paper, with the most citations, alongside its reprint (Munro & Derwing, 1999), guided future studies with these foci. This makes sense as their seminal work led to a movement toward a standard terminology. As Munro and Derwing (2020) has recently noted, the

https://doi.org/10.1017/S0272263121000966 Published online by Cambridge University Press

field of L2 pronunciation had witnessed inconsistencies among the concepts of accentedness, intelligibility, and comprehensibility before their 1995 study that showed these constructs to be related but partially independent. The following research on L2 pronunciation has consistently considered their work. A special issue of JSLP in 2020, "25 years of Intelligibility, Comprehensibility and Accentedness," also refocused on its essential role in L2 pronunciation research. The second period was also the period when there was an increasing interest in the pedagogy of L2 pronunciation led by a number of most-cited articles (e.g., Derwing & Munro, 2005; Jenkins, 2002; Levis, 2005). These articles suggested informed insights and methodologies for L2 pronunciation instruction in consideration of the intelligibility principle, accentedness, and the concept of English as an International Language (EIL). This period also covered the most-cited studies in the nexus of L2 speech perception and production. These included vowel perception (Flege & MacKay, 2004) and production (Munro et al., 1996), the perception and acquisition of contrasting segments (Escudero & Boersma, 2004), and some speech sounds (Hardison, 2003). The eminence of perception and production seems to have contributed a theoretical viewpoint to L2 pronunciation instruction, categorized as either being perception- or production-based (Lee et al., 2020).

In the third period, the study of the effectiveness of instruction in L2 pronunciation development served as the main concern of several most-cited articles with the tools of form-focused instruction and corrective feedback (Saito & Lyster, 2012), ad hoc training (Wong & Perrachione, 2007), podcasting (Ducate & Lomicka, 2009), and gestures (Smotrova, 2017). A highly cited meta-analysis (Lee et al., 2015) and a narrative review (Thomson & Derwing, 2015) were also conducted to investigate the effectiveness of L2 pronunciation instruction. The eminence of these studies in this period is not surprising. With the start year of the third period being 2007, we concur with several authors in coming up with a date close to 2005 as a milestone when L2 pronunciation instruction began to generate more research as an important area of investigation (Isaacs, 2018; Isaacs & Trofimovich, 2016; Munro & Derwing, 2015; Thomson & Derwing, 2015). Besides, accentedness and comprehensibility received wide attention among the highly cited articles in this period. The linguistic (e.g., Isaacs & Trofimovich, 2012; Saito et al., 2017) and nonlinguistic (Saito et al., 2018) influences on these concepts, their development (e.g., Derwing et al., 2008; Derwing & Munro, 2013), and the judgments of them (e.g., Kang, 2010; Kang et al., 2010) were addressed in these papers. Finally, several highly cited articles with a focus on L2 speech perception and production also appeared in this period (e.g., Carlson et al., 2016; Pelzl et al., 2019; Saito et al., 2016; Shen & Froud, 2019).

Cocitation Analysis: The Highly Influential References

Different from the citation analysis of impact that evaluated the effectiveness of the articles limited to the bibliometric dataset (i.e., the 629 articles) by the number of citations, cocitation analysis is based on the documents cited in the reference lists of the 629 articles. Therefore, cocitation analysis covers cocited documents located outside the available dataset and captures a much broader literature (Hallinger & Kovačević, 2019). When put together, an amalgamation of these emic and etic perspectives to bibliometric analysis led

https://doi.org/10.1017/S0272263121000966 Published online by Cambridge University Press

us to more effectively reveal the intellectual structure and evolution path of the field of L2 pronunciation.

In the cocitation analysis, of the 1,327 unique references cited by the articles published between 1977 and 1991, the top 42 most-cited references (Table A5 in the Appendix) had citation counts of a minimum of three. The network map created by the VOSviewer produced six clusters (Figure 3). With regard to the second period (1992–2006), when the minimum number of citations of a cited reference was set to seven, of the 3,284 references, the top 55 most-cited references (Table A6 in the Appendix) created three clusters as shown in Figure 4. Among the 14,738 references in the 2007–2020 period, the top 50 most-cited references (Table A7 in the Appendix) had at least 25 citations and produced three clusters (Figure 5).

Despite being quite an infertile period in terms of the number of cocitations, the first period provides some useful insights to shed light on the infancy of L2 pronunciation research. Some of the influential documents and clusters that emerged in the cocitation network map of this period set the scene and charted out directions for future L2 pronunciation research. This was the natural corollary of the emergence of a number of foundational theories and hypotheses. As a case in point, the cluster which we termed "interlanguage/interphonology" (Cluster 2 in green), highlighted as one of the biggest clusters with nine references, a total of 46 cocitations and total link strength (TLS), an attribute that indicates the total strength of the cocitation links. The top four most-cited references in this period were also in this cluster. This cluster was mainly represented by Selinker's (1972) highly influential paper *Interlanguage*, and the concomitant work on

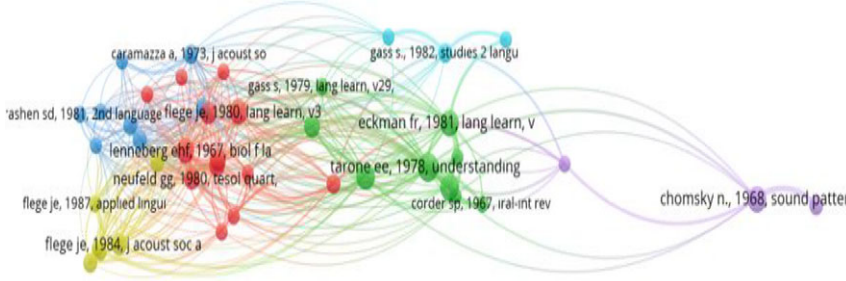


FIGURE 3. The network map of the most-cited references (1977–1991).

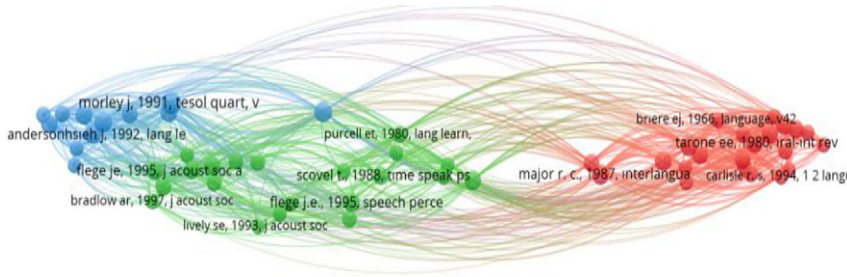


FIGURE 4. The network map of the most-cited references (1992–2006).

https://doi.org/10.1017/S0272263121000966 Published online by Cambridge University Press

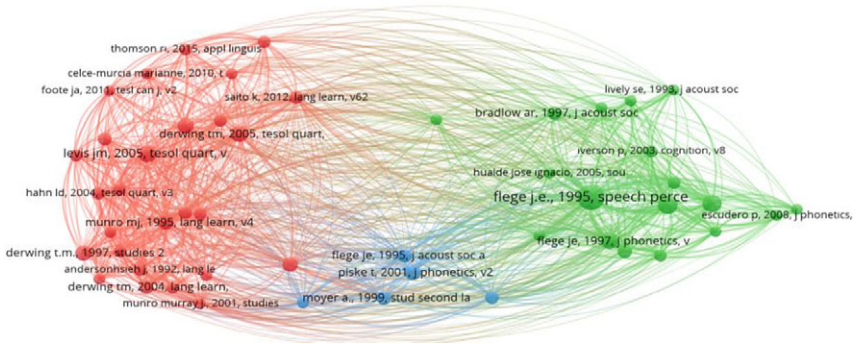


FIGURE 5. The network map of the most-cited references (2007–2020).

interlanguage phonology. Tarone (1978) in this cluster, for example, the most-cited document in this period, elaborated on the phonology of interlanguage by making a case for L2 pronunciation errors, stating that variable rules of the interlanguage are among the possible causes of such errors. A relevant effort was also made by the two highly cited papers in the same cluster (Eckman, 1977, 1981). While in the former he considered applying the Contrastive Analysis Hypothesis (CAH) to English and German phonologies and proposed typological markedness as the alternative to CAH to explain the relative degree of difficulty, in the latter he provided data for the postulation of interlanguage phonological rules. The other documents in the interlanguage/interphonology cluster dealt with considerations along similar lines such as syllable structure of interlanguage phonology (e.g., Sato, 1984; Tarone, 1980), built-in syllabus (e.g., Corder, 1967), CAH (Lado, 1957), language transfer and language universals (e.g., Gass, 1979). Alongside these central theoretical concerns, the first period also established key research themes in the field of L2 pronunciation. These themes gained ground in several documents, such as age factors, the critical and sensitive periods for the acquisition of phonological systems (e.g., Flege, 1987a; Krashen, 1973; Neufeld, 1978, 1980; Olson & Samuels, 1973; Oyama, 1976; Snow & Hoefnagel-Höhle, 1977), foreign accents (e.g., Elsendoorn, 1980; Flege, 1981, 1984; Hill, 1970; Scovel, 1969), speech perception and production (e.g., Flege, 1987b; Flege & Eefting, 1987; Flege & Hillenbrand, 1984; MacKain et al., 1981), and comprehensibility (e.g., Gass & Varonis, 1984; Varonis & Gass, 1982).

In the second period, the interlanguage/interphonology cluster grew bigger (Cluster 1 in red), and created the biggest cluster of this period with 22 documents and 188 cocitations to these documents that formed a TLS of 185. In addition to the theoretical insights presented in the first period's interlanguage/interphonology cluster, the new members of this cluster in the second period proposed, or built on, a number of hypotheses. These include Eckman's (1991) Interlanguage Structural Conformity Hypothesis (which assumes that implicational universals operate in the structuring of interlanguage phonology), Major's (1987) Ontogeny Model (which claims that interference decreases over time whereas developmental processes increase, and then decrease), parameter setting in L2 phonology (Broselow & Finer, 1991), and autosegmental and metrical phonology (Goldsmith, 1990). Apart from this cluster, this period also generated two more

https://doi.org/10.1017/S0272263121000966 Published online by Cambridge University Press

meaningful clusters. The one that we called the "age/accent/speech perception-production" cluster (Cluster 2 in green) was a systematic coming together of these constructs as opposed to their positioning in the first period, and took the form of a cluster in real terms, with 21 documents, 178 citations, and a total of 175 TLS. The other meaningful cluster in the second period witnessed the debut of a new concept, that is, L2 pronunciation teaching. It emerged for the first time to form a cluster in company with comprehensibility and intelligibility. Therefore, we termed this cluster (Cluster 3 in blue) "pronunciation teaching/comprehensibility-intelligibility." In terms of L2 pronunciation teaching, through a number of highly cited documents, this cluster suggested reference guides (Celce-Murcia et al., 1996; Morley, 1991; Pennington & Richards, 1986), the *lingua franca core* (LFC) for intelligibility-based pronunciation teaching (Jenkins, 2000), as well as the results of comparative modes of L2 pronunciation instruction (Derwing et al., 1998). With respect to comprehensibility and intelligibility, the documents in this cluster established strong connections with accentedness (e.g., Derwing & Munro, 1997; Munro & Derwing, 1995a, 1995b, 2001). The reason for these terms to be salient together might be that speakers who are perceived as accented can also be highly intelligible (Derwing & Munro, 2015; Munro & Derwing, 1995a). That is to say, this cluster situated research on the concept of accentedness in the context of comprehensibility, intelligibility, and speaking rate whereas its word stem *accent* was mainly approached in terms of the perceived degree and strength in the related documents in Cluster 2 (e.g., Flege, 1988; Flege & Fletcher, 1992; Flege et al., 1995; Piske et al., 2001).

The third period was an established period with considerably higher numbers of cocitations to the references in comparison to the earlier periods. The interlanguage/interphonology cluster that swelled in the second period disappeared in this period. However, the pronunciation teaching/comprehensibility-intelligibility cluster expanded into the biggest cluster in this period (Cluster 1 in red), with 27 documents, 943 cocitations, and a TLS of 928. While two of the pedagogy-oriented documents in this cluster also existed in the related cluster of the second period (Derwing et al., 1998; Jenkins, 2000), its expansion in the third period, no doubt, led to the inclusion of a great deal of new works. Levis (2005) for example, the most-cited document of this cluster with regard to the pedagogy of L2 pronunciation, shed light on the influences of competing ideologies (teasing apart the nativeness and intelligibility principles), identities, and contextual dynamics. Levis questioned the supremacy of native speaker models, challenging the earlier nativist paradigm that viewed nativelike L2 pronunciation to be possible and desirable to achieve, and instead placing the emphasis on helping learners become simply intelligible. Levis (2005) was followed by Derwing and Munro's article (2005) that proposed a research-based approach to the teaching of L2 pronunciation. There were also two comprehensive reference books in this respect: *Teaching Pronunciation* (Celce-Murcia et al., 2010) and *Pronunciation Fundamentals* (Derwing & Munro, 2015). The intellectual focus of the pronunciation teaching component of this cluster was furthered by the research syntheses on the effectiveness of L2 pronunciation instruction (e.g., Lee et al., 2015; Saito, 2012; Thomson & Derwing, 2015). The expansion of the pronunciation teaching/comprehensibility-intelligibility cluster in the third period also extended to the work on the concepts of comprehensibility and intelligibility through newly added documents (e.g., Derwing et al., 2008; Derwing & Munro, 2009; Field, 2005; Hahn, 2004; Isaacs & Trofimovich, 2012; Munro et al., 2006; Trofimovich & Isaacs, 2012).

https://doi.org/10.1017/S0272263121000966 Published online by Cambridge University Press

Two other meaningful clusters in the third period were a result of the fission of the age/accent/speech perception-production cluster that emerged in the second period. Accordingly, "speech perception-production" and "age/accent" took the form of two separate clusters. While the age/accent cluster (Cluster 3 in blue) was a small formation devoted to the same concerns as in the second period with five documents, 192 citations, and 183 TLS, the speech perception-production cluster (Cluster 2 in green) was quite extensive, having 18 documents and 736 citations that received a TLS of 699. By far the most-cited document in the speech perception-production cluster was an instrumental book chapter by Flege (1995). Its guiding role in L2 speech perception-production research seems to result from the content laying out a model of L2 speech learning (SLM), hypotheses regarding the cause of accentedness in L2 speech production, and empirical findings on the perception and production of L2 vowels and consonants. The other highly cited documents in this cluster, among many others, were Best (1995), Best and Tyler (2007), Bradlow et al. (1997), Flege (1987b), and Flege et al. (1997). In the speech perception-production cluster, we also encountered two seemingly irrelevant documents that found a seat with high citations. The first one was a paper from a scholar in the cognitive SLA family (Schmidt, 1990). Having theorized the concepts of noticing and consciousness, this paper was cited in L2 pronunciation research when the researchers elaborated on the link between oral input, learners' noticing, and speech perception (e.g., Trofimovich et al., 2009). This interest in Schmidt echoes in Zhang's (2020) bibliometric analysis of the field of SLA between 1997 and 2018, which found his noticing hypothesis continued to influence the field even after three decades. The other one was Bates et al. (2015) cited by L2 pronunciation researchers when they conducted mixed-effects logistic regression analyses by using the glmer() function in the lme4 package for R (e.g., García-Amaya & Lang, 2020), a package that provides functions to fit and analyze linear, nonlinear, and generalized linear mixed models (Bates et al., 2015).

Trend Analysis

Paper Titles. In another effort to trace the intellectual trajectories of the key terms and themes of L2 pronunciation research in the 629 articles, we first revealed the top ten most frequently occurring terms in the articles' titles across the three periods in a heuristic manner rather than through a predetermined set of terms or themes. Naturally, a paper title could yield more than one key term with an intellectual magnitude, and this was the case in most of the paper titles in our dataset. For instance, we extracted "perception," "production," and "instruction" from the paper titled "The Effects of Perception- vs. Production-Based Pronunciation Instruction," but disregarded "effects" having no significance for our research concern. Moreover, we left out generic terms such as English, language, pronunciation, phonology, EFL, ESL, and L2 while condensing derivatives into one term (e.g., accent|ed|ness). A cautious approach needs to be followed here while interpreting these results as paper titles may not always effectively cover or reflect research orientations.

As shown in Table 1, there are a number of evergreen terms and research themes that were principally addressed in all the periods. These include *perception/production*, *segmentals and suprasegmental features*, *teaching/training/instruction*, *accent*, *speech/speaker*, *native/nonnative*, and *learners/learning*. The terms *perception/*

https://doi.org/10.1017/S0272263121000966 Published online by Cambridge University Press

TABLE 1. Top ten most common terms in the paper titles across the three periods

1977–1991			1992–2006			2007–2020		
Term	N	%	Term	N	%	Term	N	%
perception/ production	12	13%	speech/speaker	33	19%	learners/learning	185	20%
suprasegmental features	11	12%	suprasegmental features	21	12%	perception/ production	134	14%
teaching/training/ instruction	10	11%	perception/production	20	11%	speech/speaker	107	12%
accent	10	11%	teaching/training/ instruction	18	10%	suprasegmental features	101	11%
theories/hypotheses	10	11%	native/nonnative	17	10%	teaching/training/ instruction	94	10%
speech/speaker	10	11%	segmentals	15	9%	segmentals	71	8%
learners/learning	10	11%	accent	14	8%	word/lexi*/ vocabulary	66	7%
native/nonnative	8	8%	word/lexi*/vocabulary	14	8%	native/nonnative	65	7%
adults	7	7%	learners/learning	12	7%	accent	57	6%
segmentals	5	5%	comprehensibility/ intelligibility	10	6%	teachers/classroom	45	5%
Total	**93**	**100%**	**Total**	**174**	**100%**	**Total**	**925**	**100%**

Note: Percentages were rounded and calculated within the top terms. In this way, each term could be assessed in terms of its specific period, without being affected by the widely differing number of articles in different periods.

production, *suprasegmental features*, *teaching/training/instruction,* and *native/nonnative* made up more or less the same proportion of the top frequent terms across the three periods. *Native* was also the most typical collocate of *speaker* in all the three periods. Although nativeness is usually unattainable and unnecessary (Levis, 2020), a possible reason why the nativeness principle remains alive is that L2 pronunciation has evolved separately from other language skill areas in the CLT era, and therefore it continues to stand as an engaging goal for many practitioners and learners (Levis, 2020). Thomson and Derwing's (2015) narrative review also reported most of the studies under scrutiny to have adopted the nativeness principle (63%), followed by the intelligibility principle (24%), while 13% had elements of both. Raising an objection to favoring the nativeness principle, Levis (2020) offers "to embrace the intelligibility principle and consign the nativeness principle to the past" (p. 323). With regard to *segmental* and *suprasegmental (prosod|y|-ic)*, there was a diversity in cooccurrences in the third period, represented by their frequent collocates with *features*, *cues*, *attainment/acquisition*, *perception/production*, *training/instruction*, *information*, and *accuracy.* Collocates of *perception/production* in the second period were characterized by frequent cooccurrences such as *vowel perception/production*, *accent perception*, *speech perception/production*, *speaker(s') production*, and *accurate/accuracy of perception/production* while in the third period, in addition, *learner(s') perception/production*, *tone and sound perception/production*, *perception/production task*, *perception/production training*, *production*

https://doi.org/10.1017/S0272263121000966 Published online by Cambridge University Press

improvement, and *segmental and suprasegmental(prosodic) perception/production* became highly visible. Naturally, *teaching/training/instruction* collocated most often with *pronunciation* in all the periods. The coming together of *explicit* and *instruction* was also quite common in the third period. This could be accounted for by the promising findings on the effectiveness of explicit pronunciation instruction (Derwing et al., 2014; Kissling, 2013; Saito, 2013) that seem to have contributed to the growth of research with such focus.

While *speech/speaker* showed an undulating pattern in the paper titles across the periods, the ratio of *learners/learning* almost doubled and trebled, respectively, from the first and second periods to the third period, making it by far the most common title word in the last period. Cooccurrences such as *speech learning* and *speech sounds* were widespread in the third period. Despite its persistent presence in the paper titles, *accent* was proportionally in a constant state of decrease, and collocated most often with *foreign* in all the periods. *Teachers/classroom* appeared in the top ten list for the first time in the third period. Its emergence in the last period may provide evidence for the migration of L2 pronunciation research, more specifically, pronunciation instruction research, from laboratory settings to classrooms, which is also echoed by Lee et al. (2015). The collocates of *teachers/classroom* were not rich in diversity in the first two periods. In the third period, alongside *teacher training/education*, psychological constructs such as *teacher cognition/beliefs/knowledge/identity* exhibited eminence. This finding shows parallelism with the growing body of research on the learning of pronunciation pedagogy (Kochem, 2021) and the influence of psychological and social factors (Pennington & Rogerson-Revell, 2019a), which is also evident in general applied linguistics research (Lei & Liu, 2019).

In this period, moreover, the typical collocates of *classroom* were *L2*, *observations*, *learning*, *setting/environment*, and *instruction/training*. When coupled with the notable increase in the ratio of *learners/learning* in the last period, this tends to indicate that the field of L2 pronunciation seems to evolve into a more learner- and learning-centered and instructional dimension. This trend may be due in part to the effects of student-centered learning in education and calls from influential scholars such as Oxford (1996) to put the learners in the center of instruction. Previous research also acknowledged this change (Derwing & Munro, 2015; Murphy & Baker, 2015). Taken together, the collocates, along with the results of the citation, cocitation, title word, and Mann–Kendall analyses, tend to show that the field is now somehow structured by the research on L2 pronunciation instruction.

Comprehensibility/intelligibility became visible in the top ten list in the second period whereas it failed to show up in the third period despite its high frequency (n = 42). The other highly frequent key terms in the paper titles of the third period were the technologies (CAPT, ASR, computer, web, podcast, video, Twitter, distance, mobile, apps, mp3, video; n = 44), *bilinguals/bilingualism* (n = 36), *listeners/listening* (n = 32), *experience* (n = 23), and *orthography* (n = 21). One reason for the recently emergent technologies in the paper titles might be that technology seems to be a relatively recent tool of inquiry gaining rapid ground in L2 pronunciation research. Also, there is little reason to deny the role of the concomitant effects of using technological affordances in applied linguistics

https://doi.org/10.1017/S0272263121000966 Published online by Cambridge University Press

research, and by extension, in L2 pronunciation research. This technological uptrend in L2 pronunciation research also seems to be facilitated by the rise of several technology-oriented SLA journals such as *CALL*, *ReCALL*, and *Language Learning & Technology*. The years that *CALL* and *ReCALL* started to be included in the SSCI database are 2010 and 2011, respectively. The coverage of these two journals also plays a role in increasing the number of technology-oriented L2 pronunciation articles.

Mann–Kendall Trend Test. We also conducted a nonparametric Mann–Kendall test (Mann, 1945) to find out whether the top ten key terms that occurred in the paper titles of the three periods, totaling 13 different terms, revealed significant trends in the historical framework. More specifically, on a yearly basis, this analysis included the time slot starting from the first year of appearance (1980–1983, for all the top terms) through 2020. By doing so, this time, we adopted a temporally holistic approach to the trend analysis of the top key terms as opposed to the period-based frequency analyses reported earlier. The trend analysis is illustrated in Table 2, showing the top key terms, levels of significance, and trend directions. The Mann–Kendall test results indicated significant trends for all the top key terms. There was a considerably increasing resort in the paper titles to most of the top terms at $p < 0.01$ level (i.e., *perception/production*, *suprasegmental features*, *teaching/training/instruction*, *accent*, *speech/speaker*, *learners/learning*, *native/nonnative*, *word/lexi*/vocabulary*, *comprehensibility/intelligibility*, *teachers/classroom*), and to some of them at $p < 0.05$ level (i.e., *segmentals*, *adults*).

Starting from Flege's SLM (1995), the terms *perception* and *production* are evergreen because production-based instruction methodologies go as far back as the ALM, which remains in practice today (Heinz, 2013). Despite its proportional decrease in the face of the other key terms in the paper titles in their specific periods, the term *accent* is also in a general increasing trend.

TABLE 2. Trend analysis of the top key terms in the paper titles

	Mann–Kendall test			
Term	Z	S	p	Trend
perception/production	4.30	338	0.000	↑↑↑
suprasegmental features	5.26	441	0.000	↑↑↑
teaching/training/instruction	4.65	389	0.000	↑↑↑
accent	3.72	298	0.000	↑↑↑
theories/hypotheses	–2.48	–170	0.013	↓↓
speech/speaker	4.19	318	0.000	↑↑↑
learners/learning	5.01	421	0.000	↑↑↑
native/nonnative	3.39	254	0.001	↑↑↑
adults	1.97	149	0.048	↑↑
segmentals	4.57	379	0.030	↑↑
word/lexi*/vocabulary	5.71	409	0.000	↑↑↑
comprehensibility/intelligibility	4.11	310	0.000	↑↑↑
teachers/classroom	4.80	336	0.000	↑↑↑

*↑↑, ↑↑↑; significantly increasing trends with $p < 0.05$, $p < 0.01$ respectively. ↓↓; significantly decreasing trend with $p < 0.05$.

https://doi.org/10.1017/S0272263121000966 Published online by Cambridge University Press

INFLUENTIAL AUTHORS AND SOURCES

Citation Analysis of Impact and Cocitation Analysis: Influential Authors

A total of 908 unique authors contributed to the articles published in the 15 journals in the dataset. K. Saito contributed 39 articles. He is followed by P. Trofimovich, having 28 articles. T. M. Derwing, M. J. Munro, J. E. Flege, and T. Isaacs are among the top six, with the article counts of 14, 14, 13, and 12, respectively. R. I. Thomson (n = 8), J. M. Levis (n = 8), O. Kang (n = 7), D. M. Hardison (n = 7), I. R. A. Mackay (n = 5), R. C. Major (n = 5), E. Gatbonton (n = 5), C. T. Best (n = 5), and M. Wang (n = 5) also highlighted with document counts 5. When interpreting the productivity, it must be kept in mind that the authors' article counts were only generated from the 629 articles in the dataset. Otherwise, they are no doubt in a more productive position. With respect to the authors' citation performance revealed in citation analysis of impact, Table A10 in the Appendix displays the top 20 most-cited authors in L2 pronunciation research for the whole period in ranked order of normalized citations adjusted for the time effect and raw citations. The dominance of a number of authors (K. Saito, T. M. Derwing, P. Trofimovich, M. J. Munro) stands out in terms of the normalized citations they received. The other authors that make up the top ten are T. Isaacs, R. I. Thomson, O. Kang, J. E. Flege, R. Lyster, and C. T. Best. Although citation analysis led us to identify the prominent authors, this information needs to be approached with caution because citation analysis, as mentioned before, is limited to the documents in our dataset. Therefore, it is apt to resort to cocitation analysis that is based on authors cited in the reference lists of the reviewed documents, thereby covering a much broader literature. In this way, we can obtain a wider perspective on scholarly impact than basic citation analysis (White & McCain, 1998).

Alongside citation analysis which portrayed the 44-year period holistically, we also conducted cocitation analysis with a view to identifying the influential authors in the field of L2 pronunciation across the three periods, and the potential intellectual affinities between the authors. In the author cocitation analysis, of the 898 unique authors cited between 1977 and 1991, the top 32 most-cited authors had citation counts of a minimum of six. The network map created by the VOSviewer produced four clusters (Figure 6a). Regarding the second period (1992–2006), the minimum number of citations of a cited author was set to 14, creating three clusters for the top 32 most-cited authors out of 2,042 (Figure 6b). Among the 8,011 cited authors in the 2007–2020 period, the top 33 most-cited authors had at least 60 citations and produced three clusters (Figure 6c). The list of the most-cited authors in the three periods is provided in Table A11 in the Appendix.

The top-cited author lists firstly show that J. E. Flege dominated the field with the highest citation scores throughout the three periods. This may be because the most well-known perception-based model, perhaps, is Flege's SLM (Flege, 1995). The model "was designed specifically with the L2 learner in mind, attempting to describe the process by which a learner perceives then comes to produce L2 speech sounds" (Lee et al., 2020, p. 2). This model is directly germane to a large number of L2 pronunciation studies. There were two other scholars who kept their seats in the top lists in all the periods (S. Gass, R. C. Major). A number of theory builders such as L. Selinker, N. Chomsky, R. Lado, and S. Krashen, appeared in the top list of the first period only. Theory-building is a central plank of research

https://doi.org/10.1017/S0272263121000966 Published online by Cambridge University Press

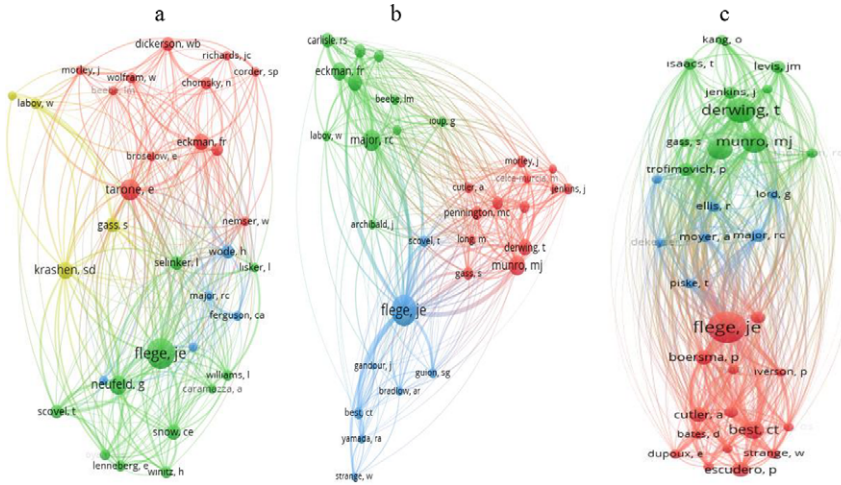


FIGURE 6. The network maps of the most-cited authors in (a) 1977–1991, (b) 1992–2006, and (c) 2007–2020.

in any field. This finding can be attributed to the fact that these theory builders are foundational in mainstream SLA research. A number of scholars (e.g., M. C. Pennington, M. Celce-Murcia, C. J. Sato) appeared in the second period for the first time, and then disappeared in the third period. Some of the scholars (e.g., E. Tarone, F. R. Eckman, T. Scovel, J. Morley, W. Labov) stayed in the top list in the first two periods but disappeared in the third period. A possible reason for this could be the natural theoretical evolution such as the increased use of new theories and paradigms (e.g., usage-based theories, EIL pedagogy) alongside the ones coming from the general field of education (e.g., individual differences, learning strategies, self-paced learning) and distant disciplines (e.g., music, computer science), which is also the case in general applied linguistics research (Lei & Liu, 2019). A number of scholars entered the list in the second period, and remained increasingly influential in the third period, best exemplified by T. M. Derwing, M. J. Munro, C. T. Best, and A. Cutler. Of these, especially Derwing and Munro dominated the field by resolving the inconsistencies among accentedness, intelligibility, and comprehensibility. These authors inspired researchers publishing on these constructs and gave impetus to many of the studies conducted recently. The top list of the third period also welcomed newly added scholars, such as, in order of citation count, K. Saito, P. Boersma, P. Escudero, P. Trofimovich, J. M. Levis, T. Isaacs, P. K. Kuhl, Y. Wang, and R. I. Thomson. Several scholars from the cognitive-interactionist family, such as R. Ellis, R. DeKeyser, and M. Long also appeared together in the top list of the third period.

The network maps (Figure 6) visualize the intellectual structure of the field of L2 pronunciation by clarifying some meaningful clusters and intellectual links between some of the highly influential authors. For example, the 1977–1991 map identifies the "theorists" cluster (Cluster 1 in red), comprising the pioneers of the approximative system (W. Nemser), CAH (R. Lado), Markedness Differential Hypothesis (F. R. Eckman), Universal Grammar (N. Chomsky), and interlanguage phonology (E. Tarone). The 1992–2006 map shows some of the scholars taking center stage in the first cluster (M. J. Munro,

https://doi.org/10.1017/S0272263121000966 Published online by Cambridge University Press

T. M. Derwing), second cluster (R. C. Major, F. R Eckman, E. Tarone), and third cluster (J. E. Flege). The 2007–2020 map reveals the strongest intellectual affinities built by some of the highly influential authors in this period (e.g., in order of LS [link strength], J. E. Flege–C. T. Best with 64.96, M. J. Munro–T. M. Derwing with 62.04, T. M. Derwing–K. Saito with 51.30, J. E. Flege–T. M. Derwing with 41.40, and J. E. Flege–M. J. Munro with 40.83). The intellectual affinity of Derwing and Munro is long-standing, and they have been instrumental in the remarkable strength of Canadian researchers in L2 pronunciation (e.g., K. Saito, P. Trofimovich, R. Thomson). Saito worked with Munro as a postdoctoral researcher, and studied under Trofimovich. Many of these researchers also have long-standing connections through the annual "Pronunciation in Second Language Learning and Teaching (PSLLT)" conferences and serving on the editorial board of the *JSLP*.

In these lists of the most highly cited authors in L2 pronunciation research, we can see the effects of both the eclectic nature of the SLA field and its evolving development. The inclusion of applied linguists, theoretical linguists, educators, teacher education specialists, methodologists, cognitive psychologists, and those from relevant disciplines altogether present a field that values applied and theoretical perspectives toward phonetics, phonology, and the learning and teaching of L2 pronunciation.

Citation Analysis of Impact and Cocitation Analysis: Influential Sources

Table A12 in the Appendix displays the citation analysis performance of the 15 journals in the dataset in ranked order of normalized citations adjusted for the time effect. *Language Learning* is by far the most-cited journal (n = 121.85). It is followed by other influential journals, such as *Studies in Second Language Acquisition (SSLA)* (n = 77.53), *TESOL Quarterly* (n = 70.32), *Applied Psycholinguistics* (n = 70.07), *Bilingualism-Language and Cognition* (n = 63.16), and *Applied Linguistics* (n = 40.68). However, *Language Teaching Research* (n = 14.82), *Computer Assisted Language Learning* (n = 13.64), *ELT Journal* (n = 2.47), and *ReCALL* (n = 2.45), with normalized citation counts as few as below 15, seem to have limited intellectual impact on the work in L2 pronunciation research in the dataset (*cf.* the number of raw citations and document counts per journal in Table A12 of the Appendix for a fuller picture).

In the source cocitation analysis, to establish tangible outcomes, the 1977–1991 and 1992–2006 periods were integrated into a single period, and formed the earlier period. When the default setting of the VOSviewer algorithm was preserved (i.e., the minimum number of citations of a source being 20), out of 2,090 sources, 32 met the threshold in the earlier period whereas the latter period (2007–2020) generated 143 publication venues out of 5,129. Table A13 in the Appendix shows the list of the 32 most-cited sources in the earlier period and the top ten most-cited sources in each cluster in the latter period.

The intellectual structures of the top publication sources are visualized in Figure 7. The network map identified three clusters in the earlier period (Figure 7a). The largest cluster in this period (Cluster 1 in red) firstly included influential phonetics and speech-oriented journals such as *Journal of Acoustical Society of America (JASA)*, *Journal of Phonetics*, and *Language and Speech.* There were also relatively less influential journals and books in this cluster with similar foci such as *Phonetica*, *Journal of Speech, Language and Hearing Research*, and *Speech Perception and Linguistic Experience: Issues in Cross-Language Research.* Moreover, this cluster included journals with a focus on psychology

https://doi.org/10.1017/S0272263121000966 Published online by Cambridge University Press

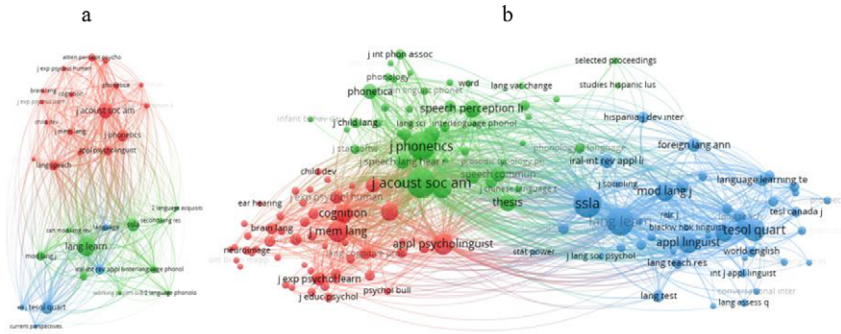


FIGURE 7. The network maps of the most-cited sources in (a) 1977–2006 and (b) 2007–2020.

and psycholinguistics such as *Applied Psycholinguistics*, *Journal of Memory and Language*, *Cognition*, *Brain and Language*, and *Attention, Perception, & Psychophysics.* The other two clusters in this period (Cluster 2 in green and Cluster 3 in blue), as in Cluster 1, illustrate intertwinements, but this time in the sense that both of these clusters are an interweave of the sources centered on SLA/T (Second Language Acquisition and Teaching), on the one hand, and linguistics/phonological focus, on the other. Cluster 2, for example, includes SLA/T sources such as *Language Learning*, *SSLA*, and *Applied Linguistics* as well as those with linguistics/phonological focus such as the books *Interlanguage Phonology: The Acquisition of a Second Language Sound System* and *First and Second Language Phonology.* Likewise, in Cluster 3, *TESOL Quarterly*, *IRAL–International Review of Applied Linguistics*, and *ELT Journal* sit together with the book *Current Perspectives on Pronunciation: Practices Anchored in Theory* and the journal *Language*, which "publishes peer-reviewed articles dealing with issues in linguistic theory" as mentioned in the website. In the earlier period, overall, the most influential publication venues were *Language Learning*, *JASA*, *TESOL Quarterly*, *SSLA*, and *Journal of Phonetics* (with citation counts of 414, 259, 203, 183, 154 and TLS of 308.92, 207.57, 143.76, 157.08, 138.98, respectively). The most established links in this period, displaying intellectual affinities, were built between *Language Learning–TESOL Quarterly* (LS = 42.65), *Language Learning–SSLA* (LS = 35.10), and *JASA–Journal of Phonetics* (LS = 26.29).

The latter period (2007–2020) presents a well-defined three-clustered structure (Figure 7b). The first cluster (Cluster 1 in red, with 53 sources) was named the "Psycholinguistics" cluster and most effectively represented by the journals such as *Journal of Memory and Language*, *Applied Psycholinguistics*, *Cognition*, *Bilingualism-Language and Cognition*, and *Attention, Perception, & Psychophysics.* The second cluster (Cluster 2 in green, with 46 sources) was entitled the "Phonetics/Speech" cluster, strongly represented by the sources such as *JASA*, *Journal of Phonetics*, *Language and Speech*, focused theses, and *Speech Perception and Linguistic Experience: Issues in Cross-Language Research.* The third cluster (Cluster 3 in blue, with 44 sources) was labeled as the "SLA-T" cluster. The strongholds of this cluster were the journals such as *SSLA*, *Language Learning*, *TESOL Quarterly*, *Applied Linguistics*, and *Modern Language Journal.* Overall, the most influential sources in this period were *JASA*, *SSLA*,

https://doi.org/10.1017/S0272263121000966 Published online by Cambridge University Press

Language Learning, *Journal of Phonetics*, *TESOL Quarterly*, *Journal of Memory and Language*, *Applied Psycholinguistics*, *Language and Speech*, and *Applied Linguistics* (with citation counts of 1,323, 1,106, 1,096, 1,031, 630, 489, 487, 447, 442 and TLS of 1124.86, 990.74, 974.96, 913.87, 559.42, 448.62, 465.11, 430.76, 415.44, respectively). Starting from the earlier period, especially in the latter period, these journals hold the flagship position, that is, the most consistently visible sources in cocitation analysis resorted by researchers in their efforts to access and cite research on L2 pronunciation. While the sources show a tendency to receive more citations in the latter period considering the higher number of articles in comparison to the earlier period, some noticeable changes are evident in some of the journals' ranking in the top-cited lists of the two periods (e.g., rises: *Journal of Memory and Language* from #14 to #6, *SSLA* from #4 to #2, *Cognition* from #16 to #11; falls: *Language Learning* from #1 to #3, *TESOL Quarterly* from #3 to #5, *IRAL* from #7 to #21). Also, some of the sources entered the top-cited list in the latter period (e.g., *Bilingualism-Language and Cognition*, *Praat: Doing Phonetics by Computer*, *System*, *Foreign Language Annals*), whereas some of the sources disappeared in the top-cited list in the latter period (e.g., *Language*, *Journal of Child Language*, *Journal of Psycholinguistic Research*, and *Interlanguage Phonology: The Acquisition of a Second Language Sound System*). As a result, it is possible to recommend the sources in the three clusters, in order of intellectual impact, to the researchers and readers of L2 pronunciation who would like to keep abreast of inspiring documents and experts in the heartland of L2 pronunciation research. The sources that became visible in the latter period such as *Praat: Doing Phonetics by Computer* and *System* point to the increasing role of technology in L2 pronunciation research. Praat's manual is a highly cited source used by researchers in their efforts to record student responses and conduct phonetic analysis. This tool contributed to the implementation of CAPT practices, providing endless opportunities for repetition and exposure to a wide range of target language speech (Pennington & Rogerson-Revell, 2019b) and for the improvement of segmental and suprasegmental features (Fouz-González, 2020). Similarly, *System* is an international journal that mainly publishes articles on educational technology and applied linguistics. In the latter period, the strongest associations were observed between *JASA–Journal of Phonetics* (LS = 130.57), *SSLA–Language Learning* (LS = 113.55), *JASA–SSLA* (LS = 72.31), *Language Learning–TESOL Quarterly* (LS = 65.81), *JASA–Language Learning* (LS = 62.17), *SSLA–Journal of Phonetics* (LS = 59.75), *Language Learning–Applied Linguistics* (LS = 53.13), and *SSLA–TESOL Quarterly* (LS = 51.81).

CONCLUSION

In this study, we have conducted a bibliometric survey of the articles published in the internationally renowned applied linguistics journals to map L2 pronunciation research over the past 44 years. The citation analyses of impact and cocitation analyses revealed the featured documents, influential sources, and authors that altogether form the schools of thought and intellectual background of the field. The network maps of the cited references, authors, and publication sources allowed us to visualize the intellectual structure of the field of L2 pronunciation by clarifying some meaningful clusters and intellectual links between some of the highly influential documents, authors, and sources. As the first of its kind in L2 pronunciation research, the results of this study also bear significant

https://doi.org/10.1017/S0272263121000966 Published online by Cambridge University Press

implications for researchers and future research directions. The results have the potential to enable L2 pronunciation researchers to stay up-to-date regarding the emergent and evolving research trends, make informed decisions regarding their research agenda, and choose from among contemporary L2 pronunciation research themes, subthemes, perspectives, and methodologies.

The present study mainly suffers coverage limitations. Our inclusion of the 15 prestigious journals and 629 articles for bibliometric analyses necessarily excluded other influential publications. Due to practical constraints, our dataretrieval practice put non-SSCI and some of the SSCI-indexed journals, non-English articles, and other types of publications aside. Greater numbers of sources and documents could have resulted in a fuller picture of the development of the field. Moreover, the validity of bibliometric studies could be leveraged through interviewing field professionals. Despite these limitations, the present study is an insightful endeavor to map and illustrate the intellectual dynamics of L2 pronunciation research.

SUPPLEMENTARY MATERIAL

To view supplementary material for this article, please visit http://doi.org/10.1017/S0272263121000966.

REFERENCES

Al-Hoorie, A. H., & Vitta, J. P. (2019). The seven sins of L2 research: A review of 30 journals' statistical quality and their CiteScore, SJR, SNIP, JCR Impact Factors. *Language Teaching Research*, *23*, 727–744. https://doi.org/10.1177/1362168818767191.

Anderson-Hsieh, J., & Koehler, K. (1988). The effect of foreign accent and speaking rate on native speaker comprehension. *Language Learning*, *38*, 561–613. https://doi.org/10.1111/j.1467-1770.1988.tb00167.x

Andrews, J. E. (2003). An author co-citation analysis of medical informatics. *Journal of the Medical Library Association*, *91*, 47–56. https://doi.org/10.5860/crln.47.1.91

Baker, A. A. (2011). Discourse prosody and teachers' stated beliefs and practices. *TESOL Journal*, *2*, 263–292. https://doi.org/10.5054/tj.2011.259955

Baker, A. A. (2014). Exploring teachers' knowledge of second language pronunciation techniques: Teacher cognitions, observed classroom practices, and student perceptions. *TESOL Quarterly*, *48*, 136–163. https://doi.org/10.1002/tesq.99

Bates, D., Machler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software*, *67*, 1–48. https://doi.org/10.18637/jss.v067.i01

Beelen, K., Thijm, T. A., Cochrane, C., Halvemaan, K., Hirst, G., Kimmins, M., … Polyanovsky, R. (2017). Digitization of the Canadian parliamentary debates. *Canadian Journal of Political Science/Revue canadienne de science politique*, *50*, 849–864. https://doi.org/10.1017/S0008423916001165

Best, C. T. (1995). A direct realist view of cross-language speech perception. In W. Strange (Ed.), *Speech perception and linguistic experience: Issues in cross-language research* (pp. 171–204). York.

Best, C. T., & Tyler, M. D. (2007). Nonnative and second-language speech perception: Commonalities and complementarities. In O.-S. Bohn & M. J. Munro (Eds.), *Language experience in second language speech learning* (pp. 13–34). Benjamins.

Bliss, H., Abel, J., & Gick, B. (2018). Computer-assisted visual articulation feedback in L2 pronunciation instruction: A review. *Journal of Second Language Pronunciation*, *4*, 129– 153. https://doi.org/10.1075/jslp.00006.bli

https://doi.org/10.1017/S0272263121000966 Published online by Cambridge University Press

Bohn, O. S., & Flege, J. E. (1990). Interlingual identification and the role of foreign language experience in L2 vowel perception. *Applied Psycholinguistics*, *11*, 303–328. https://doi.org/10.1017/S0142716400008912

Borden, G., Gerber, A., & Milsark, G. (1983). Production and perception of the /r/-/l/ contrast in Korean adults learning English. *Language Learning*, *33*, 499–526. https://doi.org/10.1111/j.1467-1770.1983.tb00946.x

Bradlow, A. R., Pisoni, D. B., Akahane-Yamada, R., & Tohkura, Y. I. (1997). Training Japanese listeners to identify English /r/ and /l: IV. Some effects of perceptual learning on speech production. *The Journal of the Acoustical Society of America*, *101*, 2299–2310. https://doi.org/10.1121/1.418276

Broselow, E., & Finer, D. (1991). Parameter setting in second language phonology and syntax. *Interlanguage Studies Bulletin (Utrecht)*, *7*, 35–59. https://doi.org/10.1177/026765839100700102

Carlson, M. T., Goldrick, M., Blasingame, M., & Fink, A. (2016). Navigating conflicting phonotactic constraints in bilingual speech perception. *Bilingualism: Language and Cognition*, *19*, 939–954. https://doi.org/10.1017/S1366728915000334

Celce-Murcia, M., Brinton, D. M., & Goodwin, J. M. (1996). *Teaching pronunciation: A reference for teachers of English to speakers of other languages*. Cambridge University.

Celce-Murcia, M., Brinton, D. M., & Goodwin, J. M. (2010). *Teaching pronunciation: A course book and reference guide*. Cambridge University.

Chen, M. L. (2018). A data-driven critical review of second language acquisition in the past 30 years. *Publications*, *6*, 33–61. https://doi.org/10.3390/publications6030033

Chen, M. R. A., Hwang, G. J., Majumdar, R., Toyokawa, Y., & Ogata, H. (2021). Research trends in the use of E-books in English as a foreign language (EFL) education from 2011 to 2020: A bibliometric and content analysis. *Interactive Learning Environments*, 1–17. https://doi.org/10.1080/10494820.2021.1888755

Cobo, M. J., López-Herrera, A. G., Herrera-Viedma, E., & Herrera, F. (2011). Sciencemapping software tools: Review, analysis, and cooperative study among tools. *Journal of the American Society for Information Science and Technology*, *62*, 1382–1402. https://doi.org/10.1002/asi.21525

Corder, S. P. (1967). The significance of learners' errors. *International Review of Applied Linguistics*, *5*, 161–170. https://doi.org/10.1515/iral.1967.5.1-4.161

Couper, G. (2017). Teacher cognition of pronunciation teaching: Teachers' concerns and issues. *TESOL Quarterly*, *51*, 820–843. https://doi.org/10.1002/tesq.354

Deng, J., Holtby, A., Howden-Weaver, L., Nessim, L., Nicholas, B., Nickle, K., Pannekoek, C.,Stephan, S., & Sun, M. (2009). *English pronunciation research: The neglected orphan of second language acquisition studies?* (WP 05-09). Prairie Metropolis Centre.

de Oliveira, O. J., da Silva, F. F., Juliani, F., Barbosa, L. C. F. M., & Nunhes, T. V. (2019). Bibliometric method for mapping the state-of-the-art and identifying research gaps and trends in literature: An essential instrument to support the development of scientific projects. In *Scientometrics Recent Advances.* IntechOpen. https://doi.org/10.5772/intechopen.85856

Derwing, T. M., & Munro, M. J. (1997). Accent, intelligibility, and comprehensibility: Evidence from four L1s. *Studies in Second Language Acquisition*, *19*, 1–16. https://doi.org/10.1017/S0272263197001010

Derwing, T. M., & Munro, M. J. (2001). What speaking rates do non-native listeners prefer? *Applied Linguistics*, *22*, 324–337. https://doi.org/10.1093/applin/22.3.324

Derwing, T. M., & Munro, M. J. (2005). Second language accent and pronunciation teaching: A research-based approach. *TESOL Quarterly*, *39*, 379–397. https://doi.org/10.2307/358848

Derwing, T. M., & Munro, M. J. (2009). Putting accent in its place: Rethinking obstacles to communication. *Language Teaching*, *42*, 476–490. https://doi.org/10.1017/S026144480800551X

Derwing, T. M., & Munro, M. J. (2013). The development of L2 oral language skills in two L1 groups: A 7-year study. *Language Learning*, *63*, 163–185. https://doi.org/10.1111/lang.12000

Derwing, T. M., & Munro, M. J. (2015). *Pronunciation fundamentals: Evidence-based perspectives for L2 teaching and research*. John Benjamins.

Derwing, T. M., Munro, M. J., Foote, J. A., Waugh, E., & Fleming, J. (2014). Opening the window on comprehensible pronunciation after 19 years: A workplace training study. *Language Learning*, *64*, 526–548. https://doi.org/10.1111/lang.12053

Derwing, T. M., Munro, M. J., & Thomson, R. I. (2008). A longitudinal study of ESL learners' fluency and comprehensibility development. *Applied Linguistics*, *29*, 359–380. https://doi.org/10.1093/applin/amm041

Derwing, T. M., Munro, M. J., & Wiebe, G. (1998). Evidence in favor of a broad framework for pronunciation instruction. *Language Learning*, *48*, 393–410. https://doi.org/10.1111/0023-8333.00047

https://doi.org/10.1017/S0272263121000966 Published online by Cambridge University Press

Dong, D., & Chen, M. L. (2015). Publication trends and co-citation mapping of translation studies between 2000 and 2015. *Scientometrics*, *105*, 1111–1128. https://doi.org/10.1007/s11192-015-1769-1

Ducate, L., & Lomicka, L. (2009). Podcasting: An effective tool for honing language students' pronunciation? *Language Learning & Technology*, *13*, 66–86.

Eckman, F. R. (1977). Markedness and the contrastive analysis hypothesis. *Language Learning*, *27*, 315–330. https://doi.org/10.1111/j.1467-1770.1977.tb00124.x

Eckman, F. R. (1981). On the naturalness of interlanguage phonological rules. *Language Learning*, *31*, 195–216. https://doi.org/10.1111/j.1467-1770.1981.tb01379.x

Eckman, F. R. (1991). The structural conformity hypothesis and the acquisition of consonant clusters in the interlanguage of ESL learners. *Studies in Second Language Acquisition*, *13*, 23–41. https://doi.org/10.1017/S0272263100009700

Egbert, J. (2007). Quality analysis of journals in TESOL and applied linguistics. *TESOL Quarterly*, *41*, 157–171. https://doi.org/10.2307/40264335.

Eisenstein, M., & Verdi, G. (1985). The intelligibility of social dialects for working-class adult learners of English. *Language Learning*, *35*, 287–298. https://doi.org/10.1111/j.1467-1770.1985.tb01029.x

Elsendoorn, B. (1980). Vowel durations as a cue to a Dutch foreign accent in English CVC-words. *Progress Report of the Institute of Phonetics*, *5*, 64–86.

Escudero, P., & Boersma, P. (2004). Bridging the gap between L2 speech perception research and phonological theory. *Studies in Second Language Acquisition*, *26*, 551–585. https://doi.org/10.1017/S0272263104040021

Fahimnia, B., Sarkis, J., & Davarzani, H. (2015). Green supply chain management: A review and bibliometric analysis. *International Journal of Production Economics*, *162*, 101–114. https://doi.org/10.1016/j.ijpe.2015.01.003

Fayer, J. M., & Krasinski, E. (1987). Native and nonnative judgments of intelligibility and irritation. *Language Learning*, *37*, 313–326. https://doi.org/10.1111/j.14671770.1987.tb00573.x

Field, J. (2005). Intelligibility and the listener: The role of lexical stress. *TESOL Quarterly*, *39*, 399–423. https://doi.org/10.2307/3588487

Flege, J. E. (1980). Phonetic approximation in second language acquisition. *Language Learning*, *30*, 117–134. https://doi.org/10.1111/j.1467-1770.1980.tb00154.x

Flege, J. E. (1981). The phonological basis of foreign accent: A hypothesis. *TESOL Quarterly*, *15*, 443–455. https://doi.org/10.2307/3586485

Flege, J. E. (1984). The detection of French accent by American listeners. *The Journal of the Acoustical Society of America*, *76*, 692–707. https://doi.org/10.1121/1.391256

Flege, J. E. (1987a). A critical period for learning to pronounce foreign languages? *Applied Linguistics*, *8*, 162–177. https://doi.org/10.1093/applin/8.2.162

Flege, J. E. (1987b). The production of "new" and "similar" phones in a foreign language: Evidence for the effect of equivalence classification. *Journal of Phonetics*, *15*, 47–65. https://doi.org/10.1016/S0095-4470(19)30537-6

Flege, J. E. (1988). Factors affecting degree of perceived foreign accent in English sentences. *The Journal of the Acoustical Society of America*, *84*, 70–79. https://doi.org/10.1121/1.396876

Flege, J. E. (1995). Second-language speech learning: Theory, findings, and problems. In W. Strange (Ed.), *Speech perception and linguistic experience: Issues in cross-language research* (pp. 229–273). York.

Flege, J. E., Bohn, O. S., & Jang, S. (1997). Effects of experience on non-native speakers' production and perception of English vowels. *Journal of Phonetics*, *25*, 437–470. https://doi.org/10.1006/jpho.1997.0052

Flege, J. E., & Eefting, W. (1987). Production and perception of English stops by native Spanish speakers. *Journal of Phonetics*, *15*, 67–83. https://doi.org/10.1016/S0095-4470(19)30538-8

Flege, J. E., & Fletcher, K. L. (1992). Talker and listener effects on degree of perceived foreign accent. *The Journal of the Acoustical Society of America*, *91*, 370–389. https://doi.org/10.1121/1.402780

Flege, J. E., & Hillenbrand, J. (1984). Limits on phonetic accuracy in foreign language speech production. *The Journal of the Acoustical Society of America*, *76*, 708–721. https://doi.org/10.1121/1.391257

Flege, J. E., & MacKay, I. R. (2004). Perceiving vowels in a second language. *Studies in Second Language Acquisition*, *26*, 1–34. https://doi.org/10.1017/S0272263104261010

Flege, J. E., Munro, M. J., & MacKay, I. R. (1995). Factors affecting strength of perceived foreign accent in a second language. *The Journal of the Acoustical Society of America*, *97*, 3125–3134. https://doi.org/10.1121/1.413041

https://doi.org/10.1017/S0272263121000966 Published online by Cambridge University Press

Fouz-González, J. (2020). Using apps for pronunciation training: An empirical evaluation of the English File Pronunciation app. *Language Learning & Technology*, *24*, 62–85. https://doi.org/10125/44709

García-Amaya, L., & Lang, S. (2020). Filled pauses are susceptible to cross-language phonetic influence: Evidence from Afrikaans-Spanish bilinguals. *Studies in Second Language Acquisition*, *42*, 1077–1105. https://doi.org/10.1017/S0272263120000169

Gass, S. (1979). Language transfer and universal grammatical relations. *Language Learning*, *29*, 327–344. https://doi.org/10.1111/j.1467-1770.1979.tb01073.x

Gass, S. M., Lee, J., & Roots, R. (2007). Firth and Wagner (1997): New ideas or a new articulation? *The Modern Language Journal*, *91*, 788–799. https://doi.org/10.1111/j.1540-4781.2007.00669.x

Gass, S., & Varonis, E. M. (1984). The effect of familiarity on the comprehensibility of nonnative speech. *Language Learning*, *34*, 65–87. https://doi.org/10.1111/j.1467-1770.1984.tb00996.x

Goldsmith, J. A. (1990). *Autosegmental and metrical phonology*. Basil Blackwell.

Granda-Orive, J. I., Alonso-Arroyo, A., García-Río, F., Solano-Reina, S., Jiménez-Ruiz, C. A., & Aleixandre-Benavent, R. (2013). Certain advantages of scopus compared with web of science in a bibliometric analysis related to smoking. *Revista Espa˜nola de Documentación Científica*, *36*, 1–9. http://doi.org/10.3989/redc.2013.2.941

Gumpenberger, C., Wieland, M., & Gorraiz, J. (2012). Bibliometric practices and activities at the University of Vienna. *Library Management*, *33*, 174–183. https://doi.org/10.1108/01435121211217199

Gülmez, D., Özteke, İ., & Gümüş, S. (2021). Overview of educational research from Turkey published in international journals: A bibliometric analysis. *Education and Science*, *46*, 213–239. https://doi.org/10.15390/EB.2020.9317

Hahn, L. D. (2004). Primary stress and intelligibility: Research to motivate the teaching of suprasegmentals. *TESOL Quarterly*, *38*, 201–223. https://doi.org/10.2307/3588378

Hallinger, P., & Kovačević, J. (2019). A bibliometric review of research on educational administration: Science mapping the literature, 1960 to 2018. *Review of Educational Research*, *89*, 335–369. https://doi.org/10.3102/0034654319830380

Hardison, D. M. (2003). Acquisition of second-language speech: Effects of visual cues, context, and talker variability. *Applied Psycholinguistics*, *24*, 495–522. https://doi.org/10.1017/S0142716403000250

Heinz, M. (2013). A preliminary survey of the preferred learning methods for interpretation students. *Journal of International Education Research*, *9*, 293–304. https://doi.org/10.19030/jier.v9i4.8081

Heradio, R., De La Torre, L., Galan, D., Cabrerizo, F. J., Herrera-Viedma, E., & Dormido, S. (2016). Virtual and remote labs in education: A bibliometric analysis. *Computers & Education*, *98*, 14–38. https://doi.org/10.1016/j.compedu.2016.03.010

Hernández-Vásquez, A., & Rosselli, D. (2017). A bibliometric analysis of the global research on sofosbuvir. *F1000Research*, *6*, 1536. https://doi.org/10.12688/f1000research.12314.1

Hill, J. H. (1970). Foreign accents, language acquisition, and cerebral dominance revisited. *Language Learning*, *20*, 237–248. https://doi.org/10.1111/j.1467-1770.1970.tb00480.x

Hodne, B. (1985). Yet another look at interlanguage phonology: The modification of English syllable structure by native speakers of Polish. *Language Learning*, *35*, 405–417. https://doi.org/10.1111/j.1467-1770.1985.tb01084.x

Isaacs, T. (2009). Integrating form and meaning in L2 pronunciation instruction. *TESL Canada Journal*, *27*, 1–12. https://doi.org/10.18806/tesl.v27i1.1034

Isaacs, T. (2018). Shifting sands in second language pronunciation teaching and assessment research and practice. *Language Assessment Quarterly*, *15*, 273–293. https://doi.org/10.1080/15434303.2018.1472264

Isaacs, T., & Trofimovich, P. (2012). Deconstructing comprehensibility: Identifying the linguistic influences on listeners' L2 comprehensibility ratings. *Studies in Second Language Acquisition*, *34*, 475–505. https://doi.org/10.1017/S0272263112000150

Ioannidis, J. P. A., Boyack, K., & Wouters, P. F. (2016). Citation metrics: A primer on how (not) to normalize. *PLoS Biology*, *14*, 1–7. https://doi.org/10.1371/journal.pbio.1002542

Isaacs, T., & Trofimovich, P. (2016). Key themes, constructs, and interdisciplinary perspectives in second language pronunciation assessment. In T. Isaacs and P. Trofimovich (Eds.), *Second language pronunciation assessment: Interdisciplinary perspectives* (pp. 3–11). Multilingual Matters.

Jenkins, J. (2000). *The phonology of English as an international language*. Oxford University.

Jenkins, J. (2002). A sociolinguistically based, empirically researched pronunciation syllabus for English as an international language. *Applied Linguistics*, *23*, 83–103. https://doi.org/10.1093/applin/23.1.83

https://doi.org/10.1017/S0272263121000966 Published online by Cambridge University Press

Kang, O. (2010). Relative salience of suprasegmental features on judgments of L2 comprehensibility and accentedness. *System*, *38*, 301–315. https://doi.org/10.1016/j.system.2010.01.005

Kang, O., Rubin, D. O. N., & Pickering, L. (2010). Suprasegmental measures of accentedness and judgments of language learner proficiency in oral English. *The Modern Language Journal*, *94*, 554–566. https://doi.org/10.1111/j.1540-4781.2010.01091.x

Kelly, L. G. (1969). *25 Centuries of Language Teaching*. Newbury House.

Kissling, E. M. (2013). Teaching pronunciation: Is explicit phonetics instruction beneficial for FL learners? *Modern Language Journal*, *97*, 720–44. https://doi.org/10.1111/j.1540-4781.2013.12029.x

Kochem, T. (2021). Exploring the connection between teacher training and teacher cognitions related to L2 pronunciation instruction. *TESOL Quarterly*, 1–27. https://doi.org/10.1002/tesq.3095

Koster, C. J., & Koet, T. (1993). The evaluation of accent in the English of Dutchmen. *Language Learning*, *43*, 69–92. https://doi.org/10.1111/j.1467-1770.1993.tb00173.x

Krashen, S. D. (1973). Lateralization, language learning, and the critical period: Some new evidence. *Language Learning*, *23*, 63–74. https://doi.org/10.1111/j.1467-1770.1973.tb00097.x

Lado, R. (1957). *Linguistics across cultures: Applied linguistics for language teachers*. University of Michigan.

Lee, J., Jang, J., & Plonsky, L. (2015). The effectiveness of second language pronunciation instruction: A meta-analysis. *Applied Linguistics*, *36*, 345–366. https://doi.org/10.1093/applin/amu040

Lee, B., Plonsky, L., & Saito, K. (2020). The effects of perception- vs. production-based pronunciation instruction. *System*, *88*, 1–13. https://doi.org/10.1016/j.system.2019.102185

Lei, L., & Liu, D. (2019). Research trends in applied linguistics from 2005 to 2016: A bibliometric analysis and its implications. *Applied Linguistics*, *40*, 540–561. https://doi.org/10.1093/applin/amy003

Levis, J. M. (2005). Changing contexts and shifting paradigms in pronunciation teaching. *TESOL Quarterly*, *39*, 369–377. https://doi.org/10.2307/3588485

Levis, J. M. (2020). Revisiting the intelligibility and nativeness principles. *Journal of Second Language Pronunciation*, *6*, 310–328. https://doi.org/10.1075/jslp.20050.lev

Levis, J. M., & Sonsaat, S. (2017). Pronunciation teaching in the early CLT era. In O. Kang, R. Thomson, & J. Murphy (Eds.), *The Routledge handbook of English pronunciation* (pp. 267–283). Routledge.

Levis, J. M., & Sonsaat, S. (2020). Publication venues for L2 pronunciation research. *Journal of Second Language Pronunciation*, *6*, 1–11. https://doi.org/10.1075/jslp.20007.lev

Liao, H. C., Tang, M., Luo, L., Li, C., Chiclana, F., & Zeng, X. J. (2018). A bibliometric analysis and visualization of medical big data research. *Sustainability*, *10*, 166–183. https://doi.org/10.3390/su10010166

MacKain, K. S., Best, C. T., & Strange, W. (1981). Categorical perception of English /r/ and /l/ by Japanese bilinguals. *Applied Psycholinguistics*, *2*, 369–390. https://doi.org/10.1017/S0142716400009796

Major, R. C. (1987). A model for interlanguage phonology. In G. Loup & S. H. Weinberger (Eds.), *Interlanguage phonology: The acquisition of a second language sound system* (pp. 101–124). Newbury House.

Mann, H. B. (1945). Nonparametric tests against trend. *Econometrica: Journal of the Econometric Society*, *13*, 245–259. https://doi.org/10.2307/1907187

Morley, J. (1991). The pronunciation component in teaching English to speakers of other languages. *TESOL Quarterly*, *25*, 481–520. https://doi.org/10.2307/3586981

Munro, M. J., & Derwing, T. M. (1995a). Foreign accent, comprehensibility, and intelligibility in the speech of second language learners. *Language Learning*, *45*, 73–97. https://doi.org/10.1111/j.1467-1770.1995.tb00963.x

Munro, M. J., & Derwing, T. M. (1995b). Processing time, accent, and comprehensibility in the perception of native and foreign-accented speech. *Language and Speech*, *38*, 289–306. https://doi.org/10.1177%2F002383099503800305

Munro, M. J., & Derwing, T. M. (1999). Foreign accent, comprehensibility, and intelligibility in the speech of second language learners. *Language Learning*, *49*, 285–310. https://psycnet.apa.org/doi/10.1111/0023-8333.49.s1.8

Munro, M. J., & Derwing, T. M. (2001). Modeling perceptions of the accentedness and comprehensibility of L2 speech: The role of speaking rate. *Studies in Second Language Acquisition*, *23*, 451–468. https://doi.org/10.1017/S0272263101004016

Munro, M. J., & Derwing, T. M. (2015). A prospectus for pronunciation research in the 21st century: A point of view. *Journal of Second Language Pronunciation*, *1*, 11–42. https://doi.org/10.1075/jslp.1.1.01mun

Munro, M. J., & Derwing, T. M. (2020). Foreign accent, comprehensibility and intelligibility, redux. *Journal of Second Language Pronunciation*, *6*, 283–309. https://doi.org/10.1075/jslp.20038.mun

https://doi.org/10.1017/S0272263121000966 Published online by Cambridge University Press

Munro, M. J., Derwing, T. M., & Morton, S. L. (2006). The mutual intelligibility of L2 speech. *Studies in Second Language Acquisition*, *28*, 111–131. https://psycnet.apa.org/doi/10.1017/S0272263106060049

Munro, M. J., Flege, J. E., & MacKay, I. R. (1996). The effects of age of second language learning on the production of English vowels. *Applied Psycholinguistics*, *17*, 313–334. https://doi.org/10.1017/S0142716400007967

Murphy, J. M. & Baker, A. A. (2015). History of ESL pronunciation teaching. In M. Reed & J. M. Levis (Eds.), *The Handbook of English Pronunciation* (pp. 36–65). Wiley-Blackwell. https://doi.org/10.1002/9781118346952.ch3

Nagle, C., Levis, J., & Todey, E. (2019). The changing face of L2 pronunciation research and teaching. In J. Levis, C. Nagle, & E. Todey (Eds.), *Proceedings of the 10th Pronunciation in Second Language Learning and Teaching Conference*, September 2018 (pp. 1–9). Iowa State University. https://lib.dr.iastate.edu/language_conf/12

Neufeld, G. G. (1978). On the acquisition of prosodic and articulatory features in adult language learning. *Canadian Modern Language Review*, *34*, 163–174. https://doi.org/10.3138/cmlr.34.2.163

Neufeld, G. G. (1980). On the adult's ability to acquire phonology. *TESOL Quarterly*, *14*, 285–298. https://doi.org/10.2307/3586595

Olson, L. L., & Jay Samuels, S. (1973). The relationship between age and accuracy of foreign language pronunciation. *The Journal of Educational Research*, *66*, 263–268. https://doi.org/10.1080/00220671.1973.10884476

Osareh, F. (1996). Bibliometrics, citation analysis and co-citation analysis: A review of literature I. *Libri*, *46*, 149–158. https://doi.org/10.1515/libr.1996.46.3.149

Oxford, R. L. (1996). (Ed.). *Language learning strategies around the world: Cross-cultural perspectives*. University of Hawaii.

Oyama, S. (1976). A sensitive period for the acquisition of a nonnative phonological system. *Journal of Psycholinguistic Research*, *5*, 261–283. https://doi.org/10.1007/BF01067377

Özçınar, H. (2015). Mapping teacher education domain: A document co-citation analysis from 1992 to 2012. *Teaching and Teacher Education*, *47*, 42–61. https://doi.org/10.1016/j.tate.2014.12.006

Parish, C. (1977). A practical philosophy of pronunciation. *TESOL Quarterly*, *11*, 311–317. https://doi.org/10.2307/3586027

Patkowski, M. S. (1990). Age and accent in a second language: A reply to James Emil Flege. *Applied Linguistics*, *11*, 73–89. https://doi.org/10.1093/applin/11.1.73

Pelzl, E., Lau, E. F., Guo, T., & DeKeyser, R. (2019). Advanced second language learners' perception of lexical tone contrasts. *Studies in Second Language Acquisition*, *41*, 59–86. https://doi.org/10.1017/S0272263117000444

Pennington, M. C. (2021). Teaching pronunciation: The state of the art 2021. *RELC Journal*, *52*, 3–21. https://doi.org/10.1177/00336882211002283

Pennington, M. C., & Richards, J. C. (1986). Pronunciation revisited. *TESOL Quarterly*, *20*, 207–225. https://doi.org/10.2307/3586541

Pennington, M. C., & Rogerson-Revell, P. (2019a). Relating pronunciation research and practice. In *English Pronunciation Teaching and Research* (pp. 401–463). Palgrave Macmillan.

Pennington, M. C., & Rogerson-Revell, P. (2019b). Using technology for pronunciation teaching, learning, and assessment. In *English Pronunciation Teaching and Research* (pp. 235–286). Palgrave Macmillan.

Piske, T., MacKay, I. R., & Flege, J. E. (2001). Factors affecting degree of foreign accent in an L2: A review. *Journal of Phonetics*, *29*, 191–215. https://doi.org/10.1006/jpho.2001.0134

Plonsky, L., & Derrick, D. J. (2016). A meta-analysis of reliability coefficients in second language research. *The Modern Language Journal*, *100*, 538–553. https://doi.org/10.1111/modl.12335

Plonsky, L., & Ghanbar, H. (2018). Multiple regression in L2 research: A methodological synthesis and guide to interpreting R2 values. *The Modern Language Journal*, *102*, 713–731. https://doi.org/10.1111/modl.12509

Pritchard, A. (1969). Statistical bibliography or bibliometrics. *Journal of Documentation*, *25*, 348–349. https://doi.org/10.1108/eb026482

Richards, J., & Rodgers, T. (2014). *Approaches and methods in language teaching*. Cambridge University.

Roemer, R. C., & Borchardt, R. (2015). *Meaningful metrics: A 21st-century librarian's guide to bibliometrics, altmetrics, and research impact*. American Library Association.

Saito, K. (2012). Effects of instruction on L2 pronunciation development: A synthesis of 15 quasi-experimental intervention studies. *TESOL Quarterly*, *46*, 842–854. https://doi.org/10.1002/tesq.67

https://doi.org/10.1017/S0272263121000966 Published online by Cambridge University Press

Saito, K. (2013). Re-examining effects of form-focused instruction on L2 pronunciation development: The role of explicit phonetic information. *Studies in Second Language Acquisition*, *35*, 1–29. https://doi.org/10.1017/S0272263112000666

Saito, K. (2021). What characterizes comprehensible and native-like pronunciation among English-as-a-second-language speakers? Meta-analyses of phonological, rater, and instructional factors. *TESOL Quarterly*, *55*, 866–900. https://doi.org/10.1002/tesq.3027

Saito, K., Dewaele, J. M., Abe, M., & In'nami, Y. (2018). Motivation, emotion, learning experience, and second language comprehensibility development in classroom settings: A cross-sectional and longitudinal study. *Language Learning*, *68*, 709–743. https://doi.org/10.1111/lang.12297

Saito, K., & Lyster, R. (2012). Effects of form-focused instruction and corrective feedback on L2 pronunciation development of /ɹ/ by Japanese learners of English. *Language Learning*, *62*, 595–633. https://doi.org/10.1111/j.1467-9922.2011.00639.x

Saito, K., & Plonsky, L. (2019). Effects of second language pronunciation teaching revisited: A proposed measurement framework and meta-analysis. *Language Learning*, *69*, 652–708. https://doi.org/10.1111/lang.12345

Saito, K., Trofimovich, P., & Isaacs, T. (2016). Second language speech production: Investigating linguistic correlates of comprehensibility and accentedness for learners at different ability levels. *Applied Psycholinguistics*, *37*, 217–240. https://doi.org/10.1017/S0142716414000502

Saito, K., Trofimovich, P., & Isaacs, T. (2017). Using listener judgments to investigate linguistic influences on L2 comprehensibility and accentedness: A validation and generalization study. *Applied Linguistics*, *38*, 439–462. https://doi.org/10.1093/applin/amv047

Sakai, M., & Moorman, C. (2018). Can perception training improve the production of Second Language phonemes? A meta-analytic review of 25 years of perception training research. *Applied PsychoLinguistics*, *39*, 187–224. https://doi.org/10.1017/S0142716417000418

Sato, C. J. (1984). Phonological processes in second language acquisition: Another look at interlanguage syllable structure. *Language Learning*, *34*, 43–58. https://doi.org/10.1111/j.1467-1770.1984.tb00351.x

Schmidt, R. W. (1990). The role of consciousness in second language learning. *Applied Linguistics*, *11*, 129–158. https://doi.org/10.1093/applin/11.2.129

Scovel, T. (1969). Foreign accents, language acquisition, and cerebral dominance. *Language Learning*, *19*, 245–253. https://doi.org/10.1111/j.1467-1770.1969.tb00466.x

Selinker, L. (1972). Interlanguage. *International Review of Applied Linguistics*, *10*, 219–231. https://doi.org/10.1515/iral.1972.10.1-4.209

Shen, G., & Froud, K. (2019). Electrophysiological correlates of categorical perception of lexical tones by English learners of Mandarin Chinese: An ERP study. *Bilingualism: Language and Cognition*, *22*, 253–265. https://doi.org/10.1017/S136672891800038X

Shiau, W. L., Chen, S. Y., & Tsai, Y. C. (2015). Management information systems issues: Co-citation analysis of journal articles. *International Journal of Electronic Commerce Studies*, *6*, 145–162. https://doi.org/10.7903/ijecs.1393

Small, H. (1973). Co-citation in the scientific literature: A new measure of the relationship between two documents. *Journal of the Association for Information Science and Technology*, *24*, 265–269. https://doi.org/10.1002/asi.4630240406

Small, H. (1999). Visualizing science by citation mapping. *Journal of the American Society for Information Science*, *50*, 799–813. https://doi.org/10.1002/(SICI)1097-4571(1999)50:9<799::AID-ASI9>3.0.CO;2-G

Smith, L. E., & Bisazza, J. A. (1982). The comprehensibility of three varieties of English for college students in seven countries. *Language Learning*, *32*, 259–269. https://doi.org/10.1111/j.1467-1770.1982.tb00971.x

Smotrova, T. (2017). Making pronunciation visible: Gesture in teaching pronunciation. *TESOL Quarterly*, *51*, 59–89. https://doi.org/10.1002/tesq.276

Snow, C. E., & Hoefnagel-Höhle, M. (1977). Age differences in the pronunciation of foreign sounds. *Language and Speech*, *20*, 357–365. https://doi.org/10.1177/002383097702000407

Tarone, E. (1978). The phonology of interlanguage. In J. Richards (Ed.), *Understanding second and foreign language learning* (pp. 15–33). Newbury House.

Tarone, E. (1980). Some influences on the syllable structure of interlanguage phonology. *International Review of Applied Linguistics*, *18*, 139–152.

Thompson, I. (1991). Foreign accents revisited: The English pronunciation of Russian immigrants. *Language Learning*, *41*, 177–204. https://doi.org/10.1111/j.1467-1770.1991.tb00683.x

https://doi.org/10.1017/S0272263121000966 Published online by Cambridge University Press

Thomson, R. I. (2018). High variability [pronunciation] training (HVPT): A proven technique about which every language teacher and learner ought to know. *Journal of Second Language Pronunciation*, *4*, 208–231. https://doi.org/10.1075/jslp.17038.tho

Thomson, R. I., & Derwing, T. M. (2015). The effectiveness of L2 pronunciation instruction: A narrative review. *Applied Linguistics*, *36*, 326–344. https://doi.org/10.1093/applin/amu076

Trofimovich, P., & Isaacs, T. (2012). Disentangling accent from comprehensibility. *Bilingualism: Language and Cognition*, *15*, 905–916. https://doi.org/10.1017/S1366728912000168

Trofimovich, P., Lightbown, P. M., Halter, R. H., & Song, H. (2009). Comprehension-based practice: The development of L2 pronunciation in a listening and reading program. *Studies in Second Language Acquisition*, *31*, 609–639. https://doi.org/10.1017/S0272263109990040

Tsai, P. (2019). Beyond self-directed computer-assisted pronunciation learning: A qualitative investigation of a collaborative approach. *Computer Assisted Language Learning*, *32*, 713–744. https://doi.org/10.1080/09588221.2019.1614069

UCCLLT (2009). Considerations for evaluation of applied linguists in language, literature, and culture departments in the UC system. Unpublished manuscript http://uccllt.ucdavis.edu/white-papers/evaluation-white-paper5.15.pdf

Van Eck, N. J., & Waltman, L. (2009). How to normalize cooccurrence data? An analysis of some wellknown similarity measures. *Journal of the American Society for Information Science and Technology*, *60*, 1635–1651. https://doi.org/10.1002/asi.21075

Van Eck, N. J., & Waltman, L. (2020). *VOSviewer manual*. Univeristeit Leiden.

Van Eck, N. J., Waltman, L., Dekker, R., & van den Berg, J. (2010). A comparison of two techniques for bibliometric mapping: Multidimensional scaling and VOS. *Journal of the Association for Information Science and Technology*, *61*, 2405–2416. https://doi.org/10.1002/asi.21421

Van Els, T., & De Bot, K. (1987). The role of intonation in foreign accent. *The Modern Language Journal*, *71*, 147–155. https://doi.org/10.1111/j.1540-4781.1987.tb01597.x

VanPatten, B., & Williams, J. (2002). *Research criteria for tenure in second language acquisition: Results from a survey of the field*. *Unpublished manuscript*. University of Illinois at Chicago, Chicago, IL.

Van Raan, A. F. (2014). Advances in bibliometric analysis: Research performance assessment and science mapping. *Bibliometrics*, *3*, 17–28.

Varonis, E. M., & Gass, S. (1982). The comprehensibility of non-native speech. *Studies in Second Language Acquisition*, *4*, 114–136. https://doi.org/10.1017/S027226310000437X

Vogel, R. (2014). What happened to the public organization? A bibliometric analysis of public administration and organization studies. *The American Review of Public Administration*, *44*, 383–408. https://doi.org/10.1177/0275074012470867

Werker, J. F. (1986). The effect of multilingualism. *Applied Psycholinguistics*, *7*, 141–156. https://doi.org/10.1017/S0142716400007360

White, H. D., & McCain, K. W. (1998). Visualizing a discipline: An author co-citation analysis of information science, 1972–1995. *Journal of the American Society for Information Science*, *49*, 327–355. https://doi.org/10.1002/(SICI)1097-4571(19980401)49:4<327::AID-ASI4>3.0.CO;2-4

Wong, P. C., & Perrachione, T. K. (2007). Learning pitch patterns in lexical identification by native English-speaking adults. *Applied Psycholinguistics*, *28*, 565–585. https://doi.org/10.1017/S0142716407070312

Xiang, C., Wang, Y., Liu, H. (2017). A scientometrics review on nonpoint source pollution research. *Ecological Engineering*, *99*, 400–408. https://doi.org/10.1016/j.ecoleng.2016.11.028

Zhang, X. (2020). A bibliometric analysis of second language acquisition between 1997 and 2018. *Studies in Second Language Acquisition*, *42*, 199–222. https://doi.org/10.1017/S0272263119000573

https://doi.org/10.1017/S0272263121000966 Published online by Cambridge University Press