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| REVIEW ARTICLE

Cross-Linguistic Influence in Third-Language Phonological Acquisition: A Systematic Mapping Review of Empirical Research, 2010-2026

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| ABSTRACT

Research on third-language (L3) phonological acquisition has grown considerably, but the evidence remains dispersed across language combinations, phonological domains, methods, and theoretical traditions. This systematic mapping review synthesizes a verified corpus of 47 empirical studies published between 2010 and 2026 and distinguishes them from 16 Arab-world and Moroccan publications retained for regional contextualization. The corpus was assembled through focused bibliographic searching, publisher and DOI verification, and backward and forward citation chaining from major reviews of L3 transfer and phonology. Studies were coded for publication period, geographical context, language constellation, phonological domain, method, theoretical orientation, and proposed source of cross-linguistic influence. The mapping shows that research is strongly concentrated in European contexts and in production-oriented studies of consonants, stops, and voice onset time, whereas vowels, stress, prosody, perception-based designs, and longitudinal work remain comparatively limited. Only two core studies directly represented North-African or Arabic-speaking multilingual contexts, and none focused specifically on Moroccan or Amazigh-speaking L3 learners. The evidence does not support a single universal source of transfer; rather, L1, L2, heritage-language, proficiency-based, and property-specific effects are foregrounded across different studies. No confirmed core study explicitly applied Optimality Theory, although OT appears in regional pronunciation research. The review argues for more geographically diverse, theoretically explicit, perception-production, longitudinal, and vowel-focused L3 phonology research, with Moroccan multilingualism offering a particularly valuable testing ground for future work.

| KEYWORDS

third-language acquisition; phonological transfer; cross-linguistic influence; multilingualism; speech perception; speech production; systematic mapping review

| ARTICLE INFORMATION

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1. Introduction

Multilingualism is no longer treated as an exceptional condition at the margins of second language acquisition (SLA). In many educational and social settings, learners approach a new language with knowledge of two or more previously acquired languages, each of which may remain available during comprehension, production, and learning. The study of third and additional language acquisition emerged from the recognition that such learners cannot be described adequately through models based on a single L1-L2 relationship (Rothman, Cabrelli Amaro, & de Bot, 2013; Rothman, González Alonso, & Puig-Mayenco, 2019).

Third-language acquisition differs from conventional L2 acquisition because several previously acquired systems may serve as sources of cross-linguistic influence. A learner may draw on the L1, the L2, a heritage language, or features distributed across more than one language. The source of influence may also vary across linguistic properties. Language status, typological or structural similarity, proficiency, recency of use, exposure, dominance, age of acquisition, and learning context can all condition which system

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becomes active. Influence may be progressive, affecting the developing L3, or regressive, reshaping established L1 or L2 categories. The multilingual repertoire is therefore better understood as an interacting system than as a set of permanently independent languages.

Several models have been proposed to explain transfer-source selection. The L2 Status Factor gives a privileged role to a previously acquired non-native language because the L2 and L3 share non-native status (Williams & Hammarberg, 1998; Bardel & Falk, 2012). The Cumulative Enhancement Model assumes that all prior languages remain available and that transfer occurs when earlier knowledge facilitates acquisition (Flynn, Foley, & Vinnitskaya, 2004). The Typological Primacy Model proposes that initial transfer is drawn from the previously acquired language perceived as globally closest to the L3 (Rothman, 2011, 2015). Property-by-property accounts, including the Linguistic Proximity Model and the Scalpel Model, allow different L3 features to receive influence from different prior languages (Slabakova, 2017; Westergaard et al., 2017).

Although these models have shaped contemporary L3 research, their development and testing have relied heavily on syntax and morphosyntax. Questions concerning the initial state of L3 grammar, word order, agreement, determiner systems, and verb placement have occupied a central position in the theoretical literature. Puig-Mayenco, González Alonso, and Rothman (2020), for example, offered a systematic review of L3 transfer but concentrated primarily on morphosyntactic evidence. Phonological research has not received an equivalent level of cumulative synthesis.

Phonology offers a particularly revealing domain in which to examine multilingual transfer. Learners must perceive unfamiliar distinctions, establish or reorganize phonetic categories, acquire new phonotactic patterns, and control segmental and suprasegmental properties. Previously acquired languages may facilitate learning when they contain similar contrasts, but they may also encourage substitution, category assimilation, neutralization, epenthesis, altered temporal patterns, or non-target stress and intonation. An L3 sound may resemble an L1 category in one respect and an L2 category in another, creating conditions in which global transfer from a single language is unlikely to explain the entire developing system.

Empirical work on L3 speech has gradually expanded. The 2010 special issue of the International Journal of Multilingualism provided an early concentration of studies on positive transfer, voice onset time (VOT), vowels, global accent, and the relative roles of language distance and language status. Subsequent research addressed rhotics, sibilants, laterals, coda obstruents, lexical tone, rhythm, intonation, speech perception, longitudinal change, heritage-language influence, and task effects. State-of-the-art discussions by Cabrelli Amaro and Wrembel (2016), the collection edited by Wrembel and Cabrelli Amaro (2018), and the later reviews by Wang and Nance (2023) and Wrembel (2023) established L3 phonology as a recognizable, though still developing, subfield.

The evidence nevertheless remains difficult to compare. Studies differ in their definitions of the L3, language constellations, proficiency measures, participant profiles, elicitation tasks, acoustic variables, and theoretical assumptions. Some examine one sound contrast at the beginning of instruction, whereas others investigate advanced multilinguals or heritage speakers. Production studies use reading, repetition, spontaneous speech, and accentedness ratings; perception studies use identification, discrimination, or assimilation tasks. These differences make it difficult to identify the dominant phonological domains, assess the balance between perception and production, or determine whether the field supports consistent L1, L2, or combined transfer patterns.

Geographical representation constitutes a further concern. Much of the available evidence involves European languages and European research contexts. Arab, North-African, and Amazigh-speaking populations remain much less visible, despite the theoretical value of multilingual settings in which Arabic varieties, Amazigh languages, French, English, and other languages interact. Morocco is particularly relevant: English learners may have experience with Tashlhit or another Amazigh language, Moroccan Arabic, Modern Standard Arabic, and French. Such repertoires allow researchers to test language status, structural proximity, and property-specific transfer across typologically distinct systems.

Regional pronunciation research does exist, but it cannot automatically be treated as evidence of L3 acquisition. Some Moroccan and Arab-world studies investigate English vowels, consonants, clusters, stress, or phonotactics without establishing that English is the participants' third language or without reporting a sufficiently detailed linguistic history. A rigorous synthesis must therefore distinguish empirical L3 phonology from regional L2 or EFL pronunciation research while still recognizing the latter as important contextual evidence.

The present article addresses these issues through a systematic mapping review of a verified corpus of empirical L3 phonology studies published between 2010 and 2026. Earlier foundational sources are retained to explain the development of transfer theory, while Arab-world and Moroccan publications are mapped separately as regional supporting literature. The purpose is not to estimate a pooled effect size or claim an exhaustive census of every publication. Rather, the review organizes the accessible empirical evidence, identifies recurrent patterns, and makes the boundaries of the corpus explicit.

The review addresses five questions: (1) Which phonological domains are most frequently represented in the corpus? (2) Which sources of cross-linguistic influence are foregrounded in the studies? (3) Which theoretical frameworks and methodological

approaches are used? (4) To what extent are Arab, North-African, Moroccan, and Amazigh-speaking contexts represented? and (5) Which theoretical, methodological, linguistic, and geographical gaps emerge from the mapped evidence?

Table 1. Foundational models used to interpret transfer in L3 research

Model	Key source(s)	Central claim	Relevance to L3 phonology
Language roles and L2 Status Factor	Williams & Hammarberg (1998); Hammarberg (2001); Bardel & Falk (2012)	A previously acquired non-native language may be highly activated because the L2 and L3 share non-native status.	Relevant to L2-accented production, VOT, and effects of L2 experience.
Cumulative Enhancement Model	Flynn et al. (2004)	All previously acquired languages are available; transfer is predicted when it facilitates acquisition.	Useful for positive transfer and multilingual advantages.
Phonological Permeability Hypothesis	Cabrelli Amaro & Rothman (2010)	Previously acquired non-native phonological systems remain open to influence during further language learning.	Directly addresses interaction and regressive influence among phonological systems.
Typological Primacy Model	Rothman (2011, 2015)	Initial transfer is selected from the previously acquired language perceived as globally closest to the L3.	Supports predictions based on language distance, but was developed primarily for morphosyntax.
Linguistic Proximity Model	Westergaard et al. (2017)	Transfer proceeds property by property from the structurally closest prior language.	Particularly suitable for segmental and prosodic evidence that points to different sources.
Scalpel Model	Slabakova (2017)	Transfer is selective and conditioned by linguistic, cognitive, and experiential factors.	Useful for heterogeneous findings across sounds and tasks.

2. Methodology

2.1 Review design and scope

The study adopted a systematic mapping-review design. Mapping reviews are appropriate when a field contains heterogeneous research questions, methods, language combinations, and outcome measures that cannot be combined meaningfully in a statistical meta-analysis. The objective was to describe the distribution and characteristics of the evidence rather than calculate a pooled effect. The reporting structure was informed by the transparency principles of PRISMA 2020, particularly the use of explicit eligibility criteria, traceable classifications, and clear separation between included empirical evidence and contextual sources (Page et al., 2021).

The analytical corpus comprised 47 empirical studies of L3 or additional-language phonological acquisition published from 2010 to the search cut-off of 11 June 2026. Sixteen additional publications concerning Morocco, North Africa, or the wider Arab world were retained as regional supporting literature. Ten foundational theoretical publications and six review or methodological sources were used to frame the analysis but were not included in the empirical frequency counts.

An L3 was operationally defined as a language learned after the learner had acquired or developed knowledge of at least two other languages. The numerical labels L1, L2, and L3 referred primarily to order or status in the learner's repertoire rather than to equal levels of proficiency. Studies of bilingual participants learning an additional language were eligible when the target language was demonstrably treated as an L3 or additional language and the study examined the influence of prior linguistic knowledge on phonetic or phonological outcomes.

2.2 Corpus identification and bibliographic verification

Corpus construction began with three high-relevance review sources: Cabrelli Amaro and Wrembel (2016), Puig-Mayenco et al. (2020), and Wang and Nance (2023). Their reference lists were used to establish a seed set of empirical L3 phonology studies and to identify recurrent terminology. Additional publications were located through focused searches using combinations of third language, L3, additional language, phonology, phonetics, pronunciation, vowel, consonant, VOT, stress, prosody, intonation,

perception, production, transfer, and cross-linguistic influence. Regional searches added Morocco, Moroccan, Maghreb, North Africa, Arabic, Amazigh, Berber, Tashlhit, Tunisia, Algeria, and corresponding French-language terms.

Searches were conducted across Google Scholar, publisher platforms, DOI records, IMIST and regional journal websites, and institutional repositories. Backward citation searching was used to identify earlier studies, and forward citation searching was used to locate later work building on frequently cited publications. Each record was checked against a publisher page, DOI registration, journal page, institutional repository, or full-text publication when available. Bibliographic records with insufficient information were retained only as background sources or excluded from the core corpus.

The process produced a verified library of 79 sources: 47 core empirical L3 phonology studies, 16 regional supporting publications, 10 foundational theoretical sources, and six reviews or methodological publications. Because the corpus was assembled iteratively through targeted searching and citation chaining rather than a fully exported multi-database search with recorded duplicate counts, the review is presented as a systematic evidence map rather than as an exhaustive PRISMA systematic review.

2.3 Eligibility criteria

Table 2. Eligibility criteria for the core empirical corpus

Criterion	Included	Excluded from core corpus
Publication period	Published between 2010 and 11 June 2026	Earlier empirical studies; later publications outside the cut-off
Research focus	Original empirical research on L3/additional-language phonetics or phonology	Syntax, morphology, vocabulary, motivation, or non-phonological outcomes
Linguistic profile	Participants had knowledge of at least two languages before or while learning the target language	Clearly L2-only populations without an additional-language context
Outcomes	Vowels, consonants, VOT, clusters, phonotactics, stress, rhythm, tone, prosody, intonation, global accent, perception, or production	No identifiable phonetic or phonological variable
Cross-linguistic relevance	The study examined or permitted analysis of prior-language influence, typological similarity, status, dominance, proficiency, or exposure	Pronunciation research with no relationship to prior linguistic knowledge
Publication type	Peer-reviewed articles, scholarly chapters, and substantive peer-reviewed proceedings	Editorials, teaching materials, informal webpages, and abstracts without sufficient detail
Accessibility	Sufficient full-text or bibliographic information for coding and verification	Records that could not be assessed reliably

Review articles, theoretical papers, and descriptive phonological sources were excluded from the empirical counts but retained when they contributed to the conceptual framework or regional interpretation. Regional L2 or EFL studies were mapped separately and were not combined with the L3 corpus unless they met all core criteria.

2.4 Data extraction and classification

A structured matrix was used to record authorship, publication year, outlet, geographical context, participant profile, language constellation, phonological domain, research method, theoretical orientation, principal relevance, DOI or source link, and corpus status. Phonological domains were coded as vowels, consonants, stops/VOT, clusters and phonotactics, stress, rhythm, tone, prosody, intonation, global accent, or broad phonological acquisition. Multiple coding was permitted when a study addressed more than one domain.

Methodological orientation was coded as production-focused, perception-focused, combined perception and production, or general empirical/comparative analysis. The proposed source of transfer was classified as L1 or heritage-language influence, L2 status/experience/proficiency, combined or multiple-source influence, or not sufficiently explicit in the matrix. This final category was used whenever an abstract-level summary did not justify a stronger result-level claim.

Theoretical coding recorded explicit use of the L2 Status Factor, language distance, the Phonological Permeability Hypothesis, PAM/PAM-L2, the Speech Learning Model, dynamic-systems approaches, property-by-property transfer, the Linguistic Proximity Model, or other named accounts. Optimality Theory was recorded separately because of its relevance to Moroccan and Arab-world pronunciation research.

2.5 Data synthesis

The evidence was synthesized through descriptive mapping and structured narrative analysis. Counts and percentages were calculated for publication period, geographical context, methodological orientation, and major phonological domain. Because studies could receive more than one domain or theoretical code, percentages in multi-label tables were not expected to sum to 100%.

The narrative synthesis compared the concentration of research across phonological domains, the balance between perception and production, reported or foregrounded transfer sources, and the representation of regional contexts. Contradictory findings were retained rather than collapsed into a single conclusion. No meta-analysis was attempted because of substantial variation in language combinations, tasks, acoustic variables, proficiency measures, and statistical procedures.

3. Results

3.1 Composition and development of the corpus

The core corpus contained 47 empirical studies published between 2010 and 2026. Nine studies appeared from 2010 to 2014, 15 from 2015 to 2019, 15 from 2020 to 2023, and eight from 2024 to the June 2026 cut-off. Thus, 30 studies (63.8%) were published between 2015 and 2023, indicating that L3 phonological acquisition became a more visible empirical area during the middle and later part of the period.

The corpus was geographically concentrated. Twenty-nine studies (61.7%) were coded as Europe-only contexts. Seven studies involved Asian or Asia-linked contexts, six were international or multiregional, three were North American or Canadian, one represented Northern Africa, and one represented a Middle-Eastern or Arabic-speaking multilingual context. Methodologically, 24 studies (51.1%) were production-focused, eight (17.0%) were perception-focused, five (10.6%) combined perception and production, and 10 (21.3%) were general empirical, comparative, or reanalysis-based.

Table 3. General distribution of the 47 core empirical studies

Dimension	Category	n	%
Publication period	2010-2014	9	19.1%
	2015-2019	15	31.9%
	2020-2023	15	31.9%
	2024-2026	8	17.0%
Geographical context	Europe only	29	61.7%
	Asia or Asia-linked	7	14.9%
	International/multiregional	6	12.8%
	North America/Canada	3	6.4%
	Northern Africa	1	2.1%
	Middle East/Arabic-speaking	1	2.1%
Methodological orientation	Production-focused	24	51.1%
	Perception-focused	8	17.0%
	Combined perception-production	5	10.6%
	General/comparative/reanalysis	10	21.3%

3.2 Distribution across phonological domains

Research was distributed unevenly across phonological domains. Consonants, stops, and VOT formed the largest identifiable category: 21 studies (44.7%) examined stop timing, rhotics, sibilants, laterals, coda obstruents, or related consonantal phenomena. The concentration was visible throughout the period, from early VOT studies to recent longitudinal work on L3 Norwegian and Polish stops.

Vowels and vowel-length contrasts were examined in seven studies (14.9%). These studies addressed child L3 English vowels, acoustic interactions among L1, L2, and L3 systems, vowel-length perception, and German vowel-length production. Although the vowel evidence is theoretically valuable for category assimilation and acoustic approximation, it remains smaller than the consonant/VOT literature.

Suprasegmental research was limited. Five studies addressed rhythm, intonation, lexical tone, or broader prosodic properties, and only one core study was explicitly coded for stress. Sixteen studies were broad or non-domain-specific, including work on global accent, general speech perception, multi-feature production, or phonological transfer across several properties.

Table 4. Core studies classified by major phonological domain

Domain	n	% of corpus	General pattern
Consonants, stops, and VOT	21	44.7%	Largest domain; strong emphasis on stop timing and production
Vowels and vowel length	7	14.9%	Smaller but growing; frequently acoustic or duration-based
Prosody, rhythm, intonation, and tone	5	10.6%	Limited and internally diverse suprasegmental research
Stress	1	2.1%	Substantial gap in the mapped corpus
Broad or non-domain-specific phonology	16	34.0%	Global accent, general perception, transfer, or multi-feature studies

Note. Multiple coding was permitted; percentages are not mutually exclusive and should not be summed.

3.3 Methodological patterns

Production-oriented designs dominated the literature. Acoustic measurement was especially common in studies of VOT, vowel quality, vowel duration, sibilants, laterals, and coda obstruents. Reading tasks, elicited speech, repetition, and accentedness ratings were also frequent. By contrast, eight studies were perception-focused, and five combined perception and production. The imbalance is important because production differences cannot be assumed to reflect perceptual categorization or phonological representation directly.

Longitudinal evidence was uncommon. Kartushina and Martin (2019), Nelson (2022), Cal and Wrembel (2025), and Kopečková (2025) were among the relatively small group of studies that examined development over time. Most of the corpus relied on cross-sectional comparisons between language groups, proficiency levels, or learner profiles. Measures of proficiency, dominance, exposure, and typological similarity also varied considerably, reducing direct comparability and making a statistical meta-analysis inappropriate.

3.4 Transfer-source patterns

The mapped evidence did not support a single universal source of phonological transfer. Six studies foregrounded L1 or heritage-language influence, and six explicitly examined L2 status, L2 experience, or L2 proficiency. Four studies considered combined, dynamic, or multiple-source influence. For 31 studies, the available study-level coding did not justify a definitive result-level assignment to an L1, L2, or combined category.

The balance among the explicitly classified studies suggests that source selection is conditioned by the feature, learner profile, and task rather than by one fixed hierarchy. L2-accented production and language-status effects remain relevant, but heritage-language work shows that the L1 may remain active even when it is not dominant. North-African evidence also supports a property-by-property analysis in which segmental and prosodic properties may draw on different prior systems.

Table 5. Transfer-source emphasis in the mapped corpus

Transfer-source category	n	%	Interpretation
L1 or heritage-language influence foregrounded	6	12.8%	L1/heritage language was central to the design or interpretation
L2 status, experience, or proficiency foregrounded	6	12.8%	L2 status or experience was tested explicitly
Combined, dynamic, or multiple-source influence	4	8.5%	Several prior languages or feature-specific sources were considered
Source not explicit enough for definitive coding	31	66.0%	The available coding did not support a definitive source assignment

3.5 Geographical and regional representation

European research settings accounted for almost two-thirds of the core corpus. The most common language combinations involved English, German, French, Spanish, Polish, Italian, Danish, Norwegian, or other European languages. This concentration has generated detailed knowledge about a relatively narrow set of multilingual configurations, but it limits the extent to which general transfer models have been tested across typologically and sociolinguistically different repertoires.

Only two core studies directly represented North-African or Arabic-speaking multilingual contexts: Archibald (2022), which analysed L1 Arabic-L2 French-L3 English evidence from Algeria and Tunisia, and Norman, Prior, and Degani (2025), which investigated Arabic-Hebrew-English trilinguals. No confirmed core study focused specifically on Moroccan L3 learners or an explicitly Amazigh-Arabic-English or Amazigh-French-English group.

Sixteen regional publications were therefore retained outside the core corpus. Seven were Morocco-specific and addressed diphthongs, word stress, English vowels among Tashlhit speakers, Moroccan Arabic phonotactics, Amazigh-Arabic contact, Tashlhit phonetics, or Moroccan Arabic variation. Four regional studies had conditional relevance to the L3 corpus because their participants were multilingual or English was described as a third language, but the evidence was not combined with the core counts without full satisfaction of all criteria.

Table 6. Representation of Arab, Moroccan, and Amazigh contexts

Category	n	Interpretation
Core studies representing North-African or Arabic-speaking multilingual contexts	2	Included in the 47-study corpus
Confirmed core studies focused specifically on Moroccan L3 learners	0	No such study in the mapped core corpus
Arab-world and Moroccan supporting publications	16	Mapped separately for contextualization
Morocco-specific supporting publications	7	Vowels, stress, phonotactics, contact, and description
Regional studies with conditional core relevance	4	Require strict L3-status verification
Supporting studies directly involving Amazigh/Tashlhit	3	Kula & Louriz; Lahrouchi; Ridouane
Confirmed core L3 studies involving Amazigh-speaking learners	0	Clear geographical and linguistic gap

3.6 Theoretical orientation and Optimality Theory

The theoretical orientation of the corpus was heterogeneous. Cross-linguistic influence often functioned as a broad explanatory label, whereas named frameworks were applied less consistently. The L2 Status Factor and language-distance accounts, the Phonological Permeability Hypothesis, PAM/PAM-L2, the Speech Learning Model, dynamic-systems perspectives, property-by-property transfer, and Complex Dynamic Systems Theory were each represented in a small subset of studies.

No confirmed core empirical study was explicitly coded as applying Optimality Theory. OT was nevertheless present in five regional supporting publications addressing English diphthongs, word stress, pronunciation errors, schwa epenthesis, or plural production. Its absence from the core corpus points to an opportunity for research that links formal constraint-based analysis with the competing influence of more than one previously acquired language.

Table 7. Selected theoretical orientations in the mapped literature

Orientation	Explicitly coded studies	Examples
L2 status or language-distance accounts	2	Llama et al. (2010); Wrembel (2010)
Phonological Permeability Hypothesis	1	Cabrelli Amaro (2017)
PAM/PAM-L2	1	Wrembel et al. (2019)
Speech Learning Model or dynamic-systems account	2	Sypiańska (2016); Kartushina & Martin (2019)
Linguistic Proximity/property-by-property transfer	1	Archibald (2022)
Complex Dynamic Systems Theory	1	Kopečková (2025)
Optimality Theory in core empirical corpus	0	No confirmed case

Orientation	Explicitly coded studies	Examples
Optimality Theory in regional supporting literature	5	Zouiten; Smirkou; Assunitan; Mrhar & Smirkou; Al Arabw

4. Discussion

4.1 A growing but narrowly distributed field

The corpus confirms that L3 phonological acquisition has developed into a distinct empirical area, but its growth has been uneven. The concentration of studies after 2015 is consistent with earlier descriptions of the field as emerging and methodologically fragmented (Cabrelli Amaro & Wrembel, 2016; Wang & Nance, 2023). The increase in publications should not be mistaken for broad coverage: much of the evidence remains clustered around a small set of languages, researchers, and phonetic variables.

The dominance of consonants and VOT is understandable. Stop timing can be measured acoustically, compared across languages, and interpreted in relation to language status and phonetic similarity. These advantages have made VOT an efficient test case for multilingual transfer. At the same time, repeated reliance on the same variable risks narrowing theoretical conclusions. Models intended to explain multilingual phonology should also account for vowels, complex consonants, phonotactics, stress, rhythm, intonation, and perception-production relations. The very small stress category and limited suprasegmental evidence show that such coverage has not yet been achieved.

Vowel research represents a particularly promising area. Vowels allow researchers to examine spectral quality, duration, category overlap, and dynamic adjustment across several systems. Longitudinal vowel studies have also demonstrated that additional-language learning can reshape previously acquired categories, supporting a view of multilingual phonology as permeable and continuously reorganized. The small number of vowel studies in the core corpus therefore reflects an empirical gap rather than a lack of theoretical relevance.

4.2 Transfer source is feature-dependent rather than universal

The mapped studies do not justify a simple claim that either the L1 or the L2 is the default source of L3 phonological influence. Evidence relevant to the L2 Status Factor coexists with heritage-language effects, typological similarity, proficiency effects, and multiple-source interaction. This pattern is more compatible with accounts that permit selective or property-specific transfer than with a single global source applied uniformly across the developing phonological system.

This conclusion should remain cautious because two-thirds of the studies could not be classified definitively from the available study-level coding. Nevertheless, the explicitly coded subset illustrates why transfer-source questions must be linked to a particular property and method. The language influencing VOT may not be the same language influencing stress, rhythm, or global accent. Perception may also draw on prior categories differently from production. Future syntheses should therefore code not only the language identified as the source but also the direction, facilitative or non-facilitative character, and statistical strength of the reported effect.

4.3 Methodological implications

The strong production bias reproduces a limitation identified in earlier reviews. Production is indispensable, but it offers only indirect evidence about category formation. A learner may distinguish an L3 contrast perceptually without producing it reliably, or may approximate a target acoustically without forming a stable category. Designs that combine perception and production are therefore necessary for evaluating the relationship between phonological representation and motor implementation.

Longitudinal work is equally important. Cross-sectional comparisons cannot determine whether an observed pattern represents initial transfer, later restructuring, or stable multilingual interaction. The few longitudinal studies in the corpus suggest that categories can shift across all languages during L3 learning. More repeated-measures research would make it possible to connect early source selection with subsequent development and to test whether transfer effects diminish, persist, or become redistributed across the repertoire.

Greater consistency is also required in reporting multilingual backgrounds. Studies should provide explicit information about age of acquisition, proficiency, frequency and recency of use, formal instruction, residence abroad, and exposure to different varieties. The term L3 should not be assigned solely on the basis of school order when the learner's functional experience suggests a more complex profile. Clearer participant reporting would improve comparison and reduce the risk that language status is treated as a fixed property rather than a learner-specific configuration.

4.4 Geographical imbalance and the value of Moroccan multilingualism

The European concentration is one of the most consequential findings. Theories of L3 transfer are often presented as general models of multilingual acquisition, yet their phonological evidence comes largely from European language combinations. Expanding the evidence base is not simply a matter of representation; it is theoretically necessary. Arabic, Amazigh, French, and English differ markedly in inventory size, vowel structure, consonantal contrasts, phonotactics, rhythm, and sociolinguistic status. Their interaction can test whether models derived from closely related European languages generalize to more distant systems.

Morocco provides an especially productive setting. Learners may use Tashlhit or another Amazigh language in the home, Moroccan Arabic in daily interaction, Modern Standard Arabic in formal education, French in academic or technical contexts, and English as an additional language. The influence of these systems is unlikely to be captured by a single L1-L2-L3 sequence. Property-specific studies of English vowels, consonant clusters, stress, and perception-production relations could make a substantial contribution to L3 theory while also documenting a multilingual population that remains largely absent from the core literature.

The regional supporting literature shows that relevant work has already begun, particularly on Moroccan diphthongs, word stress, Tashlhit-English vowels, Arabic consonant clusters, and phonotactic repair. The next step is to design studies that document the complete repertoire explicitly and test competing sources of influence rather than treating English pronunciation as a conventional L2 problem.

4.5 Theoretical development and the place of Optimality Theory

The uneven use of named theoretical frameworks makes cumulative comparison difficult. General references to cross-linguistic influence do not always specify what a model predicts for a particular sound, learner group, task, or developmental stage. This is especially problematic in phonology because the same learner may show one transfer pattern in stop timing, another in vowel duration, and another in stress or rhythm. L3 phonology therefore needs theoretical accounts that can link a proposed source of influence to a clearly defined phonological property and to an observable outcome in perception or production.

Optimality Theory is relevant here because it offers a way to formalize the competition between markedness pressures and faithfulness to input or prior-language categories (Prince & Smolensky, 2004; McCarthy & Prince, 1995). In an L3 context, non-target productions should not be treated only as isolated errors. They can be interpreted as the visible outcome of competing constraints that are shaped by more than one previously acquired system. A learner may, for example, preserve vowel length because of exposure to a prior language where duration is contrastive, reduce a tense-lax contrast because of a smaller vowel inventory in another language, or repair clusters because of familiar syllable-structure restrictions. OT can make such competition explicit by asking which constraints must dominate others for a particular output to emerge.

For Moroccan multilingual learners, this formal potential is especially important. Tashlhit, Moroccan Arabic, Modern Standard Arabic, French, and English differ in vowel inventory, vowel duration, syllable structure, stress assignment, and the phonological status of several segmental contrasts. A Moroccan learner of English may therefore receive partly converging and partly conflicting cues from the repertoire. In the case of English tense-lax vowels, for instance, the difficulty may not be reducible to an L1 effect or an L2 effect alone. The learner may rely on spectral proximity, duration, spelling, French-based vowel categories, Arabic or Amazigh vowel systems, and classroom pronunciation models at the same time. An OT analysis can represent this by comparing candidate outputs and by showing whether the selected form follows markedness, faithfulness to the English target, or faithfulness to a previously established category.

The review also shows that OT has so far been more visible in regional pronunciation studies than in the confirmed core L3 phonology corpus. This is not a weakness of OT itself; rather, it points to a missing bridge between formal phonological analysis and L3 transfer research. Regional OT studies of diphthongs, word stress, epenthesis, and segmental errors demonstrate that constraint-based analysis is already familiar in Arab-world and Moroccan pronunciation research. What remains underdeveloped is an explicitly multilingual OT account in which competing constraint rankings are motivated by the learner's full language history rather than by a single L1-English comparison.

OT should therefore be used as a complementary framework rather than as a replacement for L3 transfer models. Transfer models identify possible sources of influence, such as language status, typological proximity, cumulative facilitation, or property-specific similarity. OT can then specify how these influences are reflected in the grammar of a given contrast. A stronger L3 phonology study would combine the two: it would state which language is predicted to influence a target property, justify the prediction through the learner's repertoire, test it through acoustic and/or perceptual data, and finally model the resulting forms through a constraint ranking or reranking. This would make OT analytically useful rather than merely descriptive.

5. Implications for L3 Phonology Research

The first implication is theoretical. The mapped literature suggests that L3 phonological acquisition should move beyond the search for one dominant transfer source. The question is not simply whether the L1 or the L2 transfers, but which prior language becomes relevant for which phonological property, at which moment of development, and under which task conditions. This shift matters because phonological systems are internally diverse. Segmental contrasts, timing patterns, syllable-structure repairs, stress, rhythm,

and intonation may not be guided by the same prior language. A useful theoretical account should therefore predict transfer at the level of the property rather than at the level of the whole language.

A second implication concerns the interpretation of multilingual influence. Several studies in the corpus point to the importance of proficiency, dominance, exposure, heritage-language experience, and recency of use. These variables show that language order alone is not sufficient. The labels L1, L2, and L3 can be useful for description, but they may hide important differences between learners who share the same nominal sequence of languages. Future theorizing should therefore treat multilingual profiles as dynamic configurations rather than fixed lists. This is particularly relevant in contexts where languages have different institutional values and different everyday functions.

Methodologically, the review supports a stronger integration of perception and production. Production data are essential, especially when acoustic measures are available, but they cannot by themselves show whether the learner has established a stable phonological contrast. Perceptual discrimination, identification, and assimilation tasks can reveal whether learners hear a contrast before they produce it accurately, or whether they produce an approximation without having formed a separate category. Studies that connect perception, production, and background variables would therefore provide a fuller account of L3 sound-system development.

The regional implication is equally important. Moroccan multilingualism should not be presented only as an underrepresented context. It is a theoretically rich testing ground for claims about language status, structural proximity, cumulative influence, and property-specific transfer. Learners who use Amazigh, Moroccan Arabic, Modern Standard Arabic, French, and English do not fit neatly into a simple bilingual model. Their repertoires allow researchers to test whether a target English sound is shaped by inventory size, phonetic similarity, orthographic influence, classroom exposure, or the social and educational status of French and English.

Finally, the review has implications for pronunciation research in applied settings. A multilingual account of L3 phonology can help avoid treating all non-target pronunciation as a general lack of accuracy. Some patterns may result from rational transfer from an available system, while others may reflect incomplete category formation, insufficient exposure, or task-related performance pressure. Recognizing this distinction can support more precise research designs and, eventually, more targeted pronunciation instruction.

6. Limitations and Future Directions

The review has several limitations. First, it maps a curated and bibliographically verified corpus rather than claiming exhaustive coverage of all publications on L3 phonology. Sources absent from major reviews, publisher platforms, accessible repositories, or regional journal websites may not be represented. The reported frequencies should therefore be read as patterns within the included corpus, not as final counts for the entire field.

Second, the studies were heterogeneous in design, terminology, and reporting. Some examined narrowly defined acoustic variables, whereas others addressed global accent, broad phonological development, or several properties at once. Multi-label coding was therefore necessary for phonological domains and theoretical orientations. This choice made the map more faithful to the literature, but it also means that some categories overlap and should not be interpreted as mutually exclusive.

Third, the transfer source remained unclear for 31 studies in the available study-level coding. This does not mean that those studies lacked value; rather, it indicates that the published descriptions did not always permit a firm result-level classification into L1, L2, heritage-language, or combined influence. A future full systematic review should extract result-level evidence from every article, record the direction and statistical support of transfer, and use independent screening and coding by more than one reviewer.

Fourth, no formal risk-of-bias or methodological-quality score was applied because the purpose was descriptive evidence mapping and the corpus included experimental, acoustic, perceptual, rating-based, descriptive, and reanalysis designs. Future reviews could develop a phonology-specific appraisal tool covering sample adequacy, participant-language histories, proficiency measurement, exposure and dominance controls, task design, acoustic segmentation reliability, perceptual-task reliability, statistical transparency, and replicability of coding decisions.

Future research should first address the domain imbalance identified in the map. Consonants, stops, and VOT have provided valuable evidence, but they cannot carry the theoretical weight of L3 phonology alone. More studies are needed on vowels, vowel length, reduced vowels, stress, rhythm, intonation, lexical tone, and phonotactic repair. These domains are not peripheral; they are central to how multilingual speakers reorganize sound systems and how perception and production interact.

A second priority is the design of studies that combine perception and production. In vowel research, for example, acoustic measures such as F1, F2, duration, and category overlap should ideally be paired with perception tasks that test whether learners distinguish the same contrasts. This would help determine whether production difficulty reflects motor implementation, perceptual assimilation, orthographic influence, or unstable category formation. Repeated-measures and longitudinal designs would be particularly valuable because they can show whether transfer effects weaken, persist, or become redistributed as exposure to the L3 increases.

A third priority is fuller documentation of multilingual backgrounds. Future studies should report age of acquisition, order of acquisition, self-rated and tested proficiency, literacy, frequency and recency of use, formal instruction, residence abroad, exposure to different varieties, and the social domains in which each language is used. Such information is not merely descriptive. It is necessary for testing whether transfer is better explained by language status, structural proximity, dominance, recency, or property-specific similarity.

Research in Moroccan and North-African contexts should be developed as a major future direction. Studies could compare Amazigh-speaking and Darija-speaking learners of English, examine the role of French as a previously learned academic language, and test English contrasts that are likely to create competition among prior systems. English tense-lax vowels, mid and low vowels, schwa, consonant clusters, stress placement, and rhythm are especially promising. Moroccan data would also allow researchers to ask whether a learner's home language, schooling language, and high-status foreign language contribute differently to L3 English phonology.

Finally, future work should connect formal analysis more directly with empirical design. OT-based studies would be stronger if they did not only list surface errors, but also predicted competing outputs before analysis, justified constraint rankings through the learner's multilingual repertoire, and tested those predictions through acoustic or perceptual evidence. Such studies could examine whether constraint reranking differs across proficiency levels, whether perception precedes production in constraint restructuring, and whether the same learner shows different rankings for vowels, clusters, and stress. This would make OT part of a broader explanatory account of L3 phonological development rather than a purely descriptive afterthought.

7. Conclusion

This systematic mapping review organized 47 empirical studies of L3 phonological acquisition published between 2010 and 2026 and situated them alongside 16 Arab-world and Moroccan supporting publications. The mapped evidence shows a field that has expanded but remains concentrated in European contexts, production-oriented designs, and research on consonants, stops, and VOT. Vowels, stress, prosody, perception-based research, and longitudinal development receive substantially less attention.

The evidence also resists a single-source account of transfer. L1, L2, heritage-language, proficiency, typological, and multiple-source effects appear across the literature, supporting the need to connect transfer claims to specific phonological properties, learner profiles, and research tasks. The field therefore seems better served by property-specific and dynamic accounts than by a universal assumption that one prior language will dominate the entire L3 phonological system.

The scarcity of Moroccan and Amazigh-speaking L3 research is not only a geographical gap; it is a theoretical opportunity. Moroccan multilingual repertoires make it possible to examine how Arabic, Amazigh, French, and English interact across segmental, suprasegmental, perceptual, and production domains. Such work could test whether transfer is shaped by structural proximity, educational status, language dominance, or the specific demands of the phonological property under study.

The review further suggests that formal phonological approaches, including OT, can contribute to L3 research when they are connected to explicit transfer predictions and empirical evidence. Constraint-based analysis can help explain why particular outputs emerge, but it should be grounded in the learner's full multilingual repertoire and supported by acoustic, perceptual, or longitudinal data. A broader and more theoretically explicit empirical base is therefore necessary if L3 phonology is to move from a collection of isolated transfer effects toward a more comprehensive account of multilingual sound-system development.

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Appendix A. Core Empirical L3 Phonology Studies

The appendix summarizes the 47 studies used in the mapped empirical corpus. Full bibliographic details appear in the reference list.

ID	Study	Languages/participants	Domain	Method	Theory/factor	Main relevance
C01	Marx, N., & Mehlhorn, G. (2010)	L2 to L3 learners	Production / phonology	Empirical study	CLI; positive transfer	Shows that previous languages can facilitate L3 phonological learning.
C02	Gut, U. (2010)	Multilingual learners	Segmental/prosodic phonology	Empirical phonetic/phonological study	CLI	Directly relevant early L3 phonology study.
C03	Llama, R., Cardoso, W., & Collins, L. (2010)	Spanish-English-French multilinguals	VOT / stops	Production study	Language distance; L2 status	Classic study for language distance and L2 status in L3 phonology.
C04	Missaglia, F. (2010)	German–Italian bilingual children acquiring English	Vowels	Empirical study	CLI; child L3 phonology	Important vowel-focused L3 acquisition study.
C05	Wrembel, M. (2010)	Polish-English-French/German multilinguals	Global accent / production	Production/perception ratings	L2 status; global accent	Shows L2 accent effects in L3 speech production.
C06	Wrembel, M. (2011)	Multilingual learners	VOT / stops	Acoustic production study	CLI; VOT	Important early VOT study in L3 phonetics.
C07	Wrembel, M. (2012)	L3 English multilinguals	Global accent	Production/rating study	L3 accentedness	Useful for global accent and L3 speech production.
C08	Wrembel, M. (2014)	Multilingual learners	VOT / stops	Acoustic production study	CLI; VOT	Relevant for acoustic measures and VOT transfer.
C09	Kopečková, R. (2014)	Children learning L3	Child L3 phonology	Empirical chapter	CLI; instructed L3	Adds child and instructed-learning perspective.
C10	Gabriel, C., Stahnke, J., & Thulke, J. (2015)	Multilingual classroom learners of English and French	Rhythm / prosody	Production / prosodic analysis	Speech rhythm; multilingualism	Provides evidence on multilingual speech rhythm and comparison with Asian Englishes.
C11	Wrembel, M. (2015)	L2/L3 learners	General L3 phonology	Comparative empirical/theoretical chapter	CLI	Useful for contrasting L2 and L3 phonology.
C12	Kopečková, R. (2016)	L3 learners with bilingual background	Rhotics / consonants	Developmental production study	Bilingual advantage; CLI	Important consonant-specific L3 study.

ID	Study	Languages/participants	Domain	Method	Theory/factor	Main relevance
C13	Gabriel, C., Kupisch, T., & Seoudy, J. (2016)	German/Mandarin-Chinese learners of French	VOT / stops	Production and perception	CLI; VOT	Useful for comparing monolingual and multilingual learners.
C14	Llama, R., & López-Morelos, L. P. (2016)	Spanish heritage speakers in trilingual context	VOT / stops	Acoustic production study	Heritage language; CLI	Relevant for heritage bilingualism and L3 phonology.
C15	Onishi, H. (2016)	L3 learners with varied L2 experience	Speech perception	Perception experiment	L2 experience; perception	Useful for perception-focused L3 phonology.
C16	Sypiańska, J. (2016)	L1 Polish, L2 Danish, L3 English learners	Vowels	Acoustic production study	CLI; vowel acquisition	Very relevant to your vowel section.
C17	Sypiańska, J. (2016)	L1 Polish, L2/L3 multilinguals	Vowels / regressive influence	Acoustic study	SLM; multilingual phonology	Useful for discussing regressive influence and SLM in multilingualism.
C18	Qin, Z., & Jongman, A. (2016)	L3 tone learners	Tone perception	Perception experiment	L2 experience; tone perception	Important because it extends L3 phonology beyond segments.
C19	Cabrelli Amaro, J. (2017)	L3 learners	Cross-system phonology	Experimental phonology study	Phonological Permeability Hypothesis	Directly relevant to permeability and transfer direction.
C20	Lloyd-Smith, A., Gyllstad, H., & Kupisch, T. (2017)	Turkish heritage speakers, German-dominant, L3 English	Global accent	Accent rating study	Heritage language; global accent	Relevant for heritage bilingualism and L3 English.
C21	Llama, R., & Cardoso, W. (2018)	Advanced L3 Spanish learners	VOT / stops	Acoustic production study	CLI; VOT	Useful for advanced L3 learners and source of transfer.
C22	Cabrelli, J., & Pichan, C. (2021)	L3 Brazilian Portuguese and Italian learners	Stops / segmental phonology	Experimental production study	Initial transfer	Relevant for initial stages and transfer source.
C23	Wrembel, M., Marecka, M., & Kopečková, R. (2019)	L3 learners	Perception	Perception experiment	PAM/PAM-L2; L3 perception	Important for adapting L2 perception models to L3.
C24	Kartushina, N., & Martin, C. D. (2019)	Bilinguals learning an L3	Vowels / longitudinal	Longitudinal acoustic study	Dynamic systems; SLM	Strong evidence of dynamic interactions across language systems.
C25	Liu, J., Zeng, T., & Lu, X. (2019)	Chinese multilingual learners	Stops / perception	Perception study	CLI; stop perception	Shows cross-linguistic effects in the perception of stop contrasts.
C26	Wrembel, M., Gut, U., Kopečková, R., & Balas, A. (2020)	L3 learners	Multi-feature segmental phonology	Acoustic/production study	CLI; L3 production	Useful because it examines multiple phonological features rather than one sound only.

ID	Study	Languages/participants	Domain	Method	Theory/factor	Main relevance
C27	Luo, H., Li, M., & Mok, P. P. K. (2020)	Mandarin/Cantonese multilingual context	Vowel length	Perception experiment	Speech perception; CLI	Useful for vowel length contrast and perception.
C28	Cal, Z., & Sypiańska, J. (2020)	Multilingual learners	L3 phonology	Empirical study	Proficiency; CLI	Useful for proficiency as a factor in transfer.
C29	Sypiańska, J., & Cal, Z. (2020)	L1 Polish/L2 English/L3 Spanish learners	Sibilants / consonants	Acoustic production study	Proficiency; CLI	Useful for consonant acquisition and proficiency effects.
C30	Nelson, C. (2020)	Adolescent/adult L3 learners	Perception	Perception study	Age; perception	Useful for age/developmental factors in L3 phonology.
C31	Liu, H., & Lin, C. (2021)	L3 stop contrast learners	Stops / VOT	Perception/production study	CLI; stop contrasts	Useful for stop contrast section.
C32	Geiss, M., Gumbsheimer, S., Lloyd-Smith, A., Schmid, S., & Kupisch, T. (2022)	Italian heritage speakers in Germany with L3 English	VOT / stops	Acoustic production study	Heritage language; VOT	Important recent heritage language VOT study.
C33	Archibald, J. (2022)	L1 Arabic, L2 French, L3 English data from Algeria/Tunisia	Consonants, vowels, stress, rhythm	Reanalysis/phonological analysis	Property-by-property transfer; LPM-compatible	Very important regional L3 phonology item for Arab/North-African context.
C34	Grünke, J., & Gabriel, C. (2022)	German–Turkish heritage bilinguals learning French	Intonation / prosody	Production/perception study	Heritage bilingualism; prosody	Useful for prosody and intonation section.
C35	Nelson, C. (2022)	Adolescent/adult L3 learners	Perception/production development	Longitudinal/developmental study	Exposure; CLI	Useful for exposure and age effects.
C36	Parrish, K. (2024)	Spanish–English bilinguals learning L3 French	Stops / VOT	Acoustic production study	CLI; stop production	Examines the production of stop-initial L3 French words and possible sources of cross-linguistic influence.
C37	Patience, M., & Qian, W. (2022)	L3 Spanish learners	Consonants / production routines	Production experiment	Articulatory routines; task complexity	Useful methodologically: task complexity can affect production results.
C38	Sypiańska, J. (2022)	Unbalanced bilinguals learning Polish	Laterals/consonants	Acoustic production study	L1 drift; transfer	Useful for lateral consonants and L1 drift/regressive influence.
C39	Kopečková, R., Gut, U., Wrembel, M., & Balas, A. (2023)	L1 German, L2 English, L3 Polish learners	Coda obstruents / production	Production study	Initial transfer; CLI	Key recent study on initial L3 phonological influence.

ID	Study	Languages/participants	Domain	Method	Theory/factor	Main relevance
C40	Lloyd-Smith, A. (2023)	Heritage speakers with L3 English	Global accent	Accent rating study	Heritage language; global accent	Useful for heritage-language influence on L3 English accent.
C41	Oh, M. (2024)	L1 Korean/L2 English/L3 Japanese and L1 Japanese/L2 English/L3 Korean learners	Stops / VOT	Acoustic production study	Typological similarity; proficiency	Important 2024 update; directly relevant to the 2000–2026 window.
C42	Stan, I. (2024)	English-Spanish-French and Spanish-English-French L3 learners	Stops / perception	Perception experiment	CLI; perception; stop contrasts	Important 2024 perception update.
C43	Cal, Z., & Wrembel, M. (2025)	L1 Polish, L2 English, L3 Norwegian speakers	Stops / VOT	Acoustic longitudinal/production study	Developmental CLI; VOT	Important 2025 update on developmental VOT patterns.
C44	Kopečková, R. (2025)	L1 German, L2 English, L3 Polish adult learners	Coda obstruents / perception	Longitudinal perception study	Complex Dynamic Systems; perception	Important 2025 update; perceptual studies are still scarce.
C45	Norman, T., Prior, A., & Degani, T. (2025)	Arabic-Hebrew-English trilinguals	Perception and production	Oddity perception task and word repetition task	Prior knowledge; CLI	Very relevant recent study and includes Arabic-speaking multilinguals.
C46	Wei, Y. (2025)	L1 Chinese, L2 English, L3 Spanish learners	Stops / VOT	Acoustic production study	CLI source/direction; VOT	Important 2025 study on source and direction of CLI.
C47	Zhu, Y., & Mok, P. P. K. (2026)	Cantonese-English-German trilinguals compared with control groups	Vowels / vowel length	Read-speech acoustic production study	CLI; vowel length; acoustic analysis	Crucial 2026 update; directly matches vowel length and cross-linguistic influence.

Appendix B. Arab-World and Moroccan Supporting Studies

These studies provide regional context but are not automatically part of the strict L3 empirical corpus.

ID	Study	Region	Participants/languages	Domain	Method	Status	Use in review
A01	Zouiten, R. (2020)	Morocco	96 Moroccan EFL learners across Baccalaureate, second-year university and Master's levels	Diphthongs / vowels	Oral production task; OT/CDA analysis	Conditional	Regional support; cite in Moroccan/Amazigh/Arabic background or discussion.
A02	Smirkou, M. (2023)	Morocco	60 Moroccan EFL learners	Word stress	OT/CDA analysis	Conditional	Regional support; stress and OT background.
A03	Kula, N., & Louriz, N. (2024)	Morocco / Tashlhit	Native speakers of Tashlhit learning English in Moroccan multilingual context	Mid/low vowels	Perception and production experiments	Conditional	Regional support; could be core if framed as multilingual/L3 phonology.

ID	Study	Region	Participants/languages	Domain	Method	Status	Use in review
A04	Bouchhioua, N. (2016)	Tunisia / Arab world	Tunisian Arabic, MSA, French, English multilinguals	Pronunciation features	Production study	Conditional	Regional / near-core L3 support.
A05	Evans, B. G., & Alshangiti, W. (2018)	Saudi Arabia / Arab world	26 native Saudi Arabic learners of English	Vowels and consonants	Perception and production tasks	No	Use as Arab EFL pronunciation background.
A06	Naji, M., & Almakrob, A. (2023)	Yemen / Arab world	67 Yemeni-Arabic EFL learners	Vowels	Questionnaire and vowel production test	No	Use in regional/background vowel section.
A07	Alshangiti, W., Evans, B. G., & Wibrow, M. (2023)	Arab world	Arabic-speaking children learning English vowels	Vowels	Training/perception/production study	No	Use as Arab EFL/ESL vowel background; check final volume/pages before citation.
A08	Al-Abdullah, S., & Almutairi, M. A. (2024)	Kuwait / Arab world	25 Kuwaiti EFL learners	Consonant clusters / epenthesis	Production study	No	Use in consonant/cluster regional background.
A09	Altakhaineh, A. R. M., AL-Junaid, N., & Younes, Z. B. (2024)	Arab world	Arabic-speaking EFL learners	Consonant clusters	Pronunciation and spelling tasks	No	Use in regional background and discussion of Arabic phonotactics.
A10	Al Arabw, A. (2025)	Iraq / Arab world	Iraqi Arabic-speaking EFL students	Plural allomorphy / segmental production	Production analysis; OT	No	Use as regional OT-based supporting study.
A11	Assunitan, A. (2023)	Saudi Arabia / Arab world	30 Saudi female learners of English	Vowels/consonants/errors	OT analysis of pronunciation errors	No	Use in regional background.
A12	Al-Kinany, T. (2022)	Oman / Arab world	Omani Arabic EFL learners	English phoneme perception	Perception study	No	Background only; check exact journal metadata before article submission.
A13	Mrhar, A., & Smirkou, A. (2024)	Morocco	Moroccan Arabic data	Schwa epenthesis / phonotactics	OT analysis	No	Use as Moroccan phonological background.
A14	Lahrouchi, M. (2018)	Morocco / Amazigh-Arabic contact	Moroccan Arabic and Amazigh contact	Phonology/morphology	Theoretical/descriptive analysis	No	Use as Moroccan linguistic-background source.
A15	Ridouane, R. (2014)	Morocco / Tashlhit	Tashlhiyt speaker from Agadir	Tashlhiyt segmental inventory	IPA illustration / descriptive phonetics	No	Use in background; not an acquisition study.
A16	Rguibi, S. (2021)	Morocco	Moroccan Arabic varieties	Segmental variation	Theoretical/descriptive study	No	Use in Moroccan Arabic background.