

The Pronunciation of the Schwa

An Acoustic Analysis of Gender Inclusivity in Spoken Italian

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Abstract In Italian, the schwa has spread to encode gender beyond the binary, yet /ə/ is not part of the standard phonemic inventory. This study addresses the recurring unpronounceability argument by focusing on acoustic vowel distance. Drawing on 10 interpreters' production of words containing the mid-central vowel (/ə/; n=205) and vowels most likely to replace it (/a/, /ɛ/, /e/, /ɔ/, /o/; n=925), we conducted an acoustic analysis via Pillai scores (z-normalized F1-F2) and a mixed-effects model of Euclidean distances from the space center. Results show that /ə/ is produced as a distinct sound with higher centralization than standard Italian vowels.

Keywords Gender-inclusive language. Non-binary gender. Schwa. Spoken Italian. Acoustic analysis. Orality.

Summary 1 Introduction. – 2 Literature Review. – 3 Methodology of the Present Study. – 4 Data Analysis. – 5 Results. – 6 Discussion. – 7 Limitations and Future Directions. – 8 Conclusions.



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1 Introduction

Italian has a binary grammatical gender system in which all nouns and related syntactic elements are either grammatically masculine or feminine.¹ Gender-inclusive strategies have been proposed in several languages to avoid misgendering non-binary individuals, with recent studies showing a shift in language users' representation of referential gender. In Italian, substituting typical word endings associated with masculine or feminine gender (e.g. *-o/-a*) with the schwa (*-ə*) has sparked off debate both among academics and the wider public, becoming a highly topical issue since the late 2010s (Giusti 2022; Sulis, Gheno 2022). While the schwa, unlike other innovative typographic devices such as the asterisk, may translate into speech, the phoneme */ə/* lacks phonemic status in standard Italian. As such, not only does it introduce elements unfamiliar to the morphological system, similarly to other innovative strategies, but it also entails phonological changes to standard spoken language.

While the uses and misuses of the schwa have been widely discussed in written forms, its status in spoken Italian remains underexplored in research. As Lo Duca (2024) points out, most available research on non-sexist and gender-inclusive language focuses on the written modality due to written language being easier to collect and analyze. However, this research gap is particularly striking when discussing non-binary identities, since nearly all discussions about their linguistic representation explicitly raise the problem of orality and of the spoken realization of innovative forms (Facchini 2026, 120-37). This convergence suggests that spoken language is becoming the site where the limits of gender inclusivity in contemporary Italian are being heavily tested.

As far as spoken language processing is concerned, a study on the perception of role nouns presented in isolation found that the schwa partially reduces stereotypical associations, although more effectively so in the written than in the auditory modality (Abbondanza et al. 2025). The one study that has, to our knowledge, examined speech production found that the schwa was generally implemented in an appropriate way, despite participants' concerns about its pronunciation and a perceived increase in cognitive load (Facchini 2024). Since the phoneme */ə/* does not belong to the standard Italian phonemic inventory, but only to central and southern Italian dialects, the pronunciation of the schwa depends, at a basic level, on speakers' ability to produce a sound that is phonetically distinct from their native vowels.

1 We thank the reviewers for their insightful comments, which helped us improve the clarity of the manuscript.

Against this background, this study provides a first acoustic analysis of Italian speech that includes the schwa as a gender-inclusive strategy. The overarching research question that will be addressed in this paper is the following: can Italian speakers produce the schwa as a distinct vowel with minimal prior training? To address this question, we analyze acoustically semi-spontaneous speech data extracted from Facchini (2024) to examine whether a specific cohort of Italian speakers (i.e. advanced trainee conference interpreters) produces gender-inclusive schwa as a distinct vowel, namely to what extent it differs from other vowels belonging to their standard phonemic inventory. As such, this study contributes to ongoing debates on gender-inclusive language by providing empirical phonetic evidence.

2 Literature Review

2.1 The Rise of the Schwa for Non-Binary Gender Representation in Contemporary Italian

Since the 2010s, a prominent strand of the debate on language and gender has started addressing the call for inclusive representation of queer and non-binary communities (Nugara 2025; Robustelli 2025). Alongside earlier concerns for the linguistic subordination and exclusion of women and the related efforts of feminization, contemporary Italian speakers have begun experimenting with strategies moving beyond the male/female grammatical gender binary by introducing new gender markers. These developments reflect a broader attempt to represent gender pluralities and to promote forms of communication that are more respectful of gender diversity.

The earliest solution adopted within Italian queer communities was to replace typical masculine (-o, -i) or feminine (-a, -e) word endings with an asterisk, proposed as a symbol representing an “open space” (Marotta, Monaco 2016, 50; Authors’ transl.) that could be filled according to individual self-identification. As Sulis and Gheno (2022) note, however, the asterisk (e.g. *car* tutt** ‘dear(NB) all(NB)’ instead of *cari tutti e care tutte* ‘dear(M) all(M) and dear(F) all(F)’)² is only one among a wide range of innovations that have circulated in written Italian to neutralize gender reference. Alternatives include word endings such as -x, -y, or -z, typographic characters such as the at sign, the apostrophe, the underscore, or the ampersand, truncated forms, and hybrid endings

2 Alongside M and F for grammatically masculine and feminine forms respectively, we use NB for non-binary alternatives.

combining masculine and feminine morphemes. Notably, most of these strategies present clear difficulties when transferred to speech (Pires 2020; Thornton 2022), as some (i) lack straightforward pronunciations (‘, _), (ii) tend to create phonotactically illegal clusters (x, y, z), or (iii) may be phonologically mapped onto vowels that are typically associated with the feminine gender (@ with singular /a/, & with plural /e/). In practice, when such forms are oralized, speakers may also revert to masculine or binary double forms, undermining the visibility of non-binary identities. For this reason, alternative solutions explicitly designed for oral use have been proposed.

From the perspective of oralization, -u endings appear to offer a viable solution since Italian canonical morphology employs four of the five atonic vowels as nominal endings, leaving the -u as the only unused option. However, this proposal has raised concerns, since – especially when used in isolation (i.e. *caru tuttu* ‘dear(NB) all(NB)’ rather than in triple forms such as *cari tutti, tutte e tuttu* ‘dear(M) all(M), all(F) and all(NB)’ – the final -u may phonetically converge with the word endings of several Italian dialects, where it corresponds to masculine grammatical gender (Rohlf’s 2021). This potential overlap has fueled skepticism about the suitability of -u as a non-binary marker.

In order to move beyond the standard Italian vowel system more decisively, the proposal that has generated the most intense and polarized debate in recent years is the use of the schwa (ə) as a new morpheme (e.g. *bambinə* ‘children(NB)’ instead of *bambini e bambine* ‘children(M) and children(F)’). Originally proposed by activist Luca Boschetto in 2015 and brought to the attention of a larger public by sociolinguist Vera Gheno in 2019, this neomorpheme is used to refer to mixed-gender groups, to individuals whose gender is unknown or irrelevant, and to non-binary individuals (Gheno 2024). In this sense, schwa endings explicitly address the invisibility of non-binary people in language and their marginalization in society, contributing to affirmative linguistic practices (Baiocco, Rosati, Pistella 2023).

Notably, one of the earliest documented uses of written gender-inclusive schwa was prompted by a cross-linguistic need, i.e. to translate non-binary forms from Brazilian Portuguese into Italian (Sulis, Gheno 2022). In this respect, Nugara (2025, 159) highlights the pivotal role of translation – both written (e.g. novels, essays) and audiovisual (e.g. videogames, subtitles) – in disseminating the solution. Esposito (2024) and Formato, Somma and Baldo (2026) further report a long series of uses and misuses of the schwa in activist circles, in the media, and in the publishing industry, notably highlighting the many translated works that feature it.

As far as recommendations are concerned, non-binary strategies are particularly discussed in guidelines drafted by private individuals. For instance, addressing the issue of pronounceability,

Anelli (2022) and Vitiello (2022) stress that the schwa offers strong potential as a strategy suitable for spoken Italian and offer practical tips for pronouncing it, thus embracing innovation while also raising concerns about clarity and accessibility. Indeed, the schwa poses difficulties for people with dyslexia and for text-to-speech systems used by individuals with visual impairments, as these tools may fail to correctly recognize or vocalize words containing it (Iacopini 2021). Although text-to-speech systems can be programmed to handle innovative forms (Giovine 2026), identifying accessible solutions for people with dyslexia remains considerably more challenging, raising not only practical but also ethical concerns (Rosola 2024).

At the institutional level, documents adopt a more clear-cut, restrictive stance. For instance, while reserving the right to continue to closely monitor ongoing developments, the Swiss Federal Chancellery claims that there are grounds for choosing to reject innovative forms for non-binary reference in Italian in favor of standard alternatives.³ Notably, the Swiss Federal Chancellery identifies unpronounceability as the primary argument against adopting innovative forms, followed by concerns regarding readability, accessibility, and ambiguity (Ferrari, Pecorari 2024, 86). Likewise, Italian governmental and administrative institutions predominantly discourage the use of the schwa (Nugara 2025). As recently as 2025, the Italian Ministry of Education and Merit issued a circular advising that schools avoid strategies such as the schwa in official communication,⁴ explicitly classifying them as grammatical errors and urging adherence to standard Italian norms.

2.2 Empirical Research on Schwa Usage Patterns and Cognitive Processing

In parallel with ongoing debates, empirical studies have analyzed the adoption of the schwa. Analyses by Giusti (2022) and Thornton (2022) report fluctuations between instances where the written schwa is applied to designate individuals generically and instances where it is used to refer specifically to non-binary individuals. Moreover, these two authors highlight the linguistic limitations of the proposal to use the schwa, focusing on phonetic, phonological, typological, and morphosyntactic aspects. Corpus-based research conducted on Facebook posts (Comandini 2021; Safina 2026), on tweets (Formato

³ Standard gender neutrality could be achieved using periphrases through common gender, epicene, or collective terms. However, the Swiss Federal Chancellery presents the so-called “inclusive masculine” as a legitimate alternative that would allegedly avoid reinforcing gender binarism.

⁴ <https://www.mim.gov.it/web/guest/-/nota-porot-n-1784-del-21-marzo-2025>.

2024), and on the web (De Cesare 2024) shows that the schwa is employed especially by online queer communities in informal written communication to refer to oneself, to others, or to signal a political stance. While showing a significant increase in both neomorphemes *-ə* for the singular and *-3* for the plural, these studies reveal that their use is not stable nor systematic: the schwa is not applied to all nouns nor is it consistently applied to all agreement targets such as determiners, adjectives, and past participles.

Recent psycholinguistic research has also investigated whether the schwa achieves its intended cognitive effect to overcome gender binarism. Across four studies, two of which employed experimental methods, Safina (2025) evaluated grammatical gender neutralization strategies in written Italian. Findings suggest that non-binary strategies are perceived as ideologically marked and function performatively rather than purely grammatically. While the schwa increased female visibility among participants with highly positive attitudes toward gender-inclusive language, it triggered more negative judgments overall. Safina concludes that producing non-binary mental representations remains challenging for speakers accustomed to pervasive binary gender encoding. Abbondanza et al. (2025) conducted three studies on the processing of schwa by presenting role nouns in isolation in both written and spoken modalities. Overall, the schwa reduced gendered inferences associated with role nouns but did not eliminate them. In cases where forms retained a strong morpho-phonological link to the masculine (e.g. in suffix *-torə*, closer to masculine *-tore* than to feminine *-trice*), or where role nouns were strongly stereotyped, the schwa proved largely ineffective. Further analyses showed that visual schwa was more effective than auditory schwa, which tended to shift interpretations back toward the masculine. Marenghi, Cardinaletti and Suozzi (2026) tested the interpretation of the written schwa through a sentence-picture matching task in 2023 and a follow-up study in 2025. In the first study, the schwa did not prompt a specific non-binary interpretation of singular nouns, but tended to activate a female interpretation instead, whereas for plural nouns it successfully triggered an immediate association with a specific non-binary group and, to a lesser extent, a generic mixed-gender group. In the second study, overall accuracy improved. The authors explain the difference between the two studies arguing that, among other things, it is likely that the results reflect the growing public awareness of gender-inclusive schwa.

A further point emerging from Marenghi, Cardinaletti and Suozzi (2026) is particularly relevant for the scope of this paper. When surveyed through questionnaires, participants across samples generally reported comprehension to be advancing more rapidly than production, suggesting that the schwa is becoming semantically accessible even as its implementation in naturalistic

speech remains an obstacle. In other words, the schwa is reported as easy to understand but difficult to pronounce. Against this backdrop, pronunciation is confirmed as a point of contention in the adoption of non-binary language forms in Italian. It thus seems crucial to investigate how the schwa is actually realized in speech.

2.3 The Schwa in Italian Phonology

In Italian, the mid-central vowel /ə/, or schwa, is a non-standard phoneme which only occurs in some central and southern dialects. The monophthongal vowel sounds of standard Italian include one open central vowel /a/, three front vowels and three back vowels [fig. 1]. The front and back vowels are pronounced by progressively lifting the tongue from an open-mid place of articulation (/ɛ/ and /ɔ/) to a close-mid (/e/ and /o/) and close position (/i/ and /u/) (Bertinetto, Loporcaro 2005).

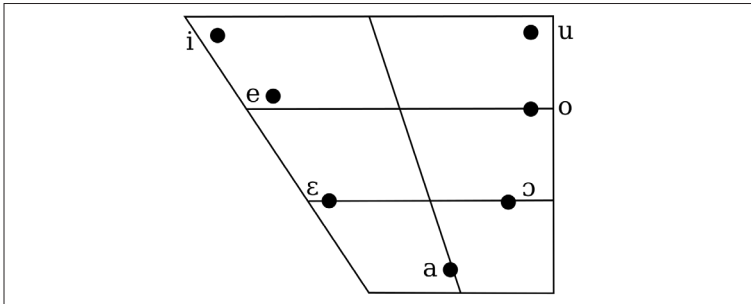


Figure 1 Visual representation of standard Italian vowels in the vowel space, from Rogers and d'Arcangeli (2004, 119)

Against the backdrop of the Italian phonological system, regional varieties are spoken across the country, and local dialects are preferred in informal and colloquial settings, especially in the southern and north-eastern regions (Istat 2017). Some central and southern dialects spoken in Campania, Puglia, and Abruzzo include the schwa in their inventory (Maturi 2023). In Neapolitan, for example, stressed vowels are identical to Italian, but only four vowels can be produced in unstressed syllables (/ə/, /a/, /i/ and /u/). All unstressed vowels can occur in pretonic positions, e.g. *veléno* 'poison' becomes /və'lenə/, *staggione* 'summer' /stad'dʒonə/, *bicchiére* 'glass' /bik'kjerə/, *cunziglio* 'advice' /kun'tsijjə/ (Maturi 2023, 34, Authors' transl.). Posttonic vowels, including word endings in phrase-final positions, are always reduced to /ə/, a pattern that also emerges in the examples above (/və'lenə/, /stad'dʒonə/, /bik'kjerə/, /kun'tsijjə/). It

must be pointed out that vowel reduction does not necessarily imply any changes in gender representation as, for example, the adjective /'bellə/ can refer to male (*bello* 'handsome(M)', in standard Italian) or female (*bella* 'beautiful(F)', in standard Italian) individuals (Maturi 2023). While speakers of other varieties of Italian have some degree of exposure to these dialects, for example through TV programs set in southern regions, the majority of Italians are unlikely to have experience pronouncing the schwa while speaking Italian.

In some languages, including English, the schwa is typically produced as a result of vowel reduction, i.e. the neutralization of vowel quality contrasts due to articulatory undershooting in unstressed syllables (Byers, Yavas 2017). Since meaningful vowel contrasts tend to occur at the periphery of the oral cavity – represented by the perimeter of the vowel space in Figure 1 – reduced vowels localized in the central space are perceived as underspecified or 'weak'. The process of vowel centralization and shortening in connected speech is common to many languages, in line with the principle of linguistic economy that drives humans to convey meaning with the least possible cost in terms of energy. However, in languages such as standard Italian and Spanish, vowel reduction does not cause the loss of the vowels' intrinsic qualities or the substitution of full vowels with weak ones (Bertinetto, Loporcaro 2005; Gómez Lacabex, García Lecumberri, Cooke 2008). In order to perceive and produce a mid-central vowel, Italian and Spanish speakers would need to establish a new phonetic category, a process that typically requires sustained exposure and training in adult language learners (Best, Tyler 2007; Flege, Bohn 2021). Speakers of Spanish, a language with a similar vowel inventory to Italian and with analogous reduction patterns, require intensive training over several weeks to learn how to produce the /ə/ sound and discriminate it from other vowels (Gómez Lacabex, García Lecumberri, Cooke 2008; Gómez Lacabex, Gallardo-del-Puerto 2020).

In sum, the status of the /ə/ phoneme in Italian regional varieties may affect its use as a non-binary alternative to gender-marked nouns. Since the majority of speakers are not familiar with the schwa, they may instead produce other vowels such as /a/ or /e/, which typically mark the feminine gender, or default to truncating words, which may compromise comprehensibility (De Santis 2022). In this sense, the familiarity of a large group of speakers with the phonological realization of the schwa through dialectal use may significantly facilitate the incorporation of this non-binary strategy within interactions carried out in Italian. However, speakers of Neapolitan and other central and southern dialects may struggle to assign the semantic notion of 'gender inclusivity' to a phoneme that they use not as a generic word ending for nouns of all genders and numbers, but in lieu of unstressed vowels within words. Finally, the association of schwa endings with specific local accents may activate stereotypes related

to the speaker's socioeconomic status, educational background, and personal characteristics (Cavanaugh 2005), potentially interfering with the use of gender-inclusive variants.

3 Methodology of the Present Study

The objective of this small-scale study is to investigate whether Italian speakers who are encouraged to use the schwa to refer to unspecified and non-binary referents manage to produce this novel phoneme in place of other native vowels. To this end, this study presents an acoustic analysis of the oral corpus collected by Facchini (2024), which consists of consecutive interpretations from English into Italian performed by advanced trainee conference interpreters in early 2022. Critically, the recordings had not been analyzed acoustically in the original study, as the focus was on interpreters' performance, error patterns, and perceptions of cognitive effort, rather than finding out whether the forms identified as schwa endings were acoustically consistent with the target vowel.

To elicit the phonetic realization of the schwa, participants were tasked with interpreting the speech of a non-binary English speaker. Given that English largely lacks grammatical gender whereas Italian requires grammatical gender encoding on personal nouns and agreement targets, participants were instructed to use the schwa in their Italian target text. Specifically, this strategy would help them avoid misgendering unspecified and non-binary referents within singular and plural, first- and third-person expressions. To encourage the use of this relatively unconventional linguistic option, participants were primed prior to completing the task. First, they received written instructions with samples of language containing schwa endings (Facchini 2024, 137). Then, right before the interpreting task, they received an oral briefing read aloud by the researcher which ensured that every participant was exposed to the phonetic realization of three words with schwa endings (i.e. *unə oratorə non binariə* 'a(NB) non-binary(NB) speaker(NB)') immediately before the execution of the task. Critically, participants were not provided with specific acoustic training on how to integrate the schwa into Italian phonology.

The final sample for the present study consisted of 10 female native speakers of Italian in the final stages of a master's degree in Conference Interpreting at the University of Bologna. Beyond their professional training, the participants' prior relationship with gender-inclusive language was assessed via a questionnaire. While all participants reported being aware of the proposal to use the schwa as a non-binary linguistic experiment in Italian, none reported using it in their spontaneous oral production. Table 1 contains the demographic information of the participants.

Table 1 Demographic characteristics of participants

Speaker	Gender	Age	Province of origin
P1	F	24	Savona
P2	F	24	Pesaro-Urbino
P3	F	25	Taranto
P4	F	24	Forlì-Cesena
P5	F	24	Pisa
P7	F	24	Bologna
P9	F	24	Torino
P10	F	26	Gorizia
P11	F	24	Siena
P12	F	25	Salerno

4 Data Analysis

The acoustic analysis focused on nouns, adjectives, past participles, articles, and pronouns that featured the mid-central vowel /ə/ (n=205) and on a corresponding number of tokens for each of the participants' native vowels, restricting the comparison to close-mid (/e/, /o/), open-mid (/ɛ/, /ɔ/), and open (/a/) vowels (n=925). These specific vowels were selected for comparison because their phonetic proximity makes them the most likely candidates to be substituted for the schwa during speech production.⁵

As a preliminary step, the manual transcriptions of the recordings (N=10, SR=48 kHz) were converted into Praat textgrids and aligned with the speech intervals using the WebMAUS Basic automatic segmentation system (Kisler, Reichel, Schiel 2017). For each word with a schwa produced by a participant, a corresponding word containing one native vowel (/a/, /ɛ/, /e/, /ɔ/, or /o/) was selected within the recording and matched based on the phonetic context preceding the target vowel whenever possible, to ensure comparability across vowel categories [tab. 2]. Given that Italian syllable structure typically adheres to a consonant-vowel (CV) pattern and most of the schwa vowels were produced in word-final position, the phonetic context following the target vowel was not considered an exclusion criteria in the selection of native vowels to maximize the number of tokens available for analysis.

⁵ Close vowels /i/ and /u/ were excluded due to being at the far ends of the Italian vowel diagram and therefore unlikely to be pronounced in substitution of a mid-central vowel.

Table 2 Number of vowel tokens for each category by speaker

Speaker	ə	a	e	ɛ	o	ɔ
P1	38	36	37	28	37	20
P2	32	33	33	28	32	20
P3	21	20	21	18	21	19
P4	13	13	13	13	14	12
P5	13	13	15	10	13	13
P7	10	9	10	9	10	10
P9	9	7	8	6	8	8
P10	24	20	23	16	24	19
P11	32	30	30	31	30	23
P12	13	14	14	10	14	10
Total	205	195	204	169	203	154

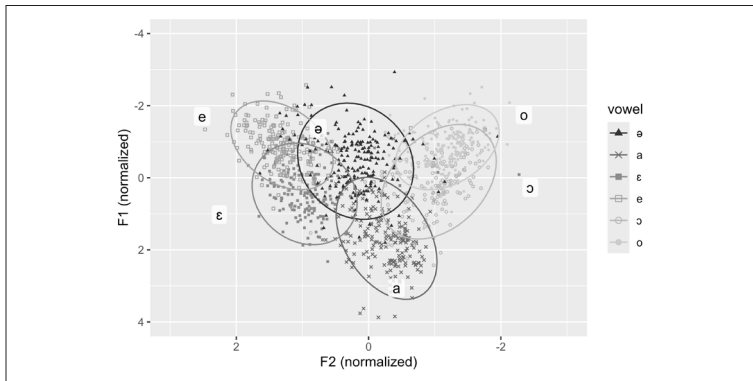
The selection of vowel segments for analysis (N=1130) involved the inspection of the waveform and spectrogram for formant stability within the segment boundaries automatically obtained with WebMAUS. Once all segmented textgrids had been reviewed by both authors, mid-point formant values were extracted using a custom Praat script.⁶ F1 and F2 means were obtained for each vowel category and speaker and averaged to obtain grand means. Individual formant values were then z-normalized by: (1) subtracting the grand mean value (per vowel, per speaker) from the raw individual value, and (2) dividing this by the standard deviation of the grand mean (Brand et al. 2021). The degree of overlap between the schwa and other vowels in the two-dimensional F1-F2 acoustic space was assessed using Pillai scores, a multivariate analog of the F-ratio test statistic from an ANOVA representing an accurate measure of vowel overlap (Hay, Warren, Drager 2006; Kelley, Tucker 2020). Pillai scores range from 0, indicating complete overlap of the vowel distributions, to 1, indicating complete separation, and can provide an intrinsic evaluation of how well a non-native vowel is pronounced (Mairano, Santiago, Roa 2023). For each comparison, F1 and F2 (normalized by speaker) were treated jointly as dependent variables, with Vowel as the grouping factor. To test differences in centralization between the vowels, Euclidian distances from the vowel space center [0, 0] were obtained for each vowel and a linear mixed model was run using the *lmer* function in R, with Vowel as fixed factor

⁶ Adapted from the scripts available at <https://github.com/wendyelviragarcia/vowels>.

and Speaker and Word as random factors.⁷

5 Results

The visual inspection of participants' vowel space suggests that, despite the relatively low number of tokens in our corpus, each vowel category occupies a relatively defined area [fig. 2]. The target vowel /ə/ tends to occupy a central position, although a degree of dispersion is visible for this non-native sound relative to the native vowels (especially for speakers P3, P5, P9, P12). The overlap between open-mid and close-mid vowels exhibited by some participants [fig. 3] can be explained in terms of the low functional load of these contrasts and of the substantial variation across regional varieties of Italian (Renwick 2024).



⁷ The data frame and script are available in the supplementary materials at the OSF public link: https://osf.io/e5b36/overview?view_only=ac17643de5db458e910234f3a7bdc270.

Figure 2 Overall distribution of vowel tokens in the acoustic vowel space, with F1 and F2 values z-normalized using the Lobanov 2.0 formula in Brand et al. (2021). Ellipses represent 95% confidence regions for each vowel's F1-F2 distribution

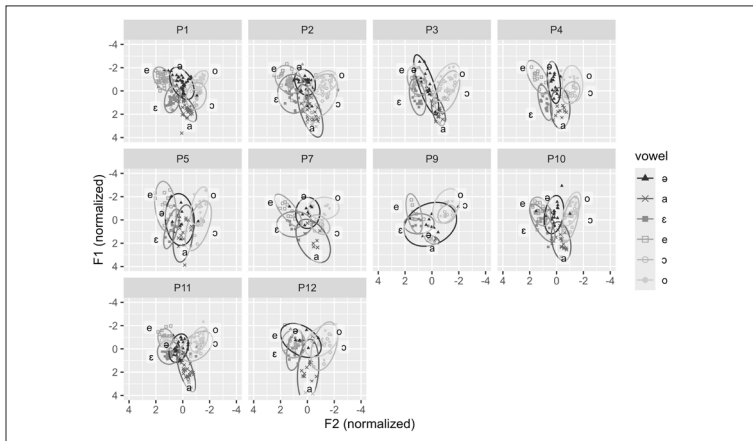


Figure 3 Z-normalized vowel space by participant

Multivariate analyses comparing the distribution of the schwa against each of the speakers' native vowels were run on normalized F1-F2 values, and Pillai scores (0=complete overlap to 1=complete separation) were used to assess whether the vowels occupied different areas of the vowel space. The MANOVAs indicated significant differences for all comparisons [tab. 3], with the /ə/ vs /ε/ comparison showing the lowest degree of separation (Pillai=.51, $F(2,371)=190$, $p < .001$) and the /ə/ vs /o/ comparison the highest (Pillai=.73, $F(2,405)=551$, $p < .001$).

Table 3 Results of multivariate comparisons between the schwa and the speakers' native vowels

Comparison	Pillai	Approx F	Num Df	Den Df	p. value
ə vs a	0.66	378	2	397	<.001
ə vs ε	0.51	190	2	371	<.001
ə vs e	0.59	291	2	406	<.001
ə vs ɔ	0.67	353	2	356	<.001
ə vs o	0.73	551	2	405	<.001

The model run on Euclidian distances revealed significant differences between the schwa and each native vowel, showing that the schwa was more centralized than the speakers' native vowels [tab. 4]. The difference between the schwa and open-mid vowels was relatively modest, especially in the case of front vowel /ε/ (Est.=0.36, SE=0.06,

$t(318.72)=5.55$, $p < .001$), compared to the difference between the schwa and the open central vowel /a/ ($\text{Est.}=0.89$, $\text{SE}=0.06$, $t(410.23)=14.99$, $p < .001$).

Table 4 Results of linear mixed model between the schwa and the speakers' native vowels

Comparison	Est.	S.E.	t	Df	95% CI	p. value
(Intercept)	0.86	0.04	19.69	160.45	0.78 – 0.95	<.001
Vowel a	0.89	0.06	14.99	410.23	0.77 – 1.00	<.001
Vowel ε	0.36	0.06	5.55	318.72	0.23 – 0.48	<.001
Vowel e	0.81	0.06	14.02	440.07	0.70 – 0.93	<.001
Vowel ɔ	0.42	0.07	6.13	256.1	0.28 – 0.55	<.001
Vowel o	0.67	0.06	11.48	460.53	0.56 – 0.78	<.001

6 Discussion

The primary objective of this study was to address the frequent scholarly and institutional criticism regarding matters of pronounceability of the schwa for non-binary gender representation in spoken Italian. Our acoustic analysis provides initial empirical evidence that contradicts the alleged unpronounceability of the schwa, even among speakers with very limited exposure to non-binary Italian and no prior specific training on phonetic accuracy. Overall, the results indicate that participants were able to produce /ə/ as a distinct vocalic category, characterized by a higher degree of centralization compared to native Italian vowels. Both the multivariate analyses and the model on Euclidean distances consistently show that the schwa occupies a separate area of the vowel space, despite some proximity to open-mid vowels, particularly /ɛ/. These findings directly address concerns about acoustic distinctiveness raised in the literature, according to which mid-central vowels risk being assimilated to more peripheral categories such as /e/ (Giusti 2022). While our data do reveal partial overlaps in some cases, the statistical separation observed across all comparisons suggests that such proximity does not lead to complete phonetic merging.

The high degree of centralization exhibited by the schwa suggests that it may be integrated as a novel phonetic category that speakers can target and realize, even if its realization remains more variable than long-established native vowels. Indeed, the observed acoustic dispersion of /ə/ among some participants, i.e. the higher degree of token-to-token variability, suggests that while speakers can target a central production, they may not have yet developed stable articulatory routines. This is not unexpected, given that the schwa does not belong to the standard Italian phonemic inventory. In this

sense, our findings reflect the status of the schwa as a new phoneme and show that a process of phonetic stabilization is possible.

From a typological perspective, Thornton (2022) observes that introducing the phoneme /ə/ entails a reconfiguration of the Italian vowel system. While standard Italian is traditionally characterized by a seven-vowel tonic system and a five-vowel atonic system, the addition of /ə/ expands these inventories to eight tonic and six atonic vowel phonemes, respectively. As noted by Thornton, this expansion does not push the language into an impossible phonological state: languages such as Slovene and Pashto successfully maintain similar vowel systems, although the schwa does not bear the functional load that is expected of the Italian gender-inclusive schwa. Still, our findings align with Thornton's observation that such an expansion is not implausible. Crucially, the present study challenges the stronger version of the unpronounceability argument. While previous work has reported the difficulty of producing the schwa in speech (Ferrari, Pecorari 2024; Marengi, Cardinaletti, Suozzi 2026), our data show that speakers – at least within the experimental conditions considered here – are capable of approximating a mid-central vowel that is acoustically distinct from other sounds. This suggests that the issue may be less about absolute articulatory impossibility and more about degrees of control, consistency, and familiarity. From a usage-based perspective, the schwa appears to be pronounceable, but it is likely to require metalinguistic awareness as well as sustained exposure and practice to become fully integrated into Italian speakers' vowel system.

From a communicative perspective, however, distinctiveness remains a key concern. For the schwa to become truly distinctive, it must acquire a stable morphological value (Giusti 2022). While our results confirm that speakers can produce the schwa as a distinct sound, the communicative success of this strategy hinges on its recognizability by listeners. We must distinguish between the speaker's acoustic output and the listener's phonological categorization. The risk for non-binary schwa is that, if a listener lacks it in their morphological repertoire, they may perform an assimilation, mapping the sound onto the nearest standard morpheme (e.g. -a, -e, -o). Such an assimilation would result in the intended gender-inclusive meaning being overridden, leading either to unintended binary interpretations or to misgendering. If a speaker produces a schwa in *buongiorno a tuttə* 'good morning everyone(NB)' but the listener perceives it as *buongiorno a tutte* 'good morning everyone(F)', the communicative intent to go beyond the gender binary fails. In the framework of Austin's (1975) speech act theory, this would constitute an infelicity, whereby the utterance is acoustically performed in line with formal criteria, but it fails to achieve its perlocutionary effect, i.e. in this case the recognition of non-binary identity, because the phonetic signal is misinterpreted. Importantly, our acoustic results suggest that such a risk cannot be

entirely ruled out, especially in cases where the schwa shows limited separation from open-mid vowels.

This point relates to the broader distinction between *langue* and *parole* (De Saussure 1995), which highlights the dichotomy between the abstract linguistic system shared by speakers and its individual, variable realization in actual use. Speech production is inherently variable: speakers routinely produce vowels that deviate from ideal acoustic targets without compromising intelligibility. Acoustic measurements of formants in natural speech frequently show partial overlaps, especially in unstressed syllables (Renwick 2024). Therefore, within this perspective, the crucial issue is not whether the schwa perfectly matches a canonical mid-central vowel, but whether it is sufficiently distinct from other vowels to be interpreted as carrying a specific function. As far as production is concerned, the present findings suggest that even a non-standard vowel can begin to acquire phonetic autonomy through use. However, while our data map the acoustic space of this vowel, only dedicated perception studies on phoneme discrimination can ultimately determine what counts as a sufficient baseline for functional intelligibility.

7 Limitations and Future Directions

The controlled nature of the task may have facilitated schwa production in ways that do not fully reflect spontaneous speech. Notably, it cannot be excluded that pronunciation may remain particularly challenging for speakers lacking the metalinguistic awareness, public speaking expertise, or English fluency of the participants of this study. While English proficiency likely provided perceptual familiarity with the schwa – by virtue of its being a common vowel sound in spoken English – this does not automatically translate into the ability to produce it while speaking Italian. Furthermore, a similar logic applies to dialects, yet results remain inconclusive regarding their influence. Due to the small-scale nature of this study, no clear correlation can be established between participants' geographic origin and the success in stabilizing this novel phoneme.

These considerations point to several avenues for future research. First, it is necessary to collect data across a wider range of speech production contexts, moving beyond the cross-linguistic transfer inherent in interpreting. While the challenge of translating non-binary language from a natural gender language such as English into a grammatical gender language such as Italian has attracted considerable attention, the use of the schwa should not be reduced to a translation problem alone. As noted by Mackenzie (2022), such practices are often framed as imported by anglophone identity politics. However, they are better understood as agentic responses

to local linguistic constraints driven by the need for greater gender inclusivity. In this sense, it remains crucial to investigate how Italian speakers deploy the schwa in monolingual settings.

Closely related to this point is the need to analyze naturally-occurring spoken data rather than relying exclusively on controlled scenarios: what remain to be answered are, beyond the phonological realm, the questions of where speakers are heading and what their majority choices are (Lo Duca 2024), as well as the cognitive load caused by the introduction of a new morpheme into the grammar and the extent to which innovative forms prove communicatively effective in everyday interaction (Robustelli 2021).

Finally, conducting a larger-scale study and adopting a longitudinal perspective would make it possible to confirm the robustness of the acoustic patterns observed here while assessing whether usage has shifted since 2022. This data was collected at a time when the debate on gender-inclusive language reached high topicality in Italian public discourse. Yet, non-binary gender representation remains a live and unresolved issue among Italian speakers, as evidenced by the high interest shown by both academic and non-academic debates that continues to this day.

8 Conclusions

The present study set out to address a central concern in the debate on gender-inclusive and non-binary language in Italian, namely, whether the schwa can be effectively produced in speech. The analysis was conducted on a dataset consisting of 10 female native speakers of Italian, focusing on a total of 205 tokens containing /ə/, which were compared with tokens of the speakers' native vowels. Our small-scale study suggests that gender-inclusive schwa can be successfully incorporated into Italian speech. Despite only minimal prior exposure to the schwa, participants were able to produce the sound as a mid-central vowel distinct from other vowels belonging to the standard phonemic inventory. This suggests that even limited familiarization can activate the ability to intentionally approximate a novel phonetic target, thereby supporting the viability of the schwa as a gender-inclusive strategy at the level of speech production in Italian. This supports the idea that the issue of acoustic proximity is not an insurmountable phonemic constraint, but rather a matter of sociolinguistic priming, at least as far as linguistic production is concerned.

Ultimately, it remains relevant to distinguish between speakers' acoustic output and listeners' phonological categorization. Our study suggests that the focus should move from whether the schwa can be pronounced – as our participants have demonstrated it can – toward how it is received. The modest difference found between the schwa

and open-mid vowels (especially /ɛ/) remains a potential source of interference. Future research should prioritize language processing in the realm of orality to gauge the effects of an (in)distinct acoustic realization of the schwa on listeners. Only then can we conclude whether the schwa serves as an effective device for gender inclusivity in spontaneous, real-time spoken communication.

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