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VOWEL MINIMAL PAIRS IN XITSONGA: PHONOLOGICAL CONTRASTS AND LEXICAL CATEGORISATION WITHIN A STRUCTURALIST FRAMEWORK

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Abstract

Research on Xitsonga has not sufficiently examined the role of vowel minimal pairs in distinguishing lexical and grammatical categories, particularly between nouns and verbs. This study investigates how vowel contrasts function phonemically to encode meaning and categorisation in Xitsonga. A data of 25 vowel minimal pairs was collected from dictionaries and scholarly sources, and analysed using morphophonological and thematic approaches within a Structuralist Phonological Theory framework. The findings reveal that vowel contrasts play a systematic role in lexical differentiation, occurring across initial, medial, and final positions, as well as cross-category contrasts between nouns and verbs. Initial vowel contrasts differentiate verbs, medial contrasts exist in both nouns and verbs, and final vowel contrasts occur in nouns. Cross-category contrasts further underscore the role of vowels in marking lexical category distinctions, revealing systematic positional regularities within the language's phonological system. These patterns demonstrate that vowel quality functions as a structural marker of meaning and lexical categorisation in Xitsonga. This study contributes to Xitsonga phonology by providing a systematic account of vowel minimal pairs and their grammatical significance. It also offers empirical support for structuralist principles by showing how phonemic opposition operates in Xitsonga, with implications for phonological theory, language documentation, and pedagogy.

Keywords: *lexical categories; phonological contrast; structuralist theory; vowel minimal pairs; Xitsonga phonology*

1. Introduction

Minimal pairs are central to phonological analysis because they provide direct evidence for phonemic contrast within a language. Despite their importance, vowel minimal pairs in Xitsonga remain underexplored, particularly with respect to how vowel contrasts contribute to lexical meaning and grammatical categorisation. This gap limits our understanding of Xitsonga phonology and constrains broader comparative and descriptive work on Bantu languages.

Minimal pairs are commonly defined as pairs of words that differ by only one sound segment and exhibit a difference in meaning (Ahmad, Bello, & Stephen, 2023). In phonological research, they are used to identify contrastive units and to demonstrate how

sound differences function meaningfully within a linguistic system (Afifah & Lubis, 2023). While previous studies have shown that minimal pairs can involve both segmental and suprasegmental features, including tone, the present study focuses on segmental vowel contrasts, as these play a crucial role in distinguishing lexical items and grammatical categories across languages (Vainio, Järvikivi, Aalto, & Suni, 2010; Jones, Van der Merwe, Van der Linde, & le Roux, 2018).

Vowel minimal pairs are word pairs that differ in meaning due to a change in a single vowel while the surrounding segmental structure remains constant are significant in illustrating the contrastive function of vowels (Lubis, Batubara, & Fathani, 2023). Such contrasts are known to influence lexical differentiation and morphological patterning in many languages (Bassetti, Sokolović-Perović, Mairano, & Cerni, 2018). Vowel minimal pairs may occur in initial, medial, or final word positions, underscoring the pivotal role they play in creating phonological distinctions and enriching the vocabulary of a language (Sanjaya, 2020). However, research on vowel minimal pairs has been uneven across languages, with minority languages such as Xitsonga receiving less attention.

Xitsonga employs a five-vowel system: /a/, /e/, /i/, /o/, and /u/ (Mabaso, 2017; Vratsanos & Kadenge, 2017). These vowels are classified according to their height (high, mid, low), backness (front, central, back), and roundedness (rounded or unrounded) (Shabangu, 2016). While earlier studies, such as Mlambo (2025a, 2005b), have examined consonantal and tonal minimal pairs in Xitsonga, systematic investigations into vowel-based minimal pairs and their role in distinguishing nouns and verbs are limited. As a result, there is insufficient understanding of how vowel contrasts contribute to lexical classification and grammatical distinctions in the language. This lack of focused analysis poses challenges for linguistic description, language pedagogy, and the preservation and documentation of Xitsonga.

The present study addresses this gap by investigating vowel minimal pairs in Xitsonga, focusing on their function in nouns and verbs. The study aims to (i) identify and categorise vowel minimal pairs in Xitsonga, and (ii) analyse their role in lexical classification and semantic differentiation. The study is guided by the following research questions:

1. What vowel minimal pair patterns occur in Xitsonga nouns and verbs?
2. How do these vowel contrasts function to mark grammatical distinctions and semantic differentiation?

By providing a systematic analysis of vowel minimal pairs in Xitsonga, this study contributes to Xitsonga phonology by demonstrating how vowel contrasts shape lexical and grammatical categorisation.

2. Literature Review

2.1 Structuralist Phonological Theory as Theoretical Foundation

This study is situated within Structuralist Phonological Theory (SPT), which conceptualises language as a system of interrelated elements whose meanings arise from oppositional relationships rather than isolated sounds (Salmons & Honeybone, 2015; Juanda, 2024). Within this framework, phonemes are defined by their contrastive function, and minimal pairs constitute the primary empirical evidence for establishing phonemic distinctions (Joseph, 2022). This theory provides a robust analytical framework for examining minimal pairs, as it enables the systematic identification of contrastive vowel phonemes and their role in distinguishing lexical meaning and grammatical categories.

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SPT is particularly relevant to the present study because it provides a principled method for analysing vowel minimal pairs as oppositional units that distinguish meaning and grammatical categories in Xitsonga. By focusing on distribution, contrast, and binary opposition, the theory enables the identification of vowel contrasts that signal lexical and grammatical differences between nouns and verbs. Rather than offering a purely phonetic account, SPT allows for a system-oriented description of how vowel contrasts function within the broader phonological structure of Xitsonga.

2.2 Minimal Pairs in Phonological Analysis

Across languages, minimal pairs have long been employed to establish phonemic inventories and to demonstrate how small segmental differences encode meaning. Studies in both tonal and non-tonal languages confirm that minimal pairs are central to understanding how phonological systems organise contrast. While some research extends minimal pair analysis to suprasegmental features such as tone, segmental contrasts such as consonants and vowels, remain a core focus in phonological theory due to their role in lexical and meaning differentiation.

Research in Bantu languages supports this perspective. Ndinga-Koumba-Binza and Roux (2009), working on Civili, demonstrated that vowel contrasts must be empirically validated, as perceptual salience varies across vowel qualities. Their findings highlight that phonological contrast cannot be assumed solely on theoretical grounds, a principle that directly informs the present investigation of vowel minimal pairs in Xitsonga. Ndinga-Koumba-Binza and Roux (2009) underscore the importance of grounding phonological descriptions in actual contrastive usage, especially in under-resourced languages.

Comparatively, research in non-Bantu languages illustrates the broader analytical value of minimal pairs. Kovačević, Milosavljević and Simonović (2024) showed that minimal contrasts in Serbo-Croatian verbs are realised through theme vowels, reflecting an underlying morphosyntactic distinctions rather than purely phonetic variation. This demonstrates that minimal pair methodology can illuminate lexical categorisation and grammatical structure, which is a key concern of the current study on Xitsonga nouns and verbs. Kovačević et al. (2024) indicated that minimal pairs function not only as phonological diagnostics, but as gateways into understanding deeper grammatical organisation. This insight motivates the application of minimal pair analysis to vowel contrasts in Xitsonga.

2.3 Minimal Pairs in Perception and Pedagogy

Minimal pairs have also been widely applied in perceptual and pedagogical contexts, particularly in second-language acquisition research. Studies such as Tuan (2010), and Dewi and Astriyanti (2021) demonstrated that minimal pair training improves learners' ability to understand and produce difficult phonemic contrasts, especially vowels absent from their first languages. These findings reinforce the idea that phonemic contrasts must be clearly identifiable and functionally robust within a language system. While these studies focused on language learning rather than description, they offer an important implication for Xitsonga as unclear or undocumented vowel contrasts can hinder effective teaching, learning, and standardisation.

Similarly, Balčytytė and Skerstonaitė (2024) showed that even when learners improve segmental placement, subtle vowel distinctions may remain resistant without targeted feedback. This highlights the need for precise phonological descriptions of vowel contrasts, particularly in minority languages where pedagogical resources are limited.

Although these pedagogical studies consulted are not directly concerned with Xitsonga teaching and learning, they underscore the broader significance of systematically identifying and analysing vowel minimal pairs this language which is a central goal to the present study.

2.4 Minimal Pairs in Xitsonga

Within African linguistics, minimal pair analysis has been instrumental in documenting phonological systems, though attention has been uneven across languages. In Xitsonga, existing research has focused primarily on consonantal and tonal minimal pairs. Mlambo (2025a) demonstrated that consonant minimal pairs in Xitsonga play a crucial role in lexical meaning, noun class assignment, and grammatical interpretation, aligning closely with structuralist principles of opposition and distribution. Similarly, Mlambo (2025b) provided compelling evidence that tone functions as a phonemic and grammatical marker in Xitsonga, distinguishing lexical meanings and grammatical categories across parts of speech, such as nouns and verbs. Collectively, these studies validated that minimal pairs are central to Xitsonga's phonological and grammatical organisation. Nevertheless, vowel minimal pairs have not received systematic attention, especially regarding their role in distinguishing nouns from verbs. This represents a significant gap in the phonological description of Xitsonga.

2.5 Research Gap

Despite extensive research on consonantal and tonal minimal pairs in Xitsonga (Mlambo, 2025a; 2005b) and studies of vowel contrasts in other Bantu languages (Ndinga-Koumba-Binza & Roux, 2009), no study has systematically examined vowel minimal pairs in Xitsonga across word classes. This reveal that the role of vowel contrasts in lexical categorisation and grammatical differentiation between nouns and verbs remains unexplored. Therefore, this is study addresses this gap by providing a focused structuralist analysis of vowel minimal pairs in Xitsonga.

3. Research Method

A descriptive qualitative research design was adopted to examine vowel minimal pairs in Xitsonga nouns and verbs. Data were collected through purposive sampling of secondary sources, including Xitsonga dictionaries, grammar books, and scholarly articles. These sources were selected because they provide systematically documented lexical items across word classes, enabling the identification of contrastive vowel patterns without the need for field elicitation. From these sources, a dataset comprising 50 lexical items, organised into 25 vowel minimal pairs, was selected for analysis. The dataset was limited to nouns and verbs that differed solely in vowel quality while retaining comparable segmental environments. The collected data were analysed using a combination of morphophonological and thematic analysis. Morphophonological analysis was applied first to examine how vowel contrasts function phonologically within identical segmental structures and how these contrasts contribute to word formation and lexical meaning. Thematic analysis was then used to identify recurring patterns across the minimal pairs, allowing the study to categorise systematic vowel distinctions within nouns and verbs. These analytical approaches were suitable for highlighting the role of vowel variation in meaning differentiation and lexical categorisation in Xitsonga, providing a structured understanding of vowel minimal pairs within the language's phonological system.

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4. Results and Discussion

This section presents and discusses the results based on five identified themes: initial contrasts of verbs, medial contrasts of nouns, medial contrasts of verbs, final contrasts of nouns, and cross-category contrasts. These themes highlight the phonemic function of vowels in Xitsonga.

4.1 Initial Contrasts of Verbs

In this study, initial vowel contrasts in verbs are observed in minimal pairs where a change in the first vowel differentiates meaning, while all other segments and morphemes remain identical. This contrast highlights the functional role of initial vowels in signalling semantic distinctions and demonstrating how vowel quality operates as a phonemic marker within the verbal system of a languages (Sanjaya, 2020). Examples of such initial vowel minimal pairs are presented in Table 1.

Table 1
Xitsonga initial contrasts of verbs

Verb 1	Verb 2	Contrast
ava	**o**va	/a/ vs /o/
alela	**o**lela	/a/ vs /o/
okelana	**a**kelana	/o/ vs /a/
ovela	**u**vela	/o/ vs /u/
endliwa	**o**ndliwa	/e/ vs /o/

Initial vowel contrasts in verbs in this study reveal how minimal phonemic changes systematically shape meaning and grammatical function in Xitsonga, as shown in Table 1. For example, pairs such as *ava* (divide or separate) versus *ova* (bend), and *ovela* (bend to bring near) versus *uvela* (to be spiteful), illustrate that a single vowel substitution can differentiate both semantic content and verbal function. Reciprocal and applicative forms, as in *okelana* (to fetch fire for each other) versus *akelana* (build near one another), or *alela* (withhold or forbid) versus *olela* (pick up, collect), show how initial vowel changes mark shifts between physical, emotional, and cooperative actions. Similarly, passive forms such as *endliwa* (formation of something) and *ondliwa* (maintained or nurtured) highlight contrasts in processual meaning, resulting from initial vowel alternations. Such patterns underscore the functional significance of vowel height and backness in encoding semantic distinctions and align with SPT, where phonemes derive their value relationally within a system of oppositions (Joseph, 2015; Mlambo, 2025a). These findings not only document previously underexplored vowel contrasts in Xitsonga verbs but also provide empirical evidence supporting structuralist principles in a minority language. Moreover, they offer practical implications for language teaching and phonological awareness, reinforcing the need to consider initial vowel distinctions in literacy, pronunciation instruction, and lexical categorisation.

4.2 Medial Contrasts of Nouns

Medial vowel contrasts in nouns are identified in minimal pairs where a single vowel change in the middle of the word differentiates meaning while all other segments remain unchanged. These contrasts serve as systematic phonemic markers, signalling lexical

distinctions and contributing to the organisation of the nominal lexicon in Xitsonga. Examples of such medial vowel minimal pairs are presented in Table 2.

Table 2
Xitsonga contrasts of nouns

Noun 1	Noun 2	Contrast
b**a**ji	b**e**ji	/a/ vs /e/
m**u**si	m**a**si	/u/ vs /a/
mh**u**la	mh**i**la	/u/ vs /i/
ndl**e**la	ndl**a**la	/e/ vs /a/
xis**a**ti	xis**u**ti	/a/ vs /u/

Table 2 presents medial contrasts of Xitsonga nouns, demonstrating how vowel quality functions as a key phonemic marker in lexical meaning differentiation. For instance, *baji* (jacket) and *beji* (badge, insignia) differ only in the medial vowels /a/ and /e/, yet this contrast results in distinct semantic outcomes. Similar patterns occur in *musi* (smoke, pestle) versus *masi* (milk), where the shift from /u/ to /a/ highlights the functional role of vowel height and backness in distinguishing unrelated lexical categories. Likewise, in *mhula* (wax) and *mhila* (medicinal bulb) the contrast is /u/ and /i/, underscoring how medial vowel opposition signals clear semantic boundaries. The contrast in *ndlela* (path) and *ndlala* (hunger) further illustrates that even subtle differences in vowel quality are sufficient to create distinct meanings. A comparable observation emerges in *xisati* (female) versus *xisuti* (waist, loins), where variation between /a/ and /u/ reinforces the systematic nature of vowel contrasts in Xitsonga noun. Such patterns reveal that medial vowel contrasts are not merely phonetic variations but serve as structural mechanisms through which Xitsonga encodes lexical distinctions. In line with SPT, these findings support the view that phonemes gain linguistic value through opposition within the sound system, rather than in isolation (Stoltz, 2021). Importantly, this phenomenon is consistent with evidence from other Bantu languages, where vowel alternations similarly function as phonemic cues for meaning differentiation, suggesting that Xitsonga shares broader typological patterns within the language family. Beyond these examples provided, this analysis contributes to Xitsonga phonology and expands the knowledge of vowel-based minimal pairs in noun systems. It also offers empirical support for structuralist linguistic theory in a lesser-studied African language.

4.3 Medial Contrasts of Verbs

Medial vowel contrasts in verbs are realised through minimal pairs in which a single vowel alternation in the medial position differentiates verbal meanings. The findings show that such medial vowel variation functions as a systematic phonological device for distinguishing actions or processes, rather than as incidental phonetic fluctuation (Renwick, 2024). These contrasts underscore the role of vowel quality in encoding lexical distinctions within the verbal system of Xitsonga and contribute to a clearer understanding of its internal sound patterns. Examples of medial vowel minimal pairs in Xitsonga verbs are presented in Table 3.

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Table 3
Medial contrasts of verbs in Xitsonga

Verb 1	Verb 2	Contrast
t**a**ta	t**o**ta	/a/ vs /o/
pf**a**la	pf**u**la	/a/ vs /u/
hl**o**la	hl**u**la	/o/ vs /u/
kh**i**nya	kh**a**nya	/i/ vs /a/
amb**e**la	amb**a**la	/e/ vs /a/

Table 3 illustrates the functional significance of medial vowel contrasts in Xitsonga verbs, showing that vowel quality operates as a structural marker for distinguishing verbal meaning. For example, *tata* (fill) and *tota* (smear, coat) differ only in the medial vowels' /a/ and /o/, yet the contrast separates two related action types: containment versus surface application. Similarly, the alternation between /a/ and /u/ in *pfala* (close) and *pfula* (open) encodes an antonymic opposition, suggesting that vowel height and backness can systematically signal contrasting semantic domains. A comparable pattern is found in *hlola* (presage) versus *hlula* (overcome), where the shift from /o/ to /u/ marks movement from abstract prediction to dominance or achievement, reinforcing the role of vowel features in differentiating lexical meanings. The contrast between *khinya* (fold cloth) and *khanya* (glint) further highlights how vowel frontness versus openness distinguishes between a manual, technical process and a perceptual or visual phenomenon. Likewise, *ambela* (narrate) and *ambala* (wear) show that the vowels /e/ and /a/ are oppositions that separate communicative acts from physical actions, underscoring the systematic mapping between vowel contrasts and semantic classes. Such patterns emphasise that medial vowel alternations in Xitsonga verbs are not incidental phonetic variations but phonemic oppositions that structure lexical meaning. In line with Saussurean structural phonology, these findings support the view that vowel phonemes gain value through contrast within the sound system. Importantly, this analysis contributes to the documentation of Xitsonga verb phonology by demonstrating how subtle vowel shifts encode major semantic differences in verbs.

4.4 Final Contrasts of Nouns

Final vowel contrasts in nouns refer to minimal pairs in which a change in the final vowel of words differentiates lexical meaning. Final-position vowel alternations function as contrastive phonological cues that distinguish one nominal item from another, rather than reflecting incidental phonetic variation (Astorkiza, 2007; Sanjaya, 2020). These contrasts demonstrate that final vowels in Xitsonga nouns carry a systematic semantic load and contribute to the organisation of the nominal lexicon. As shown in Table 4, such final vowel minimal pairs provide empirical evidence for the role of vowel quality in establishing phonemic contrasts within the language.

Table 4

Xitsonga final contrasts of nouns

Noun 1	Noun 2	Contrast
od**i**	od**a**	/i/ vs /a/
mbang**i**	mbang**u**	/i/ vs /u/
matil**o**	matil**a**	/o/ vs /a/
vukul**e**	vukul**u**	/e/ vs /u/
khandlel**o**	khandlel**a**	/o/ vs /a/

Table 4 presents Xitsonga noun minimal pairs in which contrasts in the final vowel serve as phonemic cues for lexical differentiation. For example, *odi* (ode poem) and *oda* (order) differ only in the final vowels /i/ and /a/, yet the opposition produces distinct semantic interpretations. Similar vowel-based contrasts occur in *mbangi* (dagga) versus *mbangu* (environment), where the shift from a front vowel /i/ to a back vowel /u/ separates a concrete substance from an abstract spatial concept. The contrast between *matilo* (firmament) and *matila* (astringency) further shows how final vowel variation marks a shift between conceptual domains, from cosmological reference to sensory experience. Likewise, *vukule* (distance) and *vukulu* (size, volume) demonstrate that a minimal change from /e/ to /u/ can distinguish between spatial extension and physical magnitude. The pair *khandlelo* (anvil) and *khandlela* (candle) similarly illustrates how final vowel contrasts differentiate unrelated objects within the noun system. These minimal pairings reveal that final vowel quality in Xitsonga is not merely a phonetic detail but functions structurally to encode lexical contrasts. In line with SPT, these findings also support the view that vowel phonemes gain linguistic value through systematic opposition within the sound system.

4.5 Cross-category Contrasts

Cross-category vowel contrasts refer to minimal pairs in which a single vowel alternation differentiates a noun from a verb. These contrasts primarily occur in medial or final positions, and do not only signal semantic variation but also mark shifts in grammatical categories. Vowel quality functions as a morphophonological cue that distinguishes nominal reference from verbal predication, thereby encoding both meaning and category membership. As illustrated in Table 5, such cross-category minimal pairs demonstrate that vowel contrasts in Xitsonga operate at the interface of phonology and grammar rather than serving a purely phonetic role.

Table 5

Cross-category contrasts nouns and verbs in Xitsonga

Noun	Verb	Contrast
bol**o**	bol**a**	/o/ vs /a/
tsw**i**la	tsw**a**la	/i/ vs /a/
t**a**mba	t**e**mba	/a/ vs /e/
hundzuk**o**	hundzuk**a**	/o/ vs /a/
phyam**u**sa	phyam**i**sa	/u/ vs /i/

Table 5 shows cross-category vowel minimal pairs in Xitsonga which reveal how minimal vowel alternations systematically encode shifts in both lexical meaning and grammatical category. For examples, contrasts such as *bolo* (ball) versus *bola* (decay) show

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that a change in the final vowel from /o/ to /a/ differentiate a noun from a process-denoting verb. Similarly, medial vowel alternations in pairs like *tswila* (wild medlar tree) versus *tswala* (to bear/give birth), and *tamba* (rock) versus *temba* (to confirm), mark transitions from static, inanimate referents to dynamic or abstract verbal actions. In these cases, vowel height and backness function as structural cues distinguishing semantic domains and lexical categories.

Final vowel contrasts further hightlight the cross-category pattern of vowel minimal pairs. In *hundzuko* (metamorphosis) versus *hundzuka* (to change), the alternation between /o/ and /a/ differentiates a nominalised event from an ongoing verbal process. Likewise, medial vowel differences in *phyamusa* (newborn child) and *phyamisa* (spoilage of food) signal distinct grammatical and semantic roles, reinforcing the observation that vowel quality plays a decisive role in cross-category differentiation. These findings provide empirical support for SPT, which holds that phonemic value arises from oppositional relationships within the linguistic system (Danesi, 2009; Joseph, 2015, 2022). By documenting how vowel contrasts mediate noun–verb alternations, this study contributes to Xitsonga phonology by illuminating an under-researched mechanism of grammatical distinction in this language. Beyond theoretical relevance, the results have practical implications for pedagogy and language learning, highlighting the importance of vowel awareness for accurate lexical interpretation and grammatical competence.

Across initial, medial, and final positions, vowel contrasts consistently mark lexical and grammatical distinctions. This demonstrates the central role of vowel phonemes in Xitsonga's phonological system and supports the structuralist view of meaning through opposition. Beyond describing individual minimal pairs, this study shows that vowel contrastivity in Xitsonga plays a structural role in grammatical categorisation, aligning with observations from other Southern Bantu languages such as Setswana (Jones et al., 2018) and with broader patterns reported for contrast-based systems in tonal and non-tonal Bantu languages. This observation also reinforces the structuralist account in which meaning emerges from patterned relational contrasts within the entire system of the language.

5. Conclusion

This study investigated the phonemic role of vowel contrasts in Xitsonga by identifying and analysing minimal pairs in nouns and verbs across initial, medial, and final positions, as well as cross-category contrasts between nouns and verbs. The findings demonstrate that a single vowel change can systematically alter lexical meaning and grammatical function, confirming that vowels in Xitsonga operate as contrastive, and structural markers within the language. Initial vowel contrasts were most prominent in verbs, medial contrasts occurred in both nouns and verbs, and final contrasts were observed in nouns, while cross-category contrasts highlighted the role of vowels in distinguishing lexical categories.

Theoretically, these results provide empirical support for SPT, reinforcing Saussure's principle that phonemes derive their value from oppositional relationships rather than inherent meaning. Vowel minimal pairs in Xitsonga exemplify how relational contrasts shape lexical and grammatical distinctions, demonstrating the functional and systematic nature of the language's phonological system. Practically, this study contributes to the documentation and preservation of Xitsonga phonology, offering insights relevant to language pedagogy and linguistic resource development. By mapping vowel contrasts in nouns and verbs, the study

provided a foundation for learners, educators, and researchers to understand subtle phonemic distinctions that are critical for accurate comprehension and communication.

A key limitation of this study is its reliance on secondary data sources, such as dictionaries and published materials, without direct elicitation or perceptual testing. Future research should incorporate spoken corpora, acoustic analyses, and perceptual experiments to verify the functional load of vowel contrasts in natural speech and explore their role in language acquisition. Comparative studies with other Bantu languages could further situate Xitsonga within the broader typology of vowel systems. In summary, this research fills a critical gap in African phonological studies by systematically documenting vowel minimal pairs in Xitsonga, advancing theoretical understanding of phonemic opposition.

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