Investigating Post-Focus Compression in the Saraiki Language

Muhammad Hamza Razzaq
Lasbela University of Agriculture water and Marine Sciences, Uthal.
hamzamalghanii@yahoo.com

Abstract

This study investigates the manifestation of post-focus compression (PFC) in the Saraiki language, a member of the Indo-Aryan language family. Through an analysis of fundamental frequency, syllable duration, and intensity patterns, the study reveals that The Saraiki language does not possess post-focus compression. Specifically, while there is a slight increase in fundamental frequency in sentence-initial focus positions, a noticeable decrease is observed in medial word focus positions. In fundamental frequency in sentence-initial focus positions, a noticeable decrease is observed in medial word focus positions. Similarly, syllable duration shows a minor decline in sentence-initial focus positions but a significant increase in medial word focus positions. Despite these observed patterns, statistical analysis indicates that the differences in prosodic features between post-focus and neutral phrases do not reach significance. This study was conducted to verify the hypothesis that post-focus compression is spread vertically in language families and all the languages that have post-focus compression originated from a single proto-language. The findings of this study indicate that Saraiki does not possess PFC.

Keywords: *Saraiki, Indo-Aryan language, Fundamental frequency, Weak PFC.*

1. Introduction

Post-focus compression (PFC) has gained substantial attention in linguistics due to its role in optimizing communication efficiency across languages. PFC involves the reduction of intensity, pitch range, and other prosodic features following a focused element in an utterance (Xu, 2011). While languages vary in their strategies for expressing focus, many exhibit patterns of increased intensity and pitch range for focused elements, followed by a compression of these features in post-focus segments (Cooper et al., 1985; Lee & Xu, 2010; Xu & Xu, 2005).

Post-focus compression has been observed in a diverse range of languages, including Indo-European languages like English, as well as languages from South Asia such as Mandarin Chinese (Xu, 2011). However, its presence is not universal, as evidenced by its absence in languages like Maya, Chichewa, and Wolof (Xu, 2011). The factors influencing the presence or lack of PFC in a language are complex and may involve linguistic, historical, and sociocultural considerations.

Post-focus compression (PFC) is the compression of fundamental frequency (F0) after prosodic focus, is observed in both tonal and non-tonal languages, demonstrating its cross-linguistic prevalence (Ardali & Xu, 2012; Jin, 1996; Syed et al., 2022; Wang et al., 2011; Xu, 1999). Despite methodological discrepancies, studies consistently highlight heightened fundamental frequency, duration, and intensity, as characteristics of emphasized components within utterances (Féry & Kügler, 2008; Liu & Xu, 2005). While PFC is recognized in Mandarin, variations in focus recognition exist within the Chinese language family. Taiwanese, a variant of Southern Min Chinese, exhibits more consistent alterations in duration than F0 under focus, unlike Mandarin where duration and intensity are compressed post-focus (Chen et al., 2009; Pan, 2007).

Comparisons among Mandarin dialects reveal distinct prosodic realizations of focus. While Beijing Mandarin demonstrates PFC through lowered F0 and intensity post-focus, Taiwanese and Taiwanese Mandarin show weaker or absent PFC, relying more on duration changes (Xu & Shen, 2016). Despite consistent increases in intensity, F0, and duration of on-focus words across languages, the lack of post-focus duration reduction in Taiwanese suggests potential inefficiency in focus (Xu & Shen, 2016).

The study of PFC and its manifestation across languages underscores the complexity of prosodic focus realization. While some languages employ consistent prosodic strategies for marking focus, others exhibit variability within language families. Perception tests are crucial for elucidating the perceptual implications of prosodic variations and furthering our understanding of prosodic focus across languages and dialects.

Saraiki is an Indo-Aryan language spoken in southern Punjab, some areas of Dera Ismail Khan, Loralai, and Nasser Abad in Balochistan. The estimated number of Saraiki speakers is approximately 30 million. Saraiki has several dialects: Central Saraiki, spoken in Dera Ghazi Khan and Multan; Northern Saraiki, spoken in Mianwali and Dera Ismail Khan; and Sindhi Saraiki, which represents a blend of Saraiki and Sindhi spoken in the Sindh province. Saraiki is influenced by neighboring languages; for instance, Saraiki spoken in Rajjanpur exhibits Balochi influence, while Saraiki in Dera Ismail Khan shows characteristics of Pashto due to its proximity to Khyber Pakhtunkhwa (KPK).

This study is an experimental study focusing on the presence/absence of post-focus compression in Saraiki an understudied language. Indo-European English (Cooper et al.,

1985) and German (Féry & Kügler, 2008), are reported to have PFC. Other languages from different language families are reported to have PFC for example Arabic (Azid & Xu, 2020), Japanese (Lee & Xu, 2012), Brahvi (Syed et al., 2022), and Korean (Lee & Xu, 2010). Although post-focus compression is present in a wide range of languages it is not universal (Xu, 2011). The present study attempts to contribute to the existing literature on PFC and the hypothesis that it spreads vertically in languages. For this, the present study is designed to answer the following research questions.

1.1 Research Questions

Q1. How does post-focus compression manifest in Saraiki language?

Q2. What is the importance of PFC in Saraiki concerning the Nostratic family hypothesis?

2. Literature Review

Xu (2011) extensively investigates the origins of Post-Focus Compression (PFC), offering a framework to understand its emergence across languages. He proposes three distinct hypotheses that attempt to explain the mechanisms through which PFC arises. The first hypothesis is independent genesis, which suggests that PFC can emerge independently within various languages, without requiring external linguistic influences. This indicates that PFC could be a naturally occurring phonetic phenomenon that languages develop to mark focus distinctions. The second hypothesis is horizontal spreading, which posits that PFC spreads through language contact, where linguistic features are transferred between languages as speakers interact. An example of this is found in Taiwanese Mandarin, where PFC, once present, appears to have been lost, potentially due to influence from neighboring non-PFC languages. The third hypothesis vertical inheritance, suggests that PFC is inherited from a shared ancestral language, implying that languages exhibiting PFC today may have a common proto-language ancestor. These hypotheses provide a comprehensive lens through which to examine the possible paths of PFC's development and diffusion.

Xu's hypotheses reflect broader questions about linguistic evolution: does language change more from internal innovation or from external contact? The independent genesis hypothesis supports the notion that linguistic features like PFC can emerge within a language as a result of internal phonetic and prosodic developments. In contrast, the horizontal spreading hypothesis highlights the importance of social factors,

where language contact drives the spread or loss of prosodic features such as PFC. Taiwanese Mandarin, where PFC has diminished, provides a case study of how contact with non-PFC languages, such as Taiwanese, may lead to the erosion of such features. Finally, the vertical inheritance hypothesis connects PFC to historical linguistics, suggesting that ancient proto-languages might have passed down prosodic features like PFC to their descendant languages. The idea that modern languages could share this feature through common ancestry situates PFC as a deeper, historical aspect of language evolution.

Historical context plays a pivotal role in understanding the spread of PFC, especially in the case of Mandarin. Xu (2011) draws attention to the extensive interactions between Northern Chinese speakers and non-Chinese groups during significant periods of Chinese history, such as the Yuan Dynasty (1271–1368) under Mongol rule and the Qing Dynasty (1644–1912) under the Manchus. These interactions facilitated linguistic exchange, potentially influencing the prosodic patterns of Mandarin, including PFC. Scholars such as Chappell (2001)and LaPolla (2001) have documented the impact of these cultural and linguistic exchanges, which may have introduced or reinforced prosodic features like PFC in Mandarin. This historical perspective underscores the role of sociopolitical factors in shaping the phonetic characteristics of languages and suggests that PFC could have emerged or been modified as a result of prolonged language contact during these dynastic periods.

In addition to historical factors, Xu (2011) suggests that PFC could be traced back to an ancient proto-language, situating it within the Nostratic superfamily hypothesis. This hypothesis, as explored by Bomhard (2008)and Koerner (1972), proposes that several language families—including Dravidian, Uralic, Indo-European, and Altaic—descended from a common proto-language, referred to as Proto-Nostratic. If PFC existed in this proto-language, it could explain why this feature appears in such a wide range of languages today. Xu et al. (2010) propose different scenarios for the spread of PFC, including the Altaic Origin of PFC (AO-PFC), where PFC spreads from Altaic languages to Mandarin and European languages, and the Indo-European Origin of PFC (IO-PFC), where it spreads in the opposite direction. These hypotheses are collectively referred to as the Single Origin of PFC hypothesis (SO-PFC), which suggests that PFC may have a single point of origin from which it spread to various language families. This hypothesis challenges the idea that prosodic features are continually in flux,

instead proposing that features like PFC can remain stable across time unless disrupted by external influences, such as language contact.

Xu et al. (2010), highlight the significance of empirical research in understanding how PFC operates across different languages. PFC is primarily a phonetic phenomenon associated with focus, whereby focused words are acoustically highlighted, while post-focus words are compressed in terms of intensity and fundamental frequency (F0). Studies across a variety of languages, including Tibetan, Turkish, Korean, German, Dutch, Japanese, and Estonian, have consistently shown that post-focus reductions in F0 and intensity are key markers of PFC. However, the presence or absence of PFC is not universal. For instance, in languages like Mandarin, English, and Korean, PFC is present, while in Taiwanese and Cantonese, it is absent. This cross-linguistic variability raises questions about what factors contribute to the retention or loss of PFC within languages and dialects.

Chen and Yang (2015) conducted a study on bilingual speakers of Quanzhou Southern Min and Mandarin, focusing on how focus is realized in these languages. They found that intensity and fundamental frequency were extended in on-focus regions, demonstrating that the realization of focus can vary depending on the language or dialect in question. In this case, while Mandarin exhibits PFC, Quanzhou Southern Min does not, indicating that prosodic features like PFC can differ even within the same language family. The absence of PFC in Taiwan Southern Min and Quanzhou Southern Min Mandarin speakers further supports the notion that PFC can be lost or altered through language interaction, as seen in the interaction between Taiwanese speakers and speakers of Taiwanese Mandarin, where PFC is absent. This variability within dialects illustrates how language contact can influence the retention or loss of specific phonetic features like PFC.

Further evidence of cross-linguistic variability in PFC is provided by Ardali and Xu (2012)who examined Persian and found that post-focus words exhibited longer duration and higher pitch compared to neutral-focus conditions. This aligns Persian with other languages that exhibit PFC features. Similarly, Wu and Xu (2010)studied Hong Kong Cantonese and observed that words under focus had increased duration and intensity, but post-focus words did not exhibit the compression seen in other PFC languages. These findings suggest that while tonal languages like Cantonese may share some

prosodic similarities with non-tonal languages in terms of focus realization, they may not always display post-focus compression. This cross-linguistic diversity highlights the complexity of prosodic systems and emphasizes that PFC is not a universally present feature, but rather one that varies according to language-specific phonetic, historical, and social factors.

Xu (2011) further posits that in some dialects, such as Lan-Yin Mandarin, PFC may not have emerged through language contact but was instead inherited from a shared ancestral language. This idea points to a potential genetic division between Northern and Southern Chinese languages in terms of PFC presence, where Northern dialects like Lan-Yin Mandarin have retained PFC, while Southern dialects have lost or never acquired it. This genetic perspective provides insights into the historical development of Chinese dialects and their relationships to each other. The presence of PFC in Northern Mandarin and its absence in Southern dialects may reflect ancient phonetic splits within the Chinese language family, linked to the geographical and historical spread of these dialects.

Syed et al. (2022) compare Balochi and Brahvi to study post-focus compression (PFC). Their analysis shows that Balochi has clear PFC, which aligns with patterns found in other Iranian languages. In contrast, Brahvi shows less intense PFC. This is notable because it's the first time PFC has been observed in a Dravidian language.

In conclusion, the distribution of PFC across languages and dialects offers a window into the complex interplay of phonetic characteristics, historical development, and language contact. Xu's exploration of PFC origins highlights how linguistic features can be shaped by internal developments, social interactions, and ancient linguistic inheritances. As research into PFC continues, particularly in Chinese dialects, it has the potential to shed light on broader questions of linguistic typology, prosodic stability, and the role of language contact in shaping phonetic systems. Understanding the factors that contribute to the presence or absence of PFC will enhance our comprehension of prosodic evolution and the dynamic processes of language change.

3. Methodology

This study adopts a comparative approach to investigate focus prosody in Saraiki, aiming to determine if Saraiki exhibits Post Focus Compression (PFC). Following

established methods in recent studies (Chen et al., 2009; Xu, 1999, 2011), the research employs a question-answer model to elicit focus at different sentence locations, including initial, medial, and final focuses. It involves a direct comparison between focus and neutral conditions, examining how prosodic features, particularly Post Focus Compression, vary between sentences with focused elements and those without focus. Continuous fundamental frequency (F0) contours are analyzed to understand the pitch patterns associated with focused and non-focused elements in Saraiki sentences. At the same time, statistical comparisons of multiple acoustic measurements, including duration, intensity, and F0, are conducted at on-focus, post-focus, and pre-focus locations within the sentences. By following this established methodology, the study aims to provide a comprehensive analysis of focus prosody in Saraiki, contributing to our understanding of prosodic phenomena in the language.

3.1 Stimuli

Three sentences were composed, each containing only sonorant consonants and vowels, and comprising three disyllabic words. Additionally, four wh-questions were formulated for each sentence, intended to target neutral, sentence-initial, sentence-medial, and sentence-final focus, respectively. (Stimuli is given in table 1)

3.2 Procedure

This study is an exploration of Post-Focus Compression within the Saraiki language. The data for this investigation were gathered from 12 male native speakers of Saraiki ages ranging from 35 to 52 (mean age 43.6) in a quiet environment in Sokar using the question-answer technique. The questions were strategically designed to elicit answers with varying focus conditions, specifically initial, medial, and final focuses. Stimulus sentences were displayed on a computer screen in the Roman script through a JavaScript program. Participants were instructed to articulate these sentences with distinct focuses. The JavaScript program enabled the generation of diverse patterns for the target sentences. Each script file was stored in MS Word during the recording process. Each participant generated twelve (12) sentences, encompassing four focus conditions and three repetitions, resulting in a total of thirty-six (36) sentences per participant.

Table 1: **Stimuli Saraiki: Target sentences (presented in right columns) Wh-questions for stimulating different focus. Words to be focused on are underlined and bold-faced.**

Sentence A	
Chaiv akhy ve? (What do did you say?)	Nana mely ruly (Grandfather lost in Fair)
Kon mely ruly? (Who lost in the fair?	**Nana** mely ruly. (**Grandfather** lost in fair)
Nana kithan ruly? (Where did Grandfather lost?)	Nana **mely** ruly. (Grandfather lost in **fair)**
Nany nal mely ich chaiv thy? (What happen to Grandfather in Fair?)	Nana mely **ruly**. (Grandfather **lost**in fair)

Sentence B	
Q1. Chaiv akhy ve? (What did you say?)	Mame nara marye (Uncle shouted a slogan)
Q2. Kain nara mareay? (Who shout ed a slogan?)	**Mame** nara marye (**Uncle**shouted a slogan)
Q3. Mame chaiv mareay? (What did uncle shout?)	Mame **nara** marye (Uncle shouted a **slogan**)
Q3. Mame nary kon chaiv kity? What uncle did with slogan?	Mame nara **marye**(Uncle **shouted**a slogan)

Sentence C	
Q1. Chaiv akhy ve? (What did you say?	Mana moro Waleay? (Mana came from Moro)
Q2. Kon Moro waleay? (Who came from Moro?)	**Mana**moro Waleay? **(Mana**came from Moro)
Q3. Mana Kitho Waleay? (Where did Mana come from?	Mana **moro**Waleay? (Mana came from **Moro**)
Q3. Mana Moro mareay? (Mana Died in Moro?)	Mana moro **Waleay**? (Mana **came**from Moro)

4. Statistical Analysis

Table 2: Statistical form of data taken from 12 native speakers of Saraiki

Correlates	F0		Duration		Intensity	
Context	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Pre-focus Medial	142.2774	8.85217	187.7115	11.77911	71.0216	1.15636
Pre-focus Final	138.1364	7.11936	184.8509	9.84303	71.7300	1.03695
Neutral focus Medial	142.8982	8.69081	204.0151	15.92957	71.9388	1.07127
Neutral focus Final	137.4354	7.03299	200.8647	14.85405	72.2332	1.38478
On-focus Initial	143.0277	9.69546	189.0001	11.23728	71.8115	1.11541
On-focus Medial	141.1195	9.85441	163.2634	8.12971	72.7903	1.29642
On-focus Final	121.3763	8.40903	213.9914	26.31086	67.8948	1.30903
Neutral Initial	142.8982	8.69081	203.9075	15.93763	71.9388	1.07127
Neutral Medial	138.7173	7.85635	165.7272	14.80790	73.3570	1.39973
Neutral Final	117.1503	7.53881	197.5698	17.68009	67.5237	2.85902
Post-focus Initial	122.1518	4.82378	210.0428	19.82541	67.7272	.77249
Post-focus Medial	117.4368	7.85499	207.3515	21.47691	66.5046	1.42875
Neutral Initial	124.8250	9.23882	213.8224	18.77982	68.7302	2.38289
Neutral Medial	117.1503	7.53881	197.5421	17.66242	67.5237	2.85902

The study employed 2x2 repeated measures ANOVA to analyze two focus conditions: pre-focus and post-focus. This design allowed researchers to examine how these conditions influenced fundamental duration, frequency (F0), and intensity. For the analysis of three focus conditions—on-focus, pre-focus, and post-focus—a 2x3 repeated measures ANOVA was employed. This approach helped assess variations in measurements across the three focus positions, specifically focusing on duration, intensity, and F0. Using these ANOVAs provided a clearer understanding of how focus affects these speech characteristics in different contexts.

In the analysis of pre-focus words, the F0 showed mixed patterns. In medial positions, F0 decreased slightly, while in final positions, it increased by approximately 1 Hz. The ANOVA indicated non-significant focus effects ($F = 0.008$, $p = 0.930$), but significant

locus effects ($F = 23.78$, $p < 0.001$). The interaction between focus and locus was close to significance ($F = 4.108$, $p = 0.068$).

For on-focus words, F0 increased by 0.2 Hz in the initial position and by 2.4 Hz in the medial position. However, a decrease of 4 Hz was observed in the final position. The ANOVA results revealed non-significant focus effects ($F = 3.308$, $p = 0.068$) and significant locus effects ($F = 155.507$, $p < 0.001$). The interaction between focus and locus was not significant ($F = 1.998$, $p = 0.160$).

In post-focus words, F0 decreased by 2.6 Hz in the initial position and by 0.18 Hz in the medial position. The ANOVA showed non-significant focus effects ($F = 0.269$, $p = 0.614$) and significant locus effects ($F = 27.975$, $p < 0.001$). The interaction between locus and focus was not significant ($F = 1.959$, $p = 0.189$).

For duration, pre-focus words decreased by 14.3 ms in the medial focus position and by 15.2 ms in the final position. The readings indicated significant main effects for focus ($F = 16.661$, $p = 0.002$) and locus ($F = 4.877$, $p = 0.049$), but the interaction was not significant ($F = 0.010$, $p = 0.921$).

Regarding on-focus words, there was a decrease of 14ms in the initial position and 2.5ms in the medial position. However, a significant increase of 14.6 ms was noted in the final position. The results showed non-significant focus effects ($F = 0.024$, $p = 0.881$) but highly significant locus effects ($F = 36.492$, $p < 0.001$). The interaction between locus and focus was also significant ($F = 11.019$, $p = 0.003$).

In post-focus words, the duration decreased by 2.2ms in the initial focus position but increased by 10ms in the medial focus position. The readings revealed non-significant focus effects ($F = 0.398$, $p = 0.541$) and significant locus effects ($F = 17.687$, $p = 0.001$). The interaction between locus and focus was significant ($F = 11.130$, $p = 0.007$).

For intensity, pre-focus words showed a decrease of 0.9 dB in the medial position and 0.5 dB in the final position. The results indicated significant main effects for both focus ($F = 32.779$, $p < 0.001$) and locus ($F = 31.62$, $p < 0.001$), while the interaction was not significant ($F = 2.797$, $p = 0.123$).

In on-focus words, intensity slightly decreased in the initial and medial positions but increased in the final position. The results revealed non-significant focus effects ($F =$

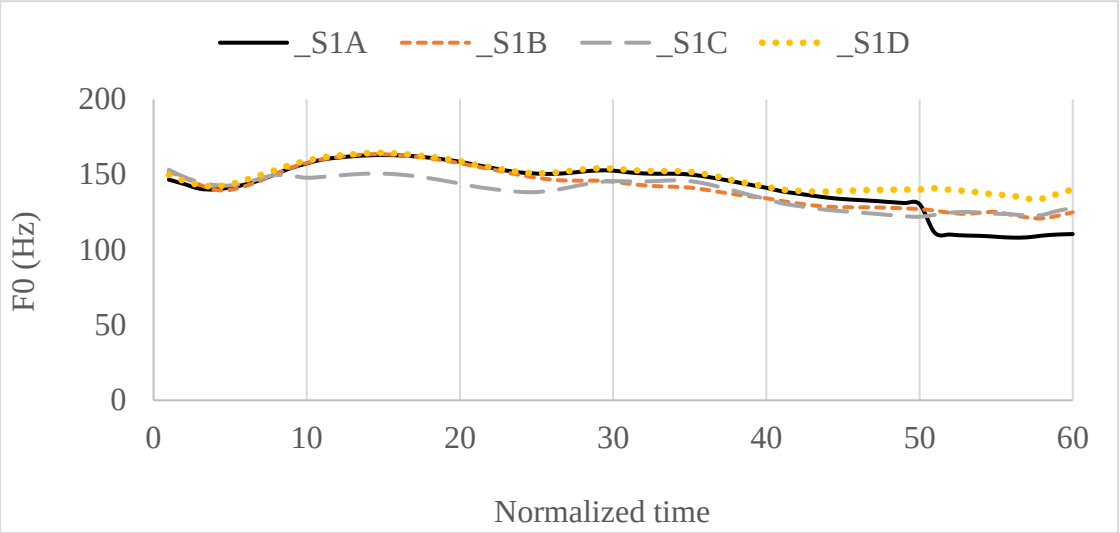
0.112, p = 0.744) but significant locus effects (F = 89.348, p < 0.001). The interaction was not significant (F = 2.006, p = 0.158).

Finally, for post-focus phrases, intensity decreased in the initial focus position and increased in the medial focus position. The results showed non-significant focus effects (F = 1.412, p = 0.260) and significant locus effects (F = 45.121, p < 0.001), with no significant interaction.

Overall, these findings highlight the complex relationships between focus conditions and speech characteristics, with locus consistently showing significant effects across analyses. Graphs will help visualize these results from different focus conditions. To provide a clearer understanding of the statistical data, the next section presents the results in graphical form. Each graph represents a single sentence under four different focus conditions, produced by 12 participants.

5. Graphical Analysis

In the graphs below the black solid line (titled as A) represents neutral phrases in all sentences (S1, S2, S3,). B, C, and D represent initial, medial, and final focus respectively. Vertical lines represent syllable boundaries, normalized time is measured in milliseconds. When compared with neutral phrases a clear lowering of f0 can be seen in all sentences indicating the presence of post-focus compression in the Saraiki language. In Saraiki, there is no significant effect of focus on pre-focus and on-focus phrases observed.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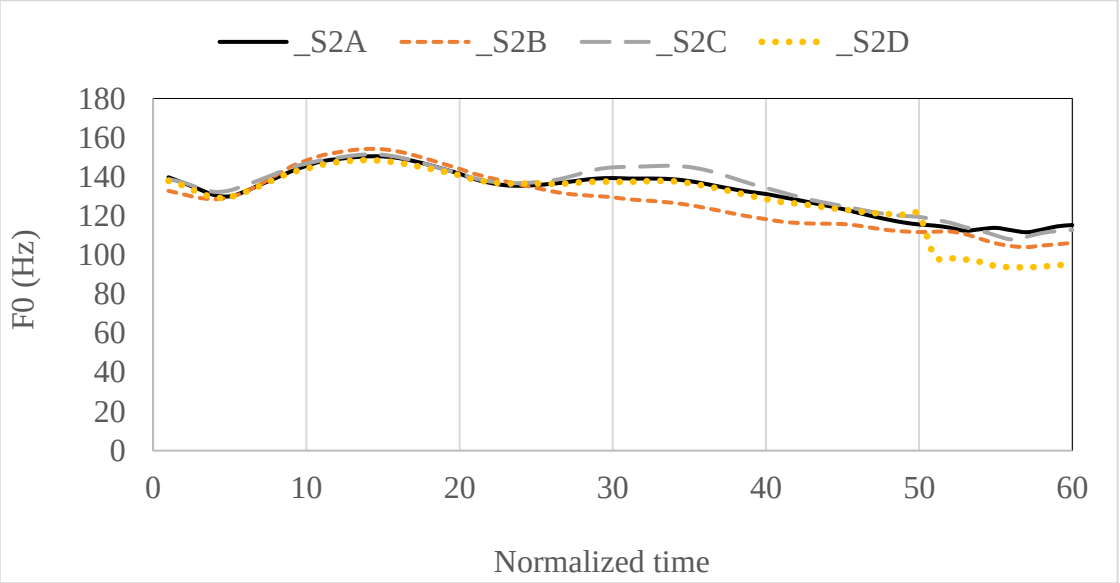
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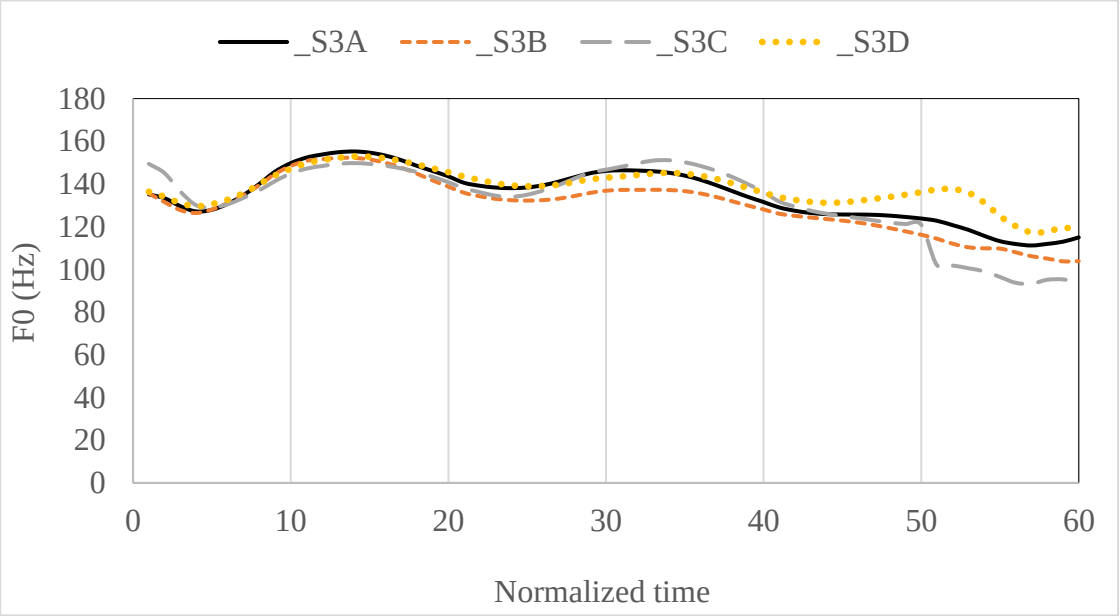
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Normalized time

6. Discussion

This research constitutes an experimental investigation into the occurrence of post-focus compression in the Saraiki language. Data were gathered from 12 native Saraiki speakers using a voice recorder and subsequently analyzed using Praat and ProsodyPro software. The study compared the duration, mean intensity, and mean fundamental frequency (f0) of focused phrases with those of neutral phrases within corresponding sentences.

The results revealed mixed outcomes across all focus conditions. The duration of pre-focus phrases decreased in the medial focus position but increased in the final position. The ANOVA results indicated non-significant effects, suggesting no influence of focus on the duration of pre-focus phrases.

For on-focus phrases, the duration decreased in both the initial and medial positions, while an increase was observed in the final focus position. The analysis yielded significant effects for the focus variable and highly significant effects for the locus variable. Additionally, the interaction between focus and locus was also significant.

Regarding post-focus words, the duration decreased in the initial position but increased in the medial position. The results showed non-significant effects for the focus variable, whereas significant effects were found for the locus variable. The interaction between focus and locus variables was also significant.

The fundamental frequency (F0) of pre-focus phrases exhibited a slight increase in the medial focus position but a decrease in the final focus position. The focus variable yielded non-significant results, while the locus variable showed significant effects. However, the interaction between these two variables was non-significant, indicating no effect on F0.

Regarding on-focus phrases, F0 increased in the initial and medial positions but decreased in the final position. ANOVA results revealed non-significant effects for the focus variable, while significant effects were observed for the locus variable. The interaction between focus and locus was non-significant, suggesting no significant effect of focus on the F0 of on-focus phrases.

For post-focus phrases, F0 decreased in the initial focus position and experienced a slight decrease in the medial focus position. The focus variable showed non-significant effects, whereas the locus variable demonstrated significant effects. The interaction between these two variables was also non-significant, indicating no significant impact of focus on the F0 of post-focus phrases.

The intensity of pre-focus words decreased slightly in both the medial and final focus positions. ANOVA results indicated significant effects for both the focus and locus variables, though the interaction between these variables was non-significant.

For on-focus words, intensity decreased in the initial and medial focus positions but increased slightly in the final position. The results were non-significant, indicating no substantial effect of focus on the intensity of on-focus phrases.

The intensity of post-focus phrases showed mixed results, with a decrease in intensity for post-initial phrases and an increase for post-medial phrases. The ANOVA results were non-significant, suggesting no significant effect of focus on the intensity of post-focus phrases.

7. Findings

The findings showed no clear evidence of post-focus compression (PFC) in Saraiki, as the results were statistically insignificant. While PFC was observed in terms of duration, it was not present in intensity or fundamental frequency. This suggests that Saraiki might have originally had PFC but is gradually losing it due to contact with other languages. Alternatively, it's possible that Saraiki never had PFC, and through interaction with languages that do, it began adopting this feature. As Xu (2011) pointed out, adopting PFC from another language is difficult, which could explain why Saraiki only shows it in duration and not in intensity or pitch. However, the literature does not widely support cases like this, so it is more likely that Saraiki inherited PFC through vertical transmission. Over time, language contact seems to be causing Saraiki to lose this feature.

Findings revealed that PFC is absent in Saraiki. Among Indo-Aryan languages, Hindi has been documented to display PFC (Kügler, 2020). To make stronger claims about the presence of PFC in Indo-Aryan language family and to support and deny the Xu

hypothesis of Nostratic Family and spreading of PFC, more languages from this family should be studied with respect to PFC.

8. Limitations and Recommendations

This study has several limitations. Firstly, it involved only 12 male speakers, which does not adequately represent the diversity within the Saraiki-speaking population, such as female speakers and individuals from various regional backgrounds. Consequently, the findings may not be generalizable to all Saraiki speakers. Additionally, the research focused on specific positions of emphasis (initial, medial, final) without considering other influential factors, such as emotional tone or speech rate, which may also affect prosodic features. The data collection method, primarily utilizing a question-and-answer format, may not fully capture the naturalistic speech patterns of speakers. Furthermore, while the study concentrated on fundamental frequency, duration, and intensity, it did not explore other important prosodic elements, such as rhythm.

For future research, it would be beneficial to include a larger and more diverse sample of participants to enhance the generalizability of the results. Longitudinal studies could provide insights into how prosodic features manifest over time in various contexts. Additionally, comparing the findings with those from other related Indo-Aryan languages may reveal significant patterns of variation. Employing more naturalistic methods, such as analyzing spontaneous conversations, could offer a clearer understanding of how focus interacts with prosody in everyday speech. Finally, investigating additional acoustic features beyond pitch and loudness would contribute to a more comprehensive understanding of the prosodic characteristics of the Saraiki language.

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