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VOWEL NASALITY IN AKAN

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Abstract: This paper discusses vowel nasality in Akan, a Kwa language. Nasality in Akan is surface-contrastive in vowels and could be phonemic or phonetic. We show that nasal vowels contrast with oral counterparts, and also occur mainly after voiceless consonants in Akan. Moreover, there are disparities between the production and distribution of the oral-nasal-nasalized vowels, which are phonologically motivated. The environments of the nasalized vowels in Akan are accounted for.

Keywords: nasalization, oral vowels, nasal vowels, nasalized vowels, voiceless consonants.

1. Introduction

This paper discusses vowel nasality in Akan. The paper contributes to the typology and other phonology-related issues in Akan vowel nasalization. Nasal vowels are common among West African languages and have received detailed erudite attention concerning their suprasegmental representation, their interaction with nasal consonants, and their phonetic realization. Several scholars have given different explanations of the distribution of the phonemic nasal vowels in (West) Africa, including Schachter and Fromkin (1968: 79) on Akan; Hyman (1972) on some Kwa languages; Ruhlen (1978: 3) in languages universals; Maddieson (1984, 2007), Clements (2000), Clements and Rialland (2008), Hajek (2013) in West African languages; and Rolle (2013), nasal vowel patterns in West Africa. It can be understood as a prototypical phonological feature of Kwa languages (Clements & Rialland 2008: 8). Diachronically, several authors, including Robins (1953), Hocket (1955), Ferguson (1963), Greensberg (1966), and Ladefoged (1982), among others, have argued that nasal vowels are invariably preceded by a nasal consonant (NC). It is this nasal consonant that spreads its nasal feature to the following oral vowel for the vowel to be realized as nasalized (cf. Nasukawa 2005; Ploch 1999). Also, Hyman (1972) argues convincingly that in the Kwa languages, the original nasal consonants preceded the vowels that were eventually nasalized.

Akan is one of the Kwa group of languages, yet, it has two types of vowel nasality, namely nasal vowels, which are phonemic, and nasalized vowels, which are phonetic (cf. Adomako 2018a; Dolphyne 2006: 118; Schachter & Fromkin 1968: 78). Phonemic nasal vowels are indicated by a diacritic [~]. The nasal feature is integral in the language as it lexically contrasts meaning, as indicated in the examples [fã] "half/festival" and [fa] "to take" in Akan (cf. Dolphyne 2006: 118; Schachter & Fromkin 1968). Akan has five phonemic nasal vowels and of these, four are high vowels /ĩ/, /ĩ/, /ũ/, /õ/, with /ã/ being the only low vowel among them. All these vowels have the inherent feature specification [+nasal]. Nasal vowels are articulatorily different from nasalized vowels. This is because while nasal vowels have the underlying feature specification [+nasal, +vocalic=(Ṽ)], nasalized vowels have the underlying feature specification [-nasal,+vocalic] unless it is in the environment of nasal consonants [CnV=CnṼ] (cf. Capo 1981; Clements 2000; Clements & Rialland 2008; Hyman 1972, 1982; Ruhlen 1978; Schachter & Fromkin 1968; Williamson 1973).

This means that nasalized vowels result from an assimilatory process and their environments are phonologically predictable (Durvasula 2009; Hyman 1972; Rolle 2013; Schachter & Fromkin 1968). Cross-linguistically, most of the studies on vowel nasalization have centreed on nasalized vowels, where an oral segment undergoes nasalization due to its proximity to a nasal segment (cf. Clements 2000; Clements & Rialland 2008; Hajek 2013; Hyman 1972; Maddieson 1984, 2007; Rolle 2013; Ruhlen 1978; Schachter & Fromkin 1968; Williamson 1973).

Hitherto, a study on vowel nasality in Akan has received very little or no erudite attention in the existing literature. From an acoustic perspective, Manyah (2011) compares inherent nasal vowels with oral counterparts and demonstrates how inherent nasal vowels contrast with their oral counterparts in short and long vowels in Twi. In their lexical distributions, Dolphyne (2006: 98) provides examples of words with nasal vowels in Akan and shows how they contrast in meaning with their oral counterparts. Again, in their systematic occurrence, Schachter and Fromkin (1968) discuss two cases where [-nasal] vowels are made [+nasal] through the operation of some phonological rules (p-rules). None of these studies has discussed the typology and phonological occurrences of vowel nasalization in Akan. The differences and why nasal vowels occur after voiceless consonants, why nasal vowels contrast with oral vowels, and why nasal vowels are contrastive but nasalized vowels are not in Akan have all not yet been studied. Since vowel nasality remains less studied in the existing literature on Akan, this study is a contribution to research on oral-nasal and nasalized vowels in Akan.

The data discussed in this paper were drawn from both primary and secondary sources. The primary source was elicited from six adult native speakers of Akan, two from each dialect, i.e. Fante (Fa), Asante (As), and Akuapem (Ak). The secondary source, on the other hand, was a collection of data from articles and books, which we have duly referenced. The data gathered were categorized, transcribed, and English glosses provided. In addition to these, the authors' intuitive knowledge as native speakers was also drawn on for the data collection, organization, and analysis.

The remainder of the paper is organized as follows: Section **2** discusses vowels; oral and nasal vowels in Akan and phonological issues. Section **3** discusses the distribution of phonemic nasal vowels and the phonological motivation of why nasal vowels contrast with oral vowels in Akan. Section **4** focuses on nasalized [phonetic] vowels and their systematic predictable environments, and why they are not contrastive in Akan phonology. Section **5** concludes the discussions in the present paper.

2. Vowels in Akan

Before we proceed to discuss vowel nasality, it is imperative that we briefly talk about Akan vowels in general. Akan vowels are usually divided into two groups based on the property of orality; i.e. oral and nasal vowels.

2.1 Oral vowels in Akan

We have earlier indicated that Akan has five phonemic nasal vowels /ĩ/, /ɪ̃/, /ã/, /ũ/, /õ/ and ten phonetic oral vowels /i/, /ɪ/, /e/, /ɛ/, /u/, /ʊ/, /o/, /ɔ/, /æ/, /a/ (cf. Abakah 2003, 2013; Adomako 2008; Clements 1984, 1985; Dolphyne 2006; Eshun 1993; Manyah 2011; Schachter & Fromkin 1968; Stewart 1967). Nine out of the ten phonetic oral vowels are phonemic, only [æ] is realized at the phonetic level (cf. Abakah 2005; Adomako 2008, 2018a; Casali 2012; Clements 1981, 1984, 1985; Dolphyne 2006; Schachter & Fromkin 1968; Stewart 1967, 1983). It is the allophonic variant of the unadvanced low vowel /a/ as its environment is phonologically predictable (Adomako 2008: 10). In the production of the oral vowels, the velum is raised to block the nasal cavity, thereby leaving the oral cavity open for the air from the lungs to escape through (Cohn 1990; Katamba 1989; Ladefoged 1982; Yule 2010).

In terms of their distribution, six vowels [e, ɛ, æ, a, ɔ, o] can occur word-initially in Asante and Akuapem dialects, whereas eight vowels [i, ɪ, e, ɛ, æ, a, ɔ, o] occur in the same place in the Fante dialect. All the ten phonetic oral vowels occur word-medially and finally, except [æ], which does not occur at the word-

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final position in Asante and Akuapem dialects (cf. Abakah 2004, 2013; Berry 1957; Clement 1983; Dolphyne 2006; Eshun 1993; Schachter & Fromkin 1968). It occurs word-finally in some of the subdialects of Fante, particularly Gomoa, Ajumako, Ekumfi, and Bɔrbɔr Mfantse, which Abakah (1978) classifies as Boka Mfantse.

Aside from their groupings based on their orality, the ten phonetic vowels can be grouped based on the feature [±ATR] (Abakah 2004; Adomako 2015; Berry 1957; Clements 1981, 1984; Dolphyne 2006; Stewart 1967). The following are the [+ATR] vowels [i, u, e, o, æ] and the [-ATR] vowels [ɪ, ʊ, ɛ, ɔ, a]. Moreover, Abakah (2004) and Dolphyne (2006: 18) have also classified the phonetic vowels based on the feature [round] in relation to the lip posture. The [+round] vowels include [u, o, ɔ, ʊ] and the [-round] vowels are [i, ɪ, e, ɛ, a, æ]. The [±round] feature is more predominant in the Fante dialect than it is in the Asante and Akuapem dialects of Akan (Abakah 2004; Dolphyne 2006). These classifications of vowels in Akan constrain the distribution of the vowels so that vowels in words or across words must have identical feature values (Berry 1957; Dolphyne 2006; Schachter & Fromkin 1968; Stewart 1967).

2.2 Nasal vowels in Akan

Ferguson (1963) argues that no language has NVs unless it also has one or more Primary Nasal Consonants (PNC). According to Ruhlen:

> "*…the mere physical presence of nasality is not in itself sufficient to define what has traditionally been called nasal vowels (NV's)…. Thus, … the nasalization of a NV must be in some sense inherent (intrinsic, phonemic, underlying, non-contingent, etc.) in the vowel, and not phonetically conditioned. The term NV has consequently been reserved for vowels that (I) show marked nasalization and (II) contrast phonetically with the corresponding oral vowel*" (1978: 3).

In this paper, we show that the term NV has consequently been reserved for vowels that contrast *phonemically* with the corresponding oral vowel in Akan, and argue that there exists both inherent and phonetic nasalization of vowels in Akan as has been claimed by Dolphyne (2006: 3), Manyah (2011), Rolle (2013) among others. In other words, nasal vowels are the cognitive property of the vowel sound in Akan (following Ploch 1999). Barbosa and Albano (2004) use the term "nasalized" vowels to describe such vowels. However, we follow the conventions in Stevens (1998) and refer to these vowels as "nasal" vowels, as they are arguably phonemically distinct from their oral counterparts. Following Cohn (1990), we employ the term (phonetically) nasalized to refer to oral vowels that undergo nasalization due to their proximity to a nasal segment, usually consonant.

In Akan, phonemic nasal vowels contrast with their oral counterparts thus resulting in contrast in meaning. These contrastive nasal vowels constitute individual phonemes, unlike their phonetic nasal counterparts. This distinction is made because the substitution of such nasal vowels with their oral counterparts in a given context, results in contrasts in meaning in Akan (cf. Dolphyne 2006; Hyman 1972; Pulleyblank 1989; Schachter & Fromkin 1968).

We have explained in *2.1* that Akan has five phonemic nasal vowels, which are [ĩ, ɪ̃, ã, ũ, ɔ̃]. The number of oral vowels in Akan is more than that of the nasal vowels as in a similar perceptually motivated approach by Hawkins and Stevens (1985). According to Hawkins and Stevens, "In a substantial minority of languages that contrast nasal and non-nasal vowels, there is a reduced number of nasal vowels ... Most commonly it is the mid vowels that are missing in these imbalanced systems…" (ibid., 1574).

Ruhlen (1978) defines a phonemic nasal vowel as a vowel that is phonetically nasalized, and where the feature [+nasal] is not predictable in terms of phonetic structure. In Akan, the phonemic nasal vowel is not phonetically nasalized but rather the nasal feature is intrinsic. Thus, a phonemic nasal vowel in Akan can be defined as a vowel that has the feature [+nasal] as an inherent property and that cannot be predictable in terms of phonetic structure. During the production of phonemic nasal vowels, the air comes out through both the mouth and the nose (Dolphyne 2006: 3)**.**

In Akan, mid-vowels do not occur as nasal vowels as reported by Hyman (1972) in most of the Kwa languages. Articulatorily, oral and nasal vowels are specified only in the position of the velum as has been explained already. Table 1 below demonstrates the feature matrix specification of oral and nasal vowels in Akan.

Table 1: Feature matrix specification of oral and nasal vowels in Akan

	/i/	/ɪ/	/u/	/ʊ/	/e/	/ɛ/	/o/	/ɔ/	/æ/	/a/	/ĩ/	/ɪ̃/	/ũ/	/ɔ̃/	/ã/
High	+	+	+	+	-	-	-	-	-	-	+	+	+	+	-
Low	-	-	-	-	-	-	-	-	+	+	-	-	-	-	+
Back	-	-	+	+	-	-	+	+	-	-	-	-	+	+	-
Nasal	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+
ATR	+	-	+	-	+	-	+	-	+	-	+	-	+	-	-

It is observable from Table 1 that all the phonemic nasal vowels in Akan are peripheral, i.e., [+high] and [+low] vowels. Among these nasal vowels, only two /ũ/ and /ɔ̃/ are [+back], and two vowels, namely /ɪ̃/ and /ũ/ are specified for [+ATR]. We have established from the previous discussion that the contrast

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between the nasal vowels and their oral counterparts lies in the [nasal] feature. Consequently, the following minimal pairs demonstrate the contrastiveness of nasality in Akan.

(1) **Minimal pairs of oral and nasal vowels in Akan**

(i)	fã	'half/festival'
	fa	'to take'
(ii)	fĩ	'dirty'
	fi	'come from/go out'
(iii)	sũ	'to cry'
	su	'character/form'
(iv)	sɔ̃	'be big/to reach'
	sʊ	'to carry/on top of'
(v)	sĩ	'a tooth'
	sɪ	'to tell/sharpen'
(vi)	sã	'to finish/to be on'
	sa	'war/to heal or cure’

Both vowels and consonants in each pair of words are identical in all respects except in only one feature. The feature that contrasts the paired words is the [nasal] feature. This implies that nasality is phonemic in Akan as has been elucidated above. We, therefore, posit here that Akan has both oral and nasal vowels as explained in Schachter and Fromkin (1968), Hyman (1972), Dolphyne (2006), and Manyah (2011).

2.2.1 Why nasal vowels contrast with oral vowels in Akan: A phonological explanation

We have demonstrated from example (**1**i-vi) that nasal vowels contrast with oral vowels in Akan and their contrast is in the feature [nasal]. This section attempts to answer the question of why [phonemic] nasal vowels contrast with oral vowels in Akan. From a phonological perspective, we attempt to answer this question based on the position of the velum during the articulation of the nasal-oral vowels (Cohn 1993; Ohala 1990) and employ the Feature Geometry (FG) theory to support the fact that each feature is privative (Pulleyblank 1988).

Some previous studies of nasalization have compared phonemic nasal and oral vowel pairs assuming that the only physical difference between the two is the position of the velum; that is, while a nasal vowel is produced by opening the velopharyngeal port, maintaining the oropharyngeal configuration is associated with the oral vowel (Berger 2007; Cohn 1990; Nasukawa 2005; Pruthi 2007). However, articulatory phoneticians suggest that the position of the tongue, lips, and pharynx, as well as the velum, may differ between oral and nasal vowel congeners.

The production of vowels involves the airflow escaping through the mouth unobstructed. This shows that in the production of vowels, the air comes out through the mouth. This is because the velum is raised to block the airflow through the nasal cavity and leaves the oral cavity open, hence airflow passing through the mouth (Cohn 1990; Dolphyne 2006: 6; Katamba 1989: 8-9). This process results in the production of oral vowels. However, in the production of inherent nasal vowels, on the other hand, the air escapes through both the mouth and the nose (Dolphyne 2006: 6). This can be attributed to the fact that vowels have oral freedom and the inherent [nasal] feature also contributes to nasal functioning. Here, nasality is seen as an innate entity that is a bearer of phonological contrast in Akan (Cohn 1990: 10; Dolphyne 2006: 98).

It is obvious that the same velum, which is raised to block the nasal cavity for the production of oral vowels, is partially lowered for the airflow to escape through both the mouth and the nose for the production of nasal vowels. Thus, the passage of air through the nasal cavity or the nasal cavity causes the difference between the oral-nasal vowels because they all agree in orality (Cohn 1990; Eshun 1993; Hyman 1972; Katamba 1989). The Feature Geometry (FG) schema in Figure 1 is employed to illustrate this contrast and show the independence of each phoneme in the pairs.

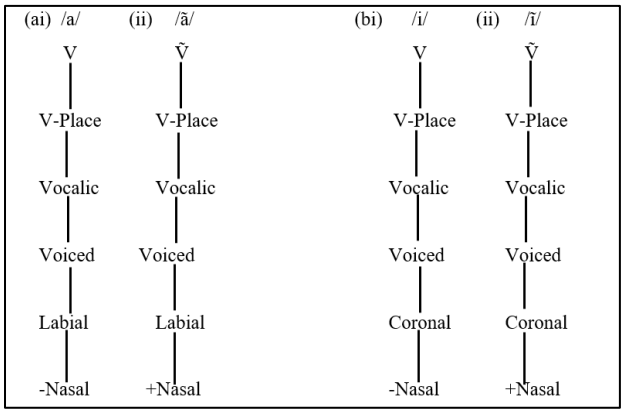

Figure 1. Feature Geometry showing the privative nature of phonemic nasal and oral vowels

(Source: Own processing)

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It is evident from Figure 1 that at the place node, both oral and nasal vowels show the same feature representations. That is, they have the same place and manner of articulation. Their contrast is only in the feature based on the position of the velum, i.e. whereas (i) is [-nasal], (ii) is [+nasal]. This shows that each vowel quality is privative as a phoneme.

3. Distribution of phonemic nasal vowels in Akan

This section provides data to account for the distribution of contrastive nasal vowels in Akan. Contrastive nasal vowels occur mainly in open words, i.e. at the word-final position after voiceless consonants in Akan. They do not occur at the word-initial or medial position as demonstrated in Table 2 below.

Table 2. Distributions of contrastive nasal vowels

Positions	/ĩ/	/ɪ̃/	/ũ/	/õ/	/ã/
Word-initial	-	-	-	-	-
Word-medial	-	-	-	-	-
Word-final	+	+	+	+	+

The distribution of contrastive nasal vowels is presented in the minimal pairs in example 2 below.

(2) **Distribution of contrastive nasal vowels at the word-final position in Akan**

	Nasal-oral contrast	**Gloss**
(i)	**h**ũ	'fear/to see'
	hu	'to blow/to fan'
(ii)	ŋ**f**ã	'guinea worm'
	ŋfa	'don't take it'
(iii)	**s**ã	'to finish'
	sa	'to dance/to scoop'
(iv)	tɕĩ	'to squeeze'
	tɕi	'to hate'
(v)	**tɕ**ĩ	'to live long/last'
	tɕɪ	'to fry/roast'

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(vi) æfũ 'hunchback'

æfu 'it has become bushy

When the examples in (2i-vi) are closely examined, it can be seen that all the nasal vowels come after a voiceless fricative (2i-v) or voiceless affricate (2vi). The nasal vowels do not occur after a voiced consonant. This could be due to the articulatory complexity inherent in nasal vowels. Now, for emphasis, the question again is why nasal vowels occur after a voiceless consonant but not after voiced consonants in Akan? Before we attempt to answer this question, we first have to explain what constitutes voiced and voiceless consonants.

3.1 Voiced and voiceless consonants in Akan

In the production of voiced consonants, the air from the lungs, which is used to produce the speech sounds, passes through the trachea (windpipe) and reaches the larynx. When the airflow gets to the larynx, it passes through the glottis. The glottis is the opening in the larynx. The glottis can take different shapes during speech production. The various shapes of the glottis are highly essential in the production of speech sounds (Cohn 1993; Ohala & Ohala 1993; Piggott 1992, 2003; Schourup 1972; Walker & Pullum 1999).

When producing these voiced sounds, the vocal cords are brought together or extremely close together to impede the airflow from the lungs. When the glottis is closed, air moves through it with some amount of force, and this causes the vocal cords (folds) to vibrate (cf. Crystal 2008; Gussenhoven & Jacobs 1998; Hayes 2009: 6; Katamba 1989: 2-3; Yule 2010: 9). Sounds that are produced with a closed glottis are known as voiced sounds. Some of the examples of voiced consonants in Akan include, /b/, /d/, /g/, /m/, /n/, /ŋ/, /mʝ/, /w/, /r/, /l/, /j/, /ʤ/, /ʤɥ/. Following these explanations, we can conclude that nasal vowels have two blockage conditions, *the blockage responsible for voicing* and the other *responsible for nasality*. It can be deduced from the explanations given so far that voiced sounds involve blockage of either the glottis for the air passage to blow the vocal folds apart as it forces its way through or the raising of the velum to block the nasal cavity or the velum being lowered to block the oral cavity.

The direct opposite of the closed glottis is the open state of the glottis. When the vocal folds are wide apart, the space between them becomes wide and allows air from the lungs to pass through the glottis freely. Because the vocal folds are apart or open, airflow through the glottis escapes unimpeded (Hayes

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2009; Katamba 1989), and thus this state of the glottis does not result in the vibration of the vocal folds. Some of the voiceless consonants in Akan include /f/, /p/, /k/, /s/, /t/, /h/, /ɛ/, /tɛ/, /ɛɥ/, /ts/ (Abakah 2012; Dolphyne 2006; Kenstowicz 1994; Kiparsky 1985; Schachter & Fromkin 1968). These voiceless consonants are grouped into three main categories based on their manner of articulation. They are voiceless plosives /p/, /k/, /t/, voiceless fricatives /f/, /s/, /h/, /ɛ/, and voiceless affricates /tɛ/, /ɛɥ/, /ts/. All these consonant sounds occur at the word-initial and medial positions only in Akan (Dolphyne 2006: 31-48). In our previous discussions, we have demonstrated that contrastive nasal vowels co-occur with only voiceless consonants in Akan. The following minimal pairs emphasize the claim that contrastive nasal vowels occur after voiceless consonants in Akan.

(3) **Minimal pairs** **Gloss**

(i) **t**ĩĩ̃ 'straight/nothing'
tɪɪ 'heard'

(ii) **k**ã 'say/fracture'
ka 'to bite'

(iii) **p**ã 'waist'
pa 'to strike/good'

(iv) **k**õ 'to fight/truant'
kʊ 'one'

(v) **h**õ 'side'
hʊ (As/Ak) 'to smoke'

It can be observed from example (3i-v) that all the syllable-initial consonants of the given minimal pair words are voiceless obstruents. The same processes occur after voiceless affricates /ts/, /tɛ/, /ɛɥ/ too. The examples below demonstrate nasal vowels occurring after voiceless affricate consonants in Akan.

(4) **Minimal pairs** **Gloss**

(i) **tɛ**ĩ̃ 'to squeeze'
tɛi 'to hate'

(ii) **tɛ**ĩ̃ 'to live long/last'
tɛɪ 'to fry/roast'

(iii) **ɛɥ**ĩ̃ 'idiophonic way of saying something'
ɛɥɪ 'to whip/flog/cane'

(iv) **ts**ĩ̃ (Fa) 'to scratch/pinch'

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tsi 'heard'

It is evident from the illustrations in (4) that contrastive nasal vowels can occur with all the voiceless obstruents in Akan. The examples presented so far indicate that contrastive nasal vowels are systematically preceded by voiceless consonants in Akan and never after voiced consonants. Now let us return to the question of why nasal vowels occur after only voiceless consonants in Akan. The following section seeks to answer this question.

3.2 The voiceless consonants and nasal vowels co-occurrence

By referring to two phenomena, namely the nature of the articulations of nasal vowels versus voiced and voiceless consonants and the structure of Akan syllables, we provide some explanations for the question of the exclusive co-occurrence of nasal vowels with voiceless consonants in Akan.

3.2.1 Articulation of nasal vowels, voiced and voiceless consonants

The study has shown how nasal vowels, voiced, and voiceless consonants are articulated in speech production. As has already been explained, but for the sake of emphasis, during the articulation of the nasal vowels, the velum is lowered to block the oral cavity, thereby leaving the nasal cavity open for the air from the lungs to escape through. Moreover, in the production of voiceless consonants, the vocal folds are wide apart, thereby allowing the air from the lungs to pass through the glottis unimpeded (Cohn 1990; Hayes 2009; Katamba 1989). However, in the production of the voiced consonants, the vocal folds are brought together or extremely close together to block the airflow from the lungs. Since the vocal folds are close together, the air from the lungs uses some amount of force to force its way through the glottis, and this causes the vocal folds to vibrate (Crystal 2008; Dolphyne 2006; Hayes 2009; Huffman 1989; Katamba 1989).

The difference is so lucid. The production of a nasal vowel involves the opening of the nasal cavity for the air from the lungs to pass through while the production of voiceless consonants involves the opening of the vocal folds for the air from the lungs to escape unimpeded. However, in the production of the voiced consonants, on the other hand, the vocal cords are extremely close together, hence, the air from the lungs finds it difficult to escape through the glottis. These articulatory differences explain why nasal vowels occur mainly after voiceless consonants. This is because as the airflow escapes through the nasal cavity for the production of nasal vowels, the airflow for voiceless consonants escapes through the oral

cavity. It is therefore obvious that for articulatory ease, the impeded airflow for nasal vowels due to voicing receives support from the voicelessness of the consonants to pull the blocking vocal folds in nasal vowels apart to facilitate the airflow (Harris 1996, 2006; Katamba 1989; Maddieson & Ladefoged 1993; Russel 1995). The free airstream pressure in the voiceless consonant compensates for the mass obstruction in the nasal vowel in stringing the two together.

The nasal vowels have a dual blockage in their production; one in the velum for nasality and the other in the glottis for voicing. Hence, the need for support from the accompanying voiceless consonant to gradually release the constriction to enhance airflow for articulatory ease. Acoustic plausibility is in the probability that a similar double blockage for the neighbouring consonant presents a difficulty in unleashing the airstream for Akan syllable production. This is against the backdrop that languages aspire to maximize segment articulation and utter enough within a limited time frame (Kiparsky 1985; Lombardi 1994; Steriade 1995). Therefore, in the quest to attain articulatory maximization and the avoidance of complexity, the nasal vowel selects a voiceless consonant in Akan as seen in example (5) below.

(5) Voiceless consonant + nasal vowels

	Root words	**Gloss**	**Ill-forms**
(i)	hũ	'fear/to see'	
(ii)	kã	'say/fracture'	*gã
(iii)	sã	'to finish'	
(iv)	fã	'half'	
(v)	tĩ	'to pinch'	*dĩ
(vi)	tɕĩ	'to squeeze'	*dʑĩ
(vii)	tsĩ (Fa)	'to scratch/pinch'	*dzĩ (Fa)

From the examples in (5), it can be observed that for all the word-initial voiceless consonants that have voiced counterparts in Akan, their voiced counterparts do not co-occur with nasal vowels. Their co-occurrence results in ill-formedness, as seen in the examples in the right column.

3.2.2 The role of Akan syllable structure

The constraint in nasal vowels that restricts its co-occurrence with only voiceless consonants finds its root in the phonotactics and syllable structure of Akan. In terms of phonotactics, a CC sequence within

a root is a violation of Akan phonology, but a CV is permissible (Abakah 2005; Adomako 2018b; Dolphyne 2006; Schachter & Fromkin 1968). In CV syllables, the voicing status of the C does not matter; it can either be voiced or voiceless. The V, redundantly stated, is inherently voiced. Thus, a nasal vowel stringing together with a voiceless C still retains the Akan phonotactics of segment clustering. The voicelessness of the C is not a violation of the Akan CV sequence constraints since it still falls within the CV cluster as shown below.

(6)	**Minimal pairs**	**Gloss**
(i)	fõ	'bad comment/something bad'
	fʊ	'advise/exhortation'
(ii)	fõ.õ	'quiet/quietly'
	fʊ.ʊ	'plenty/adjectival way of saying something'
(iii)	fũ.ã	'to draw near/cover/hold'
	fu.a	'to plant/cloud/one'

With regard to the permissibility of the nasal vowel and the voiceless consonant in Akan phonotactics, the Akan CV syllable ordinarily has a vowel that has the highest sonority. However, nasality in the vowel in addition to its sonorous vocality compounds the sonority in the syllable to compensate for the less sonorous voiceless consonant (Halle & Stevens 2013; Park 2020: 234-235; Rice 1993). This is fitting for Akan as an open syllable language (Abakah 2005; Adomako 2015; Marfo & Yankson 2008). The compound sonority in the V from nasality and vocality renders such a CV syllable a heavy syllable in weight. Albeit, the dual sonority invested solely in the vowel is likely offset by the less sonorous voiceless consonant for a balance, however, its sonority weight is maintained in the same syllable.

Comparatively, a non-nasal V in a CV syllable structure where the C is voiced yet less sonorous is impermissible to the single sonority in the oral vowel. The sole sonority stems from the vocalic feature in the oral vowel, but the voiced consonant occurring at the onset has no sonority. In a nutshell, the double sonority in the nasal vowel both from nasality and from vocality is sufficient to feed the less sonorous voiceless consonant. The value addition of sonority from nasality in the vowel draws the voiceless consonant along for pairing as we have demonstrated in our various examples thus far.

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3.2.3 Exceptions

We have explained that phonemic nasal vowels do not co-occur with voiced consonants in Akan. However, there are very few instances where nasal vowels seem to occur after voiced consonants as shown in (7).

(7)	**Minimal pairs**	**Gloss**
(i)	**b**ãã	'personal/ name of a town'
	baa	'he came...(with object)'
(ii)	ɔ**d**ãã	'a town in Eastern Region'.
	ɔ**d**aa	'he slept/left over'

The initial consonants of the examples in (7) are /b/ and /d/. These consonants are all voiced plosives, yet a nasal vowel occurs after them. These words do not, however, invalidate the explanations made about the distributional restriction of nasal vowels occurring after the voiceless consonants and not voiced consonants. We are not certain whether the nasality is actually inherent or it was acquired from the environment in the intermediate level of representation since there is the possibility that these names in (7) hitherto had nasal consonants in underlying forms but lost the nasals in their phonetic forms. A similar example can be drawn from the Akan personal name *abaka* [abakã], which is derived from *ɔba* 'child' and *kan* [kãn] 'first'. In fact, [abakã] is the name given to a first child among the Fante of Akan. [ã] in [abakã] is derived through the acquisition of the [nasal] feature, which precedes the dropping of the final nasal consonant. Perhaps akin to the circumstance surrounding the acquisition of the nasality property in [abakã], the etymology of the names in (7) might show that the co-occurrence of nasal vowel with the voiced obstruents is only a phonetic phenomenon, which does not find its root in the underlying representation (henceforth UR).

4. Nasalized vowels in Akan

We have explained that Akan, a Kwa group of languages, has oral, nasal, and nasalized vowels in its vocalic phonology. Nasalized vowels are inherently oral vowels (Anderson 1972, 1976; Clements & Rialland 2008; Hyman 1972; Maddieson 2007; Ruhlen 1978). They occur as contextual variants of oral vowels when adjacent to a nasal consonant (phonetic [CnṼ]). Schachter and Fromkin (1968) and Dolphyne (2006) view this phenomenon as an assimilatory process. It is one of the consonant-vowel (C-

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V) harmony processes, where the consonant is specified for [+nasal]. The nasal consonant spreads its [nasal] feature to the adjacent oral vowel to become nasalized (CnṼ) as schematized below in Figure 2.

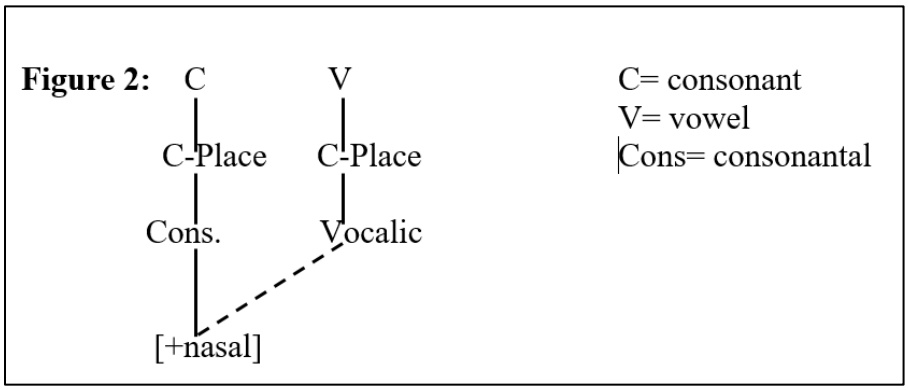

Figure 2. C→V spreading (Source: Own processing)

It can be stated with certainty from Figure 2 that the oral vowel is nasalized under the influence of the surrounding nasal consonant in Akan. Nasalized vowels are allophonic variants of their counterpart oral vowels (cf. Schachter & Fromkin 1968: 79). We, therefore, formulate this nasalization in the following linear rule: V →[+nasal]/ [+nasal] ___, which states that an oral vowel is realised as nasalized after a nasal consonant within the same syllable. It is worth pointing out that the same rule applies when the target vowel occurs before the trigger nasal consonant. The following examples demonstrate the nasalization of oral vowels in the environment of a nasal consonant.

(8)	**UR**	**Nasalised V**	**Gloss**
(i)	/ma/	mã	'to give'
(ii)	/nu/	nũ	'to pluck/to stir'
(iii)	/mia/	mĩã	'to press'
(iv)	/nana/	nãnã	' a chief'
(v)	/ŋamɪ/	ŋãmĩ	'God'
(vi)	/ænimia/	ænĩmĩã(As/Ak)	'endeavour/effort'

These examples provide evidence that oral vowels become nasalized in the environment of a nasal consonant in Akan. Moreover, when a nasal consonant follows a non-high oral vowel or a non-high oral vowel precedes the nasal consonant, nasalization occurs only in Fante, but not in Asante and Akuapem (cf. Dolphyne 2006: 141) as demonstrated below.

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(9)	**UR**	**Fante**	**Asante**	**Akuapem**	**Gloss**
(i)	/fɛmʊ/	fʲɛ̃m	fɛm	fɛm	'to borrow'
(ii)	/pɔmpɔ/	pʷɔ̃mpʷɔ	pʷɔmpʷɔ	pʷɔmpʷɔ	'a boil'
(iii)	/akamʊ/	akãm	akam	akam	'tribal mark'

Nasalization of non-high vowels, especially mid vowels, occurs mostly in the Fante dialect rather than in the Asante and Akuapem dialects. Nasalized vowels contrast with oral vowels in the environment of non-nasal voiced consonants as demonstrated in the following minimal pairs.

(10)	**UR**	**Minimal pairs**	**Gloss**
(i)	/ɔ-+N-+di/	onni	'he doesn't eat'
	/ni/-/nĩ/	onnĩ	'he doesn't have'
(ii)	/ɔ-+N-+ba/	ɔmma	'he doesn't come'
	/ma/-/mã/	ɔmmã	'he doesn't give'
(iii)	/ɔ-+N-+ʤa/	oŋŋa	'he doesn't leave behind'
	/ŋã/	oŋŋã	'he doesn't obtain it' (Dolphyne 2006: 99)

The nasalized non-nasal voiced consonants involve reciprocal spreading. The syllable initial non-nasal voiced consonant regressively assimilates the feature of the unspecified nasal archiphoneme. On the other hand, the unspecified assimilated nasal consonant spreads progressively to assimilate the adjacent non-nasal voiced consonant. This is an assimilatory process that involves both the leftward and rightward spreading of features (see Odoom & Adomako 2021 for more details on bidirectionality of feature spreading in Akan). Since the underlying consonant is not nasal, the following oral vowel is not nasalized at the phonetic level, and this contrasts with those that have nasal consonants in the UR (Schachter & Fromkin 1968: 80).

4.1 Directionalities of phonetic nasal (nasalized) vowels in Akan

Phonetic nasal vowels are realized in two different directions in Akan. The trigger, which is the nasal consonant, can spread rightward and leftward to assimilate the following target oral vowel. When the

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trigger, the nasal consonant spreads rightward, we have termed it "progressive vowel nasalization" as demonstrated below.

(11)	**UR**	**C→V [+nasal] spreading**	**Gloss**
(i)	/ɛmʊ/	ɛmõ (As/Ak)/ɪmõ (Fa)	'rice'
(ii)	/ɔnʊ/	ɔnõ	'he/she'
(iii)	/nua/	nᵘĩã	'sibling'
(iv)	/maamɪ/	mããmĩ	'a mother'
(v)	/mæko/	mæ̃ko(As/Ak)/mõko (Fa)	'pepper'

It can be seen from example (11) that the nasal consonant in each word spreads its [nasal] feature progressively to nasalize the following oral vowel for it to be phonetically realized as a [+nasal] vowel. This spreading directionality is very common in the Akan vowel nasalization processes.

Regressive directionality is another process where the triggering nasal consonant spreads to nasalize the preceding oral vowels in Akan. Here, the nasal consonant, which spreads the [nasal] feature, follows the targeted oral vowel. This is exemplified in Figure 3 below.

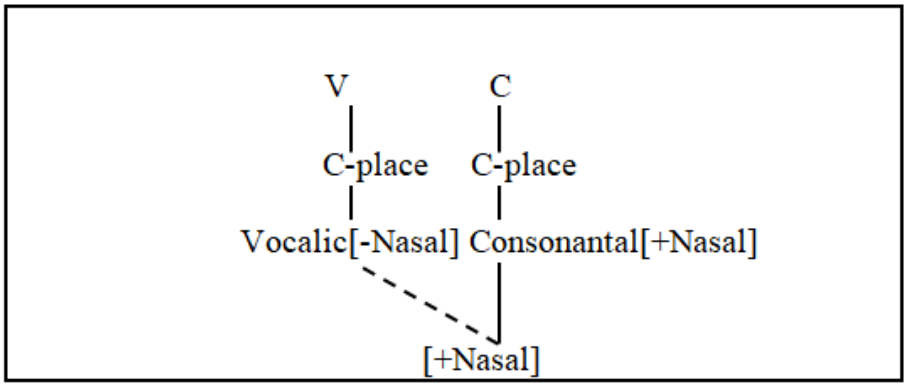

Figure 3. Schema showing regressive vowel nasalization in Akan (Source: Own processing)

It is evident from the above illustration that a nasal consonant that follows an oral vowel spreads leftward to nasalize the adjacent oral vowel. This directionality of spreading is shown in the following examples.

(12)	**UR**	**V←C [+nasal] spreading**	**Gloss**
(i)	/esumu/	esũm	'darkness'

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(ii) /ɔkɔmʊ/	ɔkɔ̃m	'hunger'
(iii) /asɛmʊ/	asɛ̃m	'issue'
(iv) /bɛnɪ/	bʲɛ̃n (Fa)/bɛ̃ŋ(Ak)/bɛ̃ĩ(As)	'to be near'
(v) /apamʊ/	apã̃m	'covenant'

It can be observed in example (12) that all the underlying word-final high vowels are deleted at the phonetic level. These realizations confirm the statement by Abakah that "There is no morpheme in Akan that is consonant-final at the systematic phonemic level and, for this reason, any analysis that posits an underlying consonant as a morpheme-final consonant starts on a faulty note" (2005: 7).

The nasal consonant, which is the trigger at the rightward position of the target vowel, spreads the [nasal] feature regressively to assimilate the adjacent oral vowel to be realized as a nasal vowel. This nasal vowel, as discussed above, is phonetic and not phonemic (Clements & Rialland 2008: 8; Durvasula 2009; Rolle 2013: 228; Schachter & Fromkin 1968: 87).

4.2 Systematic predictable environments of phonetic nasal (nasalized) vowels in Akan

Schachter and Fromkin (1968: 79) state that the morpheme structure condition (MSC) specifying the shape of the Akan syllable requires that two successive vowels in a syllable agree in nasality, tenseness, and tone. At the phonetic level, however, the requirement of nasality agreement between successive vowels extends beyond the syllable. Whenever it happens that at some point in a derivation, two successive vowels within a word show different specifications for the feature [nasal], the [-nasal] vowel is made [+nasal] by the application of the P-rule. This rule applies regardless of the order in which the [-nasal] vowel and the [+nasal] vowel occur.

One of these systematic environments where this rule applies is when an inherently [-nasal] vowel is realized as [+nasal] in the Asante dialect. In Akan, when the alveolar nasal consonant [n] occurs at the systematic word-final position, it is realized differently in all the three major dialects of Akan (cf. Abakah 2005). It is realized as alveolar nasal [n] in Fante, velar nasal [ŋ] in Akuapem, and nasalized [phonetic] vowels [ĩ, ɪ̃, ũ, ʊ̃] in Asante. The shape and the form of the nasalized vowel depend on the vowel in the root word as shown in Figure 4 below. The rule for nasalizing an oral vowel adjacent to a nasalized vowel can be stated in Figure 4 as follows:

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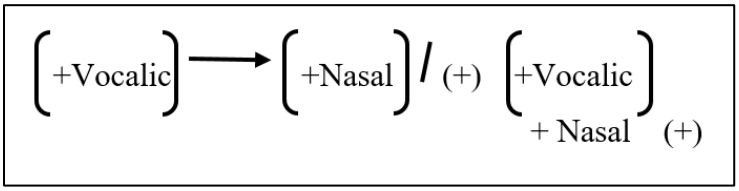

Figure 4. Rule 1 for vowel nasalization (Source: Own processing)

(13)	UR	Fante	Akuapem	Asante	Gloss
(i)	/ɔtanɪ/	ɔtãn	ɔtãŋ	ɔtãĩ	'hatred'
(ii)	/banɪ/	bãn	bãŋ	bãĩ	'fence'
(iii)	/tɔnʊ/	tʷɔ̃n	tʷɔ̃ŋ	tʷɔ̃ʊ̃	'to sell'
(iv)	/edini/	dᶻĩn	edʲĩŋ	edʲĩĩ	'name'
(v)	/punu/	pʷũn	pʷũŋ	pʷũũ	'to smoke'

This is one of the predictable environments where an underlying [-nasal] vowel can become [+nasal] at the P-level in Akan. In the Asante variant, the alveolar nasal [n] feeds and bleeds its [+nasal] feature on the adjacent high vowel to become phonetically nasalized.

Another systematic environment where this P-rule applies is when the inherently [-nasal] past-aspect suffix morpheme occurs after a verb root that ends with a [+nasal] vowel. The phonemic nasal vowel spreads progressively to nasalize the [-nasal] past-aspect suffix morpheme. The [-nasal] past-aspect suffix morphemes in Akan are {-i} and {-ɪ}. The rule for nasalizing a vowel adjacent to a nasal vowel may be stated in Figure 5 as follows:

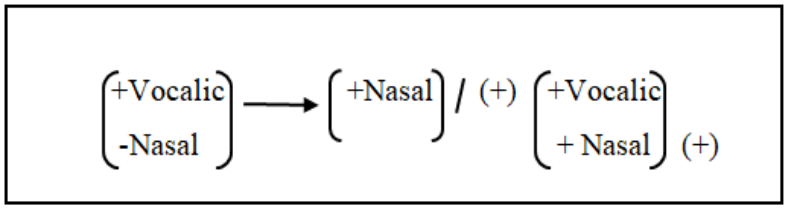

Figure 5. Rule 2 for vowel nasalization (Source: Own processing)

Let us consider the examples in (14) below for an illustration to facilitate better understanding.

(14)	Nasal Vowel	Gloss	Past-Suffix	Nasalized	Gloss
(i)	osũ	's/he cries'	-i	sũĩ	's/he cried'

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(ii) otɕĩ'	s/he squeezes'	-i	otɕĩĩ	's/he squeezed'
(iii) ɔtõ	's/he bakes'	-ɪ	ɔtõĩ	's/he baked'
(iv) ɔkã	's/he says'	-ɪ	ɔkãĩ	's/he said'
(v) sã	'to finish'	-ɪ	sãĩ	'finished'

We observe that the non-nasal vowel has been phonetically nasalized due to the influence of an adjacent phonemic nasal vowel.

4.3 Why are nasal vowels contrastive but nasalized vowels are not in Akan?

We will address this phonological question from two different perspectives; (i) production or articulation of nasal-nasalized vowels and (ii) distribution of nasal-nasalized vowels.

4.3.1 Production or articulation perspective

The production of inherent nasal vowels and nasalized vowels is the same as discussed in *2.2.1*. The airflow escapes through both the oral and nasal cavities (see Dolphyne 2006: 6). However, while nasal vowels are phonemic and phonetically intrinsic, nasalized vowels are products of assimilatory processes because they involve spreading. It is local and reciprocal (Katamba 1989; Schachter & Fromkin 1968; Yule 2010). Nasalized vowels depend on nasal consonants. Now, we can explicate that because nasalized vowels depend on a nasal consonant for their realization, nasal vowels are independent, inherent, intrinsic, and phonemic. Thus, the difference between the two is phonological, not phonetic (cf. Crystal 2008; Hayes 2009; Katamba 1989: 214; Yule 2010).

4.3.2 Distribution perspective

In their distribution, we have extensively illustrated that nasalized vowels occur in the environment of [+nasal] consonants or vowels. The nasal consonant or vowel spreads its nasal feature onto the adjacent oral vowel to become nasalized [CnV→CnṼ]. Thus, non-nasal consonants do not cause oral vowels to become nasalized. This shows that nasalized vowels occur only in the environment of the [+nasal] segment (cf. Gussenhoven & Jacobs 1998; Hyman 1972; Schachter & Fromkin 1968; Stewart 1967). However, for the distribution of nasal vowels, we have discussed that they have phonetically intrinsic nasal features and do not need any nasal influence to cause them to become nasalized. They are phonemic. In other words, nasal vowels are phonetically independent. Accordingly, they occur mainly after voiceless consonants, and not after a voiced nasal consonant in Akan (cf. Dolphyne 2006; Hyman

1972; Manyah 2011; Schachter & Fromkin 1968). This causes nasal vowels to become contrastive to nasalized vowels.

5. Conclusion

In this paper, we have tried to address some phonological issues concerning oral-nasal and nasalized vowels in Akan. The paper has demonstrated that nasal vowels occur after voiceless consonants but not voiced consonants in Akan. The paper, through phonological approaches, found some phonological reason(s) that account for why nasal vowels occur only after voiceless consonants in Akan. Through careful analysis, we have shown that nasal vowels contrast with oral vowels in Akan. Moreover, the paper continued to show that nasal vowels are contrastive but nasalized vowels are not, except when comparing them with nasalized non-nasal voiced consonants. Moreover, we concluded that the difference between the phonemic nasal vowels and nasalized vowels is mainly phonological and not phonetic. Thus, the paper contributed to the study of the typology of vowel nasality and its related phenomena in Akan.

Abbreviations

Ak – Akuapem

As – Asante

ATR – advanced tongue root

C – consonant

CC – consonant cluster

Cons – consonantal

CV – consonant-vowel

Fa – Fante

FG – Feature geometry

MSC – morpheme structure condition

NC – nasal consonant

NV – nasal vowel

PNC – primary nasal consonants

UR – underlying representation

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Résumé

This paper discusses vowel nasality in Akan, a Niger-Congo (Kwa) language. Nasality in Akan is surface-contrastive in vowels, but not in consonants. Vowel nasality could be inherent (phonemic), or phonetic in Akan. There are five phonemic nasal vowels in the Akan vocalic inventory, namely /ĩ/, /ẽ/, /ũ/, /õ/, /ã/. The data for the present study were gathered from both primary and secondary sources in addition to the authors' native speakers' intuition. From language-internal evidence, we show that these nasal (phonemic) vowels contrast with their oral counterparts. With regard to their distribution, we further show that the nasal vowels occur mainly after voiceless consonants, including voiceless fricative, voiceless stops, and voiceless affricates, and not after voiced consonants in Akan. Moreover, as nasal vowels are contrastive, nasalized (phonetic) vowels are not, except when comparing them with nasalized non-nasal voiced consonants, and we provide phonological explanations for this exception. We postulate that even in the so-called exceptional cases where the supposed nasal vowels co-occur with voiced consonants in the surface representation, those vowels might have undergone nasalization in the intermediary level of representation. This nasalization precedes the eventual deletion of the trigger nasal

consonant in the underlying representation. Furthermore, the paper highlights some systematic predictable environments for nasalized vowels and draws some phonological dissimilarities between why nasal vowels are contrastive but nasalized vowels are not in Akan. Finally, the paper attempts to contribute to the typology of vowel nasality. The generative phonological theory of Feature Geometry is employed for the formalization of the discussions in the present paper.

Keywords: nasalization, oral vowels, nasal vowels, nasalized vowels, voiceless consonants.

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