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Torben Andersen*

Vowel quality alternation in Dinka verb derivation: The Agar variety

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Abstract: In Dinka, a predominantly monosyllabic and highly fusional Western Nilotic language, vowel quality alternation in the root plays a major and systematic role in the morphology of verbs, together with alternations in vowel length, voice quality, and tone. Earlier work has shown that in the inflection of simple, i.e., underived, transitive verbs, the vowel quality alternation conforms to a vowel height gradation system with three vowel grades. The present article shows that this vowel gradation system is also operative in the morphology of derived verbs with a transitive root, but with certain modifications. These include a different distribution of the vowel grades and interaction with a shift in voice quality, to breathy voice.

Keywords: Dinka, vowel alternation, vowel quality, voice quality, nonlinear morphology, verb derivation

1 Introduction

The Western Nilotic language Dinka is largely monosyllabic, but nevertheless it has a fairly rich morphology. Most of its morphology is not expressed by affixes, but by alternations in the phonological material of the monosyllabic root, which makes Dinka a highly fusional language. As described in Andersen (1987), the Agar dialect of Dinka has three contrastive degrees of vowel length, two contrastive voice qualities in vowels (breathy and non-breathy), and three contrastive tones. Together with vowel quality alternation, alternations in these three phonological parameters of the syllable peak constitute most of the nonlinear morphology in both verbs and nouns.

In Andersen (1992–1994) it was demonstrated how voice quality, vowel length and tone are exponents of derivation and/or inflection in verbs with a transitive root in the Agar dialect. In Andersen (1993) it was furthermore shown how vowel quality is an exponent of inflection in simple (i.e., non-derived) verbs with a transitive root, and a system of vowel gradation with three vowel grades

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was uncovered. The purpose of the present article is to demonstrate how, in the Agar dialect, vowel quality alternation also plays a central role in the formation of derived verbs with a transitive root and in the inflection of such verbs. The article thus fills the gap left by Andersen (1992–1994, 1993) in the description of the central parts of the morphology of transitive verbal roots.

The article is based on data from the Agar dialect collected during ten fieldwork trips to Sudan between 1984 and 1995 and a trip in 2009. What is described here is the variety of the Agar dialect spoken in the village of Pacong about 20 kilometers south-east of Rumbek in South Sudan. The data used are from elicitation sessions with four speakers, namely Isaac Maker, David Daniel Marial and Peter Gum Panther from Pacong and Kuyok Abol Kuyok from north of Rumbek. I worked with Isaac Maker in Juba in 1984, with Kuyok Abol Kuyok in Juba in 1985 and 1986 and in Khartoum in 1988, 1989 and 1990, with David Daniel Marial in Khartoum in 1988 and 1989, and with Peter Gum Panther in Khartoum in 1990, 1991, 1992, 1993, 1994, 1995 and again in 2009.¹

The article is organized as follows. As a prerequisite, Section 2 recapitulates some of the findings in Andersen (1992–1994, 1993). Section 3 shows that the vowel gradation system also accounts for vowel quality alternation in derived verbs, but with a partly different distribution of the vowel grades and with a partly different manifestation of one of the grades. Section 4 demonstrates that although vowel quality is basically independent of voice quality, the shift from non-breathy to breathy phonation has some consequences for vowel quality. Moreover, it is discussed how this shift interacts with the vowel gradation system. Section 5 is a conclusion which includes some reflections on the historical development of the vowel alternations.

2 Background

2.1 Verb shapes

A verb in Dinka is generally a monosyllable which conforms to the segmental shape C(w)(j)V(V(V))C with optional segments in parentheses. Thus, the verb segmentally consists of an onset consonant (C), optionally followed by one or two glides (/w/ and/or /j/ in that order), a vowel which is either short (V),

¹ Prior to that, I conducted exploratory research on Dinka in the Agar Dinka area in 1981 as a member of a multi-disciplinary expedition to the southern Sudan by the British Institute in Eastern Africa, cf. Robertshaw (1981) and Robertshaw and Siiriäinen (1985).

medium (VV) or long (VVV), and a coda consonant (C).² The voice quality of the vowel is either breathy (ᵛ) or non-breathy (ᵐ), and the vowel carries a tone which in the Agar dialect is either low (ò), high (ó) or falling (ô).³ In my transcription, the voice quality and tone diacritics are placed on the first of a sequence of vowel symbols.⁴ The monosyllable may be followed by a suffix with the segmental shape -(C)V.

2.2 Derivational and inflectional categories

2.2.1 Derivational categories

A verb with a transitive root is either *simple* or *derived*. As accounted for in Andersen (1992–1994), derived verbs with a transitive root include the following five categories: *centrifugal*, which indicates direction towards a goal which is different from the deictic center (Andersen 2012b: 160); *centripetal*, which indicates direction towards the deictic center; *dative*, an applicative which makes the verb ditransitive by including a recipient, goal or beneficiary as an extra object⁵; *antipassive*, which makes the verb intransitive by excluding the object of the simple verb; and *dativized antipassive*, an applicative which transitivizes the antipassive by including a recipient, goal or beneficiary as an object.⁶ All of these derivations are fairly productive.⁷ The sentences in (1) with the transitive root **m̥j̥it** ‘pull’ exemplify the formation and use of the simple verb and the five derived categories listed above.⁸

² A few intransitive verbs deviate from this shape by lacking a coda consonant.

³ In some other dialects of Dinka, there are four tones (Remijsen and Ladd 2008; Remijsen 2010).

⁴ The consonant symbols used in my transcription basically conform to IPA. Thus, /j/ is a palatal glide, and /ɟ/ is a voiced palatal stop. However, the point of articulation of /t̪, d̪, n̪/ is interdental rather than dental.

⁵ The dative is called “benefactive” in Andersen (1992–1994).

⁶ The dativized antipassive is called “benefactive-antipassive” in Andersen (1992–1994). There is morphological evidence that it is indeed based on the antipassive; but for reasons of space, this evidence is not given here.

⁷ There are more derivational categories with a transitive root, at least the following: Antipassive centrifugal, antipassive centripetal, reciprocal, causative, anticausative or middle, multiplicative (or pluractional or plural), and antipassive multiplicative. But they are less productive, and they are not considered here.

⁸ It might be convenient to use the term “stem” when dealing with the derivational status of a verb, and thus to talk about, for instance, a “simple stem” or a “centripetal stem” as in Andersen (1992–1994), thereby referring to an abstract entity without any inflectional information. Here, however, I only use the terms “root” and “verb (form)”.

- (1) a. Simple⁹:
ḍḍḍḍḍḍ ḍ = mḍit wḍḍ.
 boy D = pull Cow
 'The boy is pulling a cow.'
- b. Centrifugal:
ḍḍḍḍḍ ḍ = mḍiit wḍḍ bḍeec.
 boy D = pull.CF cow out.ALL
 'The boy is pulling a cow out.'
- c. Centripetal:
ḍḍḍḍḍ ḍ = mḍiit wḍḍ
 boy D = pull.CP cow
 'The boy is pulling a cow hither.'
- d. Dative:
ḍḍḍḍḍ ḍ = mḍit wḍḍ mḍec.
 boy D = pull.DAT cow man
 'The boy is pulling a cow for the man.'
- e. Antipassive:
ḍḍḍḍḍ ḍ = mḍit.
 boy D = pull.AP
 'The boy is pulling.'
- f. Dativized antipassive:
ḍḍḍḍḍ ḍ = mḍiit mḍkwḍc.
 boy D = pull.AP.DAT Makuac
 'The boy is pulling for Makuac.'

2.2.2 Inflectional categories

As for inflection, verbs are either *finite* or *non-finite* (Andersen 1992–1994, 1993), as exemplified with the simple transitive verb **mḍc** 'shoot' in declarative clauses in (2).¹⁰ All the verb forms in (2) are finite, except for the last one in (2k).

⁹ The following abbreviations are used in interlinear translations and elsewhere: 1PL = first person plural; 1SG = first person singular; 2PL = second person plural; 2SG = second person singular; 3PL = third person plural; 3SG = third person singular; ALL = allative; AP = antipassive; CF = centrifugal; CP = centripetal; CS1 = first construct state; CS2 = second construct state; D = declarative; DAT = dative; DEM1 = first person demonstrative; DEM2 = second person demonstrative; ESS/ABL = essive/ablative; FOC = focus; LOC = locative; NF = non-finite; NTS = having a non-topical subject; PASS = passive; PASS.CT = passive with a circumstantial topic; PF = perfect; PL = plural; PRO = proform; SG = singular.

¹⁰ A "declarative" clause is here defined as a clause which includes a declarative proclitic particle, cf. Andersen (1991).

- (2) a. **bòol à = mọc lāj.**
 Bol D = shoot animal
 ‘Bol is shooting an animal.’
- b. **lāj à = mọoc bọol.**
 animal D = shoot.NTS Bol
 ‘Bol is shooting the animal.’
- c. **lāj à = mwọc.**
 animal D = shoot.1SG
 ‘I am shooting the animal.’
- d. **lāj à = mọc.**
 animal D = shoot.2SG
 ‘You are shooting the animal.’
- e. **lāj à = mọoc.**
 animal D = shoot.3SG
 ‘He is shooting the animal.’
- f. **lāj à = mọc-kụ.**
 animal D = shoot-1PL
 ‘We are shooting the animal.’
- g. **lāj à = mwọc-kạ.**
 animal D = shoot-2PL
 ‘You are shooting the animal.’
- h. **lāj à = mọc-kẹ.**
 animal D = shoot-3PL
 ‘They are shooting the animal.’
- i. **lāj à = mọc.**
 animal D = shoot.PASS
 ‘The animal is being shot.’
- j. **tẹn = ẹ à = mọoc-ẹ lāj tịn.**
 place.CS1 = DEM2 D = shoot-PASS.CT animal PRO.ESS/ABL
 ‘An animal is being shot in that place.’
- k. **bọol à = cẹ lāj mọoc.**
 Bol D = PF animal shoot.NF
 ‘Bol has shot an animal.’

There are ten finite forms. As exemplified in (2a), one of them is inflectionally unmarked and left unglossed. It is used when the verb is preceded by the subject, whereas the form in (2b), glossed as NTS, indicates that the verb is followed by a non-topical subject.¹¹ Six other finite forms express a pronominal

¹¹ On the notion of “topic” used here, see Andersen (1991, 2015a).

Table 1: Classes of transitive verbal roots in Agar Dinka, with examples.

Class	Non-breathy			Breathy		
	Infl. unm.	Non-finite		Infl. unm.	Non-finite	
1F	d̥ɔm	d̥ɔɔm	‘catch’	t̥ut̥	t̥ut̥	‘pierce’
1L	b̥il	b̥iil	‘taste’	m̥er	m̋er	‘decorate’
2F	ɟ̥im	ɟ̥iim	‘filter’	mw̥oɔt̥	mw̋oɔt̥	‘greet’
2H	t̥aal	t̥aaal	‘cook’	p̥iic	p̋iic	‘twirl’

a short vowel and a falling tone (Class 1F), a short vowel and a low tone (Class 1L), a medium-length vowel and a falling tone (Class 2F), or a medium-length vowel and a high tone (Class 2H). The class names given here consist of a number, which indicates the number of morae (1 or 2) in the inflectionally unmarked form, and a letter, which indicates the tone (F for falling, L for low, and H for high) in the non-finite form. As also illustrated in Table 1, all of the four classes contain both non-breathy roots and breathy roots. These classes also determine the way in which derived verbs are formed.

Table 2 gives information about the empirical basis of the description. Thus, this table shows for each of the four root classes how many roots have been examined for each of the six derivational categories. Not all the verbs have been examined exhaustively, i.e. with elicitation of all inflected forms, apart from the inflectionally unmarked form and the non-finite form.

Table 2: Empirical basis of the analysis: Number of verbs examined for each of six derivational categories for each of the four root classes.

	Simple	CF	CP	DAT	AP.DAT	AP
1F	224	76	54	51	30	145
1L	80	26	13	12	7	62
2F	197	45	24	36	25	100
2H	135	53	35	24	18	79
Total	636	200	126	123	80	386

2.4 Voice quality alternation

As summarized in Table 3, voice quality alternation is one of the exponents of derivational categories (Andersen 1992–1994: 33). In this table, “breathy” means that the derivational category is characterized by breathy voice quality in the root vowel, and thus may involve a shift from non-breathy voice to breathy

Table 3: Voice quality alternation in verbs with a transitive root.

Root class	Derivational (and inflectional) categories						
	Simple	CF	CP	DAT	AP.DAT	AP	
							finite non-finite
1F	inherent	inherent	breathy	breathy	breathy	breathy	inherent
1L	inherent	inherent	breathy	breathy	breathy	inherent	inherent
2F	inherent	inherent	breathy	breathy	breathy	breathy	breathy
2H	inherent	inherent	breathy	breathy	breathy	breathy	inherent

voice, whereas “inherent” means that no voice quality shift takes place. As seen in the table, centripetal, dative and dativized antipassive verbs have breathy voice. To a large extent, this feature also characterizes antipassive verbs, but with some systematic exceptions in terms of the inflectional class of the root and the inflectional category.

2.5 Vowel gradation system of simple transitive verbs

In Andersen (1993) it was shown how vowel quality alternation works in the inflection of simple transitive verbs. The account uncovered a vowel gradation system with three vowel grades across basic vowel qualities (“series”). A slightly revised version of this system is shown in Table 4 (based on Table X in Andersen [1993: 19]) without regard to vowel length.¹⁵

For each root there is a basic vowel quality, called *grade 1* (1°), and for each grade 1 vowel the table shows the two other grades, called *grade 2* (2°) and *grade 3* (3°). The upper part of the table shows non-breathy vowels, the lower part shows breathy vowels. Moreover, a distinction is made between grade 1 vowels in three different phonological contexts: vowels that are not preceded by a postconsonantal glide (on the left), vowels that are preceded by a postconsonantal /j/ (in the middle), and vowels that are preceded by a postconsonantal /w/ (on the right). Grade 2 differs from grade 1 in that the low central vowel quality /a/ is fronted and raised to lower-mid /ɛ/ in accordance with a

¹⁵ The /wɨ/-series in Table 4 was not included in Andersen (1993). It is found in, for instance, the root **cwɨil** ‘dispense from a prohibition’ (Class 2F) with the 3SG grade 2 form **cwɨil** and the 1SG grade 3 form **cwɨeel**. The glide /w/ is manifested phonetically as a labiopalatal [ɰ] before /i/ whether it occurs as onset or in postconsonantal position. The sequence of postconsonantal glides /wɰ/ is also manifested phonetically as [ɰ].

Table 4: Vowel gradation in the inflection of simple transitive verbs (simplified).

		Series												
		Without postcons. glide						With postcons. /j/			With postcons. /w/			
Non-breathy	1 ^o	j	e	a	ɔ	o		jɛ	ja	jɔ	wj	wɛ	wa	wɔ
	2 ^o	j	e	ɛ	ɔ	o		jɛ	jɛ	jɔ	wj	wɛ	wɛ	wɔ
	3 ^o	jɛ	ɛ	a	a	wɔ		jɛ	ja	ja	wjɛ	wɛ	wa	ja
Breathy	1 ^o	j	e	a	ɔ	o	u	jɛ	ja	jɔ	wj	wɛ	wa	wɔ
	2 ^o	j	e	ɛ	ɔ	o	u	jɛ	jɛ	jɔ	wj	wɛ	wɛ	wɔ
	3 ^o	jɛ	ɛ	a	a	ɔ	wɔ	jɛ	ja	ja	wjɛ	wɛ	wa	ja

morphophonological rule called *Fronting* (Andersen 1993: 21–25).¹⁶ Grade 3 differs from grade 1 in that other vowel qualities than /a/ are lowered in accordance with a morphophonological rule called *Lowering* (Andersen 1993: 25–32), a process which sometimes involves “breaking” which adds a postconsonantal glide. It should be noted that /ɛ/ is not a basic vowel quality, since it is not a member of the grade 1 inventory; it arises either from fronting of /a/ or from lowering of /e/ or /i/.

The situation delineated in Table 4 is somewhat simplified. Thus, the table disregards that grade 1 of the /a/-series has an /ɔ/ alternant, cf. Section 4.4 below. It also disregards that some of the vowels have raised variants, cf. Section 4.3 below. Moreover, the table disregards that the contrast between the qualities /a/ and /ɛ/ which exists in medium and long vowels seems to be absent in short vowels (Andersen 1993: 13–14), in which case I use the symbol /a/ to the exclusion of /ɛ/. This means that grade 2 of the various /a/-series appears as /a/ rather than /ɛ/ in short vowels.

Each of the 11 forms of a simple transitive verb “has” (or “belongs to” or “occurs in”) a particular grade. Thus, grade 1, in addition to occurring in the inflectionally unmarked form, is an exponent of 2SG, 1PL, 3PL, PASS and NF. Grade 2 is an exponent of NTS, 3SG and PASS.CT. And grade 3 is an exponent of 1SG and 2PL. Examples are given in Sections 3 and 4 below. The vowel gradation system shown in Table 4 also plays a significant role in the morphology of nouns (Andersen 2002, 2014).

The rest of this article deals with the nature and role of vowel quality alternation in derived verbs with a transitive root, thus complementing the description of the morphology of transitive roots given in Andersen (1992–1994)

¹⁶ A vowel symbol enclosed in slashes refers to a vowel quality without regard to vowel length, and the absence of a voice quality diacritic abstracts away from voice quality.

and Andersen (1993). First, it is shown that the vowel grade system set up to account for vowel quality alternation in simple verbs also works for derived verbs, but that the distribution of the grades is different and that the phonological range of Fronting is extended. Second, it is shown that the shift from non-breathy voice to breathy voice, which occurs in some derived verbs, involves some systematic shifts in vowel quality as well.

3 Vowel gradation in derived verbs

3.1 Distribution of vowel grades in derived verbs

In general, the vowel qualities used in derived verbs are the same as those used in the corresponding simple verbs, but the distribution of the alternants is partly different. This can be seen in Tables 5 and 6, which show all forms with the inherently breathy roots **gùt** ‘stab’ and **tàr** ‘spear’, respectively.¹⁷ Both of these roots belong to Class 1F. Since the root **gùt** in Table 5 has the grade 1 quality /u/, its grade 2 quality is phonologically identical to its grade 1 quality, while its grade

Table 5: Forms with the transitive breathy root **gùt** ‘stab’ (Class 1F).

	Simple	CF	CP	DAT	AP.DAT	AP
Unm.	gùt	gùut	gùut	gùut	gùut	gùut
NF	gùut	gwòot	gwòot	gwòot	gwòot	gùt
NTS	gùut	gùut	gùut	gùut	gùut	gùut*
1SG	gwòot	gwòot	gwòot	gwòot	gwòot	gwòot
2SG	gùt	gwòot-è	gùut	gwòot-è	gwòot-è	gwòot-è
3SG	gùut	gùut	gùut	gùut	gùut	gùut
1PL	gùt-kù	gùut-kù	gùut-kù	gùut-kù	gùut-kù	gùut-kù
2PL	gwòt-kà	gwòot-kà	gwòot-kà	gwòot-kà	gwòot-kà	gwòot-kà
3PL	gùt-kè	gùut-kè	gùut-kè	gùut-kè	gùut-kè	gùut-kè
PASS	gùt	gùut-è	gùut-è	gùut-è	gùut-è	—
PASS.CT	gùut-è	gùut-è	gùut-è	gùut-è	gùut-è	gùut-è*

¹⁷ Forms followed by an asterisk (*) have not been attested for the particular verbs in question, but these are the predicted forms if the verbs turn out to inflect regularly. For antipassive verbs, as for intransitive verbs in general, there is no plain passive form. Centripetal forms with plural suffixes exhibit free (inter- and intra-individual) tonal variation between between H.L (as given in Tables 5–6 and 8–9) and L.H (Andersen 1992–1994: 57).

Table 6: Forms with the transitive breathy root *t̪ar* ‘spear’ (Class 1F).

	Simple	CF	CP	DAT	AP.DAT	AP
Unm.	t̪ar	t̪̥ɛr	t̪̥ɛr	t̪̥ɛr	t̪̥ɛr*	t̪̥ɛr
NF	t̪̥ɔr	t̪̥ar	t̪̥ar	t̪̥ar	t̪̥ar*	t̪̥ar
NTS	t̪̥ɛr	t̪̥ɛr	t̪̥ɛr	t̪̥ɛr	t̪̥ɛr*	t̪̥ɛr*
1SG	t̪̥ar	t̪̥ar	t̪̥ar	t̪̥ar	t̪̥ar	t̪̥ar
2SG	t̪ar	t̪̥ar-ɛ̃	t̪̥ɛr	t̪̥ar-ɛ̃	t̪̥ar-ɛ̃	t̪̥ar-ɛ̃
3SG	t̪̥ɛr	t̪̥ɛr	t̪̥ɛr	t̪̥ɛr	t̪̥ɛr	t̪̥ɛr
1PL	t̪̥ar-k̪̥	t̪̥ɛr-k̪̥	t̪̥ɛr-k̪̥	t̪̥ɛr-k̪̥	t̪̥ɛr-k̪̥	t̪̥ɛr-k̪̥
2PL	t̪̥ar-k̪̥	t̪̥ar-k̪̥	t̪̥ar-k̪̥	t̪̥ar-k̪̥	t̪̥ar-k̪̥	t̪̥ar-k̪̥
3PL	t̪̥ar-k̪̥	t̪̥ɛr-k̪̥	t̪̥ɛr-k̪̥	t̪̥ɛr-k̪̥	t̪̥ɛr-k̪̥*	t̪̥ɛr-k̪̥
PASS	t̪̥ar	t̪̥ɛr-ɛ̃	t̪̥ɛr-ɛ̃	t̪̥ɛr-ɛ̃	t̪̥ɛr-ɛ̃*	–
PASS.CT	t̪̥ɛr-ɛ̃*	t̪̥ɛr-ɛ̃*	t̪̥ɛr-ɛ̃*	t̪̥ɛr-ɛ̃*	t̪̥ɛr-ɛ̃*	t̪̥ɛr-ɛ̃*

3 quality is /wo/, cf. Table 4 above. Conversely, since the root *t̪ar* in Table 6 has the grade 1 quality /a/, its grade 3 quality is phonologically identical to grade 1, while its grade 2 quality is /ɛ/.

Based on the forms in Tables 5 and 6 taken together, and on antipassive forms dealt with in Section 3.2 below, the distribution of the vowel grades can be determined as being what is shown in Table 7. The distribution in transitive derived verbs is the same in all four root classes, cf. Tables 10–13 at the end of this subsection. But in antipassive verbs the distribution depends on the root class, as also shown in Table 7.

Table 7: Vowel height gradation in verbs with a transitive root.

	Simple	CF	CP	DAT	AP.DAT	AP			
						1F	1L	2F	2H
Unm.	1°	2°	2°	2°	2°	2°	3°	2°	1°
NF	1°	3°	3°	3°	3°	1°	1°	2°	1°
NTS	2°	2°	2°	2°	2°	2°	2°	2°	2°
1SG	3°	3°	3°	3°	3°	3°	3°	3°	3°
2SG	1°	3°	2°	3°	3°	3°	3°	3°/2°	3°
3SG	2°	2°	2°	2°	2°	2°	2°	2°	2°
1PL	1°	2°	2°	2°	2°	2°	2°	2°	1°/2°
2PL	3°	3°	3°	3°	3°	3°	3°	3°	3°
3PL	1°	2°	2°	2°	2°	2°	2°	2°	1°/2°
PASS	1°	2°	2°	2°	2°	–	–	–	–
PASS.CT	2°	2°	2°	2°	2°	2°	2°	2°	2°

In derived transitive (i.e., non-antipassive) verbs, as seen in Table 7, the vowel grade is either 2° or 3°, never 1°. The inflectionally unmarked form of such verbs has grade 2, and this is also the grade of NTS, 2SG in centripetal verbs, 3SG, 1PL, 3PL, PASS and PASS.CT. Grade 3 is found in NF, 1SG, 2SG (except in centripetal verbs) and 2PL. Thus, grade 2 here characterizes all the inflectional categories that have either grade 1 or grade 2 in simple verbs, except for NF. Hence, in derived transitive verbs, grade 2 appears to be the default grade and can therefore be taken to be an exponent of the derived status of the verb rather than a means of inflection. Grade 3, by contrast, must be taken to be a means of inflection, namely an exponent of NF, 1SG, 2SG (except in centripetal verbs) and 2PL.

Although the generalizations expressed in Table 7 are based on breathy roots, they also cover non-breathy roots. But here the situation is complicated by the fact that some derived categories exhibit voice quality shift, and for some non-breathy vowels the shift to breathy voice is accompanied by a change in vowel quality, as described in Section 4 below. In general, however, the vowel quality alternation in verbs with their inherently non-breathy voice shifted to breathy voice is the same as in verbs with inherently breathy voice, cf. Table 4 above. This situation is exemplified in Tables 8 and 9, while exceptions are dealt with in Section 4 below. Table 8 shows all forms with the non-breathy Class 2F root **m̥iit** ‘pull’, for which grade 2 is identical to grade 1. Table 9 shows all forms with the non-breathy Class 1F root **b̥ar** ‘take along’, for which grade 3 is identical to grade 1. In Table 8 the breathy grade 2 vowel /i/ behaves like an /i/ in an inherently breathy root, i.e. it has /je/ as its grade 3 counterpart, cf. Table 4 above. In Table 9, similarly, the breathy grade 2 vowel /ɛ/ behaves like an /ɛ/ in a root with an inherently breathy grade 1 vowel /a/, i.e. it has /a/ as its grade 3 counterpart, cf. again Table 4 above.

Table 8: Forms with the transitive Class 2F root **m̥iit** ‘pull’.

	Simple	CF	CP	DAT	AP.DAT	AP
Unm.	m̥iit	m̥iit	m̥iit	m̥iit	m̥iit	m̥iit
NF	m̥iit	m̥j̥eet	m̥j̥eet	m̥j̥et	m̥j̥eet	m̥iit
NTS	m̥iit	m̥iit	m̥iit	m̥iit	m̥iit	m̥iit
1SG	m̥j̥eet	m̥j̥eet	m̥j̥eet	m̥j̥et	m̥j̥eet	m̥j̥eet
2SG	m̥iit	m̥j̥eet-ɛ	m̥iit	m̥j̥et-ɛ	m̥j̥eet-ɛ	m̥j̥eet-ɛ, m̥iit
3SG	m̥iit	m̥iit	m̥iit	m̥iit	m̥iit	m̥iit
1PL	m̥iit-k̥u	m̥iit-k̥u	m̥iit-k̥u	m̥iit-k̥u	m̥iit-k̥u	m̥iit-k̥u
2PL	m̥j̥eet-k̥a	m̥j̥eet-k̥a	m̥j̥eet-k̥a	m̥j̥et-k̥a	m̥j̥eet-k̥a	m̥j̥et-k̥a
3PL	m̥iit-k̥e	m̥iit-k̥e	m̥iit-k̥e	m̥iit-k̥e	m̥iit-k̥e	m̥iit-k̥e
PASS	m̥iit	m̥iit-ɛ	m̥iit-ɛ	m̥iit-ɛ	m̥iit-ɛ	–
PAS.CT	m̥iit-ɛ	m̥iit-ɛ*	m̥iit-ɛ	m̥iit-ɛ*	m̥iit-ɛ*	m̥iit-ɛ

Table 9: Forms with the transitive Class 1F root **bàr** ‘take along’.

	Simple	CF	CP	DAT	AP.DAT	AP
Unm.	b̥ar	b̥ær	b̥ær	b̥ær	b̥ær	b̥ær
NF	b̥aar	b̥aar	b̥aar	b̥aar	b̥aar	b̥ar
NTS	b̥ær	b̥ær	b̥ær	b̥ær	b̥ær	b̥ær*
1SG	b̥aar	b̥aar	b̥aar	b̥aar	b̥aar	b̥aar
2SG	b̥ar	b̥aar-ê	b̥ær	b̥aar-ê	b̥aar-ê	b̥aar-ê
3SG	b̥ær	b̥ær	b̥ær	b̥ær	b̥ær	b̥ær
1PL	b̥ar-kû	b̥ær-kû	b̥ær-kû	b̥ær-kû	b̥ær-kû	b̥ær-kû
2PL	b̥ar-kâ	b̥aar-kâ	b̥aar-kâ	b̥aar-kâ	b̥aar-kâ	b̥ar-kâ
3PL	b̥ar-kè	b̥ær-kè	b̥ær-kè	b̥ær-kè	b̥ær-kè	b̥ær-kè
PASS	b̥âr	b̥ær-è	b̥ær-è	b̥ær-è	b̥ær-è	—
PAS.CT	b̥ær-ê*	b̥ær-ê*	b̥ær-ê*	b̥ær-ê*	b̥ær-ê*	b̥ær-ê*

As mentioned above, the distribution of vowel grades in transitive derived verbs is the same in all four root classes. This fact is illustrated in Tables 10–13. Each of these tables shows a paradigm from each root class, centrifugal in Table 10, centripetal in Table 11, dative in Table 12 and dativized antipassive in Table 13.¹⁸ The tables also show the inflectionally unmarked form and the non-finite form of the corresponding simple verbs.

Table 10: Vowel height gradation in centrifugal verbs.

Root class			1F	1L	2F	2H
Gloss			‘pull’	‘plait’	‘pull’	‘send’
Simple	Unm.	1°	t̪ɛ̀l	n̪aj	m̪iit	t̪ooc
	NF	1°	t̪ɛ̀el	n̪aj	m̪iit	t̪ooc
CF	Unm.	2°	t̪éel	n̪ɛj	m̪iit	t̪ooc
	NF	3°	t̪éel	n̪aj	m̪ɛɛt	twɔɔc
	NTS	2°	t̪éel	n̪ɛj	m̪iit	t̪ooc
	1SG	3°	t̪éel	n̪aj	m̪ɛɛt	twɔɔc
	2SG	3°	t̪éel-é	n̪aj-é	m̪ɛɛt-é	twɔɔc-é
	3SG	2°	t̪éel	n̪ɛj	m̪iit	t̪ooc
	1PL	2°	t̪éel-k̪ù	n̪ɛj-k̪ù	m̪iit-k̪ù	t̪ooc-k̪ù
	2PL	3°	t̪éel-k̪à	n̪aj-k̪à	m̪ɛɛt-k̪à	twɔɔc-k̪à
	3PL	2°	t̪éel-k̪è	n̪ɛj-k̪è	m̪iit-k̪è	t̪ooc-k̪è
	PASS	2°	t̪ɛ̀el-è	n̪ɛj-è	m̪iit-è	t̪ooc-è

18 PASS.CT forms are not included in these tables since they are identical to the PASS forms.

Table 13: Vowel height gradation in dativized antipassive verbs.

Root class			1F	1L	2F	2H
Gloss			‘catch’	‘dust’	‘milk’	‘send’
Simple	Unm.	1°	dɔ̌m	tɛ̌ŋ	r̥aak	tɔ̌oc
	NF	1°	dɔ̌ɔm	tɛ̌ɛŋ	r̥aak	tɔ̌ooc
AP.DAT	Unm.	2°	dɔ̌om	tɛ̌ɛŋ	r̥ɛɛk	tɔ̌uc
	NF	3°	dɔ̌ɔm	tɛ̌ɛŋ	r̥aak	twɔ̌oc
	NTS	2°	dɔ̌om	tɛ̌ɛŋ	r̥ɛɛk	tɔ̌uc
	1SG	3°	dɔ̌ɔm	tɛ̌ɛŋ	r̥aak	twɔ̌oc
	2SG	3°	dɔ̌ɔm-ɛ	tɛ̌ɛŋ-ɛ	r̥aak-ɛ	twɔ̌oc-ɛ
	3SG	2°	dɔ̌om	tɛ̌ɛŋ	r̥ɛɛk	tɔ̌uc
	1PL	2°	dɔ̌om-kù	tɛ̌ɛŋ-kù	r̥ɛɛk-kù	tɔ̌uc-kù
	2PL	3°	dɔ̌ɔm-k̩à	tɛ̌ɛŋ-k̩à	r̥aak-k̩à	twɔ̌oc-k̩à
	3PL	2°	dɔ̌om-k̩ɛ	tɛ̌ɛŋ-k̩ɛ	r̥ɛɛk-k̩ɛ	tɔ̌uc-k̩ɛ
	PASS	2°	dɔ̌om-ɛ	tɛ̌ɛŋ-ɛ	r̥ɛɛk-ɛ	tɔ̌uc-ɛ

tone (Andersen 1992–1994), but also vowel quality alternation. The following subsections therefore deal in more detail with the antipassive for each of the four root classes. Table 14 summarizes the inflection of antipassive verbs by means of paradigms of generalized forms. Since the inflection of verbs with Class 2F roots depends on the lexical voice quality of the root, two paradigms are given for this class. In the generalized forms, the vowel grade is indicated by a subscript number after the coda consonant, and the voice quality symbol /◌̤/ indicates that the form is breathy, whereas the absence of a voice quality symbol indicates that the form has the voice quality which is inherent in the root.

Table 14: Inflection of antipassive verbs, shown by generalized forms.

	1F	1L	2F, -breathy	2F, +breathy	2H
Unm.	C̥VC ₂	C̥VC ₃	C̥VC ₂	C̥V(V)C ₂	C̥VC ₁
NF	C̥VC ₁	C̥VC ₁	C̥VVC ₂	C̥V(V)C ₂	C̥VC ₁
NTS	C̥VC ₂	C̥VC ₂	C̥VVC ₂	C̥V(V)C ₂	C̥VC ₂
1SG	C̥VC ₃	C̥VC ₃	C̥VVC ₃	C̥V(V)C ₃	C̥VC ₃
2SG	C̥VC ₃ -ɛ	C̥VC ₃ -ɛ	C̥VVC ₃ -ɛ	C̥V(V)C ₃ -ɛ	C̥VC ₃ -ɛ
3SG	C̥VC ₂	C̥VC ₂	C̥VVC ₂	C̥V(V)C ₂	C̥VC ₂
1PL	C̥VC ₂ -kù	C̥VC ₂ -kù	C̥VC ₂ -kù	C̥V(V)C ₂ -kù	C̥C ₁ -kù/C̥VC ₂ -kù
2PL	C̥VC ₃ -k̩à	C̥VC ₃ -k̩à	C̥VC ₃ -k̩à	C̥V(V)C ₃ -k̩à	C̥C ₃ -k̩à/C̥VC ₃ -k̩à
3PL	C̥VC ₂ -k̩ɛ	C̥VC ₂ -k̩ɛ	C̥VC ₂ -k̩ɛ	C̥V(V)C ₂ -k̩ɛ	C̥C ₁ -k̩ɛ/C̥VC ₂ -k̩ɛ
PASS.CT	C̥VC ₂ -ɛ	C̥VC ₂ -ɛ	C̥VVC ₂ -ɛ	C̥V(V)C ₂ -ɛ	C̥VC ₂ -ɛ

3.2.2 Antipassive with Class 1F roots

Table 15 shows paradigms with four antipassive verbs with Class 1F roots, non-breathy **b̥ar** ‘take along’ and **m̥oc** ‘shoot’, and breathy **gūt** ‘stab’ and **t̥jāk** ‘bury’. The table also shows the inflectionally unmarked form and the non-finite form of the corresponding simple verbs.

Table 15: Paradigms with antipassive (AP) verbs with Class 1F roots.

Gloss			‘take along’	‘shoot’	‘stab’	‘bury’
Simple	Unm.	1°	b̥ar	m̥oc	gūt	t̥jāk
	NF	1°	b̥aar	m̥oc	gūtut	t̥jōk
AP	Unm.	2°	b̥ær	m̥uc	gūtut	t̥jæk
	NF	1°	b̥ar	m̥oc	gūt	t̥jāk
	NTS	2°	b̥ær*	m̥uc	gūtut*	t̥jæk*
	1SG	3°	b̥aar	m̥woc	gwōt	t̥jāk
	2SG	3°	b̥aar-ē	m̥woc-ē	gwōt-ē	t̥jāk-ē
	3SG	2°	b̥ær	m̥uc	gūtut	t̥jæk
	1PL	2°	b̥ær-kū	m̥uc-kū	gūtut-kū	t̥jæk-kū
	2PL	3°	b̥aar-kā	m̥woc-kā	gwōt-kā	t̥jāk-kā
	3PL	2°	b̥ær-kē	m̥uc-kē	gūtut-kē	t̥jæk-kē
	PASS.CT	2°	b̥ær-ē*	m̥uc-ē	gūtut-ē*	t̥jæk-ē*

The distribution of vowel grades in antipassive verbs with Class 1F roots is the same as in derived transitive verbs, except for the non-finite form. Unlike the other forms, which have a medium-length vowel characterized by breathy voice, the non-finite form has a short vowel with inherent voice quality. In fact, it is phonologically identical to the inflectionally unmarked form of the simple verb, and it may therefore be said to occur in grade 1.

3.2.3 Antipassive with Class 1L roots

Antipassive verbs with Class 1L roots differ from antipassive verbs with other roots in that they are not characterized by breathy voice, but retain the inherent voice quality of the simple verb. This is seen in Table 16, which shows paradigms with the two non-breathy roots **j̥or** ‘water’ and **n̥aj** ‘plait’, and the two breathy roots **b̥ūt** ‘build’ and **k̥et** ‘scratch’.

Antipassive verbs with Class 1L roots furthermore differ from transitive derived verbs in that their inflectionally unmarked form has grade 3 rather than grade 2, and in that their non-finite form has grade 1 rather than grade 3.

Table 16: Paradigms with antipassive (AP) verbs with Class 1L roots.

Gloss			‘water’	‘plait’	‘build’	‘scratch’
Simple	Unm.	1°	j̥or	n̥aj	b̥ut	k̥ot
	NF	1°	j̥or	n̥aj	b̥ut	k̥ot
AP	Unm.	3°	jw̥or	n̥aj	bw̥ot	k̥at
	NF	1°	j̥or	n̥aj	b̥ut	k̥ot
	NTS	2°	j̥or*	n̥ej*	b̥ut	k̥et*
	1SG	3°	jw̥or	n̥aj	bw̥ot	k̥at
	2SG	3°	jw̥or-ē	n̥aj-ē	bw̥ot-ē	k̥at-ē
	3SG	2°	j̥or	n̥ej	b̥ut	k̥et
	1PL	2°	j̥or-k̥u	n̥ej-k̥u	b̥ut-k̥u	k̥et-k̥u
	2PL	3°	jw̥or-k̥a	n̥aj-k̥a	bw̥ot-k̥a	k̥at-k̥a
	3PL	2°	j̥or-k̥e	n̥ej-k̥e	b̥ut-k̥e	k̥et-k̥e
	PASS.CT	2°	j̥or-ē*	n̥ej-ē*	b̥ut-ē	k̥et-ē*

Taken in isolation, the non-finite forms **j̥or** of ‘water’, **b̥ut** of ‘build’ and **k̥ot** of ‘scratch’ are ambiguous between grades 1 and 2, while, conversely, the non-finite form **n̥aj** of ‘plait’ is ambiguous between grade 1 and grade 3; but for exactly this reason, all of these forms must be taken to have grade 1.

3.2.4 Antipassive with Class 2F roots

The formation of antipassive verbs with Class 2F roots depends on the inherent voice quality of the root vowel. All forms have breathy voice quality, but the two subclasses differ with respect to vowel length and tone (Andersen 1992–1994). With non-breathy roots, as exemplified in Table 17, the inflectionally unmarked form has a medium-length vowel and a low tone, while the non-finite form has a long vowel and a high tone.

In three of the four paradigms in Table 17, it is indeterminable whether the vowel quality grade of the inflectionally unmarked form and the non-finite form is 1° or 2° when viewed in isolation. This is the case for /i/ in ‘pull’, /e/ in ‘drive’, and /ɔ/ in ‘milk’. In the paradigm with ‘hate’, however, the /ɛ/ unambiguously belongs to grade 2. So generalizing, the vowel qualities /i/, /e/ and /ɔ/ in the other paradigms may also be taken to belong to grade 2. Given this generalization, Table 17 further reveals that for roots with the non-breathy quality /a/, there are three different breathy grade 2 alternants: /ɛ/ in ‘hate’, /e/ in ‘drive’ and /ɔ/ in ‘milk’. This alternation is dealt with and discussed in Section 4.4 below.

Table 17: Paradigms with antipassive (AP) verbs with non-breathy Class 2F roots.

Gloss			‘pull’	‘hate’	‘drive’	‘milk’
Simple	Unm.	1°	m̥j̥it	m̥ḁan	kw̥ḁaʈ	r̥ḁak
	NF	1°	m̥jiit	m̥ḁaan	kw̥ḁaaʈ	r̥ḁaak
AP	Unm.	2°	m̥j̥it	m̥ɛ̃ɛn	kw̥ẽeʈ	r̥ɔ̃ɔk
	NF	2°	m̥jiit	m̥ɛ̃ɛɛn	kw̥ẽeeʈ	r̥ɔ̃ɔɔk
	NTS	2°	m̥jiit	m̥ɛ̃ɛɛn*	kw̥ẽeeʈ*	r̥ɔ̃ɔɔk
	1SG	3°	m̥j̥eet	m̥ḁaan	kw̥ɛ̃ɛɛʈ	r̥ḁaak
	2SG	3°/2°	m̥j̥eet-ɛ̃, m̥jiit	m̥ɛ̃ɛn	kw̥ɛ̃ɛɛʈ-ɛ̃, kw̥ẽeʈ	r̥ḁaak-ɛ̃
	3SG	2°	m̥jiit	m̥ɛ̃ɛɛn	kw̥ẽeeʈ	r̥ɔ̃ɔɔk
	1PL	2°	m̥j̥it-kú	m̥ɛ̃ɛn-kú	kw̥ẽeʈ-kú	r̥ɔ̃ɔk-kú
	2PL	3°	m̥j̥eet-k̥á	m̥ḁan-k̥á	kw̥ɛ̃ɛʈ-k̥á	r̥ḁak-k̥á
	3PL	2°	m̥j̥it-k̥é	m̥ɛ̃ɛn-k̥é	kw̥ẽeʈ-k̥é	r̥ɔ̃ɔk-k̥é
	PASS.CT	2°	m̥jiit-ɛ̃	m̥ɛ̃ɛɛn-ɛ̃*	kw̥ẽeeʈ-ɛ̃*	r̥ɔ̃ɔɔk-ɛ̃

Table 17 also illustrates that the 2SG form of antipassive verbs with roots of this subclass exhibits free variation between a form with the suffix **-ɛ̃** and with grade 3 in the root (CȚVVC₃-ɛ̃) and a form without a suffix and with grade 2 in the root (CȚVC₂).¹⁹ Thus, for instance, there is free variation between **m̥j̥eet-ɛ̃** and **m̥j̥it** with the root **m̥j̥it** ‘pull’ and between **kw̥ɛ̃ɛɛʈ-ɛ̃** and **kw̥ẽeʈ** with the root **kw̥ḁaʈ** ‘drive’.

With breathy Class 2F roots, as illustrated in Table 18, the inflectionally unmarked form has a medium or long vowel and a high tone, while the non-finite form also has a medium or long vowel, but a low tone.²⁰ In this case it seems to be indeterminable whether these two forms belong to grade 1 or grade 2. The reason is that, apparently, there are no transitive roots with a medium breathy /ḁ/. Such roots would have the quality /ḁ/ in grade 1 and the quality /ɛ̃/ in grade 2. But given the evidence from the corresponding forms of antipassive verbs with non-breathy Class 2F roots, the forms in question may be taken to belong to grade 2.

¹⁹ This inter- and intra-individual variation was not reported in Andersen (1992–1994). One speaker systematically gave me only disyllabic forms, while another speaker systematically gave me both disyllabic forms and monosyllabic forms. A similar variation is found in 2SG forms of simple intransitive verbs. Compare, for instance, the inflectionally unmarked form **n̥jin** ‘sleep’ (1°) and the 2SG forms **n̥j̥ɛ̃ɛɛn-ɛ̃** (3°) ~ **n̥jin** (1°).

²⁰ It is not clear whether the length variation between medium and long is free or lexically determined.

Table 18: Paradigms with antipassive (AP) verbs with breathy Class 2F roots.

Gloss			‘crack’	‘withhold’	‘wake up’	‘ask’
Simple	Unm.	1°	t̪o̪ok	p̪een	pw̪o̪oc	t̪j̪e̪ec
	NF	1°	t̪o̪ook	p̪een	pw̪o̪ooc	t̪j̪e̪eec
AP	Unm.	2°	t̪o̪ook	p̪een	pw̪o̪oc	t̪j̪e̪ec
	NF	2°	t̪o̪ook	p̪een	pw̪o̪oc	t̪j̪e̪ec
	NTS	2°	t̪o̪ook	p̪een*	pw̪o̪oc*	t̪j̪e̪ec
	1SG	3°	t̪ɔ̪ɔk	p̪ɛɛn	p̪j̪a̪ac	t̪j̪e̪ec
	2SG	3°	t̪ɔ̪ɔk-ɛ̃	p̪ɛɛn-ɛ̃	p̪j̪a̪ac-ɛ̃	t̪j̪e̪ec-ɛ̃
	3SG	2°	t̪o̪ook	p̪een	pw̪o̪oc	t̪j̪e̪ec
	1PL	2°	t̪o̪ook-k̪ù	p̪een-k̪ù	pw̪o̪oc-k̪ù	t̪j̪e̪ec-k̪ù
	2PL	3°	t̪ɔ̪ɔk-k̪à	p̪ɛɛn-k̪à	p̪j̪a̪ac-k̪à	t̪j̪e̪ec-k̪à
	3PL	2°	t̪o̪ook-k̪è	p̪een-k̪è	pw̪o̪oc-k̪è	t̪j̪e̪ec-k̪è
	PASS.CT	2°	t̪o̪ook-ɛ̃	p̪een-ɛ̃	pw̪o̪oc-ɛ̃*	t̪j̪e̪ec-ɛ̃

3.2.5 Antipassive with Class 2H roots

The formation and inflection of antipassive verbs with Class 2H roots are exemplified with four roots in Table 19: the non-breathy roots **l̪ɔ̪ɔk** ‘wash’ and **ŋ̪a̪aŋ** ‘open’, and the breathy roots **ḍ̪e̪et̪** ‘transport’ and **k̪ɔ̪ɔm** ‘thresh’.

The inflectionally unmarked form and the non-finite form both have a short vowel. But whereas the inflectionally unmarked form is characterized by breathy voice like the other finite forms, the non-finite form retains the inherent voice quality of the root. Determining the vowel grade of these two forms, however, is problematic. Grade 3 is excluded, because the forms do not exhibit lowering. But

Table 19: Paradigms with antipassive (AP) verbs with Class 2H roots.

Gloss			‘wash’	‘open’	‘transport’	‘thresh’
Simple	Unm.	1°	l̪ɔ̪ɔk	ŋ̪a̪aŋ	ḍ̪e̪et̪	k̪ɔ̪ɔm
	NF	1°	l̪ɔ̪ɔk	ŋ̪a̪aŋ	ḍ̪e̪eet̪	k̪ɔ̪ɔm
AP	Unm.	1°	l̪ok	ŋ̪a̪ŋ	ḍ̪et̪	k̪ɔ̪m
	NF	1°	l̪k	ŋ̪a̪ŋ	ḍ̪et̪	k̪ɔ̪m
	NTS	2°	l̪ok	ŋ̪ɛɛŋ*	ḍ̪e̪et̪*	k̪ɔ̪m*
	1SG	3°	l̪ɔ̪ɔk	ŋ̪a̪aŋ	ḍ̪e̪et̪	k̪a̪am
	2SG	3°	l̪ɔ̪ɔk-ɛ̃	ŋ̪a̪aŋ-ɛ̃	ḍ̪e̪et̪-ɛ̃	k̪a̪am-ɛ̃
	3SG	2°	l̪ok	ŋ̪ɛɛŋ	ḍ̪e̪et̪	k̪ɔ̪m
	1PL	1°/2°	l̪ok/l̪ok-k̪ù	ŋ̪ɛɛŋ-k̪ù	ḍ̪et̪/ḍ̪e̪et̪-k̪ù	k̪ɔ̪m/k̪ɔ̪m-k̪ù
	2PL	3°	l̪k/l̪ɔ̪ɔk-k̪à	ŋ̪a̪aŋ-k̪à	ḍ̪at̪/ḍ̪e̪et̪-k̪à	k̪am/k̪a̪am-k̪à
	3PL	1°/2°	l̪ok/l̪ok-k̪è	ŋ̪ɛɛŋ-k̪è	ḍ̪et̪/ḍ̪e̪et̪-k̪è	k̪ɔ̪m/k̪ɔ̪m-k̪è
	PASS.CT	2°	l̪ok-ɛ̃	ŋ̪ɛɛŋ-ɛ̃*	ḍ̪e̪et̪-ɛ̃*	k̪ɔ̪m-ɛ̃*

there is no way of distinguishing between grade 1 and grade 2 here, since I assume that the contrast between the qualities /a/ and /ɛ/ in medium-length and long vowels is absent in short vowels (cf. Section 2.5 above), and since fronting, which is the basis for positing grade 2, only applies to /a/. For reasons of parsimony, however, I posit grade 1 for these forms, since grade 1 is overall the “unmarked” grade.

The root vowel of the three plural forms varies freely between short and medium.²¹ The root vowel of the 2PL form belongs to grade 3, since ‘wash’, ‘transport’ and ‘thresh’ exhibit lowering with both vowel lengths. The 1PL and 3PL forms with a medium vowel belong to grade 2, since ‘open’ undergoes fronting. But when the root vowel of these forms is short, the above-mentioned problem of distinguishing between grade 1 and grade 2 recurs, and again I posit grade 1. As a consequence of this analysis, the inflection of antipassive verbs with Class 2H roots, when the root vowel is short in the plural forms, follows the same pattern as that of simple verbs with Class 1F or 1L roots, except for the non-finite form and the 2SG form.

3.3 Range of Fronting in grade 2

In simple verbs, the morphophonological rule of Fronting, which characterizes grade 2, applies only to the low central vowel quality /a/, as exemplified in (4) with the non-breathy root **ḅər** ‘take along’ (Class 1F) and in (5) with the breathy root **ṭər** ‘spear’ (Class 1F). Vowel grade specification of the verb is indicated in parentheses after the sentences.²²

- (4) a. **ṃəc ̣̣ = ḅər ṭən.** (1°)
 man D = take_along spear
 ‘The man is taking a spear along.’
 b. **ẉəŋ ̣̣ = ḅ̣̣ər.** (2°)
 cow D = take_along.3SG
 ‘He is taking the cow along.’
- (5) a. **ṃəc ̣̣ = ṭər ḷaj.** (1°)
 man D = spear animal
 ‘The man is spearing an animal.’

²¹ One speaker gave me the shorter forms, another speaker the longer forms. In Andersen (1992–1994: 43), the three plural forms were described as having a short root vowel.

²² The verb forms in (4a) and (5a) are inflectionally unmarked forms, not 3SG forms. Verbs are not inflected for subject when preceded by a subject NP or when having a covert subject, which is a third person pronominal, cf. Andersen (1991, 1992–1994).

- b. **láj** **à = t̪ɛɛr.** (2°)
 animal D = spear.3SG
 'He is spearing the animal.'

As seen in the 3SG forms, which are grade 2 forms, Fronting has the effect of changing /a/ to /ɛ/, whether the voice quality is non-breathy (4b) or breathy (5b). In derived verbs, however, Fronting may in addition apply to roots with the rounded lower-mid back vowel quality /ɔ/ (whether non-breathy or breathy) and to roots which have breathy /ɔ/ as a raised variant of /ɔ/. In that case, Fronting also involves unrounding. I have not examined how common this extension of the range of Fronting is.

Fronting of non-breathy /ɔ/ to /ɛ/ is seen in derived verbs that do not undergo voice quality shift, i.e., centrifugal verbs with roots of any of the four classes and antipassive verbs with Class 1L roots. The application of Fronting to /ɔ/ in centrifugal verbs is illustrated in (6) with the root **c̥ɔɔl** 'call' (Class 2F).

- (6) a. **t̪ik** **à = c̥ɔɔl m̪ɛt.** (1°)
 woman D = call child
 'The woman is calling the child.'
- b. **m̪ɛt** **à = c̥ɔɔl.** (2°)
 child D = call.3SG
 'She is calling the child.'
- c. **t̪ik** **à = c̥ɔɔl/c̥ɛɛl m̪ɛt.** (2°)
 woman D = call.CF child
 'The woman is calling the child (away).'
- d. **m̪ɛt** **à = c̥ɔɔl/c̥ɛɛl.** (2°)
 child D = call.CF.3SG
 'She is calling the child (away).'
- e. **t̪ik** **à = c̥ɔool m̪ɛt.** (2°)
 woman D = call.CP child
 'The woman is calling the child hither.'
- f. **m̪ɛt** **à = c̥ɔool.** (2°)
 child D = call.CP.3SG
 'She is calling the child hither.'

In (6a) we find the vowel quality /ɔ/ as grade 1 in **c̥ɔɔl**, the inflectionally unmarked form of the simple verb. In (6b) the 3SG form of the simple verb, **c̥ɔɔl**, occurs in grade 2, but has the same vowel quality. In the centrifugal grade 2 forms in (6c-d), Fronting applies optionally, so that the inflectionally unmarked or 3SG form **c̥ɔɔl** varies freely with the fronted variant **c̥ɛɛl**. Centripetal and other derived categories

characterized by breathiness are not affected by Fronting since their vowel quality is /o/ rather than /ɔ/, as illustrated in (6e-f).

The application of Fronting to /ɔ/ in antipassive verbs with Class 1L roots is illustrated in (7) with the root **tɔŋ** ‘light a cow-dung fire’.

- (7) a. **mɔc ɔ = tɔŋ gɔl**. (1°)
 man D = light cow_dung_fire
 ‘The man is lighting a cow-dung fire.’
 b. **kɔ tɔŋ/tɛŋ**. (2°)
 and light.AP.3SG
 ‘and he is lighting.’

As seen in (7b), the 3SG antipassive form varies freely between non-fronted **tɔŋ** and fronted **tɛŋ**.

Fronting may also apply to roots in which /ɔ/ is preceded by postconsonantal /j/, as in (8) with the root **rjɔp** ‘pay wages, hire, rent’ (Class 1F).

- (8) a. **bɔn ɔ = rjɔp kɔac = k-ɛ**. (1°)
 chief D = pay person.PL.CS2 = PL-3SG
 ‘The chief is paying his people.’
 b. **bɔn ɔ = rjɛp ɔɔt**. (2°)
 chief D = pay.CF house
 ‘The chief is renting a house (for somebody or away).’

As seen in (8b), the inflectionally unmarked form of the centrifugal verb has been attested with the fronted form **rjɛp**.

Again, Fronting applies optionally in grade 2 to a non-breathy /ɔ/ preceded by a postconsonantal /w/, but here with an additional consequence, as illustrated in (9) with the root **bwɔt** ‘follow’ (Class 2F).

- (9) a. **jɔ ɔ = bwɔt mɔc**. (1°)
 dog D = follow man
 ‘The dog is following the man.’
 b. **jɔ ɔ = bwɔɔt/bjɛɛt mɔc rɔoor**. (2°)
 dog D = follow.CF man bush.LOC
 ‘The dog is following the man (away) into the bush.’
 c. **jɔ ɔ = cɛ mɔc bjɛaɛt rɔoor**. (3°)
 dog D = PF man follow.CF.NF bush.LOC
 ‘The dog has followed the man (away) into the bush.’

Corresponding to the simple verb with the inflectionally unmarked grade 1 form **bw̥ɔ̥ɔ̥t** in (9a), the centrifugal, inflectionally unmarked grade 2 form **bw̥ɔ̥ɔ̥t** in (9b) varies freely with the fronted form **bj̥ɛɛt**. In the latter variant, the postconsonantal labiovelar glide /w/ has been replaced with the palatal glide /j/. This is similar to the grade 3 alternant of such verbs, as seen in (9c), where the grade 3 form is **bj̥aaɬ**. Thus, the unrounding of /ɔ̥/ is accompanied by unrounding of the preceding /w/, presumably as a result of assimilation.

In Andersen (1993: 21) it was argued, on the basis of the morphology of simple verbs, that although either of grades 1 and 2 could be considered basic, it is simpler to take grade 1 to be basic. We now see independent and decisive evidence for this analysis in the following fact: The contrast between /a/ and /ɔ̥/, which exists in grade 1, is (optionally) neutralized in grade 2 forms of centrifugal verbs. Hence grade 2 cannot be basic.

Fronting of breathy /ɔ̥/ to /ɛ/ in derived verbs is illustrated in (10) with the root **k̥ɔ̥l** ‘fan’ (Class 1F).

- (10) a. **t̥ɪk** **ɔ̥ = k̥ɔ̥l m̥ɛt**. (1°)
 woman D = fan child
 ‘The woman is fanning the child.’
 b. **m̥ɛt** **ɔ̥ = k̥ɔ̥ɔl**. (2°)
 child D = fan.3SG
 ‘She is fanning the child.’
 c. **t̥ɪk** **ɔ̥ = k̥ɛɛl j̥aar**. (2°)
 woman D = fan.CF leaf
 ‘The woman is fanning (with) a leaf.’
 d. **j̥aar** **ɔ̥ = k̥ɛɛl**. (2°)
 leaf D = fan.CF.3SG
 ‘She is fanning (with) the leaf.’
 e. **t̥ɪk** **ɔ̥ = k̥ɛɛl j̥aar**. (2°)
 woman D = fan.CP leaf
 ‘The woman is fanning (with) a leaf hither.’
 f. **j̥aar** **ɔ̥ = k̥ɛɛl**. (2°)
 leaf D = fan.CP.3SG
 ‘She is fanning (with) the leaf hither.’

In (10a-b) the verb ‘fan’ is simple, with the inflectionally unmarked form **k̥ɔ̥l** occurring in grade 1, and the 3SG form **k̥ɔ̥ɔl** occurring in grade 2. In (10c-d) the

verb is centrifugal and in (10e-f) centripetal, and the forms given here also occur in grade 2, but with the fronted quality /ɛ/.²³

Free inter- and intra-individual variation between the non-fronted quality /ɔ/ and the fronted quality /ɛ/ is exemplified in (11) with the root **gɔt** ‘write’ (Class 1F). As seen in (11b), the 3SG antipassive verb varies freely between **gɔt** and **gɛt**.

- (11) a. **báɲ ɔ̌ = gɔt ɔ̌tɔ̌oor**. (1°)
 chief D = write letter
 ‘The chief is writing a letter.’
 b. **kù gɔt/gɛt**. (2°)
 and write.AP.3SG
 ‘and he is writing.’

In derived verbs, Fronting also applies in grade 2 to breathy /ɔ/ preceded by a postconsonantal /w/, as illustrated with the root **bwɔk** ‘slap’ (Class 2F) in (12).

- (12) a. **mɔc ɔ̌ = bwɔk mɛt**. (1°)
 man D = slap child
 ‘The man is slapping the child.’
 b. **mɔc ɔ̌ = bjɛek ɛ cɪn pɪn**. (2°)
 man D = slap.CF 3SG hand ground.ALL
 ‘The man is slapping his hand onto the ground.’
 c. **mɔc ɔ̌ = cɛe cɪn bjɛaak pɪn**.²⁴ (3°)
 man D = PF.3SG hand slap.CF.NF ground.ALL
 ‘The man has slapped his hand onto the ground.’

The centrifugal counterpart of the inflectionally unmarked form of the simple verb **bwɔk** in (12a) has the form **bjɛek**, as seen in (12b). As in (9) above, the fronting here has the additional consequence that the postconsonantal /w/ is turned into /j/. This change in the postconsonantal glide is also seen in the grade 3 form **bjɛaak** in (12c) as a result of Lowering. The fact that Fronting applies to /wɔ/ is evidence that /wɔ/ is a raised form of underlying /wɔ̌/, an analysis argued for in Andersen (1993: 16 and 28–29). The fronting in (12b) may thus be said to apply to the underlying form /bwɔ̌ɔk/ with the output /bjɛɛk/, which in turn undergoes raising to the actual form **bjɛek**.

²³ On the argument alternation that can be observed in (10), between the object being a patient (10a-b) and a theme (or instrument) (10c-f), see Andersen (2012a: 41–44).

²⁴ The form [cɛe] in (12c) is a contraction of PF **cɛ** and 3SG **ɛ**.

4 Voice quality shift and vowel quality

4.1 From /ɔ̣/ to /ɔ̤/, and from /ɔ̤/ to /ṳ/

The shift from non-breathy voice to breathy voice, which is an exponent of derivation, may involve a shift in vowel quality, more specifically a shift in height and, to a more limited extent, a shift in rounding.

The basics of voice quality shift (VQS) are most clearly seen in the antipassive of Class 2H roots, since the set of forms with this derivational status here arguably exhibits all three vowel alternation grades (cf. Section 3.2.5 above), whereas other derivational categories characterized by VQS only involve grades 2 and 3. Table 20 shows, for each of the five non-breathy grade 1 vowels without a preceding postconsonantal glide, the following four forms: the simple verb’s inflectionally unmarked form (which has grade 1) and three representative forms of the antipassive verb, namely the inflectionally unmarked form, which has grade 1, the 3SG form, which has grade 2, and the 1SG form, which has grade 3.

Table 20: Voice quality shift in the antipassive of non-breathy Class 2H roots.

	Simple	Antipassive			
	Unm.	Unm.	3SG	1SG	
	1°	1°	2°	3°	
/i/	d̪iɭ	d̪iɭ	d̪iɭ	d̪iɛɭ	‘plug’
/e/	w̪ɛc	w̪ɛc	w̪ɛc	w̪ɛɛc	‘sweep’
/a/	ŋ̪aɲ	ŋ̪aɲ	ŋ̪ɛɛɲ	ŋ̪aɲ	‘open’
/ɔ̣/	l̪ɔ̣k	l̪ɔ̤k	l̪ɔ̤ok	l̪ɔ̤ɔk	‘wash’
/ɔ̤/	ŋ̪ɔ̤ot	ŋ̪ṳt	ŋ̪ṳut	ŋ̪w̪ṳot	‘cut’

As seen in the table, the unrounded vowels /i/, /e/ and /a/ retain their quality in grade 1 when they become breathy. By contrast, the rounded vowels /ɔ̣/ and /ɔ̤/ are raised to /ɔ̤/ and /ṳ/, respectively. Thus, both of them are raised by one step: /ɔ̣/ from lower-mid to higher-mid, and /ɔ̤/ from higher-mid to high. This alternation is completely regular, as illustrated with centripetal verbs in (13) and (14), which show the inflectionally unmarked form of simple verbs and of the corresponding centripetal verbs.

- (13) Simple CP
- c̪ɔ̣ɭ

c̪ɔ̤ool

‘call’ (2F)
- d̪ɔ̣m

d̪ɔ̤om

‘catch’ (1F)

j̣ɔ̣t	j̣ɔ̣oot	‘jump over’ (2H)
j̣ɔ̣t	j̣ɔ̣ot	‘lift’ (1F)
ḷɔ̣k	ḷɔ̣ook	‘wash’ (2H)
ṛɔ̣ɬ	ṛɔ̣oot	‘smear’ (2F)
ṭɔ̣n	ṭɔ̣on	‘send for’ (1F)
ṭɔ̣c	ṭɔ̣oc	‘anoint’ (1F)
ṭɔ̣ŋ	ṭɔ̣oon	‘interfere’ (2H)
ụɔ̣ɬ	ụɔ̣ool	‘dig out’ (2F)

(14) Simple CP

c̣ɔ̣ol	c̣ɔ̣uul	‘pay’ (2H)
c̣ɔ̣p	c̣ɔ̣up	‘pursue’ (1F)
ḍɔ̣l	ḍɔ̣ul	‘roll up’ (1L)
ḍɔ̣ŋ	ḍɔ̣uŋ	‘break’ (1F)
j̣ɔ̣r	j̣ɔ̣ur	‘water’ (1L)
ḳɔ̣ŋ	ḳɔ̣uŋ	‘help’ (1F)
ṃɔ̣c	ṃɔ̣uc	‘shoot’ (1F)
ṇɔ̣ɬ	ṇɔ̣uɬ	‘point at’ (2F)
ṭɔ̣oc	ṭɔ̣uuc	‘send’ (2H)
ṭɔ̣om	ṭɔ̣uum	‘inject’ (2H)

In transitive derived verb categories characterized by breathy voice, there are no grade 1 forms. When a non-breathy /a/ becomes breathy in such categories, it either undergoes fronting (and raising) to /ɛ/ in grade 2 forms or it is manifested as /a/ in grade 3 forms.

Once having become breathy, the vowels in Table 20 conform to the same vowel gradation system as inherently breathy root vowels, cf. Table 4 above.

4.2 From /wɔ̣/ to /ọ/

In grades 1 and 2 of simple verbs, there is complementary distribution between /wɔ̣/ and /ɔ̣/ after an onset consonant (Andersen 1993: 18). Thus, /wɔ̣/ only occurs after labial onsets, while /ɔ̣/ only occurs after non-labial onsets and after a postconsonantal /j/. As exemplified with inflectionally unmarked forms in (15), /wɔ̣/ thus occurs after the labial consonants /p/ (15a), /b/ (15b) and /m/ (15c).

- (15) a. pẉɔ̣ɬ ‘skin, bark’ (2F)
 b. bẉɔ̣k ‘blow (of wind)’ (1F)
 bẉɔ̣ɬ ‘follow’ (2F)

- c. **mw̥ɔ̃ɔc** ‘give’ (2F)
mw̥ɔ̃ɔk ‘churn’ (2F)

As similarly exemplified with inflectionally unmarked forms in (16), /ɔ̃/ occurs after interdentalals (16a), alveolars (16b), palatals (16c), and velars (16d).

- (16) a. **t̥ɔ̃n** ‘send for’ (1F)
ɖ̥ɔ̃m ‘stalk’ (1F)
 b. **t̥ɔ̃ŋ** ‘knock’ (2H)
ɖ̥ɔ̃k ‘spin’ (1F)
l̥ɔ̃k ‘wash’ (2H)
r̥ɔ̃m ‘share’ (1F)
 c. **c̥ɔ̃ɔl** ‘call’ (2F)
ɟ̥ɔ̃t ‘lift’ (1F)
ɲ̥ɔ̃r ‘bewitch’ (1L)
ɟ̥ɔ̃ŋ ‘mistreat’ (1L)
t̥ɟ̥ɔ̃ŋ ‘press’ (2H)
 d. **k̥ɔ̃ɔc** ‘sew, mend’ (2F)
ɡ̥ɔ̃l ‘begin’ (1F)
ŋ̥ɔ̃k ‘vomit’ (1F)
u̥ɔ̃ɔc ‘buy’ (2F)

Given this distribution, Andersen (1993: 18) analyzed post-onset /w̥ɔ̃/ as derived from underlying /ɔ̃/ by a rule of Labialization after labial onsets.

When roots with post-onset /w̥ɔ̃/ undergo voice quality shift, the postconsonantal /w/ disappears, as seen in (17).

- (17) a. **m̥ɛt̥ ̎ = bw̥ɔ̃ɔt̥ m̎an.** (1°)
 child D = follow mother.3SG
 ‘The child is following his mother.’
 b. **m̥ɛt̥ ̎ = bw̥ɔ̃ɔt̥ m̎an w̥iir.** (2°)
 child D = follow.CF mother.3SG river.LOC
 ‘The child is following his mother to the river.’
 c. **m̥ɛt̥ ̎ = b̥ɔ̃ɔt̥.** (2°)
 child D = follow.AP
 ‘The child is following.’
 d. **m̥ɛt̥ ̎ = b̥ɔ̃ɔt̥ m̎an l̎aan̎.** (2°)
 child D = follow.CP mother.3SG side.CS1.DEM1
 ‘The child is following his mother this way.’

- c. **kù wèek.** (2°)
and rinse.AP.3SG
'and she is rinsing.'
- d. **kù wèek.** (3°)
and rinse.AP.1SG
'and I am rinsing.'

In (18a) the root occurs as a simple verb in its inflectionally unmarked form. In (18b) it occurs in the corresponding inflectionally unmarked antipassive form **wèk** with the grade 1 vowel /**ɛ**/. In (18c) it occurs in the 3SG antipassive form **wèek** with the grade 2 vowel /**ɛ̃**/. And in (18d) it occurs in the 1SG antipassive form **wèek** with the grade 3 vowel /**ɛ̄**/. In this way, the breathy alternants of /**ɛ̃**/ here merge with the breathy alternants of /**ɛ̄**/. This is seen when (18) is compared with the parallel set of forms with the non-breathy root **gèet** 'roast' (Class 2H) in (19).

- (19) a. **málèn à = gèet nùm.** (1°)
maternal_aunt.1SG D = roast sesame.PL
'My maternal aunt is roasting sesame.'
- b. **málèn à = gèt.** (1°)
maternal_aunt.1SG D = roast.AP
'My maternal aunt is roasting.'
- c. **kù gèet àjà.** (2°)
and roast.AP.3SG also
'and she is also roasting.'
- d. **kù gèt àjà.** (3°)
and roast.AP.1SG also
'and I am also roasting.'

As in (18), grades 1 and 2 are /**ɛ̃**/, and grade 3 is /**ɛ̄**/.

That /**w**/ has the same effect in postconsonantal position is seen in (20) with the non-breathy root **ɲwàar** 'collect' (Class 2H).

- (20) a. **mòc à = ɲwàar uɲk.** (1°)
man D = collect cow.PL
'The man is collecting cows.'
- b. **mòc à = ɲwèr.** (1°)
man D = collect.AP
'The man is collecting.'

- c. **màṇḍok à = jwéer uḍk bân.** (2°)
 Mangok D = collect.DAT cow.PL chief
 ‘Mangok is collecting cows for the chief.’
- d. **màṇḍok à = cé uḍk jwéer bân.** (3°)
 Mangok D = PF cow.PL collect.DAT.NF chief
 ‘Mangok has collected cows for the chief.’

In (20a) the root occurs as a simple verb in its inflectionally unmarked form. In (20b) it occurs in the corresponding inflectionally unmarked antipassive form **jwèr** with the grade 1 vowel /*ɛ*/. In (20c) the root occurs in the inflectionally unmarked dative form **jwéer**, with the vowel /*ɛ*/ here belonging to grade 2. And in (20d) it occurs in the non-finite dative form **jwéer**, whose vowel /*ɛ*/ belongs to grade 3.

The same phenomenon is seen in (21) with the non-breathy root **gwàr** ‘clear a field’ (Class 1F).

- (21) a. **wàamàṭ à = gwàr dôm ìc.** (1°)
 brother.1SG D = clear field stomach
 ‘My brother is clearing the field.’
- b. **kù gwèr.** (2°)
 and clear.AP.3SG
 ‘and he is clearing.’
- c. **kù gwéer.** (3°)
 and clear.AP.1SG
 ‘and I am clearing.’

In (21b) the 3SG antipassive verb has the grade 2 form **gwèr**, and in (21c) the 1SG antipassive verb has the grade 3 form **gwéer**. Again, the breathy alternants of /*ḡ*/ here merge with the breathy alternants of /*ɛ*/, cf. the parallel set of examples in (22) with the root **cwèt** ‘eat meat’ (Class 1F).

- (22) a. **mèt à = cwèt rîṇ.** (1°)
 child D = eat meat
 ‘The child is eating meat.’
- b. **kù cwèet.** (2°)
 and eat.AP.3SG
 ‘and he is eating.’
- c. **kù cwéet.** (3°)
 and eat.AP.1SG
 ‘and I am eating.’

A /w/ has no raising effect on forms whose root has an inherently breathy /a/. This is the case whether the /w/ is an onset or occurs in postconsonantal position, as seen in (23)–(24). The /w/ is postconsonantal in the root **gwàr** ‘grind’ (Class 1F) in (23), which parallels and contrasts with (21) with the root **gwàr** ‘clear a field’.

- (23) a. **ṇà ḁ = gwàr ràp**. (1°)
 girl D = grind sorghum.PL
 ‘The girl is grinding sorghum.’
 b. **kṛ gwḁɛr**. (2°)
 and grind.AP.3SG
 ‘and she is grinding.’
 c. **kṛ gwàar**. (3°)
 and grind.AP.1SG
 ‘and I am grinding.’

In the 3SG antipassive form in (23b), the grade 2 vowel is manifested as /ɛ/, and in the 1SG antipassive form in (23c), the grade 3 vowel is manifested as /a/. In (24) the preceding /w/ occurs in onset position in the root **wàl** ‘pour’ (Class 1F), and grade 2 is again manifested as /ɛ/, here in the inflectionally unmarked antipassive form in (24b).

- (24) a. **ṭik ḁ = wàl pṭiw**. (1°)
 woman D = pour water.PL
 ‘The woman is pouring water.’
 b. **ṭik ḁ = wḁɛl**. (2°)
 woman D = pour.AP
 ‘The woman is pouring.’

Because only roots with a lexically non-breathy vowel are affected by a preceding /w/, the raising of the breathy alternant of non-breathy /a/ from /a/ to /ɛ/ after /w/ in grades 1 and 2 must be an integral part of the VQS itself. If it were a result of a general assimilation rule raising grade 1 /a/ to /ɛ/, grade 2 /ɛ/ to /ɛ/ and grade 3 /a/ to /ɛ/ after the high semivowel /w/, then such a rule should also affect the corresponding inherently breathy vowels, but as seen in (23)–(24), this is not the case. Hence, when grade 3 is /ɛ/, the corresponding grade 2 vowel /ɛ/ is underlyingly /ɛ/ and not just a raised manifestation of underlying /ɛ/.

4.3.2 From /a/ to /e/ after a palatal

Raising may also affect the breathy alternants of /a/ after the palatal postconsonantal glide /j/, but here there is some variability. In (25) raising affects the breathy alternants of /a/ in the root **ɲj̥əc** ‘squeeze’ (Class 1F).

- (25) a. **t̥ɪk** **à = ɲj̥əc** **àl̥aɬ**. (1°)
 woman D = squeeze cloth
 ‘The woman is wringing a cloth.’
 b. **àk̥ɪuɹ** **à = ɲj̥ēc** **m̥aɲ** **cj̥ēc**. (2°)
 Akur D = squeeze.DAT mother.3SG honey
 ‘Akur is squeezing honey for her mother.’
 c. **àk̥ɪuɹ** **à = c̥e** **m̥aɲ** **ɲj̥ēc** **cj̥ēc**. (3°)
 Akur D = PF mother.3SG squeeze.DAT.NF honey
 ‘Akur has squeezed honey for her mother.’

Here the breathy grade 2 alternant of /ja/ is /j̥e/, as seen in the inflectionally unmarked dative form **ɲj̥ēc** in (25b). The breathy grade 3 alternant is manifested in the same way, as seen in the homonymous non-finite dative form **ɲj̥ēc** in (25c). The same pattern is found in (26) with the root **t̥j̥æk** ‘marry, pay bride price’ (Class 2F).

- (26) a. **m̥ɔc** **à = t̥j̥æk** **t̥ɪk**. (1°)
 man D = marry woman
 ‘The man is marrying a woman.’
 b. **r̥aɲ** **à = t̥j̥eek** **t̥ɪk**. (2°)
 person D = marry.CP woman
 ‘The person is marrying a woman and bringing her here.’
 c. **r̥aɲ** **à = c̥e** **t̥ɪk** **t̥j̥eek**. (3°)
 person D = PF woman marry.CP.NF
 ‘The person has married a woman and brought her here.’

Thus, the breathy alternants of /ja/ are here indistinguishable from the inherently breathy /j̥e/ series, which is exemplified in (27) with the root **t̥j̥ēc** ‘ask’ (Class 2F).

- (27) a. **t̥ɪk** **à = t̥j̥ēc** **c̥ɔl**. (1°)
 woman D = ask Col
 ‘The woman is asking Col.’
 b. **k̥aɹ** **à = t̥j̥eek** **b̥ɔl**. (2°)
 Kau D = ask.AP.DAT Bol
 ‘Kau is asking on behalf of Bol.’

c. **káaw** **à** = **cé** **bòol** **tjêec**. (3°)

Kau D = PF Bol ask.AP.DAT.NF

'Kau has asked on behalf of Bol.'

Here grades 2 and 3 are also both /jɛ/, like grade 1. So the raising that occurs when the roots **nj̩ac** in (25) and **tj̩ak** in (26) become breathy seems to be an integral part of VQS.

For unknown reasons, the situation is different for some other roots with /j̩a/, for instance **tj̩am** 'win' (Class 2H), which exhibits another pattern, as seen in (28).

(28) a. **ḍḍok** **à** = **tj̩am** **tj̩ec**. (1°)

boy D = win game

'The boy is winning the game.'

b. **m̩it̩** **áa** = **tj̩em** **ww̩on** = **d-ḡen**. (2°)

child.PL D.PL = win.AP.DAT cattle_camp.CS2 = SG-3PL

'The children are winning for their cattle camp.'

c. **m̩it̩** **àa** = **cé** **ww̩on** = **d-ḡen** **tj̩am**. (3°)

child.PL D.PL = PF cattle_camp.CS2 = SG-3PL win.AP.DAT.NF

'The children have won for their cattle camp.'

In (28b) the breathy grade 2 alternant of /j̩a/ is /j̩ɛ/, as in (25b) above, but the grade 3 alternant is /j̩a/, as seen in (28c).²⁵ Thus, the breathy forms with this root behave (more) like forms of roots with inherently breathy /j̩a/, as seen in (29) with the root **tj̩ak** 'bury' (Class 1F) and in (30) with the root **ḍj̩am** 'destroy' (Class 1F).

(29) a. **m̩oc** **à** = **tj̩ak** **m̩an** = **d-è**. (1°)

man D = bury child.CS2 = SG-3SG

'The man is burying his child.'

b. **m̩oc** **à** = **tj̩ek**/**tj̩ek**. (2°)

man D = bury.AP

'The man is burying.'

c. **k̩ù** **tj̩ak**. (3°)

and bury.AP.1SG

'and I am burying.'

²⁵ What happens to /a/ after a postconsonantal /j/ when undergoing voice quality shift has been examined for nine roots. In six of these roots, /a/ becomes /ɛ/ in grade 3, namely in **lj̩ac** 'impregnate', **lj̩at̩** 'peer at', **nj̩ac** 'squeeze', **nj̩aar** 'love', **tj̩ak** 'marry', and **tj̩aan** 'hide'. In three of the roots, /a/ becomes /a/ in grade 3, namely in **lj̩am** 'attack from behind', **lj̩an̩** 'drip', and **tj̩am** 'win'.

- (30) a. **mòc à = djàm pàaŋ.** (1°)
 man D = destroy wall
 ‘The man is destroying the wall.’
 b. **mòc à = djɛɛm/djɛɛm.** (2°)
 man D = destroy.AP
 ‘The man is destroying.’
 c. **pàaŋ à = djàam.** (3°)
 wall D = destroy.1SG
 ‘I am destroying the wall.’

Here grade 2 varies between /jɛ/ and /jɛ̃/, as in (29b) and (30b), so the raising of /jɛ̃/ to /jɛ/ is optional, while grade 3 is invariably /ja/, as illustrated in (29c) and (30c). Hence the raising in (28b) above is not an integral part of VQS, but is a process occurring after the voice quality shift.

A palatal onset may have the same effect as a postconsonantal /j/ when /a/ undergoes voice quality shift. That is, the grade 2 quality /ɛ̃/ may be raised to /ɛ/, while the grade 3 quality /a/ is unaffected. This can be seen in the behaviour of the root **càm** ‘eat’ (Class 1F) in (31), the root **càk** ‘create’ (Class 1F) in (32), and the root **jàn** ‘lick’ (Class 1F) in (33) with variation recorded.

- (31) a. **mèt à = càw cwùin.** (1°)
 child D = eat porridge
 ‘The child is eating porridge.’
 b. **mèt à = cɛɛm.** (2°)
 child D = eat.AP
 ‘The child is eating.’
 c. **kù càm.** (3°)
 and eat.AP.1SG
 ‘and I am eating.’
- (32) a. **njàlɪc à = càk rəaan.** (1°)
 God D = create person
 ‘God is creating a human being.’
 b. **mòc à = cɛɛk mèt.** (2°)
 man D = create.AP.DAT child
 ‘The man is naming a child.’
 c. **mòc à = cɛ mèt càak.** (3°)
 man D = PF child create.AP.DAT.NF
 ‘The man has named a child.’

- (33) a. **ᵛᵛ ᵛᵛ = ᵛᵛᵛᵛ ᵛᵛᵛᵛᵛ** ᵛᵛ. (1°)
 dog D = lick grinding_stone stomach
 ‘The dog is licking the grinding stone.’
 b. **ᵛᵛ ᵛᵛ = ᵛᵛᵛᵛᵛ/ᵛᵛᵛᵛᵛ**. (2°)
 dog D = lick.AP
 ‘The dog is licking.’

Again, such raising also occurs in grade 2 of roots with an inherently breathy /ᵛᵛ/ after a palatal onset, as in (34) with the root **cᵛᵛ** ‘put’ (Class 1F).

- (34) a. **ᵛᵛᵛ ᵛᵛ = cᵛᵛ ᵛᵛᵛᵛᵛᵛᵛ**. (1°)
 woman D = put pot
 ‘The woman is encircling the pot with sand (in order to support it).’
 b. **ᵛᵛᵛ ᵛᵛ = cᵛᵛᵛ ᵛᵛᵛᵛᵛᵛᵛ ᵛᵛᵛᵛᵛᵛᵛ**. (2°)
 woman D = put.CF pot fire.ALL
 ‘The woman is putting the pot on fire.’
 c. **ᵛᵛᵛ ᵛᵛ = cᵛᵛᵛᵛᵛᵛᵛᵛ cᵛᵛᵛ ᵛᵛᵛᵛᵛᵛᵛᵛ**.²⁶ (3°)
 woman D = PF.pot put.CF.NF fire.ALL
 ‘The woman has put the pot on fire.’

This shows that the raising in (31)–(33) is not an integral part of VQS, but rather is due to an optional phonetic rule of raising that raises underlying /ᵛᵛ/ to [ᵛᵛ].

4.3.3 From /ᵛᵛ/ to /ᵛᵛ/ in grade 3 after a palatal

When /ᵛᵛ/ undergoes VQS, grades 1 and 2 appear as /ᵛᵛ/, and grade 3 normally appears as /ᵛᵛ/, as exemplified in Section 4.1 above, and as further illustrated in (35) with the root **ᵛᵛᵛ** ‘row’ (Class 2H).

- (35) a. **ᵛᵛᵛ ᵛᵛ = ᵛᵛᵛᵛ ᵛᵛᵛᵛᵛ**. (1°)
 man D = row boat
 ‘The man is rowing a boat.’
 b. **ᵛᵛᵛ ᵛᵛ = ᵛᵛᵛᵛᵛ ᵛᵛᵛᵛᵛ**. (2°)
 man D = row.CP boat
 ‘The man is rowing a boat hither.’
 c. **ᵛᵛᵛ ᵛᵛ = cᵛᵛ ᵛᵛᵛᵛᵛ ᵛᵛᵛᵛᵛᵛᵛ**. (3°)
 man D = PF boat row.CP.NF
 ‘The man has rowed a boat hither.’

²⁶ The form [cᵛᵛᵛᵛᵛᵛᵛᵛ] in (34c) is a contraction of **cᵛᵛ ᵛᵛᵛᵛᵛᵛᵛᵛ**.

However, when /*ɛ*/ is preceded by a palatal, its breathy grade 3 alternant is /*ɛ̃*/ rather than /*ɛ̂*/, as illustrated in (36) with the root **cɛ̃ec** ‘chase’ (Class 2H) and in (37) with the root **jɛ̃p** ‘cut’ (Class 1F).

- (36) a. **lw̃aɪal ɛ̃ = cɛ̃ec dʒɛ̃ɛt.** (1°)
 Lual D = chase bird.PL
 ‘Lual is chasing birds.’
 b. **lw̃aɪal ɛ̃ = cɛ̃eec t̃ɔk.** (2°)
 Lual D = chase.CP goat.PL
 ‘Lual is chasing goats hither.’
 c. **lw̃aɪal ɛ̃ = cɛ̃ t̃ɔk cɛ̃eec.** (3°)
 Lual D = PF goat.PL chase.CP.NF
 ‘Lual has chased goats hither.’
- (37) a. **m̃ɔc ɛ̃ = jɛ̃p t̃ɪm.** (1°)
 man D = cut tree
 ‘The man is cutting down a tree.’
 b. **lw̃aɪal ɛ̃ = jɛ̃ep m̃ɔc t̃ɪm.** (2°)
 Lual D = cut.DAT man tree
 ‘Lual is cutting down a tree for the man.’
 c. **lw̃aɪal ɛ̃ = cɛ̃ t̃ɪm jɛ̃ep m̃ɔc.** (3°)
 Lual D = PF tree cut.DAT.NF man
 ‘Lual has cut down a tree for the man.’

In (36) and (37) the palatal that precedes /*ɛ̃*/ is the onset, but a postconsonantal /*j*/ has the same effect, as seen in (38) with the root **ljɛ̃p** ‘open’ (Class 1F).

- (38) a. **t̃ɪk ɛ̃ = ljɛ̃p ɛ̃f̃ɪn.** (1°)
 woman D = open door
 ‘The woman is opening the door.’
 b. **t̃ɪk ɛ̃ = ljɛ̃ep ɛ̃f̃ɪn m̃ɔc.** (2°)
 woman D = open.DAT door man
 ‘The woman is opening the door for the man.’
 c. **t̃ɪk ɛ̃ = c̃aɛ̃f̃ɪn ljɛ̃ep m̃ɔc.**²⁷ (3°)
 woman D = PF.door open.DAT.NF man
 ‘The woman has opened the door for the man.’

²⁷ The form [c̃aɛ̃f̃ɪn] in (38c) is a contraction of **cɛ̃ ɛ̃f̃ɪn**.

This is like the situation with inherently breathy roots, as illustrated in (39) with the root **tj̥ɛp** ‘taste’ (Class 2F), and as also seen with the root **tj̥ɛc** ‘ask’ (Class 2F) in Section 4.3.2 above.

- (39) a. **t̥ɪk** **à = tj̥ɛp r̥ɪŋ**. (1°)
 woman D = taste meat
 ‘The woman is tasting the meat.’
 b. **t̥ɪk** **à = tj̥ɛɛp** **n̥àn = d-è**. (2°)
 woman D = taste.AP.DAT girl.CS2 = SG-3SG
 ‘The woman is tasting on behalf of her daughter.’
 c. **t̥ɪk** **à = c̥ɛ n̥àn = d-è** **tj̥ɛɛp**. (3°)
 woman D = PF girl.CS2 = SG-3SG taste.AP.DAT.NF
 ‘The woman has tasted on behalf of her daughter.’

Because of this similarity, it must be concluded that the raising of grade 3 /ɛ/ to /e/ is not an integral part of VQS, but is due to a more general assimilation rule whereby breathy lower-mid /ɛ/ becomes higher-mid /e/ after a palatal.

4.3.4 From /ɔ/ to /jo/ in grade 3

When /ɔ/ undergoes VQS, grades 1 and 2 appear as /o/, and grade 3 normally appears as /ɔ/, as exemplified in Section 4.1 above, and as further illustrated in (40) with the root **d̥ɔm** ‘catch’ (Class 1F).

- (40) a. **d̥ɔk** **à = d̥ɔm w̥ɔŋ**. (1°)
 boy D = catch cow
 ‘The boy is catching a cow.’
 b. **d̥ɔk** **à = d̥ɔom** **m̥ɔc w̥ɔŋ**. (2°)
 boy D = catch.DAT man cow
 ‘The boy is catching a cow for the man.’
 c. **d̥ɔk** **à = c̥ɛ m̥ɔc d̥ɔom** **w̥ɔŋ**. (3°)
 boy D = PF man catch.DAT.NF cow
 ‘The boy has caught a cow for the man.’

However, when /ɔ/ is preceded by a postconsonantal /j/, its breathy grade 3 alternant is often /o/ rather than /ɔ/. This is illustrated in (41) with the root **tj̥ɔɔ** ‘press’ (Class 2H) and in (42) with the root **r̥jɔp** ‘pay wages, hire, rent’ (Class 1F).

- (41) a. **lūut** **ā = t̪j̥ɔ̯ɔ̯ɔ̯ t̪j̥ɔ̯ɔ̯**. (1°)
 mud_fish D = press mud
 ‘The mud fish is pressing the mud.’
 b. **lw̥aɪ** **ā = t̪j̥ɔ̯ɔ̯ɔ̯ t̪j̥ɔ̯ɔ̯ l̥a̯aɪ**. (2°)
 Lual D = press.CP mud side.CS1.DEM1
 ‘Lual is pressing the mud this way.’
 c. **lw̥aɪ** **ā = c̥ɛ t̪j̥ɔ̯ɔ̯ t̪j̥ɔ̯ɔ̯ l̥a̯aɪ**. (3°)
 Lual D = PF mud press.CP.NF side.CS1.DEM1
 ‘Lual has pressed the mud this way.’
- (42) a. **t̪ik** **ā = r̪j̥ɔ̯ɔ̯ ɖ̪j̥ɔ̯k**. (1°)
 woman D = pay boy
 ‘The woman is hiring a boy.’
 b. **k̪ɪ r̪j̥ɔ̯ɔ̯**. (2°)
 and pay.AP.3SG
 ‘and he is paying.’
 c. **k̪ɪ r̪j̥ɔ̯ɔ̯/r̪j̥ɔ̯ɔ̯**. (3°)
 and pay.AP.1SG
 ‘and I am paying.’

As seen here, grade 3 merges with grade 2, the grade 3 forms **t̪j̥ɔ̯ɔ̯ɔ̯** (41c) and **r̪j̥ɔ̯ɔ̯** (42c) being homonymous with the corresponding grade 2 forms in (41b) and (42b), respectively. In this respect, /j̥ɔ̯/ differs from its inherently breathy counterpart /j̥ɔ̯/, whose behaviour is exemplified in (43) with the root **r̪j̥ɔ̯ɔ̯** ‘pound’ (Class 1F) to be compared with the root **r̪j̥ɔ̯ɔ̯** ‘pay’ in (42).

- (43) a. **t̪ik** **ā = r̪j̥ɔ̯ɔ̯ r̪a̯ɔ̯**. (1°)
 woman D = pound sorghum.PL
 ‘The woman is pounding sorghum.’
 b. **k̪ɪ r̪j̥ɔ̯ɔ̯/r̪j̥ɔ̯ɔ̯**. (2°)
 and pound.AP.3SG
 ‘and she is pounding.’
 c. **k̪ɪ r̪j̥a̯ɔ̯**. (3°)
 and pound.AP.1SG
 ‘and I am pounding.’

As seen in (43c), grade 3 of /j̥ɔ̯/ is /j̥a̯/, so that (43c) is distinct from (42c). This is the case in spite of the fact that the grade 2 forms of the two verbs may be homonymous, cf. (43b) and (42b), with the grade 2 form **r̪j̥ɔ̯ɔ̯** in (43b) having the fronted variant **r̪j̥ɔ̯ɔ̯**. Given these facts, it must be concluded that /j̥ɔ̯/ in

(42c), where it varies with /ɔ̣/, is due to raising of /ɔ̣/ and thus not an integral part of VQS.

Raising of grade 3 /ɔ̣/ to /ɔ/ does not occur after a patalal onset, as seen in (44) with the non-breathy root **j̣ɔt** ‘jump over’ (Class 2H).

- (44) a. **wáɫɛn** **à = j̣ɔt** **ḳɔɫ ṇòm.** (1°)
 paternal_uncle.1SG D = jump_over hole head
 ‘My paternal uncle is jumping over the hole.’
 b. **ḳɔ̣ j̣ɔt.** (2°)
 and jump_over.AP.3SG
 ‘and he jumped.’
 c. **ḳɔ̣ j̣ɔt.** (3°)
 and jump_over.AP.1SG
 ‘and I jumped.’

Here, as in (40) above, the /ɔ̣/ which has undergone VQS behaves in the same way as an inherently breathy /ɔ/. The vowel gradation of the latter is exemplified in (45) with the root **j̣ɔk** ‘find’ (Class 1L).

- (45) a. **ṛaaan** **à = j̣ɔk** **ṃj̣ɛɛɛ.** (1°)
 person D = find food
 ‘The person is finding food.’
 b. **ṃj̣ɛɛɛ** **à = j̣ɔk.** (2°)
 food D = find.3SG
 ‘He is finding food.’
 c. **ṃj̣ɛɛɛ** **à = j̣ɔk.** (3°)
 food D = find.1SG
 ‘I am finding food.’

4.4 From /a/ to /ɔ̣/

Another complication in the effect of voice quality shift on vowel quality is found in antipassive forms with Class 2F roots. Antipassive verbs with such roots normally conform to the vowel gradation seen in Table 20 in Section 4.1 above. This is exemplified in (46) with the root **ɖ̣im** ‘filter’.

- (46) a. **ṭik** **à = ɖ̣im** **ṃəaw.** (1°)
 woman D = filter beer
 ‘The woman is filtering beer.’

- b. **t̪ik** **à = d̪im**. (2°)
 woman D = filter.AP
 ‘The woman is filtering.’
- c. **k̪i** **d̪jeem**. (3°)
 and filter.AP.1SG
 ‘and I am filtering.’

While (46a) shows the inflectionally unmarked form of the simple verb, (46b) shows the inflectionally unmarked form of the antipassive verb, which has the shape C̪VC with a grade 2 vowel. The corresponding grade 3 vowel is seen in (46c).

However, whereas the vowel /a/ normally becomes /ɛ/ (or /e/) in grade 2 when undergoing vowel quality shift, there is a systematic exception to this in antipassive verbs with Class 2F roots. Here the breathy counterpart of /a/ either has the normal quality /ɛ/ (or the raised variant /e/) or it has the quality /ɔ/. The distribution of these alternants is determined by the preceding consonant, as can be observed in Table 21, which shows the inflectionally unmarked form of the simple verb and of the antipassive verb.

Table 21: The effect of voice quality shift on /a/ in antipassive verbs with Class 2F roots.

Preceding consonant	Simple, infl. unm.	2°	AP, infl. unm.
Labial	m̪an	/ɛ/	m̪ɛn ‘hate’
	b̪aj		b̪ɛj ‘disregard’
	p̪an		p̪ɛn ‘mistake’
Postconsonantal glide	t̪jak	/e/	t̪jek ‘marry’
	kw̪aɬ		kw̪eɬ ‘drive’
Alveolar	r̪ak	/ɔ/	r̪ɔk ‘milk’
	l̪ar		l̪ɔr ‘narrate’
Palatal	c̪ar	/ɔ/	c̪ɔr ‘examine’
	j̪an		j̪ɔn ‘skin’

As seen in the table, /ɛ/ occurs after a labial onset, /e/ occurs after a postconsonantal glide, and /ɔ/ occurs after an alveolar or palatal onset, whereas no instances have been attested in which the vowel occurs immediately after an interdental or velar onset. The variation is exemplified by the sets of clauses in (47)-(50) with the roots **m̪an** ‘hate’, **t̪jak** ‘marry’, **kw̪aɬ** ‘drive’ and **r̪ak** ‘milk’. The (a)-clauses illustrate the use of the inflectionally unmarked form of the simple verb, and the (b)-clauses illustrate the use of the inflectionally unmarked form of the antipassive verb, while the (c)-clauses show the 1SG form of the antipassive verb.

- (47) a. **mòc à = mǎan t̥ik.** (1°)
 man D = hate woman
 ‘The man hates the woman.’
 b. **mòc à = m̥ɛn.** (2°)
 man D = hate.AP
 ‘The man hates.’
 c. **kù mǎaan.** (3°)
 and hate.AP.1SG
 ‘and I hate.’
- (48) a. **mòc à = t̥jàak t̥ik.** (1°)
 man D = marry woman
 ‘The man is marrying a woman.’
 b. **mòc à = t̥jèek.** (2°)
 man D = marry.AP
 ‘The man is marrying.’
 c. **kù t̥jèeek.** (3°)
 and marry.AP.1SG
 ‘and I am marrying.’
- (49) a. **mèt à = kwàat ʋɔk.** (1°)
 child D = drive cow.PL
 ‘The child is driving cows.’
 b. **mèt à = kwèet.** (2°)
 child D = drive.AP
 ‘The child is driving.’
 c. **kù kwèet.** (3°)
 and drive.AP.1SG
 ‘and I am driving.’
- (50) a. **t̥ik à = rǎak wɔŋ.** (1°)
 woman D = milk cow
 ‘The woman is milking a cow.’
 b. **t̥ik à = r̥ɔk.** (2°)
 woman D = milk.AP
 ‘The woman is milking.’
 c. **kù rǎaak.** (3°)
 and D = milk.AP.1SG
 ‘and I am milking.’

All the grade 2 variants behave like inherently breathy grade 2 vowels with respect to vowel gradation, as seen in the (c)-clauses of (47)-(50), whose verb has a grade 3 vowel. Thus, /ɛ/ and /ɹ/ become /a/ in grade 3, while /e/ becomes /ɛ/ after a postconsonantal /w/, but remains as /e/ after a postconsonantal /j/.

It is not clear why /ɹ/ occurs as a breathy counterpart of /a/ here, while the normal counterpart of /a/ is /ɛ/. Nor is it clear why /ɛ/ occurs specifically and only after labials here. As shown in Andersen (1993: 15–16), the quality /ɹ/ also appears as the medium counterpart of short breathy /a/ in grade 1 of simple transitive verbs. This alternation is exemplified by the sentences in (51).

- (51) a. **m̥ɔc ɛ̥ = d̥ɛk wj̥ɛn.** (1°)
man D = untie rope
‘The man is untying the rope.’
b. **m̥ɔc ɛ̥ = c̥ɛ wj̥ɛn d̥ɔk.** (1°)
man D = PF rope untie.NF
‘The man has untied the rope.’

The inflectionally unmarked form of the simple transitive verb ‘untie’ in (51a) has a short breathy [ḁ], whereas the non-finite form in (51b), which also belongs to the range of vowel grade 1, has a medium breathy [ɹ̥]. However, this shift from an unrounded to a rounded vowel is independent of the preceding consonant, as seen in Table 22.

Table 22: Examples of the alternation between short [ḁ] and medium [ɹ̥] or [ɔ̥] as grade 1 vowels in simple transitive verbs (Class 1F).

Preceding consonant	Simple, infl. unnm.	Simple, NF	
Labial	p̥ɛl	pw̥ɔl	‘let go, leave’
	m̥ɛr	mw̥ɔr	‘let get lost’
Interdental	t̥ɛr	t̥ɹ̥r	‘spear’
	d̥ɛl	d̥ɹ̥l	‘despise’
Alveolar	d̥ɛk	d̥ɹ̥k	‘untie’
Palatal	c̥ɛp	c̥ɹ̥p	‘put’
	ɲ̥ɛɲ	ɲ̥ɹ̥ɲ	‘withhold from’
Labiovelar	w̥ɛl	ww̥ɔl	‘pour’
Postconsonantal /j/	t̥j̥ɛk	t̥j̥ɹ̥ok	‘bury’
Postconsonantal /w/	gw̥ɛr	gw̥ɹ̥or	‘grind’

Thus, the alternation between [ḁ] and [ɹ̥] or its variant [ɔ̥] has been attested after onsets that are labial, interdental, alveolar, palatal and labiovelar, and also after postconsonantal /j/ and /w/, while [ḁ] has not been attested immediately

after a velar onset. As also seen in Table 22, the [ɟɔ] alternant undergoes Labialization after a labial, and raising after a glide (Andersen 1993: 16–17).

As pointed out in Andersen (1993: 15–16), positing a rule that rounds a non-short breathy /a/ to /ɔ/ also accounts for the absence of simple transitive verbs with a medium breathy /a/ in the inflectionally unmarked form and the corresponding presence of simple transitive verbs with a medium breathy /ɔ/ in this form. Again, the occurrence of this /ɔ/ and its raised variant /o/ is not constrained by the preceding consonant, since it occurs after consonants with all points of articulation, as seen in Table 23. As also seen in this table, /ɔ/ is raised to /o/ after a postconsonantal glide.

Table 23: Examples of simple transitive verbs with medium /ɔ/, or its raised variant /o/, in the inflectionally unmarked form.

Preceding consonant	Simple, infl. unmarked	
Labial + postconsonantal /w/	pwɔ̃ow	‘pierce’ (2F)
	bwɔ̃ok	‘slap’ (2F)
	mwɔ̃ot	‘greet’ (2F)
Interdental	tɔ̃t	‘forge’ (2H)
Alveolar	tɔ̃w	‘put’ (2F)
	rɔ̃t	‘bewitch’ (2H)
	lɔ̃t	‘scald’ (2H)
Palatal	jɔ̃t	‘challenge’ (2H)
	jɔ̃p	‘hunt’ (2F)
Velar	kɔ̃m	‘thresh’ (2H)
	gɔ̃j	‘surprise’ (2F)
	ɣɔ̃l	‘pound’ (2H)
Postconsonantal /j/	ljɔ̃ok	‘stir’ (2H)
Postconsonantal /w/	ɲwɔ̃ot	‘graze’ (2H)

4.5 Summary of voice quality shift

The basics of voice quality shift are summarized in Figure 1. The arrows show the shift from non-breathy grade 1 vowels to the corresponding breathy grade 1 vowels and subsequently grades 2 and 3 of these breathy vowels. Excluded from the figure are (i) special vowel quality changes connected with preceding postconsonantal glides and (ii) variants that are the effect of raising caused by the preceding consonant.

Figure 1: Voice quality shift and vowel height gradation.

5 Conclusion and comparative reflections

As shown in this article, the vowel quality alternation system (called vowel gradation) which is operative in simple transitive verbs is also operative in derived verbs with a transitive root, but with three modifications. First, the distribution of the vowel grades in derived verbs is partly different from the distribution in simple verbs. In simple verbs, both grade 2 and grade 3 are exponents of inflection (together with vowel length and tone); but in derived verbs, grade 2 is mainly an exponent of the derived derivational status (whose specific status is expressed by voice quality, vowel length and tone), and therefore in most cases, only grade 3 is an exponent of inflection (together with tone and, in antipassive verbs, vowel length). Second, in derived verbs the morphophonological rule of Fronting, which defines

grade 2, applies not only to /a/, as in simple verbs, but also (optionally) to /ɔ/. Third, although vowel quality is basically, or to a large extent, independent of voice quality, the morphophonological rule of voice quality shift, which changes the voice quality from non-breathy to breathy, affects some vowel qualities. Most saliently, voice quality shift affects the height of rounded vowels so that non-breathy /ɔ/ and /ɒ/ become breathy /o/ and /u/, respectively.

As an expansion of Table 4 in Section 2.5, Table 24 shows the full vowel gradation system of verbs with a transitive root, comprising both simple verbs and derived verbs.

Table 24: Vowel quality alternation in simple and derived verbs with a transitive root.

Non-breathy vowels												
Without postconsonantal glide				With postconsonantal /j/				With postconsonantal /w/				
1°	j	e	a	ɔ	o	jɛ	ja	jɔ	wj	wɛ	wa	wɔ
2°	j	e	ɛ	ɔ. ɛ	o	jɛ	jɛ	jɔ. jɛ	wj	wɛ	wɛ	wɔ. jɛ
3°	jɛ	ɛ	a	a	wɔ	jɛ	ja	ja	wjɛ	wɛ	wa	ja

Non-breathy vowels having undergone voice quality shift												
Without postconsonantal glide				With postconsonantal /j/				With postconsonantal /w/				
1°	i	e	a, e	o	u	jɛ	jɛ	jɔ	wj	wɛ	wɛ	
2°	i	e	ɛ, e; ɔ	o	u	jɛ	jɛ	jɔ	wj	wɛ	wɛ	o
3°	jɛ	ɛ, e	a, ɛ	ɔ	wɔ	jɛ	ja, jɛ	jɔ, jɔ	wjɛ	wɛ	wɛ	ɔ

Breathy vowels												
Without postconsonantal glide				With postconsonantal /j/				With postconsonantal /w/				
1°	i	e	a; ɔ	ɔ	o	u	jɛ	ja	jɔ	wj	wɛ	wɔ
2°	i	e	ɛ	ɔ. ɛ	o	u	jɛ	jɛ, jɛ	jɔ. jɛ	wj	wɛ	wɛ. jɛ
3°	jɛ	ɛ	a	a	ɔ	wɔ	jɛ	ja	ja	wjɛ	wɛ	ja

Vertically, the table has three parts: inherently non-breathy root vowels (at the top), inherently non-breathy root vowels having undergone voice quality shift (in the middle), and inherently breathy root vowels (at the bottom). Each of these parts shows the three vowel grades. Horizontally, the table also has three parts: root vowels inherently not preceded by a postconsonantal glide in grade 1 (on the left), root vowels inherently preceded by a postconsonantal /j/ in grade 1 (in the middle), and root vowels inherently preceded by a postconsonantal /w/

in grade 1 (on the right).²⁸ Some cells include more than one variant. Three types of variation are distinguished in the table by the symbol that separates the variants: A dot (x. y) indicates variation involving extension of the range of Fronting in derived verbs in the second variant; a semicolon (x; y) indicates variation involving rounding in the second variant; and a comma (x, y) indicates variation involving raising in the second variant.

Table 24 takes non-breathy /ɔ̃/ and /ɒ̃/, as grade 1 vowels, to be the functional counterparts of breathy /ɔ̥/ and /u̥/, respectively. Non-breathy /ã/, as a grade 1 vowel, has two different breathy functional counterparts, namely /ḁ/ and /ɔ̥/. As noted in Andersen (2006: 17), they must be assumed to go back to the same vowel in Proto-Western Nilotic vowel, namely /Λ/, cf. Table 25 below.²⁹

Table 25: Regular reflexes of Proto-Western Nilotic vowels in five languages.

	PWN		Mabaan		Jumjum		Mayak		Päri		Dinka	
[−ATR]	*ɪ	*ɪɪ	i	ii	i	ii	ɪ	ɪɪ	ɪ	ɪɪ	ɪ	ji
	*ɛ	*ɛɛ	iɛ	iiɛ	ɛ	ɛɛ	ɛ	ɛɛ	ɛɛ	ɪɛ	ɛ	ɛɛ
	*a	*aa	a	aa	a	aa	a	aa	a	aa	ɔ̃	ɔ̃a
	*ɔ̃	*ɔ̃ɔ̃	ua	uua	ɔ̃	ɔ̃ɔ̃	ɔ̃	ɔ̃ɔ̃	ɔ̃ɔ̃	ɔ̃ɔ̃	ɔ̃	ɔ̃ɔ̃
	*ʊ	*ʊʊ	u	uu	u	uu	ʊ	ʊʊ	ɔ̃	ʊʊ	ʊ	ʊʊ
[+ATR]	*i	*ii	ie	iiie	ɪ	ɪɪ	i	ii	i	ii	ɪ	ji
	*e	*ee	ɛ	ɛɛ	ɪ	ɪɪ	ɪ	ɪɪ	ee	ie	ɛ	ɛɛ
	*Λ	*ΛΛ	Λ	ΛΛ	Λ	ΛΛ	Λ	ΛΛ	Λ	ΛΛ	ɔ̃, ɔ̃	ɔ̃ɔ̃
	*o	*oo	ɔ̃	ɔ̃ɔ̃	ʊ	ʊʊ	ʊ	ʊʊ	oo	uo	ʊ	ʊʊ
	*u	*uu	uΛ	uuΛ	ʊ	ʊʊ	u	uu	u	uu	u	uu

As illustrated in this article, almost all of the morphology in Dinka is expressed by alternations in phonological material of the root. Many of these alternations can be explained historically as reflecting former suffixes, as evidenced by a comparison with other Western Nilotic languages. In Andersen (1990), a comparison of Dinka with Päri, a Northern Lwo language, revealed that some vowel length alternations in Dinka are due to lengthening that compensated for a lost

²⁸ No verb form has been attested in which the /wɔ̃/ series occurs with voice quality shift in grade 1. Therefore, the corresponding cell in Table 24 is empty.

²⁹ External evidence for this comes from a comparison with other Western Nilotic languages. Thus, Dinka /ã/ and /ɔ̃/ both correspond to Päri /Λ/, as in Dinka *nək* ‘kill’, Päri *nək* ‘kill’, and Dinka *ɬɔ̃ɔ̃* ‘forge’, Päri *ɬΛΛ* ‘forge’.

suffix vowel and which gave rise to the ternary vowel length contrast in this language. Moreover, as argued in Andersen (2014: 239–240), assimilation of the root vowel to such suffix vowels explains some of the vowel height alternations in Dinka. More specifically, a comparison with the Northern Burun language Surkum suggests that in non-derived verbs in Dinka, vowel grade 2, which raises grade 1 /a/ to /æ/, reflects a suffixal non-low front vowel and that grade 3, which lowers the other vowel qualities, reflects a suffixal low central vowel. This umlaut explanation can be extended to derived verbs, as seen by a comparison with Kurmuk, another Northern Burun language. As shown in Section 3.1 above, the inflectionally unmarked form of derived transitive verbs and of some sub-classes of antipassive verbs has grade 2 vowels. Corresponding verb forms in Kurmuk all have a derivational suffix with a high vowel. This is illustrated in (52)–(56) with SV(O) clauses, in which the verb has an inflectionally unmarked form in both Dinka and Kurmuk (Andersen 2015b). The examples are selected in such a way that the verbs are cognate in the two languages. The root ‘sweep’ is used in the simple verbs in (52), in the centrifugal verbs in (53), in the centripetal verbs in (54), and in the antipassive verbs in (55), and the root ‘hoe’ is used in the dative verbs in (56).³⁰

- (52) a. **t̪ik** **ǎ = w̥ēc** **p̪ɪn**. (Dinka)
 woman D = sweep ground
 ‘The woman is sweeping the ground.’
 b. **kámbál** **↓w̥éɛf** **ʔútòn**. (Kurmuk)
 girl sweep place
 ‘The girl is sweeping the place.’
- (53) a. **t̪ik** **ǎ = w̥ēc** **ǎnw̥ɔɔn**. (Dinka)
 woman D = sweep.CF weed
 ‘The woman is sweeping the weed away.’
 b. **kámbál** **w̥éɛf-í** **tá↓búr** **wóo**. (Kurmuk)
 girl sweep-CF dust out
 ‘The girl is sweeping dust out.’
- (54) a. **t̪ik** **ǎ = w̥ēc** **ǎnw̥ɔɔn**. (Dinka)
 woman D = sweep.CP weed
 ‘The woman is sweeping the weed hither.’

³⁰ The transcription of the Kurmuk examples indicates surface tones rather than underlying tones. The basic aspects of the phonology of Kurmuk are described in Andersen (2007b).

- b. **kámbál wùz-úu tá[↓]búr.** (Kurmuk)
 girl sweep-CP dust
 ‘The girl is sweeping dust hither.’

- (55) a. **t̪ik à = w̪ɛc.** (Dinka)
 woman D = sweep.AP
 ‘The woman is sweeping.’
 b. **kámbál [↓]wíj-í-r.** (Kurmuk)
 girl sweep-AP-FOC
 ‘The girl is sweeping.’

- (56) a. **à = p̪úr m̪it r̪ap.** (Dinka)
 D = hoe.DAT child.PL sorghum.PL
 ‘He is cultivating sorghum for the children.’
 b. **t̪uul p̪úr-íj ʔáarák w̪an.** (Kurmuk)
 child hoe-DAT person field
 ‘The child is hoeing the field for the man.’

Like Dinka, Kurmuk has no suffix in the inflectionally unmarked form of an underived verb, as seen (52). Unlike Dinka, however, Kurmuk has a derivational suffix in the inflectionally unmarked form of derived verbs, namely centrifugal **-(C)ɪ** (53), centripetal **-uu/-uu** (54), antipassive **-(C)ɪ/-(C)i** (55), and dative **-(C)ɪj/-(C)ij** (56). Three of these suffixes include a high front vowel, which may be what has brought about grade 2 in corresponding Dinka forms.

As argued in Andersen (1999: 117–118), the voice quality contrast in Dinka between non-breathy and breathy goes back to a contrast between [–ATR] and [+ATR], which is found in many other Western Nilotic languages, and which can be reconstructed for Proto-Western Nilotic (PWN). Table 25 from Andersen (2006: 17) shows regular correspondences between root vowels in Mabaan, Jumjum, Mayak, Pāri and Dinka, and the corresponding reconstructed PWN vowel system, with short and long vowels. The vowel systems of Surkum and Kurmuk are identical to that of Mayak in the table.

The alternation between non-breathy and breathy vowels in Dinka is much older than the vowel height alternations and most of the vowel length alternations. This is evidenced by the fact that in the other Western Nilotic languages, those derived verbs that are characterized by breathy voice in Dinka are characterized by [+ATR] (or [–ATR] evolved from [+ATR] by regular sound changes, as in Mabaan, Jumjum and Mayak), namely

centripetal verbs, dative verbs and antipassive verbs. For this reason, the [ATR] alternation must be considered to go back to Proto-Western Nilotic. In those Western Nilotic languages which have an [ATR] contrast, the [+ATR] vowels are higher than their [–ATR] counterparts. This may explain why in Dinka, the non-breathy rounded back vowels /ɔ/ and /ɔ̣/ are lower than their breathy counterparts /u/ and /ụ/. By contrast, there is no considerable height difference between, on the one hand, the non-breathy front vowels /i/ and /e/, and on the other hand, their breathy counterparts /ị/ and /ẹ/. The reason may be that Dinka has an extra front vowel quality, namely /ɛ/, which arose as a result of fronting of /a/ (or /ɔ/) or lowering of /e/ or /i/, and which reduced the available vowel space for /i/ and /e/.

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