New data for 'A-raising' in !Xoon

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!Xoon or Taa is a Tuu Khoisan language with many clicks. One interesting phenonemon is the variation of first-mora /a/ quality by the second-mora vowel, place of the initial click, and click accompaniment; this has been used to argue for novel phonology (Bradfield 2014), gang effects (Lionnet 2018), and in the last OCP, lack of gang effects (Bradfield and Ulfsbjorninn 2023). The phenomenon is called 'A-raising' after Traill 1985. Analysis is bedevilled by very limited data; this presentation reports on results from new audio data.

!Xoon: Word-initial consonants include clicks **ʘ**, **ǀ**, **ǃ**, **ǁ**, **ǂ** with *accompaniments* comprising laryngeal, nasal, etc. settings, heard in the posterior closure release. !Xoon has 22 or 23 distinct accompaniments: voiceless/plain **ǂ** or voiced **gǂ**; ejective **ǂ'**, **gǂ'**, aspirated **ǂh**, **gǂh**; nasal **nǂ**, **nhǂ** and pre-glottalized nasal **'nǂ**; click–obstruent seqences: **ǂq**, **ǂq'**, **ǂqh** [ǂq^{h}], **ǂqx'** [ǂq$^{\chi'}$], **ǂx** [ǂχ], **ǂhh** [ǂh], **ǂ''** [ǂʔ], all with voiced versions. There is also a wide range of pulmonic initial consonants. Owing to the unsettled analysis, and for readability, we write the !Xoon data in cross-Khoisan orthography, using digraphs not diacritics.

Most content lexemes are $C_1V_1(C_2)V_2$. C_1 is an initial consonant. C_2 is weak: **b** [b/v], **w**, **r/l**, **y** [j], **ny** [ɲ]. V_2 is **a**, **e**, **i**, **o**, **u**, and may be nasalized **an**.

'A-raising' (henceforth AR) concerns V_1. (Traill 1985) analysed V_1 as **a** or **o**, partly or totally assimilating ('raising') in height to V_2 in a mixed phonological/phonetic way affected by C_1 and C_2. Modern analyses after (Nakagawa 2010) prefer under-specified **A** [−round], **O** [+round] filled in phonologically. Additionally, V_1 may have non-modal phonation: breathy **ah**, glottalized **a'**, pharyngealized **aq** and combinations; pharyngealization blocks AR.

Prior work: Traill (1994) described AR as: non-pharyngealized **a** raises to [ɜ] when V_2 = **i**, **nn** and C_1 is dental non-click or a dental or palatal click (e.g. **ǀann** [ǀɜn]), and further (optionally?) raises to [i] when C_2 is empty (e.g. **ǂai** [ǂiː]). For other C_1, **a** is [æ] before **i**, **e**. He also noted that **u** lowers to [o] before **a**, **e**, so neutralizing with **o**.

AR has two striking features. First, there are degrees of raising depending on both preceding and following sounds – is this discrete, or phonetic gradience? Second, AR applies even when C_1 is a click with uvular accompaniment, which should block any raising effect: for example, **ǀq'ann-ta** with [ɜ]. Bradfield (2014) says that the lexicon entries in Traill 1994 show that uvular accompaniments do block full raising to [i]. Lionnet (2018) corrects this by showing entries with full raising after **ǀq**, **ǀqh**, **ǀq'**; however, we note that some of these entries are amended in the posthumously published revised dictionary (Traill 2018). The number of data is small, sometimes one item for a particular subcase. Bradfield (2014) reports that the West !Xoon DoBeS data show similar raising, but full raising is less common. Nakagawa (2006) has described a similar, but different, process in |Gui, and Miller-Ockhuizen (2003) in !Xung.

AR analyses vary widely: Traill assumed underlying **a** with *SPE*-style rules as above. Miller-Ockhuizen (2003) argued for underlying **i**, **e**, with *lowering*. Nakagawa (2010) opted for underspecified underlying V_1. Bradfield (2014) followed Traill, but extended the analysis using 'concurrent phonemes' to deal with the behaviour of accompaniments. Lionnet (2018) tentatively suggests using gradient subfeatural phonology. In the last OCP, Bradfield and Ulfsbjorninn (2023) counter-argued for categorical phonology using element-theoretic processes.

Data: GRN 2022 is six hours of high quality recordings of carefully spoken Bible translation in West !Xoon, by men and women of unknown ages. We have analysed 25% of the data by auditory impression and acoustic formant (Praat, Boersma and Weenink 2022) measurement. For discussion here, we group **a** realizations into broad classes [ɐ–ɜ–ə–ɔ]. Raising is accompanied by fronting, so [ɔ] should be read as [ɔ̟] or [e̞]. [æ–ɛ–e] denote especially fronted versions. Speakers are referred to as F1, F2, F3, M1, M2. C^{+} denotes consonants that, per Traill, permit A-raising, including clicks **ǀ**, **ǂ**, and C^{-} for those that do not, including clicks **ʘ**, **ǃ**, **ǁ**. We

concentrate on C_1**a(i/e)** and C_1**ann** – there are few tokens of C_1**a**C_2**(i/e)** words.

After 'back' clicks Traill says the C^- allow minimal AR to [æ]. In the data analysed to date, almost all C^-**ai** tokens are [a/ɑ]. F1 has **ǁ''ai** with [-əi]. F2 has **!''ai** with [-əi]. However, F2 has **ʘhhai** with [-ai]. F3 has a couple of full raises which contradict Traill: **ǁ''ai-sa** with [-ii], and **ǁhhae** with [-ɛe]. She also has **ǁqhai** with [-əi]. M2 (consistently) raises **ǁhhai** to [-ɛi], and **nǁae** to [æe]; however, he pronounces **!''ain**, **!xai** and **!qhai** with [-ai]. As Lionnet (2018) notes, the **''** and **hh** sounds have a long gap between C-release and V-onset, so this is unsurprising, though *contra* Traill. The equally long **x** accompaniment precedes no or reduced raising, as one would expect from its uvular articulation.

After 'front' clicks Per Traill, in C^+**ai** words without uvular accompaniment, we should expect full A-raising to [i], and otherwise to a mid vowel, although West !Xoon seems (Bradfield 2014) to raise less. F1 has full raising tokens in **nǀaen** [-eẽ], **ǂ''ae** [-ee], **ǂae** [-ee], **ǀ''ai** [-ii], **ǂ''ai** [-ii]. But she also has partial raising in **ǂ''ai-xa** [-ɜi], **ǀhai** [-əi]. In a C_1**a**C_2**(i/e)** word, there is **'nǀaje** [-ɜje] and **gǀaje** [-ʌje], and at one point an almost unraised **nǀai** [-aɪ]. F2 has no instances (so far) of full raising. She has partial raising in **ǂxai** [-əi] and **ǂ''ai** [-əi]. M2 has few instances of full raising: **ǂ''ai** [-ii], **ǂqaen** [-eẽ], **ǂqhae-ba** [-ee]. His partial raising is generally less marked, but perhaps more fronted, than F1 and F2: **ǂhhai** [-əi], **ǂain** [-æĩ, -ɛĩ], **ǂqai** [-əi], **ǀanya** [-ə], **ǀqann-te** [-ə]. In C_1**a**C_2**(i/e)** words, he has **ǀhhabi** [-æ], **ǀ''ane** [-ə]

Discussion Apart from the long accompaniments **'', hh**, after C^- data is consistent with Traill, with no or minimal raising. After C^+, AR does not reliably conform to Traill. Outside long accompaniments, there is no token of complete assimilation before **-i**, although there are several before **-e**. There are several examples of words that should be fully raised per Traill, but are not (e.g. **nǀai, ǂain**). The degree of partial raising varies within speakers, and more between speakers. While we have categorized realizations for discussion, there is little evidence to support categorical clustering for moderate raising. Full raising [i] seems to occur only after long accompaniments; perceptually, it is categorically distinct from the other degrees.

The data here are hard to reconcile with any purely phonological analysis such as Nakagawa 2010, Bradfield 2014, Bradfield and Ulfsbjorninn 2023; one must posit further phonetic assimilation after phonology. Lionnet's (still sketchy) subfeatural analysis could perhaps still apply, but our data are less tidy than his small set of examples, and do not give good support.

We have not mentioned '**O**-raising': the data on this raise a question about the primacy of the [round] feature, as **-Oi** is often unrounded.

Conclusion: 'A-raising' is, with new data, less orderly and probably less complex than previously described. An arguably better analysis combines simple underspecification (or element-theory) discrete phonology with simple gradient phonetic variation. Analysis of the remaining data is in progress.

Boersma, Paul and David Weenink (2022). Praat: doing phonetics by computer. Version 6.3.03.

Bradfield, Julian (2014). Clicks, concurrency and Khoisan. *Phonology 31*(1), 1–49.

Bradfield, Julian and Shanti Ulfsbjorninn (2023). Mirage of gradience. Talk at OCP20.

GRN (2022). !Xoon language [etc.]. `https://globalrecordings.net/en/language/nmn`.

Lionnet, Florian (2018). Phonological teamwork in Kalahari Basin languages. *Africana Linguistica 24*, 75–97.

Miller-Ockhuizen, Amanda L. (2003). *The Phonetics and Phonology of Gutturals: a Case Study from Ju|'hoansi*. Routledge.

Nakagawa, Hiroshi (2006). *Aspects of the Phonetic and Phonological Structure of the G|ui Language*. Ph. D. thesis, University of the Witwatersrand, Johannesburg.

Nakagawa, Hirosi (2010). Phonotactics of disyllabic lexical morphemes in G|ui. *Working Papers in Corpus-Based Linguistics and Language Education 5*, 23—-31.

Traill, Anthony (1985). *Phonetic and Phonological Studies of !Xóõ Bushman*. Hamburg: Buske.

Traill, Anthony (1994). *A !Xóõ Dictionary*. Köln: Köppe.

Traill, Anthony (2018). *A trilingual !Xóõ dictionary: !Xóõ – English – Setswana*, Volume 37 of *Quellen zur Khoisan-Forschung / Research in Khoisan Studies*. Rüdiger Köppe.