On diphthongs and digraphs in Blackfoot

Natalie Weber (Yale University)
Mizuki Miyashita (University of Montana)
Some definitions

● **Digraph**: orthographic entity
  ○ two orthographic symbols which are used to represent a single sound
  ○ English: [bʌθ] ‘booth’ has two digraphs: <oo> for [u], <th> for [θ],
  ○ Blackfoot: <ai>, <ao>, <oi>

● **Diphthong**: phonetic entity
  ○ a vowel sound which starts with one vowel quality and ends in a different vowel quality

Conventions: [...] for phonetics; <...> for orthography
Issue

- Diphthongs and digraphs are often confused in the Blackfoot literature
  - Digraphs $\neq$ diphthongs
  - Digraphs can be pronounced as monophthongs and diphthongs
  - This variation in pronunciation has not been a research focus
Research Goal

To study the variation between (mid vowel) monophthongs and diphthongs within and across speakers of Blackfoot
Presentation Outline

1. Previous research
   ● on digraphs
   ● on diphthongs
1. Research goals
2. Corpus study (preliminary)
3. Implications

Conventions

[...] for phonetics
/.../ for phonemics
<...> for orthography
[...] = IPA created from orthography
Digraphs
Digraphs in previous research on Blackfoot

Digraphs are related to a variety of concepts:

1. A family of non-contrastive sounds
2. Underlying vowel sequences (across morpheme boundaries)
3. Underlying phonemic contrasts (morpheme-internally)
1. Digraphs: a family of non-contrastive sounds

- Before long consonants:
  - `<ai> = [ɛ] like English said`
  - `<ao> = [ɔ] like English dawn`
  - `<oi> = like [i], but with rounded lips ([y]? [y]?)`

áínnisiwa [ɛnːisiwə] ‘he descends’
áóttakiwa [ɔtːakiwə] ‘bartender’
nitáakotoïissikópii [nitâːkotysːikopi] ‘I will go to rest’

[ ] = IPA created from orthography

(Frantz 2017: 2-3, 183)
1. Digraphs: a family of non-contrastive sounds

- Before glottal stops:
  - <ai> has dialectal variants
    - [ej] like English paid (Káínai dialect)
    - [aj] like English bite (Siksiká dialect)
  - <ao> = [aw] like English out

<table>
<thead>
<tr>
<th>Káínai</th>
<th>Siksiká</th>
</tr>
</thead>
<tbody>
<tr>
<td>áí’poyiwa</td>
<td>[êjʔpojiwã]</td>
</tr>
<tr>
<td>ákao’toowa</td>
<td>[ákawʔtoːwã]</td>
</tr>
</tbody>
</table>

[ ] = IPA created from orthography

(Frantz 2017: 2-3, 183)
1. Digraphs: a family of non-contrastive sounds

- In other positions (elsewhere; in open syllables)
  - <ai> has dialectal variants
    - [æː] like English *plaid* (Káínai dialect)
    - [ej] like English *paid* (Siksiká dialect)
  - <ao> like [ɔː] in English *dawn*
  - <oi> like [oj] in English *coin*


<table>
<thead>
<tr>
<th>Káínai</th>
<th>Siksiká</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>áípotaawa</td>
<td>[æːpotaːwə]</td>
<td>[éjpotaːwə]</td>
</tr>
<tr>
<td>áókska’siwa</td>
<td>[ɔːkskaʔsiwə]</td>
<td>[ɔːkskaʔsiwə]</td>
</tr>
<tr>
<td>nohkóíksi</td>
<td>[noxwkojksi]</td>
<td>[noxwkojksi]</td>
</tr>
</tbody>
</table>

[ ] = IPA created from orthography

(Frantz 2017: 2-3)
1. Digraphs: represent a family of non-contrastive sounds

- Digraphs obscure the actual phonetic pronunciation.
- Pronunciation varies due to phonological context and dialect.

<table>
<thead>
<tr>
<th>Orthography</th>
<th>Phonetic pronunciation</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;ai&gt;</td>
<td>[ɛ], [æː] or [ej], [aj]</td>
</tr>
<tr>
<td>&lt;ao&gt;</td>
<td>[ɔ], [ɔː] or [aw]</td>
</tr>
<tr>
<td>&lt;oi&gt;</td>
<td>[y] or [oj]</td>
</tr>
</tbody>
</table>

1. Digraphs: represent a family of non-contrastive sounds

(Frantz 1978, 2017: 2-3; Taylor 1969)
1. Digraphs: intraspeaker variation

- Even more variation than is reported in “reference” materials
- Narrow transcription of pronunciations of <ai> by Beatrice Bullshields (Blood dialect)
- Peter suggests: tense vowels or diphthongs next to plosives?

\[
\begin{align*}
\text{[ɛₐ]} & & \text{[ɛᵜ]} & & \text{[ʔɪčˈɛᵰkim:iwe:] } \\
\text{áɨpiyokskaˈsiwa} & & \text{iihtáikimmiiwáyi} & & \text{‘he runs distances’} \\
\text{[ɛː]} & & \text{[eᵜ]} & & \text{[kiˈtsiːksstet kiˈtexkaɛstutuinoexsi]} \\
\text{áɨpottaawa} & & \text{kitsíiksstato kitááhkaistotoinoahsi} & & \text{‘he’s flying’} \\
\text{[eː]} & & \text{[æɛ]} & & \text{[ʔiçˈɛᵰkim:iwe:] } \\
\text{‘he was lucky that she had pity for him’} \\
\text{[ɛː]} & & \text{[eᵜ]} & & \text{[؟icˈɛᵰkim:iwe:]} \\
\text{‘I want you to come to see her.’} \\
\end{align*}
\]

(Peter 2014: 13; similar variation in Kaneko 1999)
2. Digraphs: represent underlying vowel sequences

- Digraphs represent underlying vowel sequences across morpheme boundaries (Elfner 2006; Frantz 2017: 186; Weber 2020).

\[
\begin{align*}
\text{[sapístotóːsá]} & \quad \text{[satéːstotoːs]} \\
\text{sapistotóósá} & \quad \text{satáístotoosa} \\
\text{[sap–istoto]–s–Ø} & \quad \text{[sata–istoto]–s–Ø} \\
\text{[correct–caus.TA]–2sg:3.imp–cmd} & \quad \text{[offended–caus.TA]–2sg:3.imp–cmd} \\
\text{‘reach an agreement with him!’} & \quad \text{‘purposely make her angry!’}
\end{align*}
\]

\[\text{[]} = \text{IPA created from orthography}\]

(Weber 2020: 241)
3. Digraphs: represent underlying phonemic contrasts

- Some [ɛː] and [ɔː] are morpheme-internal, in overlapping environments with other long vowels. There is even a minimal pair:

  \[
  \begin{align*}
  &[\text{ɔːːnǐːt}] & [\text{aːnǐːt}] \\
  &\text{aonǐ́t} & \text{aanǐ́t} \\
  &[\text{ʔo–nii}–t–Ø} & [\text{ʔaan–ii}–t–Ø} \\
  &\text{[hole–by.needle.ti]–2sg.imp–cmd} & \text{[say–ai]–imp–cmd} \\
  &\text{‘pierce it!’} & \text{‘say (s.t.)!’ (BB)}
  \end{align*}
  \]

NB: [oj] always occurs across a morpheme boundary.

(Weber 2020: 42)
Digraphs: represent underlying phonemic contrasts

- Phonological inventory: five long vowels, three short vowels

(Weber 2020: 41)
Relationship of digraphs, phonetics, and phonology

<table>
<thead>
<tr>
<th>Orthography</th>
<th>Phonetic pronunciation</th>
<th>Underlying representation</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;ai&gt;</td>
<td>[ɛ] ~ [æː] ~ [ej] ~ [aj]</td>
<td>/ɛː/</td>
</tr>
<tr>
<td>&lt;ao&gt;</td>
<td>[ɔ] ~ [ɔː] ~ [aw]</td>
<td>/ɔː/</td>
</tr>
<tr>
<td>&lt;oi&gt;</td>
<td>[y] ~ [oj]</td>
<td></td>
</tr>
</tbody>
</table>

- Not always clear which aspect of digraphs researchers are studying.
Diphthongs
Diphthongs in previous research on Blackfoot

- Diphthongs are always a non-contrastive *phonetic variant* of monophthongs (Frantz 1978, 2017: 2-3; Kinsella 1972; Lowery 1979; Taylor 1969; Uhlenbeck 1938).

- Diphthongs have been mentioned as part of *phonological analyses*
  - Positional variants of mid vowels before glottal stop (Frantz 2017).
  - Diphthongization to [oj] is one vowel-hiatus resolution strategy, next to vowel coalescence, glide formation, and tolerance (Elfner 2006).

- *No* research focused only on diphthongs (acoustics, distribution, etc).
Summary of diphthongs and digraphs

- Digraphs represent a number of pronunciations
  - monophthongs like [æː] or [ɛ]
  - diphthongs like [ej] or [aj]

- Pronunciation is influenced by:
  - phonological context
  - dialect
  - speakers
  - unknown factors...

- Digraphs can occur:
  - across morpheme boundaries
  - inside of a morphemes as fully contrastive units

- No dedicated phonetic studies of diphthongs (as separate from digraphs)
Research goals
Research: goal and questions

Goal: study the variation between (mid vowel) monophthongs and diphthongs within and across speakers of Blackfoot

RQ1: In which environments do monophthongs occur? diphthongs?
RQ2: which factors influence the pronunciations of underlying vowel sequences?
RQ3: how are phonemic (morpheme-internal) mid vowels pronounced?
Corpus study
Why a corpus study?

Connected speech
  a. Some diphthongs occur at morpheme boundaries
  b. Natural speech shows what speakers actually do (vs. a lab context)
  c. Covid-19: crossing the border was not an option
Corpus for investigation

Recordings of connected speech (narrative) (age 50s~80s) [so far…]

<table>
<thead>
<tr>
<th>Speakers</th>
<th>Gender</th>
<th>Band</th>
<th>Stories</th>
<th>Duration</th>
<th>Recording</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leo Fox</td>
<td>M</td>
<td>Káínai</td>
<td>Blood Clot</td>
<td>2:27 min</td>
<td>Glenbow Museum</td>
</tr>
<tr>
<td>Leo Fox</td>
<td>M</td>
<td>Káínai</td>
<td>Naapi ki siikokiinis</td>
<td>1:26 min</td>
<td>Glenbow Museum</td>
</tr>
<tr>
<td>Shirlee Crow Shoe</td>
<td>F</td>
<td>Aapátohsipikani</td>
<td>Friends</td>
<td>8:42 min</td>
<td>Recorded 2009</td>
</tr>
<tr>
<td>Earl Old Person</td>
<td>M</td>
<td>Aamsskáápipikani</td>
<td>One Frog Too Many</td>
<td>7:52 min</td>
<td>Recorded 2012</td>
</tr>
</tbody>
</table>
Data processing

(1) Ná:piowaʔän:ajowʔkʼičkásâ:k policing’tá?pawawʼyągąjčk (H)
iːtów?:ts·tonːátonoːkw̓ wikipedia’s (..) (H)
Naapiowa annayao’kihk saakiohta’pawaawahkiih
ii·tsstonnatonooksisitsikoyihk kakòta
iito’tsstonnatonooksisitsikoyihka.
ii·it–o’t–sstonnat–onook–iksistsiko–iihk
IC‘–then–here–terrible–stormy–day. II–NARR
‘One time Napi was walking about when a great storm came up.’

(2) isveston s̲o̦ʔw̲a̦ n̲is̲t̲u̦ j̲a̦ k̲̲w̲a̦ j̲̲k̲̲ i̦ k̲̲s̲̲a̦ o̦ j̲̲ k̲̲ s̲̲ i̦ k̲̲ (H) nįtsįįjįskanajįhk (. .) (H)
Previously Recorded Narratives

The other two: recorded by Miyashita

Talking about images in the picture-only book “One Frog Too Many” (Mayer & Mayer 1975)

One was already orthographically transcribed and translated

Partially interlinearized in ELAN

Not phonetically transcribed → IPA transcribed -- only the words including diphthongs
Specific hypotheses

1. Digraphs before glottal stops are pronounced as diphthongs
2. Digraphs before long consonants are pronounced as short, lax vowels
3. Because diphthongs are one of several pronunciations of digraphs, no other orthographic sequences will be pronounced as diphthongs
4. Variation across speakers is due to dialect
   (currently untestable because there is one speaker per dialect)
5. Digraphs within a morpheme vs. across morpheme boundaries will be pronounced differently (currently untestable; not enough tokens)
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5. Digraphs within a morpheme vs. across morpheme boundaries will be pronounced differently (currently untestable; not enough tokens)
Data and annotations

For every mid vowel and diphthong in the corpus, we:

- Transcribed what we heard
- Checked the formants visually
- Annotated the data for:
  - Monophthong vs. diphthong
  - Preceding consonant
  - Following consonant
  - Morpheme internal? (y/n)
  - Across word boundary? (y/n)
  - Stressed? (y/n)
### Data and annotations

<table>
<thead>
<tr>
<th>Word (IPA)</th>
<th>Word (orthography)</th>
<th>Word (translation)</th>
<th>Story title</th>
<th>Speaker/Provenance</th>
<th>Line num</th>
<th>Time Stamp</th>
</tr>
</thead>
<tbody>
<tr>
<td>ma:to:meipio:weksaaw</td>
<td>máátomapióówaiksaaw</td>
<td>they did not go far</td>
<td>Friends</td>
<td>Shirlee Crow Shoe</td>
<td>0:03:26</td>
<td></td>
</tr>
<tr>
<td>ki:ja:kko xo:ssi</td>
<td>kiyaahkoohsi</td>
<td>they were traveled by boat</td>
<td>One Frog Too Many</td>
<td>Earl Old Person</td>
<td>0:04:04</td>
<td></td>
</tr>
<tr>
<td>ots:sa:ki:jaxkiox:sija</td>
<td>otssakiyaahkiohshiya</td>
<td>when they were still traveling (by boat)</td>
<td>One Frog Too Many</td>
<td>Earl Old Person</td>
<td>0:04:24</td>
<td></td>
</tr>
<tr>
<td>má:tx=kô:li:takiwe:ksa</td>
<td>maatohkol'takiwaiksaaw</td>
<td>they didn't mind it</td>
<td>One Frog Too Many</td>
<td>Earl Old Person</td>
<td>0:04:16</td>
<td></td>
</tr>
<tr>
<td>naj:co</td>
<td>nayoo</td>
<td>oh my!</td>
<td>Friends</td>
<td>Shirlee Crow Shoe</td>
<td>0:02:30</td>
<td></td>
</tr>
<tr>
<td>otsipbtx=pej?pi?:si</td>
<td>otsipsstohpapiiyhi</td>
<td>that he jumped in</td>
<td>One Frog Too Many</td>
<td>Earl Old Person</td>
<td>0:07:14</td>
<td></td>
</tr>
<tr>
<td>s:amitapx=kitx=pej?pi:</td>
<td>stamitapohkitohpai'piiyi</td>
<td>he jumped on (him)</td>
<td>One Frog Too Many</td>
<td>Earl Old Person</td>
<td>0:07:17</td>
<td></td>
</tr>
<tr>
<td>′a:wasej?n ′i:najj</td>
<td>aawaasaininayi</td>
<td>crying</td>
<td>Blood Clot</td>
<td>Leo Fox (Glenbow Museum)</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>kej?sx=kawa?:sej?niw</td>
<td>kai'sohkawa'a'sainiw</td>
<td>he cried out</td>
<td>Friends</td>
<td>Shirlee Crow Shoe</td>
<td>0:03:40</td>
<td></td>
</tr>
<tr>
<td>awa:sej?niw</td>
<td>aawaasa'niw</td>
<td>he was crying</td>
<td>Friends</td>
<td>Shirlee Crow Shoe</td>
<td>0:07:09</td>
<td></td>
</tr>
<tr>
<td>itô:kí:mi:qknc:</td>
<td>litohkiihihinai</td>
<td>he (obv.) was married</td>
<td>Blood Clot</td>
<td>Leo Fox (Glenbow Museum)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>ôtáwko:mo:kic (…) k’ai</td>
<td>otaawakomookihkai</td>
<td>he (obv.) was made to chase them for him (prox Blood Clot)</td>
<td>Friends</td>
<td>Leo Fox (Glenbow Museum)</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>
# Data and annotations

<table>
<thead>
<tr>
<th>UR/Orth</th>
<th>Phonetics</th>
<th>Diphthongized? (y/n)</th>
<th>Tautomorphemic? (y/n)</th>
<th>Across word boundaries?</th>
<th>Stressed? (y/n)</th>
<th>Occurs after which sound?</th>
<th>Occurs before which sound?</th>
</tr>
</thead>
<tbody>
<tr>
<td>ai</td>
<td>e</td>
<td>n</td>
<td>n?</td>
<td>n</td>
<td>n</td>
<td>w</td>
<td>k</td>
</tr>
<tr>
<td>io</td>
<td>io</td>
<td>y</td>
<td>n?</td>
<td>n</td>
<td>n</td>
<td>k</td>
<td>xw</td>
</tr>
<tr>
<td>io</td>
<td>io</td>
<td>y</td>
<td>n?</td>
<td>n</td>
<td>n</td>
<td>k</td>
<td>xw</td>
</tr>
<tr>
<td>oi</td>
<td>øi</td>
<td>y</td>
<td>n?</td>
<td>n</td>
<td>n</td>
<td>k</td>
<td>?t</td>
</tr>
<tr>
<td>a</td>
<td>a</td>
<td>y</td>
<td>y</td>
<td>n</td>
<td>?</td>
<td>n</td>
<td>j</td>
</tr>
<tr>
<td>ai</td>
<td>ej</td>
<td>y</td>
<td>y</td>
<td>n</td>
<td>n</td>
<td>p</td>
<td>?p</td>
</tr>
<tr>
<td>ai</td>
<td>ej</td>
<td>y</td>
<td>y</td>
<td>n</td>
<td>n</td>
<td>p</td>
<td>?p</td>
</tr>
<tr>
<td>ai</td>
<td>ej</td>
<td>y</td>
<td>y</td>
<td>n</td>
<td>n</td>
<td>s</td>
<td>?n</td>
</tr>
<tr>
<td>ai</td>
<td>ej</td>
<td>y</td>
<td>y</td>
<td>n</td>
<td>n</td>
<td>s</td>
<td>?n</td>
</tr>
<tr>
<td>ai</td>
<td>ej</td>
<td>y</td>
<td>y</td>
<td>n</td>
<td>n</td>
<td>s</td>
<td>?n</td>
</tr>
<tr>
<td>ai</td>
<td>ej</td>
<td>y</td>
<td>y</td>
<td>n</td>
<td>n</td>
<td>s</td>
<td>?n</td>
</tr>
<tr>
<td>ai#</td>
<td>e:</td>
<td>n</td>
<td>y</td>
<td>n</td>
<td>n</td>
<td>n</td>
<td>#</td>
</tr>
<tr>
<td>ai#</td>
<td>e:</td>
<td>n</td>
<td>y</td>
<td>n</td>
<td>n</td>
<td>k</td>
<td>#</td>
</tr>
</tbody>
</table>
Earl Old Person

\[\text{[æː]}\]

Ihkan\text{ai}sapssapiwa
‘they all looked in’

\[\text{[ej]}\]

\text{aitssapakaopi}iwa
‘he sat in it’
Hypotheses #1 and #2

- Digraphs before glottal stops are pronounced as diphthongs → PARTLY TRUE
- Digraphs before long consonants are pronounced as short, lax vowels → TRUE

<table>
<thead>
<tr>
<th></th>
<th>&lt;ai&gt;</th>
<th>&lt;ao&gt;</th>
<th>&lt;oi&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total # tokens</strong></td>
<td>85</td>
<td>34</td>
<td>8</td>
</tr>
<tr>
<td>Before [ʔ]</td>
<td>[ej], [e:]</td>
<td>[o], [o:]</td>
<td>øi (1 token)</td>
</tr>
<tr>
<td>Before CC</td>
<td>[æ], [ɛ], [a]</td>
<td>(none)</td>
<td>[oj] (2 tokens)</td>
</tr>
<tr>
<td>Elsewhere</td>
<td>[æ:], [ɛ:], [ɛ]</td>
<td>[o:], [o]</td>
<td>[oj]</td>
</tr>
<tr>
<td></td>
<td>[ai:], [aj], [ɛ:], [e], [ej]</td>
<td>[aw], [ow]</td>
<td></td>
</tr>
</tbody>
</table>
Hypothesis #3

- Because diphthongs are one of several pronunciations of digraphs, no other orthographic sequences will be pronounced as diphthongs → FALSE!

1. [inówʔksêj’s:kám:íchkâ]
   <iinao’ksaysskamimihka>
   iinao’k-saw-sskaa-mm-iihk
   however-neg-break.ai-ind-report
   ‘but it did not break’
   Naapi ki siikokiinîs by Leo Fox

2. [s:kaiʔsawaxsim::iwaj]
   <sskal'sawaahsimmiwayi>
   sska’-isaw-yaahsimm-ii-w=ayi
   shock-neg-feel.pleased.ta-dir-3=3obv
   ‘he is not very pleased’
   Friends by Shirlee Crow Shoe

- Conclusion: diphthongs are widespread!
Future work

Natalie and Mizuki’s transcriptions/perception do not always match

● Future:
  ○ include acoustic measurements (F1, F2)
  ○ add more tokens to the corpus
  ○ study environments (outside of digraphs) where monophthongs and diphthongs occur

● Ideally: statistical models (if we have enough tokens)
Implications
Disconnecting diphthongs and digraphs

Blackfoot Grammar, 3rd ed. (Frantz 2017)

“Diphthongs” section discusses digraphs

- First few chapters written for people without linguistics training (Miyashita and Many Bears 2018)
- But this may mislead learners and researchers in several ways...

DIPHTHONGS

\( \text{ai} \) varies among speakers and from dialect to dialect. Before double consonants (see below) it is about like the \( \text{ai} \) of English \textit{said}:

- \( \text{áínniwá} \) ‘he descends/falls’
- \( \text{áíkkíwá} \) ‘he blows a whistle’

Before a glottal stop (written \( ' \); see below) or another vowel \( i \) it is similar to the \( \text{ai} \) of English \textit{paid} (though on the Siksika Reserve it may sound like the \( j \) of English \textit{bite}):

- \( \text{ái’póywá} \) ‘he speaks’
- \( \text{náípisstiwa} \) ‘it is cloth’

In other positions of a word, this diphthong will sound like the \( \text{ai} \) of English \textit{plaid} on the Blood Reserve, but like the \( \text{ai} \) of English \textit{paid} on the Siksika Reserve:
Confusion in the literature

- Digraphs may be confused with *diphthongs*

  “Frantz (1997) observes **three diphthongs** in Blackfoot: [ai], [ao] and [oi].” (Peterson 2004).
Confusion in the literature

- Digraphs may be confused with *phonemes*.

Kaneko claims there is a symmetrical vowel system with three phonemic short vowels, three phonemic long vowels, and **three phonemic diphthongs** (Kaneko 1999: 13-14).

“Blackfoot also has **long diphthongs**, and the mid front vowel /ɛ/ is a reduction of the long diphthong /ai/” (Derrick 2007: 1).

Denzer-King discusses the “**underlying vowels and diphthongs** in Blackfoot” (Denzer-King 2009: 17)
Confusion in the literature

- Digraphs obscure phonetic variation.

Digraphs ‘include *ai*, and *ao* realized as long monophthongs, */ɛː/* or */eː/*, and */ɔː/*, respectively. Blackfoot’s only true diphthong is */ɔj/*, represented orthographically as *oy* or *oi*’ (Stacy 2004: 9-10).

(see Gambarage 2017 for a similar discussion of Bantu orthography)
Connections to language teaching and learning

● The orthography might not tell you all the information you need about how words are pronounced
● Teachers might want to use these generalizations and teach them explicitly
Summary

● Diphthongs ≠ digraphs
● These are often *confused* in the Blackfoot literature
● Preliminary corpus study results:
  ○ all three speakers use a mix of phonetic monophthongs and diphthongs.
  ○ phonological context affects pronunciation
  ○ some variation remains unexplained
● Diphthongs could be studied in their own right in the future.
Acknowledgements

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  ○ Leo Fox (Káínai; Blood)
  ○ Shirlee Crow Shoe (Aapátohsipikani; Northern Piegan)
  ○ Earl Old Person (Aamsskáápipikani; Blackfeet or Southern Peigan)
  ○ Rosella Many Bears (Káínai; Blood - Transcriber/Translator)
  ○ Beatrice Bullshields (Káínai; Blood)

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In memoriam

Don Frantz
References


References


References


Digraphs: relationship to phonemes

(modified from Frantz 1978; Weber 2020; only open syllables shown)
Digraphs: relationship to phonemes

/ø oː/ = [u uː] ~ [o oː]
[eː] ~ [æː] ~ [ai]

(modified from Frantz 1978; Weber 2020; only open syllables shown)
Digraphs: relationship to phonemes

\[
\begin{align*}
/o o:/ &= [u u:] \sim [o o:] \\
/ɛ:/ &= [e:] \sim [æ:] \sim [ai] \\
/ɔ:/ &= [ɔ:] \sim [ao]
\end{align*}
\]

(modified from Frantz 1978; Weber 2020; only open syllables shown)
Digraphs: relationship to phonemes

\[
/\text{o oː}/ = [\text{u uː}] \sim [\text{o oː}]
\]

\[
/\varepsilon:/ = [\varepsilon:] \sim [\text{æː}] \sim [\text{ai}]
\]

\[
/\text{ɔː}/ = [\text{ɔː}] \sim [\text{aʊ}]
\]

(modified from Frantz 1978; Weber 2020; only open syllables shown)
Relationship of digraphs, phonemes, and pronunciation

<table>
<thead>
<tr>
<th>Orthography</th>
<th>Phonology</th>
<th>Phonetics</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;ai&gt;</td>
<td>/ɛː/</td>
<td>[eː] ~ [æː:]</td>
</tr>
<tr>
<td>~ [ai]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;ao&gt;</td>
<td>/ɔː/</td>
<td>[ɔː] ~ [ao]</td>
</tr>
<tr>
<td>&lt;oi&gt;</td>
<td></td>
<td>[y] ~ [ɔi]</td>
</tr>
</tbody>
</table>
“Digraphs” in previous research

- Represent a variety of non-contrastive pronunciations

(modified from Frantz 1978)
Napi and the Black Birch
One time Napi was walking about when a great storm came up. The strong wind began to blow him all over the place. He grasped at the branches of trees and bushes as he went by, but they all broke off in his hand. Finally, he clutched at a birch tree. The flexible birch bent, but did not break and Napi was able to stop.

When the storm died down, Napi climbed out of the tree and began beating it with a stick. “Why did you stop me? I was having such fun being blown about by the big wind!” The marks left by the beating are still visible on the striped bark of birch trees.

We learned from this story that black birch makes good tipi pegs and will always hold our lodges down in a wind storm.

Listen to the story in Blackfoot (1m 26sec, 507KB)
Naapi ki Siikokiinis
Naapiowa annayao’kikh saakiohta’pawaawahkayihk
iito’tsstonnatonooksiiksistsikoyihk.
limo’tapa’paohpapokayihk anni niitsiiksopoyihk.
limo’tapa’pao’kaasiihk. Onoohko’kasatoohpistsi miistsiisti
aikaksskayihkiaisti. Nainowayissinio’tsimihk mi siikokiinis.
Ayiisskohpapokayihhk ma siikokiinis iinao’ksaisskammihk.
Aisawattohta’pohpapokayihk Naapiowa.

Otaipanissi, Naapiowa iitsinisaatsih mi siikokiinis
iito’kaasiihk miistsiisti itomatapipotsiihhkai.
“Kimo’kattssikaakssi, noohkitsit a’paohpapokay!
Nohksskaitaami’tsi’pinai sopoiy nitsita’paohpapokaani!”
Annihkayi siikokiinisstsiikki ihtaisakksinammiawa annohk.
Annahkao’k Naapiowa omattaipotahsai.

Aamoi atsiniksini ihto’tssksini’p siikonkiinistsi
otsoka’pissawa aahkohtaisstaoka’tskao’saawa.
Maataakohtsiikoohpapoka’wa kitsitokoyinnoonistsi
iimakomayiiksoosi.

Niits’powahsini niitsistsiiwakatoot (1m 26sec, 507KB)

Spoohsii
(1) Ná:piowaʔán:ajówʔk’ičkásá:kioxt’átpawawaʔwákajčk (H)
i:tówʔts:ton:átōno:ks’iwkšt’sikojčk. (.) (H)

Naapiowa anayao ’kihk
Naapi–wa ann–a–ya–o’k–iihk

‘ito’sstonnatonooksiksistsikoyihka.
i’it–o’t–ssonnat–onook–iksistsiko–iihk
IC–then–here–terrible–stormy–day.II–NARR

‘One time Napi was walking about when a great storm came up.’

(2) i:mú?tapa?pox’w’pápokajʔ’ičkánxí:ni: (H) niitsí:ji:ksopoįčk (..) (H)

limo’tapa’paohpapokayihk
ii’omo’tap–a’p–a–ohpapoka–iihk

‘The strong wind began to blow him all over the place.’
<table>
<thead>
<tr>
<th>Word (orthography)</th>
<th>Word (translation)</th>
<th>Story title</th>
<th>Speaker/Provenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>kitsisskawayinnoon</td>
<td>our people</td>
<td>Blood Clot</td>
<td>Leo Fox (Glenbow Museum)</td>
</tr>
<tr>
<td>iinaksipokayini</td>
<td>baby</td>
<td>Blood Clot</td>
<td>Leo Fox (Glenbow Museum)</td>
</tr>
<tr>
<td>noohkitsita'paohpapokaay</td>
<td>from blowing around</td>
<td>Naapi ki siikokiinis</td>
<td>Leo Fox (Glenbow Museum)</td>
</tr>
</tbody>
</table>
Diphthongs in previous research in Blackfoot (cont.)

- No consensus on how diphthongs are “treated”
  - Non-contrastive variants of monophthongs.
    - \( ai \) varies with \([ɛj]\) or even \([ɛ:]\), which Uhlenbeck (1938) writes invariably as \( ai \)
    - Taylor (1969) writes \([ai]\) and \([ɛ:\]\) in different phonological environments
  - /\(ai\)/ and /\(ao\)/ treated as vowel sequences (Uhlenbeck 1938, Taylor 1969, Kinsella 1972, Lowery 1979)
    - Taylor (1969) lists diphthongs in the “long vowels” section
    - \( ai \) and \( au \) are the most “diphthong-like” vowel combinations (Uhlenbeck 1938)
    - Kinsella (1972) and Lowery (1979) do not include diphthongs in the vowel inventory, but transcriptions include vowel sequences, e.g. \([ai]\) (Kinsella 1972); \([ay]\) (Lowery 1979).
  - Peter (2014) and Kaneko (1999) include narrow phonetic transcriptions, including diphthongs
## Data and annotations

<table>
<thead>
<tr>
<th>Occurs a</th>
<th>Occurs bef</th>
<th>Occurs bef</th>
<th>Word (IPA)</th>
<th>Word (orthography)</th>
<th>Word (translation)</th>
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<td>w</td>
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<td>Naapiowa</td>
<td>Naapi</td>
<td>Naapi</td>
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</tr>
<tr>
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<td>w</td>
<td>w</td>
<td>ná pjówa</td>
<td>Naapiowa</td>
<td>Naapi</td>
<td>Naapi</td>
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<tr>
<td>k</td>
<td>#</td>
<td></td>
<td>?ičkók̆jɔ</td>
<td>ih kokkwa</td>
<td>what he gave us</td>
<td>Blood Clot</td>
<td>Leo Fox (Glenbow M)</td>
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<tr>
<td>m</td>
<td>ssk</td>
<td>sC</td>
<td>m*óisk</td>
<td>moisk</td>
<td>this</td>
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<td>Aamoi</td>
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<td>s:</td>
<td>gem s</td>
<td>otējʔtsinikoi̤ːs:i</td>
<td>Otaʔtsinikoissi</td>
<td>when they had told him their story</td>
<td>Blood Clot</td>
<td>Leo Fox (Glenbow M)</td>
</tr>
<tr>
<td>t</td>
<td>xp</td>
<td>x</td>
<td>manʔtókstotol̂oj̤ːpja:w</td>
<td>maanistikstotoli̤ːpiaaw</td>
<td>he devised a plan to do them wrong</td>
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<tr>
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<td>ksa̤hxkoj</td>
<td>land</td>
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<tr>
<td>p</td>
<td>xk</td>
<td>x</td>
<td>ni tsi:ji kso̤pohic̤ːk̆a</td>
<td>niitsiyiiksopoiihka</td>
<td>strong wind</td>
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<td>Leo Fox (Glenbow M)</td>
</tr>
<tr>
<td>k</td>
<td>xk</td>
<td>x</td>
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<td>mattsiksistsikoi̤ːyihk</td>
<td>one day</td>
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<td>t</td>
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<td>x</td>
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<td>x</td>
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<td>itsinoyiihiaw</td>
<td>they saw him</td>
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<td>Leo Fox (Glenbow M)</td>
</tr>
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<td>ki̤ːsi̤ːto̤ːko:j̤ːn o:n̕:t̕ːsj</td>
<td>kitsiitokooi̤ːmoononisti</td>
<td>our lodges</td>
<td>Blood Clot</td>
<td>Leo Fox (Glenbow M)</td>
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<tr>
<td>n</td>
<td>j</td>
<td>j</td>
<td>n̕:aj̕ːoo</td>
<td>nayoo</td>
<td>oh my!</td>
<td>Blood Clot</td>
<td>Leo Fox (Glenbow M)</td>
</tr>
<tr>
<td>m</td>
<td>sst</td>
<td>sC</td>
<td>ome:s.t̕ːn̕:toːs::ox̕ːt̕ːko̤ːy̤ːox̕ːw̕ːtsiːmiːnayi oma isstonattσσooḥkoy̕ːoohtsiːmiːna</td>
<td>he is difficult to listen (to people/obey)</td>
<td>Friends</td>
<td>Shirlee Crow Shoe</td>
<td></td>
</tr>
<tr>
<td>#</td>
<td>k:</td>
<td>gem obs</td>
<td>ek:atsi̤ːma̤ːw</td>
<td>aik̕ːatsi̤ːma̤ːw</td>
<td>it is croakin</td>
<td>Friends</td>
<td>Shirlee Crow Shoe</td>
</tr>
<tr>
<td>t</td>
<td>s:</td>
<td>gem s</td>
<td>kj̕ːak̕ːiː-[ː]-is: at̕ːc̤ːt̕ːo̤ːt̕ːo̤ːw̕ː</td>
<td>kitāʔhik̕ːisiass̕ːa̤ːt̕ːci̤ːt̕ːo̤ːw̕ː</td>
<td>you might make him (angry)</td>
<td>Friends</td>
<td>Shirlee Crow Shoe</td>
</tr>
<tr>
<td>p</td>
<td>?p</td>
<td>glot</td>
<td>tam̕ːsoː.k̕ːːtsis:tx̕ːp̕ːejʔp̕ːi y̕ːi̤ːni</td>
<td>tam̕ːsoːko̤ːh̕ːt̕ːsip̕ːst̕ːoh̕ːp̕ːai̤ːpi̤ːyi̤ːni</td>
<td>Suddenly he jumped inside</td>
<td>Friends</td>
<td>Shirlee Crow Shoe</td>
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<tr>
<td>k</td>
<td>?s</td>
<td>glot</td>
<td>i̤ːske:jʔsawaxsiː-</td>
<td>issk̕ːai̤ːsawaa̤ːhsíː-</td>
<td>he was not happy</td>
<td>Friends</td>
<td>Shirlee Crow Shoe</td>
</tr>
</tbody>
</table>
Earl Old Person

[æː]  [æː]  [ej]

Aohkanaisapopiiya  ‘they all went in it’

Ihkanaisapssapiwa  ‘they all looked in

aitssapakaopiiwa  ‘he sat in it’
Earl Old Person
Earl Old Person
ao
h
k
a
n
ai
s:
a
p
o
p
i:
y
a

2
ki

aohkanaisapipiya

0.417592

D

D

1.033662