Morphologically conditioned (sub)segmental subtraction in Mam

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Introduction

- Mam presents a pattern of **subtractive morphology**
  - Dependent clause morphemes trigger phonological reduction of the following **absolutive clitic**

- **Matrix** /ts/  >  **Dependent** /s/  (2nd/3rd singular absolutive)

- **Matrix** /tf/...  >  **Dependent** /f/...  (1st singular absolutive)

- **Matrix** /q/...  >  **Dependent** /q/...  (1st plural absolutive)
Generalization: Iff the triggering morpheme precedes a contour segment, the first subsegment is deleted

• This pattern is important because
  1. cases of subtractive morphology are rare, especially at the left edge of a morpheme (Anderson 1992, Trommer & Zimmermann 2014)
  2. it presents evidence that subsegments are phonological entities that can be referenced within grammar

• Q-Theory elegantly accounts for the subsegmental deletion (Inkelas & Shih 2013, 2016, 2017; Shih & Inkelas 2014, 2019)
Outline

- Introduction
- Q-theory
- Mam Background
- The pattern
  - Absolutive Clitic in matrix clause
  - Absolutive Clitic in dependent clause
- Subsegmental subtraction analysis
- Conclusion
Q-Theory
Q-Theory

- Q-Theory is a model of representational phonology in which segments [Q] are divided into three subsegments \((q^1 q^2 q^3)\) (Shih & Inkelas 2019)

- The target of a phonological process can be
  - a segment \([Q] \rightarrow [\emptyset]\) or
  - a subsegment \([q] \rightarrow [\emptyset]\)
Following Landmark Theory (Gafos 2002) within Articulatory Phonology, the 3 qs roughly correspond to the notions of:

- onset transition (q₁)
- target (q₂)
- onset release (q₃)
We analyze the alternation between /tʃ/ and /ʃ/ in Mam as
We analyze the alternation between /tʃ/ and /ʃ/ in Mam as deletion of the first subsegment of the affricate.
Mam Background
Mam Background

- Mayan language

- Approximately 488,000 speakers (Eberhard, Simons, and Fennig 2019)

- Spoken in the western highlands of Guatemala and the state of Chiapas, Mexico

- The data presented here come from San Juan Atitán Mam
  - same pattern has been noted for Ixtahuacán Mam (England 1983)
Mam Background

San Ildefonso Ixtahuacán (West) and San Juan Atitán (East)
Mam Background

San Ildefonso Ixtahuacán (West) and San Juan Atitán (East)

30 km apart
The Pattern
Absolutive Clitic in Matrix Clauses
Syntactic environment: matrix clause clitics

Aspect-Clitic-Verb

ma  tfn=  uli
mat.prox  1sg.abs  arrive

‘I arrived.’
Syntactic environment: matrix clause clitics

- Absolutive clitics have two allomorphs

(1)  a) ma tʃiŋ poni
     mat.prox 1sg.abs arrive
     ‘I arrived (there).’

     b) ma tʃiŋ=uli
        mat.prox 1sg.abs=arrive
        ‘I arrived (here).’
Syntactic environment: matrix clause clitics

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<thead>
<tr>
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<th>C</th>
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<tbody>
<tr>
<td>1st</td>
<td>tʃin</td>
<td>tʃn-</td>
</tr>
<tr>
<td>2nd</td>
<td>∅</td>
<td>ts-</td>
</tr>
<tr>
<td>3rd</td>
<td>∅</td>
<td>ts-</td>
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<td>1st</td>
<td>qo</td>
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<tr>
<td>2nd</td>
<td>tʃi</td>
<td>tʃχ-</td>
</tr>
<tr>
<td>3rd</td>
<td>tʃi</td>
<td>tʃχ-</td>
</tr>
</tbody>
</table>
The realization of absolutive clitics in matrix clauses is the underlying form of the clitic.

(2) a) n=tʃin tʂoni tʃan
ip=1sg.abs prepare chan
‘I’m preparing chan.’

b) ma tʃin poni
mat.prox 1sg.abs arrive
‘I arrived.’

c) o tʃin bışni
mat.perf 1sg.abs dance
‘I danced’

d) tʃin kʂuli iʃ neχ
1sg.abs chew corn later
‘I will chew corn later.’
Absolutive Clitic: Matrix paradigm

- /ma/
- mat.prox
- verb

- [tʃn-] 1sg
- [ts-] 2/3sg
- [qw-] 1pl
- [tʃχ-] 2/3pl
Absolutive Clitic: Matrix paradigm

- Morphosyntactic syncretism
  - first/non-first distinction

Q-Theory  Mam  Matrix Pattern  Dependent Pattern  Subsegmental Analysis  Segmental Analysis  Conclusion
Absolutive Clitic: Matrix paradigm

- Morphosyntactic syncretism
  - first/non-first distinction
  - sg/pl distinction

Matrix paradigm:
- /ma/
- mat.prox
- /ul(i)/
- verb

Quantifier Theory
- Mam
- Matrix Pattern
- Dependent Pattern
- Conclusion
Absolutive Clitic: Matrix paradigm

- Morphosyntactic syncretism
  - first/non-first distinction
- Phonological Form

\[
\begin{align*}
\text{/ul(i)/} & \quad \text{verb} \\
\text{mat.prox} & \quad \text{mat.prox} \\
\text{/ma/} & \quad \text{/ma/} \\
\text{[tʃn-]} & \quad \text{[tʃn-]} \\
\text{1sg} & \quad \text{1sg} \\
\text{[ts-]} & \quad \text{[ts-]} \\
\text{2/3sg} & \quad \text{2/3sg} \\
\text{[qw-]} & \quad \text{[qw-]} \\
\text{1pl} & \quad \text{1pl} \\
\text{[tʃχ-]} & \quad \text{[tʃχ-]} \\
\text{2/3pl} & \quad \text{2/3pl}
\end{align*}
\]
Absolutive Clitic: Matrix paradigm

- Morphosyntactic syncretism
  - first/non-first distinction
- Phonological Form
  - Singulars and 2/3pl start with an affricate

\[
\begin{align*}
/m\alpha/ & \quad [t\text{ʃ}n-] \\
\text{mat.prox} & \quad [ts-] \\
/ul(i)/ & \quad [qw-] \\
\end{align*}
\]

\[
\begin{align*}
1\text{sg} & \\
2/3\text{sg} & \\
1\text{pl} & \\
2/3\text{pl} &
\end{align*}
\]
Absolutive Clitic: Matrix paradigm

- Morphosyntactic syncretism
  - first/non-first distinction

- Phonological Form
  - Singulars and 2/3pl start with an affricate
  - 1pl starts with stop

- Matrix paradigm
  - [tʃn-] 1sg
  - [ts-] 2/3sg
  - [qw-] 1pl
  - [tʃχ-] 2/3pl

- Verb
  - /ul(i)/
Absolutive Clitic: Matrix paradigm

- Morphosyntactic syncretism
  - first/non-first distinction
- Phonological Form
  - Singulars and 2/3pl start with an affricate
  - 1pl starts with stop

Crucially, only the clitics beginning with an affricate undergo the alternation.
The Pattern

Absolutive Clitic in Dependent Clauses
There are a range of clauses that count as “dependent”

We’ll show it with a [taχ-] ‘when’ clause:

\( \text{ʂ-t-il q’a [taχ ʂ-qw-ul-i.]} \)

‘He saw when we arrived.’
Dependent aspect marking is in the same slot as matrix aspect marking

- $\text{Aspect-Clitic-Verb}$
  - $\text{ʂ-}$
  - $\text{qw-}$
  - $\text{uli}$
  - $\text{dep.prox}$
  - $\text{1pl.abs}$
  - $\text{arrive}$

‘... (when) I arrived’
Absolutive Clitic: Dependent

- Phonological Form
  - Singulars and 2/3pl start with a **fricative**
  - 1pl starts with **stop**

```
1sg
[s-]  
2/3sg
[f-]  
1pl
[qw-] 
2/3pl
[ʃχ-]
```

```
verb
/ul(i)/
```
Absolutive Clitic: Dependent

- Phonological Form
  - Singulars and 2/3pl start with a fricative
  - 1pl starts with stop

Crucially, only the clitics beginning with an affricate undergo the alternation
Absolutive Clitic: Matrix vs. Dependent

Intro

• Q-Theory
• Mam
• Matrix Pattern

Dependent Pattern

• Subsegmental Analysis
• Segmental Analysis
• Conclusion
Absolutive Clitic: Matrix vs. Dependent

Intro
• Q-Theory
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• Matrix Pattern
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• Subsegmental Analysis
• Segmental Analysis
• Conclusion

/ma-/ mat.prox
[tʃn-]
[ts-]
[qw-]
[tʃχ-]
[ʃn-]
[ʃ-]
[qw-]
[tʃχ-]
Subsegmental Subtraction Analysis
<table>
<thead>
<tr>
<th></th>
<th>1.SG</th>
<th>2.SG</th>
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</thead>
<tbody>
<tr>
<td>/ma-/</td>
<td>tfn-</td>
<td>/ma-/</td>
</tr>
<tr>
<td>mat.prox</td>
<td>verb</td>
<td>mat.prox</td>
</tr>
<tr>
<td>/ul(i)/</td>
<td>ts-</td>
<td>/ul(i)/</td>
</tr>
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**Intro**
- Q-Theory
- Mam
- Matrix Pattern
- Dependent Pattern
- **Subsegmental Analysis**
- Segmental Analysis
- Conclusion
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</tr>
<tr>
<td>tsfn- verb</td>
<td>ts- verb</td>
</tr>
</tbody>
</table>
Matrix

1. SG

\[ /\text{ts}/ \]
\[ ( t^1 \, s^2 \, s^3 ) \]

2. SG

\[ /\text{ts}/ \]
\[ ( t^1 \, s^2 \, s^3 ) \]
## Dependent

<table>
<thead>
<tr>
<th></th>
<th>1.SG</th>
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<tbody>
<tr>
<td>/ʂ-/</td>
<td>jn-</td>
<td>s-</td>
</tr>
<tr>
<td>dep.prox</td>
<td>/ul(i)/ verb</td>
<td>/ul(i)/ verb</td>
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</tbody>
</table>

**Intro** • Q-Theory • Mam • Matrix Pattern • Dependent Pattern • Subsegmental Analysis • Segmental Analysis • Conclusion
## Dependent

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<td><code>/ʂ/-</code> dep.prox</td>
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<td><code>ʃn-</code></td>
<td><code>s-</code></td>
</tr>
<tr>
<td><code>/ul(i)/ verb</code></td>
<td><code>/ul(i)/ verb</code></td>
</tr>
</tbody>
</table>
Dependent

1. SG

/ʃ/  

2. SG

/ts/
Dependent

1.SG

\[ /tʃ/ \]

\[ ( t^1 \ ʃ^2 \ ʃ^3 ) \]

2.SG

\[ /ts/ \]

\[ ( t^1 \ s^2 \ s^3 ) \]
Dependent

1.SG

/tʃ/

( $t^1$ $t^2$ $t^3$ )

2.SG

/ts/

( $t^1$ $s^2$ $s^3$ )
Subsegmental deletion generalizations

When /ʂ-/'dep.prox’ precedes an affricate,
  ○ (does not apply to stops)

the first subsegment of the affricate is deleted
  ○ tʃ > ʃ, ts > s

Note: the sequence /ʂ/ + /ʃ or s/ results in fusion of the two fricatives.
  ○ *[ʂʃ]
Deletion and fusion

1. UR

2. Deletion

3. Fusion, output
This is not segmental deletion

1. Affricates are not clusters
   - [t-s] and [ts] are distinct

2. Segmental deletion is a separate process
   - Ixtahuacán Mam shows a pattern of **full segment deletion** in addition to the pattern shown here
1: Cluster vs Complex Segment

**t-s-**

[t-] is the 2/3sg possessive prefix

sipχ ‘headwrap’

t-sip-i ‘your headwrap’

**ts-**

[tsaχ] is monomorphemic

tsaχ ‘pine tree’
1: Cluster vs Complex Segment

**tʃ-**

[t-] is the 2/3sg possessive prefix

ʃel  ‘grandmother’

tʃel-i  ‘your grandmother’

**tf-**

[tʃɛχ] is monomorphemic

tʃɛχ  ‘horse’
t-feli

<table>
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<tr>
<th>t̥f</th>
<th>e</th>
<th>l</th>
<th>i</th>
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</table>

0.903

Time (s)

tfεχ

<table>
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<tr>
<th>ɫ</th>
<th>e</th>
<th>χ</th>
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</table>

0.903

Time (s)
Cluster vs Complex Segment: Q theory representation

**Underlying /t+ʃ/ cluster**

<table>
<thead>
<tr>
<th></th>
<th>V</th>
<th>t</th>
<th>ʃ</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Q]</td>
<td>(v v v)</td>
<td>(t t h)</td>
<td>(ʃʃʃ)</td>
<td>(v v v)</td>
</tr>
</tbody>
</table>

**gestural score**

- oral constriction
- voicing

**Underlying /tʃ/ complex segment**

<table>
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<th></th>
<th>V</th>
<th>tʃ</th>
<th>V</th>
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</thead>
<tbody>
<tr>
<td>[Q]</td>
<td>(v v v)</td>
<td>(tʃʃ)</td>
<td>(v v v)</td>
</tr>
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**gestural score**

- oral constriction
- voicing
2: Ixtahuacan Mam  (England 1983: 59, 162)

- The **subsegmental** deletion process in the dependent **proximate** holds

- In addition, Ixtahuacan Mam shows **segmental** deletion in the dependent **perfective**  

- Deletion of the first segment [Q] of the clitic

(4) t-uj  b’e  [  in  jaw  tz’aq-a ]  
    ∅-chin  
    3sg-rn/in  road  [  dep.perf-1sAbs  dir  slip-1s ]  
    ‘In the road I slipped (a while ago)’
## 2: Segmental deletion in Ixtahuacan Mam

*(England 1983: 59,162)*

<table>
<thead>
<tr>
<th>Clitic</th>
<th>Matrix</th>
<th>Dependent perfective</th>
<th>All clitics lose the first segment ○ Including 1.pl</th>
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<tr>
<td>1sg</td>
<td>[tʃin-]</td>
<td>[in-]</td>
<td></td>
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<tr>
<td>2/3sg</td>
<td>[ts-]</td>
<td>[∅-]</td>
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</tr>
<tr>
<td>1pl</td>
<td>[qo-]</td>
<td>[o-]</td>
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## 2: Segmental deletion in Ixtahuacan Mam

(England 1983: 59,162)

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<td>1sg</td>
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<td>• All clitics lose the first segment ○ Including 1.pl</td>
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<td>[ts-]</td>
<td>[∅-]</td>
<td></td>
</tr>
<tr>
<td>1pl</td>
<td>[qo-]</td>
<td>[o-]</td>
<td>• [Q] deletion is blind to whether the first segment is an affricate</td>
</tr>
<tr>
<td>2/3pl</td>
<td>[tʃi-]</td>
<td>[i-]</td>
<td></td>
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Subtraction in Mam

- In both dialects, we see deletion of the first subsegment of affricates in absolutive clitics.
  - In Ixtahuacan Mam, we also see deletion of the first full segment of the clitic.
- Mam shows us both segmental and subsegmental subtraction.
Morphological trigger

- The triggering of the subsegmental deletion process is the dependent proximate morpheme (bundle of morphosyntactic features)

- In Ixtahuacán Mam it is clear:
  - [dependent proximate] triggers [q] deletion
  - [dependent perfective] triggers [Q] deletion

- The alternation is **morphologically conditioned**
Against a simple lenition analysis

- An alternative analysis is that this is a case of segmental lenition process, rather than of subsegmental deletion
  - [-continuant] → [+continuant]
  - This predicts that the 1.pl clitic [qw-] [-continuant] will become [χw-]

- However, this pattern is not observed
  - Therefore, we rule out the segmental lenition analysis
Accounting for the resistance of [qw-]

- A crucial difference
  - Affricates have **2 gestural targets**
  - Stops have **1 gestural target**

- We can state the subsegmental deletion as **deletion of 1 target**

- In the case of stops, the **pressure to remain faithful** to at least one target wins out over the deletion
Conclusion
Conclusion

- We presented a robust case of **phonological subtraction**
  - dependent aspectual morphemes trigger the deletion of the first phonological unit of the following morpheme

- This is the first case of analyzing an affricate / fricative alternation as **subsegmental** subtraction

- The alternation is **morphologically** conditioned
  - One morpheme triggers subsegmental [q] subtraction
  - A separate morpheme triggers full segment [Q] subtraction

- **Q-Theory** offers a representational model that easily accounts for both segment- and subsegment-level deletion
Thank you!

Special thanks to language consultants Henry Sales-Hernandez and Gladiola Aguilar and thank you to Sharon Inkelas and Nicholas Rolle for comments and to the audience at UC Berkeley Phonetics and Phonology Forum.
Selected References

Inkelas, Sharon.; and Stephanie S. Shih. 2013. Contour segments and tones in (sub)segmental Agreement by Correspondence. University of Manchester, UK.
Shih, Stephanie S. & Sharon Inkelas. 2019. Autosegmental aims in surface optimizing phonology. Linguistic Inquiry 50, 137–196. doi:https://doi.org/10.1162/ling_a_00304
2: Ixtahuacan Mam (England 1983: 59, 162)

- **Subsegmental** deletion process in the dependent *proximate*
  
  t-uj  b’e  [  xhin  jaw  tz’aq-a ]  
  ∅-chin  
  3sg-rn/in  road  [  dep.prox-1sAbs  dir  slip-1s ]  
  ‘In the road I slipped (a while ago)”

- **Segmental** deletion in the dependent *perfective*

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