Phonetic Correlates of Accent Authenticity in Voice Disguise

Sara Neuhauser and Adrian P. Simpson

Institute of German Linguistics
University of Jena

IAFPA 2007
Plymouth 23.– 25.07.2007
It is often claimed that it is relatively easy to detect an imitated foreign accent, because:

- speaker retains much of the phonetics of his/her mother tongue
- s/he shows errors, overstatements, inconsistencies and discrepancies brought about by limited competence in the relevant foreign language
- e.g. in Dern (2003), Markham (1999), Storey (1996), Blum (1990), Künzel (1987)
It is often claimed that it is relatively easy to detect an imitated foreign accent, because:

- speaker retains much of the phonetics of his/her mother tongue
- s/he shows errors, overstatements, inconsistencies and discrepancies brought about by limited competence in the relevant foreign language
- e.g. in Dern (2003), Markham (1999), Storey (1996), Blum (1990), Künzel (1987)
It is often claimed that it is relatively easy to detect an imitated foreign accent, because:

- speaker retains much of the phonetics of his/her mother tongue
- s/he shows errors, overstatements, inconsistencies and discrepancies brought about by limited competence in the relevant foreign language
- e.g. in Dern (2003), Markham (1999), Storey (1996), Blum (1990), Künzel (1987)
It is often claimed that it is relatively easy to detect an imitated foreign accent, because:

- speaker retains much of the phonetics of his/her mother tongue
- s/he shows errors, overstatements, inconsistencies and discrepancies brought about by limited competence in the relevant foreign language
- e.g. in Dern (2003), Markham (1999), Storey (1996), Blum (1990), Künzel (1987)
these statements imply

- consistency in the interference features produced by non-native speakers
- ability of listeners to differentiate between an imitated and an authentic accent

however, listener’s ability to judge the authenticity of an accent is fairly limited (Neuhauser and Simpson, 2007)
these statements imply

- consistency in the interference features produced by non-native speakers
- ability of listeners to differentiate between an imitated and an authentic accent

however, listener’s ability to judge the authenticity of an accent is fairly limited (Neuhauser and Simpson, 2007)
Introduction

These statements imply:

- Consistency in the interference features produced by non-native speakers
- Ability of listeners to differentiate between an imitated and an authentic accent

However, listener’s ability to judge the authenticity of an accent is fairly limited (Neuhauser and Simpson, 2007)
Listening Experiment – Stimuli
(Neuhauser and Simpson, 2007)

- stimulus sentence:
  - „Die verstärkten Sicherheitsvorkehrungen der Banken könnten Räuber abgeschreckt haben.”
  (Increased security measures by banks may have deterred robbers.)

- 35 stimuli spoken by 34 speakers
  - 25 native German speakers imitating a foreign accent
  - 9 non-native German speakers speaking German
Listening Experiment – Stimuli
(Neuhauser and Simpson, 2007)

- stimulus sentence:
  - „Die verstärkten Sicherheitsvorkehrungen der Banken könnten Räuber abgeschreckt haben.”
    (Increased security measures by banks may have deterred robbers.)

- 35 stimuli spoken by 34 speakers
  - 25 native German speakers imitating a foreign accent
  - 9 non-native German speakers speaking German
Listening Experiment – Stimuli
(Neuhauser and Simpson, 2007)

- stimulus sentence:
  - "Die verstärkten Sicherheitsvorkehrungen der Banken könnten Räuber abgeschreckt haben."
  (Increased security measures by banks may have deterred robbers.)

- 35 stimuli spoken by 34 speakers
  - 25 native German speakers imitating a foreign accent
  - 9 non-native German speakers speaking German
Listening Experiment – Listeners

- 22 native German speakers (18 female, 4 male; 20–26 years old)
- undergraduate students of speech science and phonetics
22 native German speakers (18 female, 4 male; 20–26 years old)

undergraduate students of speech science and phonetics
Listening Experiment – Listeners

- 22 native German speakers (18 female, 4 male; 20–26 years old)
- undergraduate students of speech science and phonetics
Two experimental tasks:

1. judge whether the stimulus item was spoken with an authentic or a non-authentic (imitated) accent
2. name the recognised accent
Three experimental tasks:

1. judge whether the stimulus item was spoken with an authentic or a non-authentic (imitated) accent
2. name the recognised accent
Listening Experiment – Tasks

Two experimental tasks:

1. judge whether the stimulus item was spoken with an authentic or a non-authentic (imitated) accent
2. name the recognised accent
Listener’s ability to judge accent authenticity was generally limited.

High level of variation in judged authenticity for both the group of accent imitators as well as for the genuine non-native speakers, suggesting:

- Different ability of speakers to imitate an accent authentically.
- Different levels of competence in German as a foreign language.
Listening Experiment – Results

- listener’s ability to judge accent authenticity was generally limited
- high level of variation in judged authenticity for both the group of accent imitators as well as for the genuine non-native speakers, suggesting:
  - different ability of speakers to imitate an accent authentically
  - different levels of competence in German as a foreign language
Phonetic correlates of accent authenticity in voice disguise

Listening Experiment

Listening Experiment – Results

- Listener’s ability to judge accent authenticity was generally limited
- High level of variation in judged authenticity for both the group of accent imitators as well as for the genuine non-native speakers, suggesting:
  - Different ability of speakers to imitate an accent authentically
  - Different levels of competence in German as a foreign language
Subjects – Audio

Four groups of three speakers

1. most authentic sounding native German speakers (3x French accent)
2. least authentic sounding native German speakers (3x American-English accent)
3. most authentic sounding non-native German speakers (1x French, 1x American-English and 1x Czech accent)
4. least authentic sounding non-native German speakers (2x French and 1x Russian accent)
Subjects – Audio

Four groups of three speakers

1. most authentic sounding native German speakers (3x French accent)
2. least authentic sounding native German speakers (3x American-English accent)
3. most authentic sounding non-native German speakers (1x French, 1x American-English and 1x Czech accent)
4. least authentic sounding non-native German speakers (2x French and 1x Russian accent)
Subjects – Audio

Four groups of three speakers

1. most authentic sounding native German speakers (3x French accent)
2. least authentic sounding native German speakers (3x American-English accent)
3. most authentic sounding non-native German speakers (1x French, 1x American-English and 1x Czech accent)
4. least authentic sounding non-native German speakers (2x French and 1x Russian accent)
Subjects – Audio

Four groups of three speakers

1. most authentic sounding native German speakers (3x French accent)
2. least authentic sounding native German speakers (3x American-English accent)
3. most authentic sounding non-native German speakers (1x French, 1x American-English and 1x Czech accent)
4. least authentic sounding non-native German speakers (2x French and 1x Russian accent)
Subjects – Audio

Four groups of three speakers

1. most authentic sounding native German speakers (3x French accent)
2. least authentic sounding native German speakers (3x American-English accent)
3. most authentic sounding non-native German speakers (1x French, 1x American-English and 1x Czech accent)
4. least authentic sounding non-native German speakers (2x French and 1x Russian accent)
Authenticity seems to be questioned in both imitators and genuine non-native speakers if typical German phonetic/phonological patterns are present, i.e. have been

- successfully acquired by the non-natives
- unsuccessfully concealed by the imitators
Authenticity seems to be questioned in both imitators and genuine non-native speakers if typical German phonetic/phonological patterns are present, i.e. have been

- successfully acquired by the non-natives
- unsuccessfully concealed by the imitators
Authenticity seems to be questioned in both imitators and genuine non-native speakers if typical German phonetic/phonological patterns are present, i.e. have been

- successfully acquired by the non-natives
- unsuccessfully concealed by the imitators
Examined Patterns

- realisation of final /ən/
- realisation of /h/
- junctural glottalisation
- postvocalic and initial /r/
Examined Patterns

- realisation of final /ən/
- realisation of /h/
- junctural glottalisation
- postvocalic and initial /r/
Examined Patterns

- realisation of final /ən/
- realisation of /h/
- junctural glottalisation
- postvocalic and initial /r/
Examined Patterns

- realisation of final /ən/
- realisation of /h/
- junctural glottalisation
- postvocalic and initial /r/
Examined Patterns

- realisation of final /ən/
- realisation of /h/
- junctural glottalisation
- postvocalic and initial /r/
Realisation of final /ən/ I

Reduction of final /ən/ by realising a syllabic nasal:

- [haːbm̩] or [ha:mː] (rather than [haːbən], <haben>, 'to have')
- [fɛ̝stɛ̝ktn̩] (rather than [fɛ̝stɛ̝ktən], <verstärkten>, 'increased')
- [bɑŋkn̩] or [bɑŋɲŋ] (rather than [bɑŋkən], <Banken>, 'banks')

⇒ judged non-authentic
Realisation of final /ən/ I

Reduction of final /ən/ by realising a syllabic nasal:

- [haːbm] or [haːmː] (rather than [haːbən], <haben>, 'to have')
- [fɛɐstɛʁktn̩] (rather than [fɛɐstɛʁktən], <verstärkten>, 'increased')
- [bɑŋkn̩] or [bɑŋŋn̩] (rather than [bɑŋkən], <Banken>, 'banks')
- ⇒ judged non-authentic
Realisation of final /ən/ I

Reduction of final /ən/ by realising a syllabic nasal:

- [hə:bən] or [hə:mː] (rather than [hə:bən], <haben>, ’to have’)
- [fɛ̃stɛ̃ktən] (rather than [fɛ̃stɛ̃ktən], <verstärkten>, ’increased’)
- [baŋkʰ] or [baŋɲɲ] (rather than [baŋkən], <Banken>, ’banks’)
- ⇒ judged non-authentic
Realisation of final /ən/ 1

Reduction of final /ən/ by realising a syllabic nasal:

- [haːbmə] or [haːmə] (rather than [haːbən], <haben>, 'to have')
- [fɛɛstɛŋktən] (rather than [fɛɛstɛŋktən], <verstärkten>, 'increased')
- [baŋkən] or [baŋŋən] (rather than [baŋkən], <Banken>, 'banks')

⇒ judged non-authentic
Realisation of final /ən/ I

Reduction of final /ən/ by realising a syllabic nasal:

- [haːbm] or [haːmː] (rather than [haːbən], <haben>, ’to have’)
- [fɛŋʃɛktʰɛŋ] (rather than [fɛŋʃɛktən], <verstärkten>, ’increased’)
- [bɑŋkʰɛŋ] or [bɑŋŋɛŋ] (rather than [bɑŋkən], <Banken>, ’banks’)

⇒ judged non-authentic
Realisation of final /ən/ II

Full realisation of final /ən/

⇒ judged authentic
1 speaker imitated both a French and an AE accent

- French: 5x full realisation  
  ⇒ judged authentic
- AE: 4x full, 1x reduced realisation  
  ⇒ judged non-authentic
1 speaker imitated both a French and an AE accent

- French: 5x full realisation
  ⇒ judged authentic

- AE: 4x full, 1x reduced realisation
  ⇒ judged non-authentic
Realisation of final /ən/ III

1 speaker imitated both a French and an AE accent

- French: 5x full realisation
  ⇒ judged authentic
- AE: 4x full, 1x reduced realisation
  ⇒ judged non-authentic
Realisation of /h/ – French accent

- 2 native French speakers: glottal friction in <Sicherheitsvorkehrungen> and at the beginning of <haben> ⇒ judged non-authentic

- 3 native German speakers imitating a French accent: /h/ omitted or substituted by a glottal stop ⇒ judged authentic
Realisation of /h/ – French accent

- 2 native French speakers: glottal friction in <Sicherheitsvorkehrungen> and at the beginning of <haben> ⇒ judged non-authentic

- 3 native German speakers imitating a French accent: /h/ omitted or substituted by a glottal stop ⇒ judged authentic
Realisation of /h/ – French accent

- 2 native French speakers: glottal friction in <Sicherheitsvorkehrungen> and at the beginning of <haben> ⇒ judged non-authentic
- 3 native German speakers imitating a French accent: /h/ omitted or substituted by a glottal stop ⇒ judged authentic
Junctural Glottalisation – French Accent

- Germans as well as native French speakers produced junctural glottalisation in <Räuber abgeschreckt>
- None of the speakers produced a glottal stop
- 1 native French produced neither a glottal stop nor glottalisation but a smooth onset
  - Same speaker produced glottal friction in <Sicherheitsvorkehrungen> and <haben>
→ judged authentic
Junctural Glottalisation – French Accent

- Germans as well as native French speakers produced junctural glottalisation in <Räuber abgeschreckt>.

- None of the speakers produced a glottal stop.

- 1 native French produced neither a glottal stop nor glottalisation but a smooth onset.

  - Same speaker produced glottal friction in <Sicherheitsvorkehrungen> and <haben>.

  ⇒ judged authentic
Junctural Glottalisation – French Accent

- Germans as well as native French speakers produced junctural glottalisation in <Räuber abgeschreckt>
- none of the speakers produced a glottal stop
- 1 native French produced neither a glottal stop nor glottalisation but a smooth onset
  - same speaker produced glottal friction in <Sicherheitsvorkehrungen> and <haben>

⇒ judged authentic
Germans as well as native French speakers produced junctural glottalisation in <Räuber abgeschreckt>

none of the speakers produced a glottal stop

1 native French produced neither a glottal stop nor glottalisation but a smooth onset

- same speaker produced glottal friction in <Sicherheitsvorkehrungen> and <haben>

⇒ judged authentic
Postvocalic /r/ – French Accent

- Phonetic correlate of German /V+r/ ([ʁ]) as in <Räuber> [ʁɔbɐ] or <vor> [fɔʁ]

- 2 of 3 speakers judged as authentic used postvocalic (uvular?) friction ([ʁ] or [ʁ]) in places where in German [ʁ] would be expected

- The native French speaker judged as authentic also produced postvocalic /r/-friction

- 2 native French speakers judged as non-authentic produced [ʁ] (postvocalic /r/-friction could be detected only one time (<-vorkehrungen>) for one of the speakers)
Postvocalic /r/ – French Accent

- Phonetic correlate of German /V+r/ ([æ̯]) as in <Räuber> [ʁɔœba] or <vor> [فوژ]

- 2 of 3 speakers judged as authentic used postvocalic (uvular?) friction ([ɛ̯] or [ʁ]) in places where in German [æ̯] would be expected

- The native French speaker judged as authentic also produced postvocalic /r/-friction

- 2 native French speakers judged as non-authentic produced [ɛ̯] (postvocalic /r/-friction could be detected only one time (<-vorkehrungen>) for one of the speakers)
Phonetic correlates of accent authenticity in voice disguise

Postvocalic /r/ – French Accent

- Phonetic correlate of German /V+r/ ([œ]) as in <Räuber> [ʁɔ̝ˈbaʁ] or <vor> [foːʁ]
- 2 of 3 speakers judged as authentic used postvocalic (uvular?) friction ([ɛ] or [ʁ]) in places where in German [œ] would be expected
- the native French speaker judged as authentic also produced postvocalic /r/-friction
- 2 native French speakers judged as non-authentic produced [œ] (postvocalic /r/-friction could be detected only one time (<-vorkehrungen>) for one of the speakers)
Postvocalic /r/ – French Accent

- Phonetic correlate of German /V+r/ ([ɛ]) as in <Räuber> [ʁɔʊbɛr] or <vor> [fɔʁ]
- 2 of 3 speakers judged as authentic used postvocalic (uvular?) friction ([ɛ̝] or [ɛ]) in places where in German [ɛ] would be expected
- The native French speaker judged as authentic also produced postvocalic /r/-friction
- 2 native French speakers judged as non-authentic produced [ɛ] (postvocalic /r/-friction could be detected only one time (<-vorkehrungen>) for one of the speakers)
Postvocalic /r/ – French Accent

- phonetic correlate of German /V+r/ ([ɛ]) as in <Räuber> [ʁɔ̝ba] or <vor> [fo:r]
- 2 of 3 speakers judged as authentic used postvocalic (uvular?) friction ([ɛ] or [ʁ]) in places where in German [ɛ] would be expected
- the native French speaker judged as authentic also produced postvocalic /r/-friction
- 2 native French speakers judged as non-authentic produced [ɛ] (postvocalic /r/-friction could be detected only one time (<vorkehrungen>) for one of the speakers)
Features of authentic and non-authentic sounding French accents

Authentic:
- full realisation of final /ən/
- /h/ is omitted or substituted by [ʔ]
- glottalisation as well as smooth onset in vowel juncture
- postvocalic /r/-friction instead of [r]

Non-authentic:
- reduction of final /ən/ by realising a syllabic nasal
- glottal friction (voiced and voiceless)
- glottalisation in vowel juncture
- [r] as phonetic correlate of <-er, -or>
Features of authentic and non-authentic sounding French accents

**Authentic:**
- Full realisation of final /œn/
- /h/ is omitted or substituted by [ʔ]
- Glottalisation as well as smooth onset in vowel juncture
- Postvocalic /r/-friction instead of [ɻ]

**Non-authentic:**
- Reduction of final /œn/ by realising a syllabic nasal
- Glottal friction (voiced and voiceless)
- Glottalisation in vowel juncture
- [ɻ] as phonetic correlate of <-er, -or>
Features of authentic and non-authentic sounding French accents

**Authentic:**
- full realisation of final /ɛn/
- /h/ is omitted or substituted by [ʔ]
- glottalisation as well as smooth onset in vowel juncture
- postvocalic /r/-friction instead of [ɾ]

**Non-authentic:**
- reduction of final /ɛn/ by realising a syllabic nasal
- glottal friction (voiced and voiceless)
- glottalisation in vowel juncture
- [ɾ] as phonetic correlate of <-er, -or>
Features of authentic and non-authentic sounding French accents

Authentic:

- Full realisation of final /œn/
- /h/ is omitted or substituted by [?] 
- Glottalisation as well as smooth onset in vowel juncture
- Postvocalic /r/-friction instead of [r]

Non-authentic:

- Reduction of final /œn/ by realising a syllabic nasal
- Glottal friction (voiced and voiceless)
- Glottalisation in vowel juncture
- [æ] as phonetic correlate of <-er, -or>
Features of authentic and non-authentic sounding French accents

Authentic:
- full realisation of final /œn/
- /h/ is omitted or substituted by [ʔ]
- glottalisation as well as smooth onset in vowel juncture
- postvocalic /r/-friction instead of [æ]

Non-authentic:
- reduction of final /œn/ by realising a syllabic nasal
- glottal friction (voiced and voiceless)
- glottalisation in vowel juncture
- [æ] as phonetic correlate of <-er, -or>
Features of authentic and non-authentic sounding French accents

Authentic:
- full realisation of final /œn/
- /h/ is omitted or substituted by [ʔ]
- glottalisation as well as smooth onset in vowel juncture
- postvocalic /r/-friction instead of [ɾ]

Non-authentic:
- reduction of final /œn/ by realising a syllabic nasal
- glottal friction (voiced and voiceless)
- glottalisation in vowel juncture
- [ɾ] as phonetic correlate of <-er, -or>
Features of authentic and non-authentic sounding French accents

Authentic:
- full realisation of final /ən/
- /h/ is omitted or substituted by [ʔ]
- glottalisation as well as smooth onset in vowel juncture
- postvocalic /r/-friction instead of [ɾ]

Non-authentic:
- reduction of final /ən/ by realising a syllabic nasal
- glottal friction (voiced and voiceless)
- glottalisation in vowel juncture
- [ɹ] as phonetic correlate of <-er, -or>
Phonetic correlates of accent authenticity in voice disguise

Features of authentic and non-authentic sounding French accents

Authentic:
- full realisation of final /ən/
- /h/ is omitted or substituted by [ʔ]
- glottalisation as well as smooth onset in vowel juncture
- postvocalic /r/-friction instead of [ɾ]

Non-authentic:
- reduction of final /ən/ by realising a syllabic nasal
- glottal friction (voiced and voiceless)
- glottalisation in vowel juncture
- [ɾ] as phonetic correlate of <-er, -or>
Features of authentic and non-authentic sounding French accents

Authentic:

- full realisation of final /ən/
- /h/ is omitted or substituted by [ʔ]
- glottalisation as well as smooth onset in vowel juncture
- postvocalic /r/-friction instead of [v]

Non-authentic:

- reduction of final /ən/ by realising a syllabic nasal
- glottal friction (voiced and voiceless)
- glottalisation in vowel juncture
- [v] as phonetic correlate of <-er, -or>
consistent use of stereotypical patterns is not a guarantee for authenticity.
/r/ – American-English Accent

- Initial /r/ as in <Vorkehrungen, Räuber, abgeschreckt>
- German speakers imitating AE accent consistently produced an approximant /r/ stereotypical of an AE-accent in German ⇒ all judged non-authentic
- Native AE-speaker produced velar fricatives ([ɣ]) ⇒ judged authentic
Phonetic correlates of accent authenticity in voice disguise

- Phonetic correlates of accent authenticity

/r/ – American-English Accent

- initial /r/ as in <Vorkehrungen, Räuber, abgeschreckt>
- German speakers imitating AE accent consistently produced an approximant /r/ stereotypical of an AE-accent in German ⇒ all judged non-authentic
- native AE-speaker produced velar fricatives ([ɣ]) ⇒ judged authentic
/r/ – American-English Accent

- Initial /r/ as in <Vorkehrungen, Räuber, abgeschreckt>
- German speakers imitating AE accent consistently produced an approximant /r/ stereotypical of an AE-accent in German ⇒ all judged non-authentic
- Native AE-speaker produced velar fricatives ([ɣ]) ⇒ judged authentic
/r/ – American-English Accent

- initial /r/ as in <Vorkehrungen, Räuber, abgeschreckt>
- German speakers imitating AE accent consistently produced an approximant /r/ stereotypical of an AE-accent in German ⇒ all judged non-authentic
- native AE-speaker produced velar fricatives ([ɣ]) ⇒ judged authentic
Features of authentic and non-authentic sounding AE accents

**Authentic:**
- inconsistent realisation of final /ən/ (3/5 times full realisation)
- velar fricatives for initial /r/

**Non-authentic:**
- 2 of 3 speakers consistently reduced final /ən/ by realising a syllabic nasal, but 1 speaker did not reduce it
- approximant /r/
Features of authentic and non-authentic sounding AE accents

Authentic:
- inconsistent realisation of final /ən/ (3/5 times full realisation)
- velar fricatives for initial /r/

Non-authentic:
- 2 of 3 speakers consistently reduced final /ən/ by realising a syllabic nasal, but 1 speaker did not reduce it
- approximant /r/
Features of authentic and non-authentic sounding AE accents

Authentic:
- inconsistent realisation of final /ən/ (3/5 times full realisation)
- velar fricatives for initial /r/  

Non-authentic:
- 2 of 3 speakers consistently reduced final /ən/ by realising a syllabic nasal, but 1 speaker did not reduce it
- approximant /r/
Features of authentic and non-authentic sounding AE accents

Authentic:
- inconsistent realisation of final /ən/ (3/5 times full realisation)
- velar fricatives for initial /r/

Non-authentic:
- 2 of 3 speakers consistently reduced final /ən/ by realising a syllabic nasal, but 1 speaker did not reduce it
- approximant /r/
Features of authentic and non-authentic sounding AE accents

**Authentic:**
- inconsistent realisation of final /ən/ (3/5 times full realisation)
- velar fricatives for initial /r/

**Non-authentic:**
- 2 of 3 speakers consistently reduced final /ən/ by realising a syllabic nasal, but 1 speaker did not reduce it
- approximant /r/
Discussion

- Authenticity judgements of listeners with limited training seem to be unreliable.
- In general, speakers exhibiting too many features of German are judged to be non-authentic.
- Authentic foreigners do not seem to be any more consistent at producing ‘errors’ than German imitators.
- Analytic judgement of accent authenticity has to be based on more fine phonetic detail.
Discussion

- Authenticity judgements of listeners with limited training seem to be unreliable.
- In general, speakers exhibiting too many features of German are judged to be non-authentic.
- Authentic foreigners do not seem to be any more consistent at producing ‘errors’ than German imitators.
- Analytic judgement of accent authenticity has to be based on more fine phonetic detail.
Discussion

- Authenticity judgements of listeners with limited training seem to be unreliable.
- In general, speakers exhibiting too many features of German are judged to be non-authentic.
- Authentic foreigners do not seem to be any more consistent at producing 'errors' than German imitators.
- Analytic judgement of accent authenticity has to be based on more fine phonetic detail.
Discussion

- authenticity judgements of listeners with limited training seem to be unreliable
- in general, speakers exhibiting too many features of German are judged to be non-authentic
- authentic foreigners do not seem to be any more consistent at producing ‘errors’ than German imitators
- analytic judgement of accent authenticity has to be based on more fine phonetic detail
authenticity judgements of listeners with limited training seem to be unreliable

in general, speakers exhibiting too many features of German are judged to be non-authentic

authentic foreigners do not seem to be any more consistent at producing 'errors' than German imitators

analytic judgement of accent authenticity has to be based on more fine phonetic detail


