Factors affecting L2 perception/production

- **Age of L2 learning** (Long, 1990; Flage et al., 1999, 2005)
- **L1 influence** (Best, 1995; Flage, 1995)
- **Quality and quantity of input** (Flage, 2000; Mora, 2008)
- **Amount of L1/L2 use** (MacKay et al., 2001; Piske et al., 2001)

Cannot explain remaining inter-subject variability in L2 phonological development

- **Cognitive ability and L2 speech perception**

**Individual differences in cognitive ability:**
- musical aptitude (Gottfried, 2007; Slevk & Miyake, 2006)
- phonetic talent (Flage et al., 2007)
- musical ability (Gottfried, 2007; Isaacs & Trofimovich, 2011)
- working memory (Karmos & Safar, 2008)
- phonological short-term memory (Cerviño & Povedano, 2011; MacKay et al., 2007)

Little is known: relationship between these factors and L2 perception/production

**Why to explore?!**

- Exist but remain underresearched
- Examine relationship between cognitive abilities and L2 phonological acquisition
- May help to identify characteristics of learners
  - who struggle with L2 phonological acquisition
  - who successfully master L2 pronunciation

**Problems with L2 perception**

1. **Cross-linguistic phonetic similarity affects:**
   - L2 perception through L1 - inaccurate formation of L2 categories
     - **Why?**
       - L1 phonetic prototypes - “magnets”
       - Perceptual assimilation to the most similar L1 phoneme

2. **Factors independent from L1 transfer:**
   - Reliance on wrong cue
     - **Why?**
       - More salient (E.g. Duration)
     - **What to do?**
       - Discern phonetic differences between L1 and L2
       - Rely on right phonetic cue

**The Present Study: Focus**

- **Focus**
  - Inter-subject variability in L2 target-like perception
    - (weighting of phonetic cues in speech perception)
Cognitive ability and L2 speech perception

• Focus
• Inter-subject variability in L2 target-like perception (weighting of phonetic cues in speech perception)
• Spanish/Catalan EFL learners difficulty in target-like perception of English /ʊ/ and /u/ contrast
  • Single Category assimilation: English /ʊ/ - /u/ to the Native /u/ category
  • Overreliance on duration when perceiving /ʊ/ and /u/ contrast

• Individual differences in Attention Control (AC)

Attention Control (AC)

- L1/L2 processing – complex cognitive skill (rapid & flexible)
- L1: efficient and flexible AC (automatic processing)
- L2: controlled processing (requires greater attentional resources)

EXAMPLE:
The book is under the magazine

Mental representations: 1) book and magazine
2) spatial relationship (grammaticized part)

The Present Study: Focus

- Focus
- Individual differences in Attention Control (AC)
  • Discern differences underlying the contrast
  • Attend to the signaling cue
The Present Study: Aim and RQ

AIM:
- To investigate the extent to which individual differences in AC are related to L2 vowel perception.

RQ:
- Are L2 learners with more efficient AC better able to rely on spectral information than lower ability learners in the perception of the English tense-lax /iː/-/ɪ/ contrast?

Hypothesis
Individuals with higher AC capacity might be better able to rely on spectral information in the categorization of English /iː/ and /ɪ/ because they would be more successful at bringing segmental duration to the background.

The Present Study: Method

- Participants:
  - 58 Spanish/Catalan EFL learners (mean age: 21)
  - 13 NS – baseline data (Vowel Discrimination Task)
  - No speech disorders or hearing problems
  - Self-estimated proficiency level: from intermediate to advanced

- Tasks and Procedure:
  - Linguistic Background Questionnaire
  - AC (attention-shift task)
  - Cue-weighting in L2 vowel perception (Vowel Discrimination Task)

How can AC be operationalized?

- alternating runs procedure
- requires switching between tasks
- dimensions under focus appear predictably

(Rogers & Monsell 1995)
Task-switching paradigm: predictable alternating runs

Number | Letter
--- | ---
P1 | 

odd: Left key, vowel
even: Right key, consonant

---

Number | Letter
--- | ---
S5 | 

odd: Left key, vowel
even: Right key, consonant

---

Number | Letter
--- | ---
6J | 

odd: Left key, vowel
even: Right key, consonant

---

Number | Letter
--- | ---
8U | 

odd: Left key, vowel
even: Right key, consonant

---

Number | Letter
--- | ---
9O | 

odd: Left key, vowel
even: Right key, consonant

---

Number | Letter
--- | ---
2A | 

odd: Left key, vowel
even: Right key, consonant

---

Rogers & Monsell (1995)
Task-switching paradigm: measures

AC Measures:
- Shift cost = S RTs - R RTs
- Error rate = overall = S trials = R trials

Switch trial (S)
Repeat trial (R)

Number

Letter

How can AC be operationalized in language?

A person’s ability to shift focus of attention from one language-based attention-directing function to another

(Segalowitz & Frenkiel-Fishman 2005)

Language-based version of the alternating runs paradigm
Example:

Dimension 1: temporal location of events
(a) present: now, shortly, etc.
(b) not present: tomorrow, never, etc.

Mary is coming now / later

Dimension 2: causal connection of events
(a) causal: because, due to, etc.
(b) not causal: however, despite, etc.

John did well in his exams because he studied / despite not studying

Task-switching paradigm: predictable alternating runs

Time

Causality

Segalowitz & Frenkiel-Fishman (2005)

Segmented LEFT KEY Present
Not Causal LEFT KEY Not Present

Task-switching paradigm: predictable alternating runs

Time

Causality

Segalowitz & Frenkiel-Fishman (2005)

Segmented LEFT KEY Present
Not Causal LEFT KEY Not Present

Task-switching paradigm: predictable alternating runs

Time

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Task-switching paradigm: predictable alternating runs

Time

Causality

Segalowitz & Frenkiel-Fishman (2005)

Segmented LEFT KEY Present
Not Causal LEFT KEY Not Present
Segalowitz & Frenkiel-Fishman (2005) Causal Present but Causality

Task-switching paradigm: predictable alternating runs

Time but Causality

but Causality

but Causality

but Causality

later Causality

later Causality

later Causality

later Causality

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never Causality

never Causality

never Causality

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Cognitive ability and L2 speech perception

How can AC be operationalized in speech?

The Present Study

A person’s ability to shift focus of attention from one speech-based attention-directing function to another

No speech-based version of the alternating runs paradigm exists created a new one (Safronova 2011)

Stimuli: 7 Catalan vowels /i e ɛ a œ o u/ short (200ms) / long (500ms)

- Dimension 1: segmental duration short / long (500ms)
- Dimension 2: voice quality male / female

3 Practice blocks = 48 trials; Test block = 224 trials

Auditory feedback ‘beep’ Picture of a ‘loudspeaker’

Attention-shift task

Duration

Short

Long

Quality

Male

Female

Attention-shift task

Duration

Quality

Male

Female

Attention-shift task

Duration

Quality

Male

Female

Attention-shift task

Duration

Quality

Male

Female
**Attention-shift task**

**Measures:**
- Shift Cost = Shift RT (longer) – Repeat RT (shorter)
- Error rates: Overall, Repeat, Shift

**The Present Study: Materials**

- **Vowel Discrimination Task**
  FC AXB Categorial Discrimination Test (Moya-Galé & Mora, 2011)
  - /i/ and /u/ in 6 CVC minimal pairs: /b_d/, /d_d/, /s_d/, /b_t/, /p_k/, /p_t/
  - 6 native English speakers (3 males, 3 females)
  - 72 natural and 72 duration manipulated stimuli
  - Different tokens within trial
  - Different speakers within trial

**Results: AC – bid**

- Male
  - M = 58.35, t(57) = 1.39, p > 0.001
  - Vowel Discrimination Task
    - Error Rate (% ER)
      - NAT: M = 82.79, MAN: M = 73.40 (t(57) = 7.57, p < 0.001)
      - Error Rate (% ER)
        - NAT = 96.35, MAN = 1000

**Attention Control**

- Descriptives N = 58
  - Error Rate (% ER)
    - NAT: M = 82.79, MAN: M = 73.40 (t(57) = 7.57, p < 0.001)
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**Results: Correlations**

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Results: AC

Greater AC may provide learners with an advantage

• in perceptual cue-weighting in L2 speech
• in phonetic training involving backgrounding and foregrounding of L2-specific use of acoustic features

Methodological issues:

• participants focused mainly on accurate performance (feedback, time pressure)

Conclusions

ATTENTION CONTROL
• involved in the processing of L2 speech
• may facilitate target-like cue-weighting
• may explain inter-learner variation in L2 phonological attainment

FUTURE RESEARCH:
• Improve the task (time pressure)
• Proficiency measure
• Other cognitive abilities: E.g. ability for oral mimicry
• Focus on both: L2 speech ability and production

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Pavel Trofimovich
Victor Kravchenko
GRAL research assistants

Thank you!