ATTENTION CONTROL IN STUDY ABROAD CONTEXT: LONGITUDINAL DATA FROM L2 LEARNERS OF SPANISH

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RESEARCH GOALS

1. Discuss **fluency gains** in an overseas immersion context (OIM) in Spain:
   - Temporal variables
   - Hesitation phenomena

2. Advance our knowledge of correlations of fluency and **attention control**
   - **Individual differences** in second language acquisition
PREVIOUS RESEARCH
SECOND LANGUAGE & COGNITIVE ABILITIES

• Cognitive abilities:
  – Processing speed  (Salthouse, 1996)
  – Lexical retrieval  (Segalowitz, 1997)
  – Attention control  (Guion & Pedersen, 2007; Segalowitz, 1997)

→ Not sufficiently understood: how these factors relate to L2 fluency development
OUR L2 FLUENCY MEASURES

• What is fluency?
  – ‘Fluency’ is understood as a primarily temporal phenomenon: not a vague notion of proficiency, but the way speech is processed and articulated in real time (Schmidt, 1992)

• Speed
  – Rate of speech (Syllables per second)

• Hesitations
  – Filled pauses (Seconds between filled pauses)
  – Silent pauses (Seconds between silent pauses)
    • Kang, 2010, D’Amico, 2012
INDIVIDUAL DIFFERENCES AND L2 FLUENCY

• **L2 cognitive fluency** is related to utterance fluency (de Jong et al. 2012)
  – Vocabulary knowledge, retrieval processing speed

• **Phonological memory** is related to L2 oral fluency gains in L2 Spanish (O’Brien et al., 2007)
  – Serial nonword recognition

• **More efficient attention control** is also correlated with greater L2 fluency (Mora & Gilabert, 2012)
  – Trail Making Task
  – But weak correlations

• **Cognitive processing abilities** are related to fluency gains in SA (study abroad) & AH (at home) contexts (Segalowitz & Freed, 2004)
  – Lexical access, attention control
RESEARCH DESIGN
PARTICIPANTS

• **27 learners** of Spanish that participated in an *overseas immersion program* (OIM) in León, Spain through a large Midwestern institution
  – **Highly motivated learners** (between junior and senior year of high school)
  – **Previous Spanish coursework** at the high school level
  – While participating in the current study they did the following:
    • **6 weeks abroad** in Spain and **daily contact** with **native speakers**
    • **Daily classes** of **Spanish** pronunciation, culture, grammar, literature and conversation
    • **Pledge** to a **language commitment** (also known as the “No-English Rule”)

• **29 learners** of Spanish that participated in a traditional **at home (AH)** context at another large Midwestern institution
  – **Grammar and composition**
  – **Previous Spanish coursework** at the high school and college levels
# DEMOGRAPHICS

<table>
<thead>
<tr>
<th>GROUP</th>
<th>SEX</th>
<th>MEAN AGE</th>
<th>MEAN YEARS OF SPANISH INSTRUCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>AH</td>
<td>F=24 M=5</td>
<td>20.76</td>
<td>5.72</td>
</tr>
<tr>
<td>OIM</td>
<td>F=20 M=7</td>
<td>17.04</td>
<td>4.41</td>
</tr>
</tbody>
</table>

## TIME LINE

<table>
<thead>
<tr>
<th>GROUP</th>
<th>TIME 1</th>
<th>TIME 2</th>
<th>TIME 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>AH GROUP</td>
<td>AUGUST 31</td>
<td>OCTOBER 14</td>
<td>NOVEMBER 30</td>
</tr>
<tr>
<td>OIM GROUP</td>
<td>JUNE 9</td>
<td>JUNE 29</td>
<td>JULY 19</td>
</tr>
</tbody>
</table>
ORAL PRODUCTION TASK

- At each data collection time participants watched two videos from the Simons’ Cat collection (by Simon Tofield) and were asked to start retelling them as soon they finished without any pre-planning time.
GROUP RESULTS
ORGANIZATION OF RESULTS

I. LANGUAGE CONTACT PROFILE (SPEAKING)

II. PROFICIENCY TEST

III. FLUENCY ANALYSIS
   a. RATE OF SPEECH
   b. NUMBER OF SECONDS BETWEEN FILLED PAUSES
   c. NUMBER OF SECONDS BETWEEN SILENT PAUSES

IV. ATTENTION CONTROL TASK
ORGANIZATION OF RESULTS
OIM & AH

I. LANGUAGE CONTACT PROFILE (SPEAKING)

II. PROFICIENCY TEST

OIM

III. FLUENCY ANALYSIS
   a. RATE OF SPEECH
   b. NUMBER OF SECONDS BETWEEN FILLED PAUSES
   c. NUMBER OF SECONDS BETWEEN SILENT PAUSES

IV. ATTENTION CONTROL TASK
LANGUAGE CONTACT PROFILE
Self-reported time speaking Spanish

**HOURS PER WEEK**

- **Total time**
- **Other**
- **With service personnel**
- **With strangers**
- **With friends**
- **With instructor**
- **Brief exchanges**
- **With roommate, HF**
- **With NS of Sp**
- **With NNS of Sp**
- **With classmates**

**AH**

- **Other**
- **With service personnel**
- **With strangers**
- **With friends**
- **With instructor**
- **Brief exchanges**
- **With roommate, HF**
- **With NS of Sp**
- **With NNS of Sp**
- **With classmates**

**IM**

- **Other**
- **With service personnel**
- **With strangers**
- **With friends**
- **With instructor**
- **Brief exchanges**
- **With roommate, HF**
- **With NS of Sp**
- **With NNS of Sp**
- **With classmates**

**Notes**

- **HOURS PER WEEK**
- **Total time**
- **Other**
- **With service personnel**
- **With strangers**
- **With friends**
- **With instructor**
- **Brief exchanges**
- **With roommate, HF**
- **With NS of Sp**
- **With NNS of Sp**
- **With classmates**
PROFICIENCY TEST
N=27 N=27 N=29 N=29

IM T1 = 24
AH T1 = 23
T1; IM vs. AH (p=.214)

IM T2 = 32
AH T2 = 24
T2; IM vs. AH (p<.001)

IM; T1 vs. T2 (p=.026)
AH; T1 vs. T2 (p=.046)
FLUENCY
(OIM ONLY)

Development over 6 weeks in Spain
TOTAL SPOKEN TIME

The results of the fluency analyses represent the averages obtained for a total of 6 video retells by 27 participants (162 videos)

<table>
<thead>
<tr>
<th>TIME</th>
<th>VIDEO</th>
<th>1</th>
<th>2</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>60 min.</td>
<td>35 min.</td>
<td>94 min.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>51 min.</td>
<td>67 min.</td>
<td>117 min.</td>
</tr>
<tr>
<td>3</td>
<td>51 min.</td>
<td>67 min.</td>
<td>131 min.</td>
<td></td>
</tr>
</tbody>
</table>

6 HOURS OF TRANSCRIBED RECORDINGS
OIM GROUP, VIDEO RETELL TASK

RATE OF SPEECH

<table>
<thead>
<tr>
<th>Time</th>
<th>Rate of Speech (Syll/Sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time 1</td>
<td>1.54</td>
</tr>
<tr>
<td>Time 2</td>
<td>1.88</td>
</tr>
<tr>
<td>Time 3</td>
<td>2.12</td>
</tr>
</tbody>
</table>

SECONDS BETWEEN SILENT PAUSES

- short pauses
- intermediate pauses
- long pauses

<table>
<thead>
<tr>
<th>Time</th>
<th>Short Pauses</th>
<th>Intermediate Pauses</th>
<th>Long Pauses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time 1</td>
<td>26</td>
<td>28</td>
<td>32</td>
</tr>
<tr>
<td>Time 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SYLLABLES BETWEEN FILLED PAUSES

<table>
<thead>
<tr>
<th>Time</th>
<th>Syllables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time 1</td>
<td>26</td>
</tr>
<tr>
<td>Time 2</td>
<td>28</td>
</tr>
<tr>
<td>Time 3</td>
<td>32</td>
</tr>
</tbody>
</table>

SECONDS BETWEEN FILLED PAUSES

<table>
<thead>
<tr>
<th>Time</th>
<th>Seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time 1</td>
<td></td>
</tr>
<tr>
<td>Time 2</td>
<td></td>
</tr>
<tr>
<td>Time 3</td>
<td></td>
</tr>
</tbody>
</table>

n.s. indicates non-significant differences.
ATTENTION CONTROL

Design of a new task to measure attention control
ATTENTION CONTROL

• Inhibition of L1 and monitoring speech are component of fluent L2 speech
• Attention control is important because it is involved in monitoring speech and selecting input for subsequent processing, and hence, can be related to phonological and fluency development in L2
• Attention control is mainly operationalized as the ability to rapidly shift attention to different levels of linguistic information
  – This needs to be measured in a specific way
PREVIOUS MEASURES OF ATTENTION CONTROL

• Mostly not directly language-related
  – Trail Making Task
    “TMT involves visual search, visual perceptual ability, and motor speed for both Trails A and Trails B; Trail B additionally requires task shifting, planning, working memory, attention, and inhibition (Wodka et al., 2008)” (Bialystok, 2010:95)
  – Switching paradigms (e.g. Rogers & Monsell, 1995)
  – Dimensional Change Card Sort Task (Frye, Zelazo & Palfai, 1995; Bialystok & Martin 2004)
  – Wisconsin Card Sorting Task (Heaton 1981)
  – Metalinguistic categorization task (Segalowitz & Freed, 2004)
OUR TASK: SPEEDED CATEGORY DECISION

• New method to measure attentional control in L1 – auditory analog of the Dimensional Change Card Sort Task (Bialystok & Martin 2004).

• Participants must inhibit attention to a dimension that was previously selected, and refocus on a different aspect of the same stimulus.

• Requires two different types of information to be extracted from the stimulus: lexical vs. indexical.
ATTENTION CONTROL (IN L1)

— Shift attention to a specified dimension of the auditory stimuli (e.g. “Male Voice?” or “Word?”) (stimuli vary in voice and lexical status)

<table>
<thead>
<tr>
<th>Question</th>
<th>Auditory stimulus</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male voice?</td>
<td>word (female)</td>
<td>NO</td>
</tr>
<tr>
<td>Word?</td>
<td>word (male)</td>
<td>YES</td>
</tr>
<tr>
<td>Word?</td>
<td>non-word (male)</td>
<td>NO</td>
</tr>
<tr>
<td>Male voice?</td>
<td>word (female)</td>
<td>NO</td>
</tr>
</tbody>
</table>

— Measure:
  accuracy and latency on Repeat (baseline) vs. Shift conditions
EXAMPLE: 4 TRIALS
Male voice?

no

yes
Word?
Male voice?

no  yes
Participants did the same task at T1 and T3
No significant difference between Times
=> Collapsed means across times
ATTENTION CONTROL: SHIFT COST

„repeat“ (baseline) vs. „shift“ condition

<table>
<thead>
<tr>
<th>Accuracy (%)</th>
<th>Mean Acc</th>
<th>Mean RT</th>
</tr>
</thead>
<tbody>
<tr>
<td>50%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>55%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>65%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>70%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>75%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>80%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>85%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>90%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>95%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Repetition Switching:
t(26) = -5.5, p < .001

t(26) = 5.8, p < .001
INDIVIDUAL VARIATION

Fluency and Attention Control
LARGE VARIATION IN REDUCTION OF SILENT PAUSES

Changes in nb of seconds between silent pauses (T2-T1)

Negative: fewer seconds, more frequent silent pauses
Positive: more seconds, less frequent silent pauses
No relation between Rate of Speech gains and reduction of filled pauses

GAIN IN RATE OF SPEECH (DIFFERENCE SCORE T3-T1)

Change in number of seconds between filled pauses
No relation between Rate of Speech gains and shift cost

GAIN IN RATE OF SPEECH (DIFFERENCE SCORE T3-T1)

Shift Cost (Shift - Repeat)
HIGHER SHIFT COST CORRELATES WITH OVERALL MORE FREQUENT SILENT PAUSES

[T2 nb of seconds between silent pause - T1 nb of seconds between silent pauses]

Positive = fewer silent pauses; Negative = more silent pauses
Higher shift cost is related to more hesitations (shorter distance, fewer seconds between pauses)

### CORRELATIONS

<table>
<thead>
<tr>
<th></th>
<th>Distance between short silent pauses (T2-T1)</th>
<th>Distance between Intermediate silent pauses (T2-T1)</th>
<th>Distance between Intermediate silent pauses (T2-T1)</th>
<th>Distance between filled pauses (T3-T1)</th>
<th>Distance between filled pauses (T2-T1)</th>
<th>Gain in Rate of Speech (T3-T1)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean Shift Cost (T1T2)</strong></td>
<td>Pearson Correlation</td>
<td>.208</td>
<td>-.351</td>
<td>-.104</td>
<td>-.234</td>
<td>-.205</td>
</tr>
<tr>
<td></td>
<td>Sig. (1-tailed)</td>
<td>.159</td>
<td>.043</td>
<td>.310</td>
<td>.130</td>
<td>.163</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td><strong>Mean Shift Cost ratio (T1T2)</strong></td>
<td>Pearson Correlation</td>
<td>.200</td>
<td>-.385</td>
<td>-.085</td>
<td>-.247</td>
<td>-.223</td>
</tr>
<tr>
<td></td>
<td>Sig. (1-tailed)</td>
<td>.169</td>
<td>.029</td>
<td>.343</td>
<td>.117</td>
<td>.143</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td><strong>Mean RT Repeat</strong></td>
<td>Pearson Correlation</td>
<td>.002</td>
<td>-.188</td>
<td>.098</td>
<td>-.190</td>
<td>-.147</td>
</tr>
<tr>
<td></td>
<td>Sig. (1-tailed)</td>
<td>.497</td>
<td>.184</td>
<td>.321</td>
<td>.181</td>
<td>.241</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td><strong>Mean RT Shift</strong></td>
<td>Pearson Correlation</td>
<td>.110</td>
<td>-.365</td>
<td>.039</td>
<td>-.305</td>
<td>-.249</td>
</tr>
<tr>
<td></td>
<td>Sig. (1-tailed)</td>
<td>.300</td>
<td>.036</td>
<td>.426</td>
<td>.069</td>
<td>.115</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
</tbody>
</table>

Higher RT is related to more hesitations (shorter distance, fewer seconds between pauses)
DISCUSSION & CONCLUSION
MAJOR FINDINGS

• PROFICIENCY
  – IM learners improved more than AH learners

• FLUENCY
  – Fluency gains were visible for all IM learners
    • Rate of Speech and Hesitations

• ATTENTION
  – Our task is successful at measuring attention control
  – Stable over time
  – But correlations with fluency measures were not the strongest
CONCLUSION

• Correlations
  – Our findings expand previous findings about the relationship of attention control and L2 fluency (Mora and Gilabert, 2012)

• Attention control tasks must be understood better
  • Task effects
  • Speech-specific attention vs. general attention?

• More work to be done to understand its relationship with various aspects of L2 acquisition
  • Fluency vs. Proficiency
  • Phonology / pronunciation
  • Production vs. Perception
THANK YOU!