

Examining the effect of phonological memory on non-native speech perception in an online research setting

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LabPhon18: Phonology in a Rapidly Changing World
Changes in Space: Online Experimentation Thematic Session

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Background


- In a rapidly changing and increasingly socially distant world, previously laboratory-based research is moving online

Main Research question	Can findings from a previous laboratory-based speech perception study be replicated in an online data collection environment?
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- The present study aims to bolster findings from a previous study (Inceoglu, 2019) that investigated the role of **phonological short-term memory (PSTM)** in **second language (L2) speech perception**

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Original study (Inceoglu, 2019)

 **The Modern Language Journal**

Individual Differences in L2 Speech Perception: The Role of Phonological Memory and Lipreading Ability

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Research Question	How is the perception of L2 French nasal vowels related to individual differences in phonological short-term memory?
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Original Study (Inceoglu, 2019)

Participants

- 32 native speakers of English (5 male, 27 female; mean age 30 years old) enrolled in undergraduate French courses at a large Australian university
- Intermediate proficiency in French; mean age of onset of French learning: 14.42 years (range 10-19 years)

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Original Study (Inceoglu, 2019)

Materials and Procedures

L2 French vowel identification task

- 108 CVC items with one of three French nasal vowels: /ɔ̃/, /ɑ̃/, or /ɛ̃/
- Initial and final consonants were evenly distributed between place and manner of articulation (six items per place/manner= 108 stimuli total)
 - e.g. *pompe* [pɔ̃p] and *singe* [sɛ̃ʒ]
- Participants were presented a stimulus aurally and were asked to identify which French nasal vowel it contained (represented orthographically as “on,” “an,” and “un”)

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Original Study (Inceoglu, 2019)

Materials and Procedures

Non-word repetition task stimuli (PSTM)

- Participants heard 16 pairs of English nonwords that varied in syllable length from three to eight syllables (e.g. pondomicious/najistery)
- After each pair was presented aurally, there was a two-second tone-filled delay and participants repeated each pair

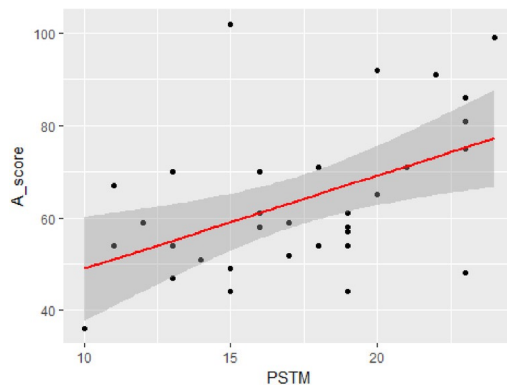
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Original Study (Inceoglu, 2019)

Results

- Simple linear regression
- **Dependent variable:** Vowel identification task score (% correct)
- **Independent variable:** Non-word repetition task score (one point awarded per pair with no more than one incorrect syllable)
- **Participants with higher PSTM had significantly higher scores in the identification task** [$F(1,30) = 9.23, p = .004$]



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Replication Study

Participants

- 32 native speakers of American English (12 male, 20 female; mean age 33.93 years old) recruited on Prolific
- Prior to participating in the main study, participants who indicated via Prolific that they had knowledge of French and were native speakers of American English were invited to complete a short language background questionnaire and the LexTALE-FR (Brysbaert, 2013)
 - Participants who scored in the 49th percentile or higher on the LexTALE-FR were invited to complete the main study
 - High intermediate/advanced proficiency; mean age of onset of French learning: 12.54 years (range 5-23 years)

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Replication Study

Materials and Procedures

- All materials were designed using Gorilla Experiment Builder

Headphone screener

- Participants completed a short headphone screener based on dichotic pitch to ensure the use of headphones (Woods et al., 2017)

L2 French vowel identification task

- Stimuli recorded by a native speaker of French (female; 31 years old)
- All materials and procedures were identical to the original study
- Prior to completing the experimental task, participants completed a short practice task

Non-word repetition task stimuli (PSTM)

- All materials and procedures were identical to the original study
- Prior to completing the experimental task, participants completed a short practice task

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Replication study methods

Analysis

- Linear mixed effects model (lme4 function in R)
- **Dependent variable:** Vowel identification task score (% correct)
- **Fixed effects:** Non-word repetition task score (one point awarded per pair with no more than one incorrect syllable)
- **Random effects:** Subject and Item (random intercepts)

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Main differences between the original study and the replication study

Difference	Justification
Data was collected online using Prolific	Main goal of study was to investigate if previously laboratory speech perception research could be replicated online
Variety of English spoken by participants was different	Current study collected data from native speakers of American English (rather than Australian English) due to restrictions in Prolific's participant pool (~25 active participants on Prolific who were native speakers of Australian English and spoke French as an L2)
L2 proficiency level was higher	The threshold of L2 proficiency levels in the present study had to be wider and higher due to availability of participants on Prolific
No lip-reading data collected	Replicating lip-reading portion would have significantly lengthened experiment time, likely leading to a larger drop-out rate and lower quality data in an online setting (Finley & Penningroth, 2015)

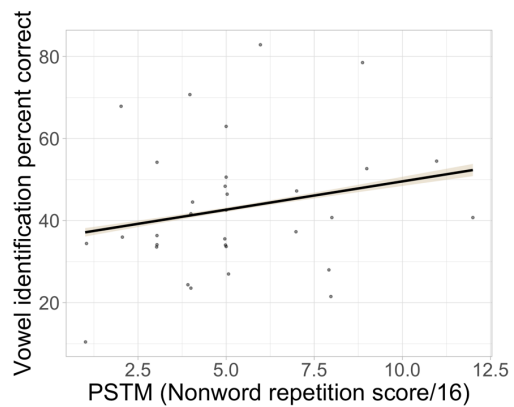
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Replication Study

Results

- Participants who **scored higher on the nonword repetition task** (indicative of higher phonological short-term memory) **were significantly more likely to have higher scores on the vowel identification task** than those with lower PSTM [$t = 5.75$; $p < 0.001$]



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Replication Study

Results

Descriptive statistics: L2 French vowel identification task

	Original study	Replication study
Mean	59.00	42.99
SD	15.35	16.73
Max	Not provided	83.33
Min	Not provided	10.19

Descriptive statistics: Non-word repetition task

	Original study	Replication study
Mean	54.09	33.19
SD	12.41	16.59
Max	75.00	75.00
Min	31.25	6.25

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Discussion

- Descriptive statistics indicate considerably lower scores for both tasks (L2 French vowel identification task and non-word repetition task) in the replication study when compared to the original study
 - Online environment is not as good as a lab?
 - Lower quality headphones, more distractions (crying child, lawn mowing, etc.), less committed to paying attention
 - Stimuli were not as acoustically salient?
 - Native French speaker in the replication study has spent a considerable amount of time in the United States and may as “clean” of nasal vowels as the original speaker
 - Replication study participants had lower proficiency than original study participants despite the LexTALE-FR indicating otherwise
 - Replication study participants were not currently enrolled in French classes

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Discussion

- As in Inceoglu (2019), **high PSTM significantly predicted success in L2 speech perception**- L2 learners with higher PSTM were significantly more target-like than those with low PSTM scores
 - PSTM capacity may encourage establishment of novel phonological material and phonetic features into stable, long-term mental representations (Inceoglu, 2019)
 - The phonological loop plays a direct role in the acquisition of L2 speech sounds (Baddeley, Gathercole, & Papagno, 1998)
- Results from Inceoglu (2019) were replicated, providing greater support for the role of PSTM in L2 speech perception

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Discussion

Major take-away

Results from Inceoglu (2019) were replicated despite the switch from in-person to online data collection, ultimately providing support for the efficacy of online L2 speech research

- This finding is crucial as research begins to adjust to accommodate a more technologically advanced and socially distant world

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Thank you!

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