Using naturalistic and engaging tasks to measure phonetic convergence

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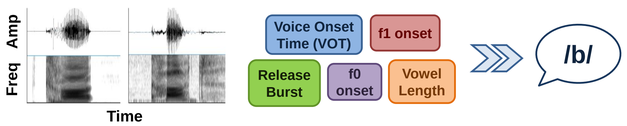
INTRODUCTION

Acoustic cues and phonetic categories



Listeners map cues onto phonetic categories

However, cues are variable and context-dependent

Convergence

Interlocutors often show increased similarity in phonetic cues during conversational speech (**phonetic convergence**)

Extent to which talkers converge is affected by a number of factors (Bradlow & Bent, 2008; Pardo, 2006) and may be difficult to measure using laboratory tasks (Olmstead, Viswanathan, Aivar, & Manuel, 2013)

More engaging tasks have been found to have an effect on language production (Toscano, Buxó-Lugo, & Watson, 2015)

Natural Setting	Laboratory Setting
• Conversational partner	• Lack of interlocutor
• Less control	• More control
• Highly engaging	• Typically boring

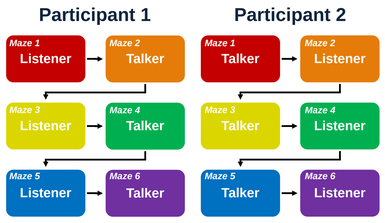
Question:
Do we find evidence for convergence in a more engaging experimental task?

METHOD

Stimuli (subset)

	Voiced	Voiceless
Velar	got	cot
	goat	coat
	ghost	coast
Alveolar	dent	tent
	dip	tip
	dart	tart
Bilabial	bat	pat
	bear	pear
	bark	park

Procedure



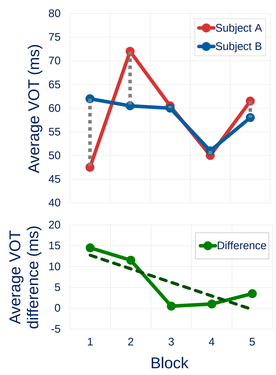
Participants solved puzzles in the computer game Minecraft

30 word-initial voicing minimal pairs provided key information that interlocutors had to provide to each other

Measured degree to which VOT values converged over the course of the one hour experiment

RESULTS

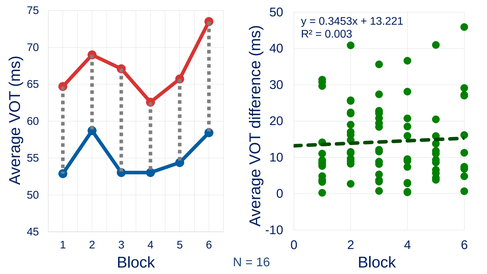
1. Analysis Approach



2. Patterns of VOT Change

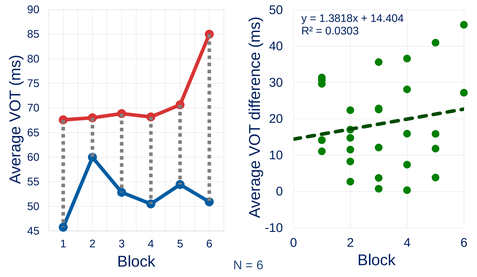
Overall

Convergence was not observed overall for the pairs
Note, some participants did not complete all six blocks



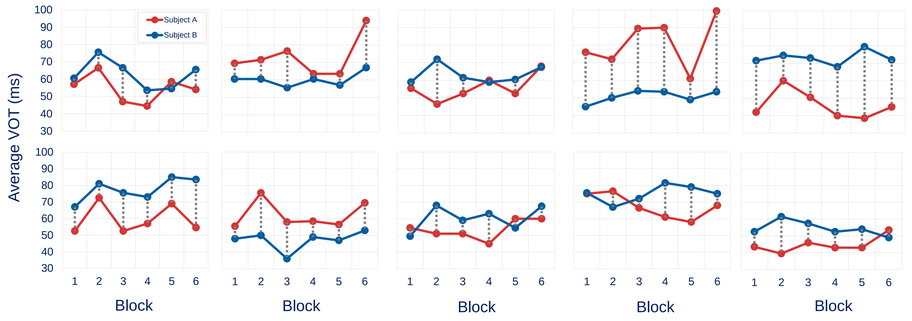
Pairs with different initial VOTs

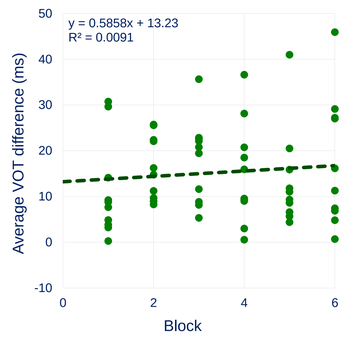
Convergence was not observed overall for pairs who started with a larger initial VOT difference (>10 ms)



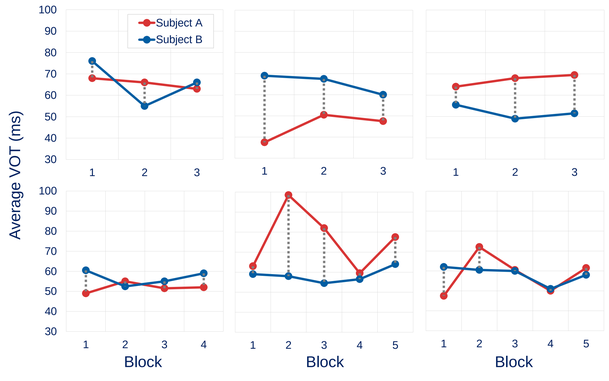
3. Effect of Task Difficulty (Time to Completion)

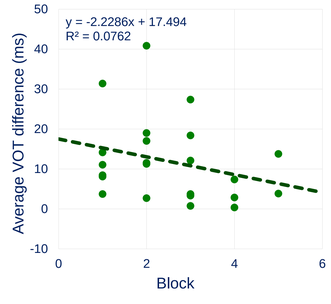
Participants completing all six blocks in one hour



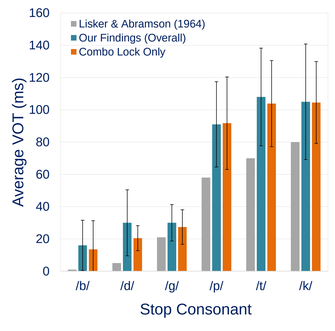


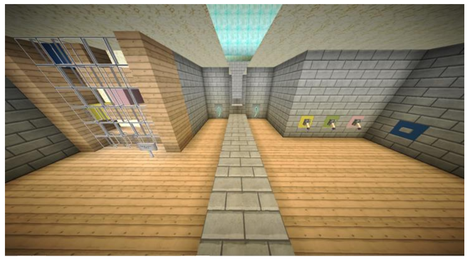
Participants with longer times per block





4. VOT Distributions





DISCUSSION

Summary of Results

Some subjects showed phonetic convergence in this task

Overall, subjects who took longer to complete the task converged more, whereas subjects who completed the experiment more quickly were less likely to converge

We also examined the overall distribution of VOT values, comparing them with previous measures for English (Lisker & Abramson, 1964). Mean VOT values for voiced and voiceless stops were longer than what has been previously reported (voiced VOT: 25 ms; voiceless VOT: 101 ms). Lexical-level factors (Baese-Berk & Goldrick, 2009) and task difficulty (Schertz, 2013) could contribute to these differences

Conclusions

Though more data is needed, these preliminary results suggest that engaging, naturalistic tasks may yield results that more accurately reflect real-world phonetic variation than traditional laboratory experiments.

Future Directions

Future studies will give more time for task completion and compare convergence findings from the Minecraft task to findings from a more traditional experimental task.

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References

Baese-Berk, M., & Goldrick, M. (2009). Mechanisms of interaction in speech production. Language and cognitive processes, 24(4), 527-554.

Bradlow, A. R., & Bent, T. (2008). Perceptual adaptation to non-native speech. *Cognition*, *106*, 707-29.

Lisker, L., & Abramson, A. S. (1964). A cross-language study of voicing in initial stops: Acoustical measurements. *Word, 20*, 384-422.

Olmstead, A. J., Viswanathan, N., Aivar, M. P., & Manuel, S. (2013). Comparison of native and non-native phone imitation by English and Spanish speakers. *Frontiers in psychology*, *4*.

Pardo, J.S. (2006). On phonetic convergence during conversational interaction. *Journal of the Acoustical Society of America, 119*, 2382-93.

Schertz, J. (2013). Exaggeration of featural contrasts in clarifications of misheard speech in English. Journal of Phonetics, 41(3), 249-263.

Toscano, J.C., Buxó-Lugo, A., & Watson, D.G. (2015). Using game-based approaches to increase level of engagement in research and education. In *TeacherCraft* (pp. 139-151). ETC Press.