



Krystal Duchi  
kduchi@kent.edu

Alison Kristoff  
akristo1@kent.edu

Schea Fissel  
sfissel@kent.edu

Jennifer Roche  
jroche3@kent.edu

## Background

- **Confidence carries social-communicative utility** for both speakers and listeners [1] [4] [5] [7]
- We perceive, extract and make decisions about confidence both in the moment, and continuously after the decision is made [2]
- Speakers are likely able to adaptively **modify acoustic behaviors to achieve social-pragmatic goals** — e.g., knowing when to *fake it* [3] [6] [8]
- It is expressed most saliently by vocal cues during speech production [3] [8] — yet the acoustic properties of confidence and its effect on listener comprehension have yet to be identified

### Hypothesis

- Expression of confidence cues are modified to achieve social pragmatic goals — e.g., to fake it
- Listeners should be able to detect speaker confidence if the speaker produces relevant cues

## Production Study: N = 17

- **Social vs No Social Pressure** (btwn sub)
- **85 questions** (ICC = .83)
- **Acoustic Measures:** speaking duration, dB range, dB and pitch slope (i.e., rising intonation)
- **Confidence rating** (dv) = x coordinate (x-axis pixels) of the confidence rating scale (see Fig. 1)
- **Question Difficulty** (dv) = Easy, Moderate, Hard

## Comprehension Study: N = 14

- **Question vs. No Question** (btwn sub)
- **12 (of the 85) Questions x 13 Talkers** (156 trials) — from the production study
- **Standardized Confidence Difference** (dv) = Speaker x-coord / Mean x-coord (per question)

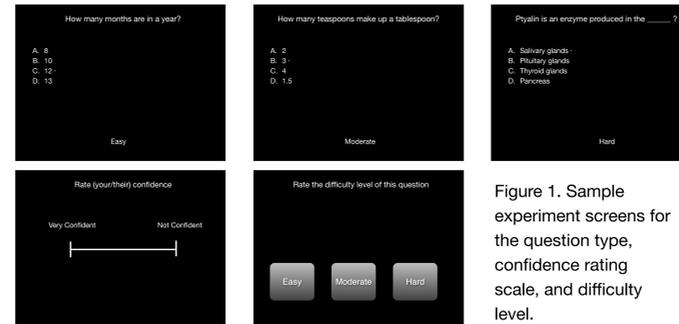


Figure 1. Sample experiment screens for the question type, confidence rating scale, and difficulty level.

## Production Study (results)

- **Question Accuracy:** ( $\beta = -2.9$ ,  $se = 0.8$ ,  $t = -3.4$ ,  $p < .001$ )
- **Linear Regression:** ( $R^2 = .42$ ,  $F(19, 136) = 5.3$ ,  $p < .001$ )

Table 1  
Unstandardized estimates, standard errors, t, p values, and semi-partial for significant regression effects.

Predictor	b	se	t	sr
dB range	3.3	1.5	2.2*	.03
speaking duration	159.9	47.4	3.3**	.08
pitch slope	100.2	15.7	6.4***	.23
Social Pressure x speaking duration	255.4	99.2	2.6*	.05
Social Pressure x Question	-198.1	91.3	-2.2*	.03
Difficulty x pitch slope				

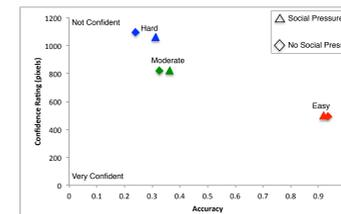


Figure 2. Confidence rating as a function of perceived question difficulty by Social Pressure Condition.

## Comprehension Study (results)

- **Mixed Random Effects:** maximal random effects structure
- Social Pressure, Question Presence, Accuracy, Acoustics

Table 2  
Unstandardized estimates, standard errors, t, and p values for significant fixed effects.

Effect Type	Effect	b	se	t
Main Effect	Pitch Slope	-0.022	0.009	-2.217*
	Speaking Duration	0.103	0.025	4.079**
	Amplitude Range	0.001	0.001	2.358*
2-way Interaction	QP x QD	0.119	0.0385	3.117**
	Acc x Pitch Slope	-0.041	0.0171	-2.391*
	SPC x Pitch Slope	0.042	0.0195	2.142*
3-way Interaction	Acc x QP x Pitch Slope	0.062	0.0315	1.968*
	Acc x SPC x Pitch Slope	0.085	0.0341	2.499**
	Acc x SPC x Speaking Duration	-0.339	0.074	-4.576**
	Acc x SPC x Amplitude Range	-0.006	0.002	-3.064**
	SPC x QD x Amplitude Range	0.005	0.002	2.018*

dB slope not included in analysis — not a significant predictor in production study model

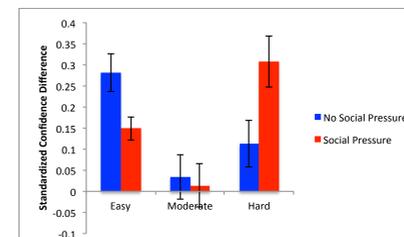


Figure 3. Standardized difference in confidence ratings between speaker and listener by Social Pressure condition and speaker perceived question difficulty.

## Discussion

### Production Study

- Social factors and knowledge affect how speakers produce confidence
  - Pitch slope (rising intonation) was the strongest predictor of uncertainty
  - Speakers adaptively dampened pitch slope to indicate more confidence under social pressure

### Comprehension Study

- Listeners reliably perceived and made decisions about speaker confidence on vocal cues
  - Listeners had more difficulty processing speaker vocal cues of confidence in the social pressure condition

### General Conclusions

- Speakers may adaptively modify and control vocal cues to express metacognitive judgements of confidence under social pressure
- Which effects the way a listener hears it — *So, no. They can't tell you are faking it, unless you want them to*

## References

1. Ellsworth, P. C. (2013). Appraisal theory: Old and new questions. *Emotion Review*, 5(2), 125–131. doi: 10.1177/1754073912463617.
2. Griffin, D., & Tversky, A. (1992). The weighing of evidence and the determinants of confidence. *Cognitive Psychology*, 24(3), 411–435. doi: 10.1016/0010-0285(92)90013-R.
3. Jiang, X., & Pell, M. D. (2015). On how the brain decodes vocal cues about speaker confidence. *Cortex*, (July). doi: 10.1016/j.cortex.2015.02.002
4. Kennedy, J. A., Anderson, C., & Moore, D. A. (2013). When overconfidence is revealed to others: Testing the status-enhancement theory of overconfidence. *Organizational Behavior and Human Decision Processes*, 122(2), 266–279. doi: 10.1016/j.obhdp.2013.08.005.
5. Kruger, J., Dunning, D. (1999). Unskilled and unaware of it: How difficulties in recognizing one's own incompetence lead to inflated self-assessment. *Journal of Personality and Social Psychology*, 77(6), 1121–1134
6. Lempert, K. M., Chen, Y. L., & Fleming, S. M. (2015). Relating pupil dilation and metacognitive confidence during auditory decision-making. *Plos One*, 10(5), e0126588. doi: 10.1371/journal.pone.0126588.
7. Moscovitch, D. A., Rodebaugh, T. L., & Hesch, B. D. (2012). How awkward! Social anxiety and the perceived consequences of social blunders. *Behaviour Research and Therapy*, 50(2), 142–149. doi: 10.1016/j.brat.2011.11.002.
8. Schroeder, J., & Epley, N. (2015). The sound of intellect: Speech reveals a thoughtful mind, increasing a job candidate's appeal. *Psychological Science*, 26(6), 877–891. doi: 10.1177/0956797615572906

### Acknowledgments

A special thanks goes to all the MADL Lab research assistants and indispensable feedback from Hayley Arnold, Jason Whitfield, and Julia Huyck.