Assessing how adults produce and understand the melody and rhythm of speech in English

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Introduction

Prosody is the melody and rhythm of speech which is vital in understanding language and diagnosing certain speech disorders ([1]).

Features	Definition
Speech Melody	Intonation (e.g., rising & falling pitch)
Phrasing	Creates units within spoken language
Rhythm	Timing, syllables, and stress
Tempo	Speed & rate of speech
Lexical Stress	Emphasis placed on a particular syllable
Affect	Emotion, like or dislike, sarcasm, irony

Strong need for a clinical tool to analyze prosodic features as it is a principal factor in determining a delay or disorder ([2]).

Few prosodic assessments exist:

- Prosody-Voice Screening Profile (**PVSP**)
- Prosody Profile (**PROP**)
  - PVSP & PROP: limited normative data & lack receptive analysis ([2], [4])
- Profiling Elements of Prosody in Speech-Communication (**PEPS-C**)
  - Assesses 7 prosodic abilities
  - Understanding & expression tasks
  - *Populations studied*: children and adults who are typically developing and those with ASD, Williams syndrome, SLI, and other communication difficulties ([5], [6]).

Study Aims

- **Aim 1:** To examine the **expressive and receptive prosodic abilities** in adults when assessed by the PEPS-C.

  Hypothesis 1: PEPS-C will provide data concerning prosodic function and form and identify areas of difficulty.

- **Aim 2:** To explore the **effectiveness of the PEPS-C assessment** when administered to a neurotypical adult population.

  Hypothesis 2: While the test claims that adults should score within a typical range, I hypothesize that specific tasks may lack ecological validity and show scores that are lower than actual ability level (e.g., lexical stress).

PEPS-C Task of Interest	Example
Lexical Stress	REcord (noun) VS reCORD (verb)
Phrase Stress	bull's eye VS bullseye
Boundary	chocolate cake & milk VS chocolate, cake, & milk
Contrastive Stress	GREEN cow VS green COW

Methods

Participants

- No current speech/language deficits
- Native speakers of American English
- 18 + years of age
- Normal or corrected-to-normal vision/hearing
- 23 participants (22 f, 1 m)

Procedure

- Consent & demographic forms
- Audiogram & vision screening
- PEPS-C (v2015) administration
  - Vocabulary & image check
  - 14 tasks (7 understanding, 7 expression)
- Follow up survey to gather data about experience

Example Expression Tasks

IMprint (noun) *or* *imPRINT* (verb)

Lexical Stress Task

Prompt: The blue cow has the ball.
→ *The GREEN cow has the ball*

Contrastive Stress Task

Analysis

- Automatically scored PEPS-C
- Audio recorded for reliability testing and follow up acoustic analyses
- All expression tasks spliced and labeled in Praat acoustic software

Example Receptive Tasks

bull's eye	**bullseye**
'bull's eye', the eye of a bull	*'bullseye', the center of a target*

Phrase Stress Task

chicken fingers, and fruit *vs.* *chicken, fingers, and fruit*

Boundary Task - Receptive

Discussion

- Importance of developing a prosodic assessment that best captures prosodic ability across domains.
- Results from an adult population indicate that one area of focus for future adaptation may be lexical stress receptive and expressive tasks as they were significantly different in comparison to the performances of the phrase, boundary, and contrastive stress tasks.
- **Future Directions**: Conduct acoustic analysis of expressive tasks.
- **Limitations:** COVID-19 impact on data collection; potential administrator bias.

Broader Impact:

- Informs our understanding of how the PEPS-C could be used as a diagnostic tool for adults and children.
- Improvement of prosodic assessments for future diagnosis of specific speech or language differences.

Acknowledgements & References

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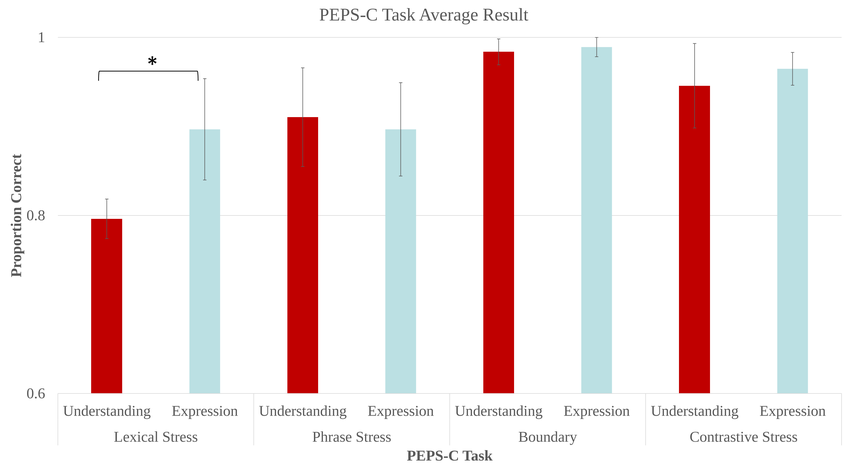
[1] Thorson, J. C. (2019). Prosody. *The SAGE Encyclopedia of Human Communication Sciences and Disorders*, 1489–1491. **[2] McSweeny, J. L., & Shriberg, L. D.** (2001). Clinical research with the prosody-voice screening profile. *Clinical Linguistics & Phonetics, 15*(7), 505–528. **[3] Terzi, A., Marinis, T., & Francis, K.** (2016). The interface of syntax with pragmatics and prosody in children with autism spectrum disorders. *Journal of Autism and Developmental Disorders, 46*(8), 2692–2706. **[4] Diehl, J. J., & Paul, R.** (2009). The assessment and treatment of prosodic disorders and neurological theories of prosody. *International Journal of Speech-Language Pathology, 11*(4), 287–292. **[5] Peppé, S., & McCann, J.** (2003). Assessing intonation and prosody in children with atypical language development: The PEPS-C test and the revised version. *Clinical Linguistics & Phonetics, 17*(4–5), 345–354. **[6] Wells, B., & Peppe, S.** (2003). Intonation abilities of children with speech and language impairments. *Journal of Speech, Language, and Hearing Research, 46*(1), 5–20. **[7] Peppé, S.** (2015). *PEPS-C: a test of prosodic ability*. PEPS-C. http://www.peps-c.com/peps-c-2015.html

Results

- Independent Variables: *Task* (lexical stress, boundary, etc.) and *Response* (expressive or receptive)
- Dependent Variable: Proportion correct

➢ Two-way repeated measures ANOVA:
- Significant task by response interaction $F(3,66) = 6.632$, $p = .001$



➢ Simple main effects for task & response:
- *Understanding* tasks were performed with significantly less accuracy in comparison to *expression* tasks
- *Boundary* tasks had the highest accuracy followed by *contrastive*, *phrase*, and then *lexical stress*
- All expressive comparisons were significant except *phrase* vs *contrastive stress*
- *Lexical stress* understanding showed significantly worse performance than expressive
- Lowest performing task was *lexical stress understanding*

Task:

Pairwise Comparisons: **Expression**	Mean Difference	*p*
Lexical vs Phrase	.000 95% CI [-.090 to .090]	1
Lexical vs Boundary	-.092 95% CI [-.160 to -.025]	**.004**
Lexical vs Contrastive	-.068 95% CI [-.120 to -.016]	**.006**
Phrase vs Boundary	-.092 95% CI [-.167 to -.018]	**.010**
Phrase vs Contrastive	-.068 95% CI [-.167 to .031]	.350
Boundary vs Contrastive	.024 95% CI [-.026 to .075]	1

Pairwise Comparisons: **Understanding**	Mean Difference	*p*
Lexical vs Phrase	-.114 95% CI [0.200 to -.028]	**.005**
Lexical vs Boundary	-.187 95% CI [-.270 to -.105]	**.000**
Lexical vs Contrastive	-.149 95% CI [-.227 to -.072]	**.000**
Phrase vs Boundary	-.073 95% CI [-.134 to -.012]	**.012**
Phrase vs Contrastive	-.035 95% CI [-.098 to .027]	.684
Boundary vs Contrastive	.038 95% CI [.008 to .068]	**.007**

Response:

Pairwise Comparison	Mean Difference	*p*
Lexical Understanding vs Expression	-.101 95% CI [-.155 to -.046]	**.001**
Phrase Understanding vs Expression	.014 95% CI [-.055 to .082]	.685
Boundary Understanding vs Expression	-.005 95% CI [-.023 to .013]	.539
Contrastive Understanding vs Expression	-.019 95% CI [-.062 to .024]	.374