



Prosodic Assessment of Language and Speech

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Introduction

Prosody refers to the rhythmic and melodic patterns of speech. Impairments in prosody are a major characteristic of many speech disorders ([1]).

- Primary components of linguistic prosody are **lexical stress**, phrasing distinctions, rhythm, tempo, phrase-level accentuation, and intonation ([2]).
- In English, there is variation in emphasis on syllables in a word which results in stressed (primary and secondary) and unstressed (tertiary) syllables (also known as strong and weak syllables) ([3]).

Type	Definition	Examples
Trochaic	1 st syllable stress	chicken, turtle, REcord
Iambic	2 nd syllable stress	giraffe, canoe, reCORD

Psychometrics are used to determine what an assessment is measuring (construct validity), if the testing is reliable (inter-rater/intra-rater reliability), and how to interpret those results ([4]).

There is a gap in the clinical use of prosodic information due to the lack of a valid and reliable assessment.

Psychometrics of most used prosodic assessments:

- Prosody-Voice Screening Profile (**PVSP**) ([5])
 - Pros: 7 characteristics of prosody assessed, expected group differences and reliability statistics listed
 - Limitations: Assesses only expressive prosody, extensive time and knowledge needed to code speech samples, limited psychometric information
- Profiling Elements of Prosody in Speech-Communication (**PEPS-C**) ([6])
 - Pros: Assesses 7 prosodic abilities, receptive & expressive tasks, automatic scoring for receptive tasks
 - Cons: No psychometric information on most recent version for American-English speakers, typical adults scored in the atypical range on receptive lexical stress task ([7]).

Study Aims

- **Aim 1:** To develop naturalistic lexical stress tasks and measure the expressive and receptive performance of neurotypical adults.
- **Aim 2:** To assess if performance on more naturalistic prosodic tasks provide a more accurate representation of an individual's lexical stress ability in comparison to the existing prosodic assessment, PEPS-C.
- **Hypothesis:** It is hypothesized that participants will perform more accurately on the naturalistic lexical stress tasks created in this study than the lexical stress tasks on the PEPS-C assessment.

Method

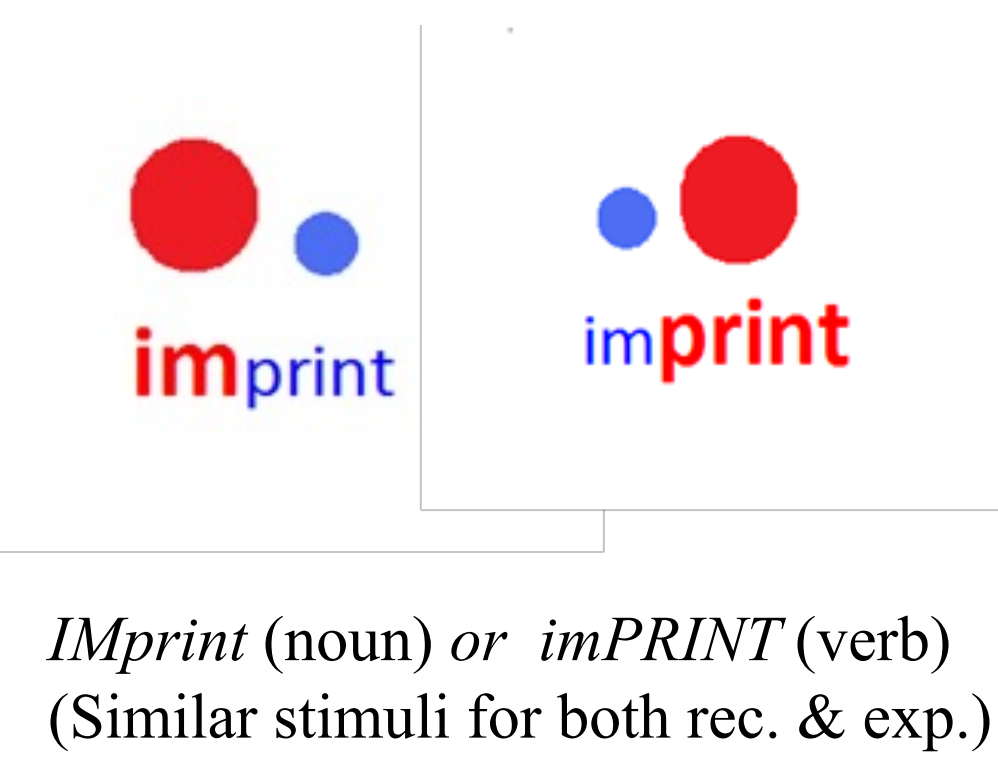
Participants

- No current speech/language deficits
- Native speakers of American English
- 18 + years of age
- Normal or corrected-to-normal vision and hearing
- 41 participants (32 f, 9 m)

Procedure

- Consent & demographic forms
- Audiogram & vision screening
- PEPS-C (v2015) administration
 - Vocabulary & image check
 - 4 tasks (2 receptive, 2 expressive)
- PALS administration
 - Vocabulary and image check
 - 2 tasks (1 receptive, 1 expressive)

Lexical Stress PEPS-C Tasks



Lexical Stress PALS Receptive Task

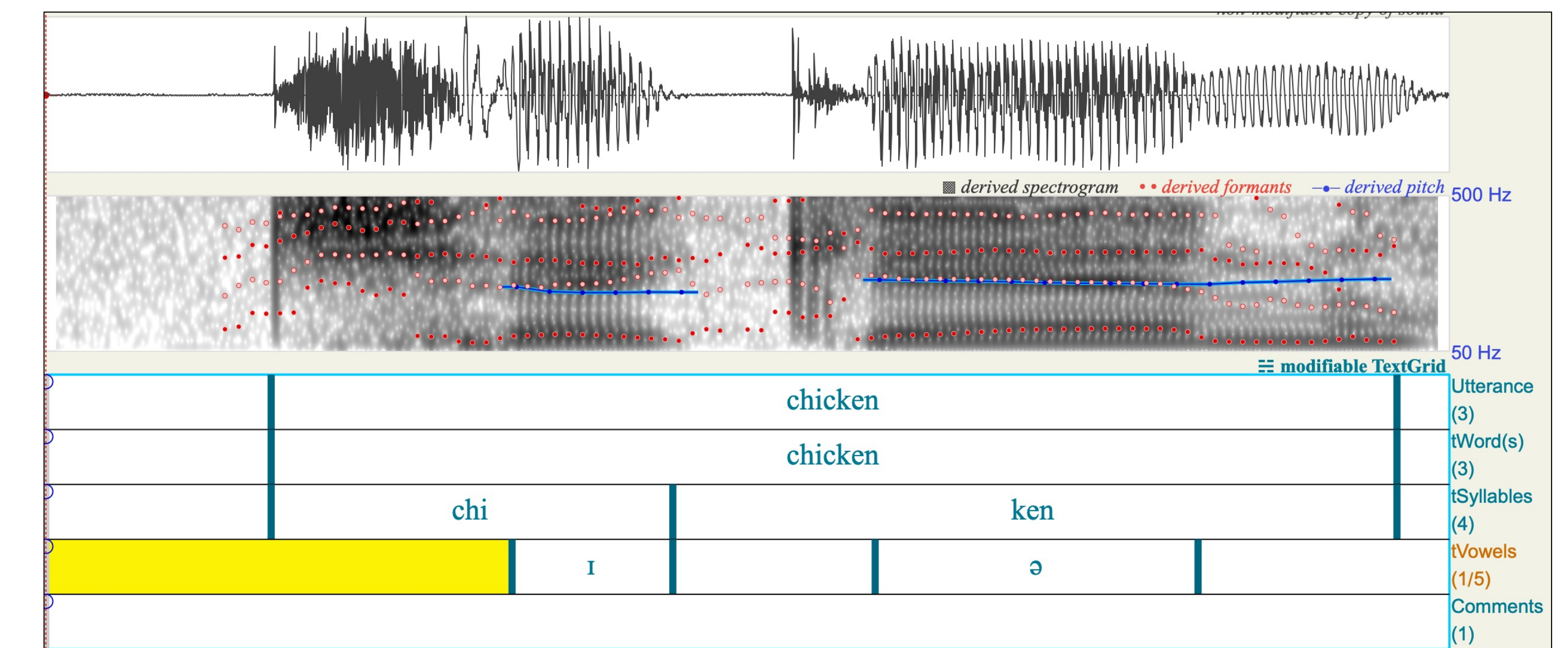


Lexical Stress PALS Expressive Task



Analyses

- Automatically scored receptive PEPS-C task
- Perceptually scored receptive and expressive PALS tasks
- Audio recorded for reliability and acoustic analysis expressive tasks of PEPS-C and PALS
- All lexical stress expression tasks were spliced, segmented, and coded in Praat acoustic software
- Statistical analyses completed using R included:
 - PVI of duration, intensity, and f0 using vowels
 - Logistic regression model to predict lexical stress
 - Statical significance using Wilcoxon Signed Rank Test
 - Internal consistency using Kuder-Richardson Formula 20
 - Intra and inter-rater reliability with 25% of the expressive scoring



Results

Performance on Expressive Tasks

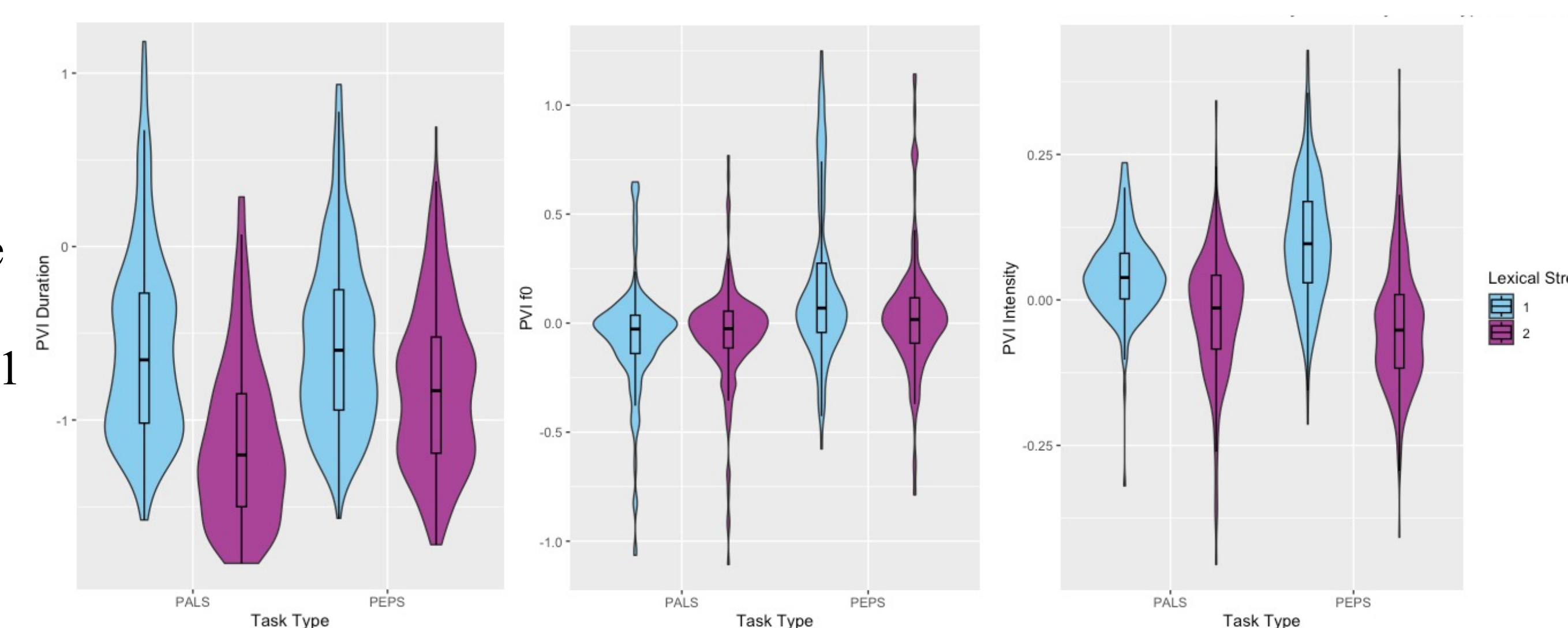
	PEPS-C	PALS	Sig.
Acoustic	M = 0.767	M = 0.686	0.027*
Perceptual	M = 0.847	M = 0.995	< 0.001***
Sig.	< 0.001***	< 0.001***	

Performance on Receptive Tasks

	PEPS-C	PALS	Sig.
Perceptual	0.759	0.983	< 0.001***

- Independent Variables: Assessment (PALS or PEPS-C) and Task (Receptive or Expressive)
- Dependent Variables: Correct or incorrect, and PVI values (*duration, intensity, f0*)
- Simple main effects for task & response:
 - Participants perceptually scored higher on both the receptive and expressive PALS tasks in comparison to the PEPS-C tasks.
 - Participants acoustically scored better on the PEPS-C task in comparison to the PALS task.

Distribution of PVI Values by Task Type and Lexical Stress



- Intra-rater & inter-rater reliability on 25% of the scoring:
- $\kappa = 0.905, p < 0.0001$

Discussion

- The need for a valid, reliable, and functional prosodic assessment that assesses both expressive and receptive abilities.
- Results from an adult population indicate that a more naturalistic prosodic assessment (PALS) provided more accurate data on ability. However, there are discrepancies in the values obtained from acoustic and perceptual scoring.
- **Future Directions:** Conduct assessment with other populations (e.g., children, AOS), include more variables in regression model and add additional tasks that are scored both acoustically and perceptually.
- **Limitations:** Convenience sampling which resulted in limited diversity with participants.

Broader Impact & Clinical Significance

- Improvement of the development and use of prosodic assessments.
- Informs clinicians and researchers surrounding the lack of psychometrics included in prosodic assessments.
- Lexical stress is a diagnostic feature for many speech disorders, and gaining knowledge in how to properly assess this area will improve assessment and support evidence-based practice.

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