Assessing Prosody in European Portuguese for ages above 4

The Profiling Elements of Prosody in Speech-Communication (PEPS-C)

Marisa Filipe[1,2], Sónia Frota[1], Selene Vicente[2]

[1]Universidade de Lisboa
[2]Universidade do Porto

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Prosody

- Prosody is considered as the "level of linguistic representation at which the acoustic-phonetic properties of an utterance vary independently of its lexical items" (Wagner & Watson, 2010: p. 905).
- It comprises a variety of phenomena, such as:
  - intonation (the melody of speech),
  - phrasing (the chunking of the speech continuum),
  - prominence (the highlighting of words or phrases), and
  - rhythm (the cadence of speech)
- Moreover, it may convey several dimensions of meaning.

(Ladd, 2008; Wagner & Watson, 2010)

Why Prosody Matters?

- Prosody is essential to language development during the early years, and it is known that children have the ability to understand prosodic features from birth and use prosody early in development (Gervain & Mehler, 2010; Nazzi, Bertoncini, & Mehler, 1998). At the same time, certain aspects of prosody are not mastered in an adult-like fashion before puberty (Wells, Peppé, & Goulandris, 2004).
- Prosody is frequently impaired in a large number of clinical populations, such as autism spectrum disorders (e.g., Gibbon, O' Hare, & Rutherford, 2007).

Prosodic Skills Assessment

- Prosodic tests are important to gain knowledge on the development of typical and atypical prosodic acquisition;
- Without well-developed measurement tools, clinicians cannot accomplish an assessment to determine when goals have been achieved and when new ones should be targeted.

Prosodic Skills Assessment

- There is a great diversity of tasks that aim to evaluate prosody.
- The only available test assessing both receptive and expressive prosodic abilities is the Profiling Elements of Prosody in Speech-Communication (PEPS-C; Peppé & McCann, 2003).

Prosodic Skills Assessment

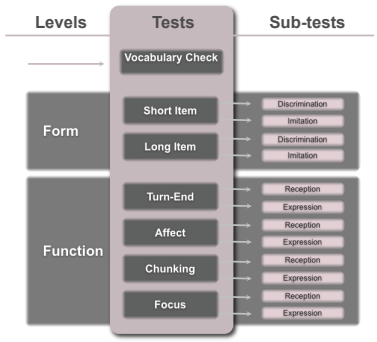
- In addition, the PEPS-C also has the following advantages:
  - (a) Transcription skills, of both lexical and prosodic elements, are not needed;
  - (b) Samples of speech are elicited in a homogeneous way across subjects and types of populations; and
  - (c) Instructions are suitable for individuals who may have low cognitive levels.

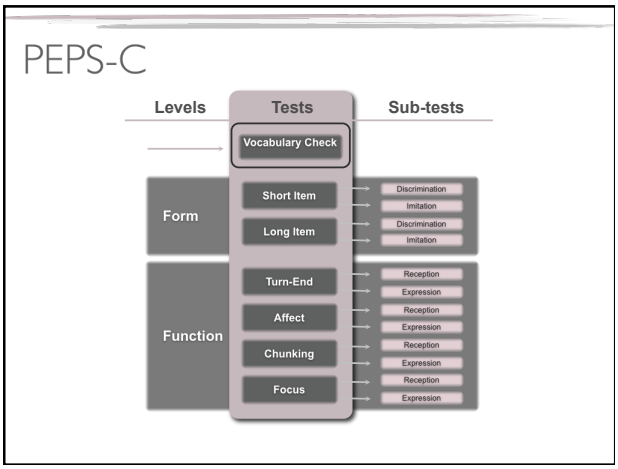
Prosodic Skills Assessment

The PEPS-C seems a valuable procedure to assess prosody in both clinical and research settings.

This test has been used in a number of studies investigating prosody in typically and non-typically developing children.
(e.g., Foley, Gibbon, & Peppé, 2011; Martínez-Castilla & Peppé, 2008; Peppé & McCann, 2003; Peppé, McCann, Gibbon, O' Hare, & Rutherford, 2007; Wells & Peppé, 2003; Wells, Peppé, & Goulandris, 2004)

PEPS-C

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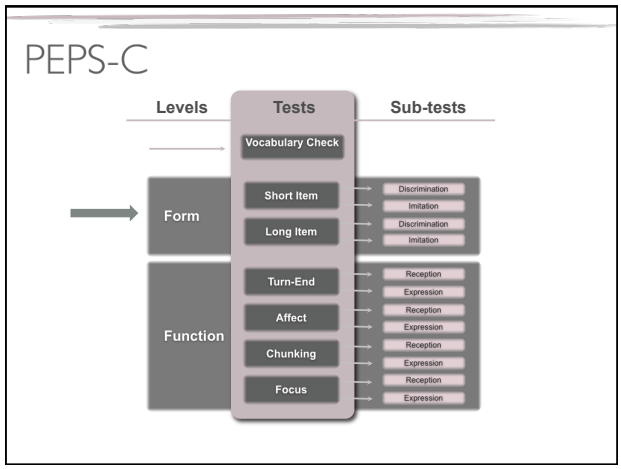
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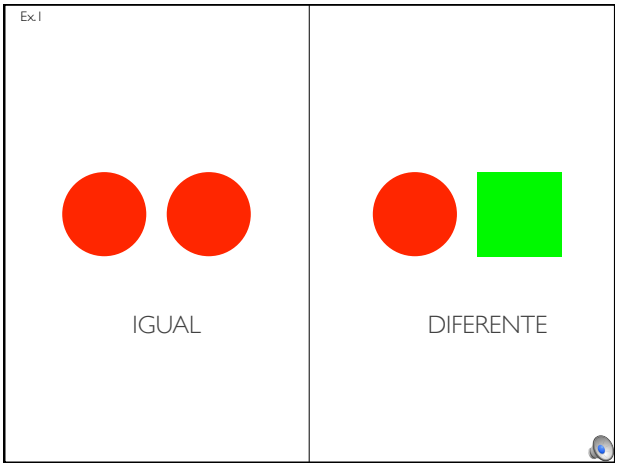
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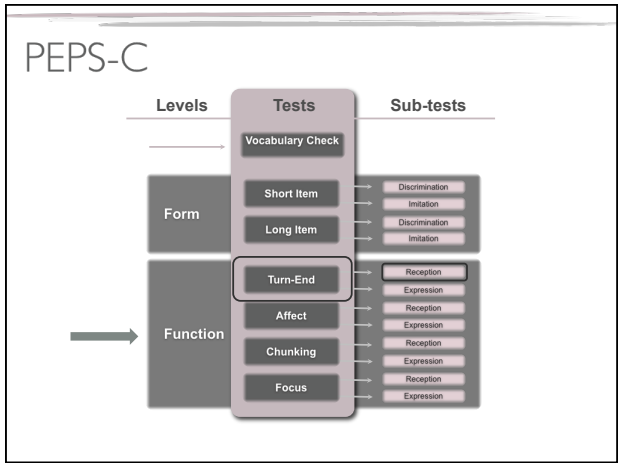
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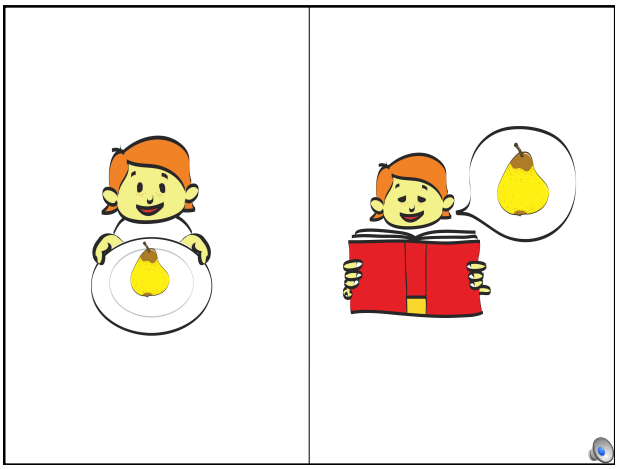

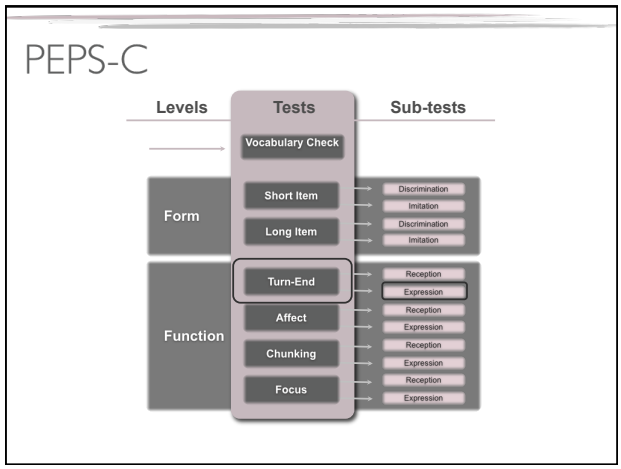
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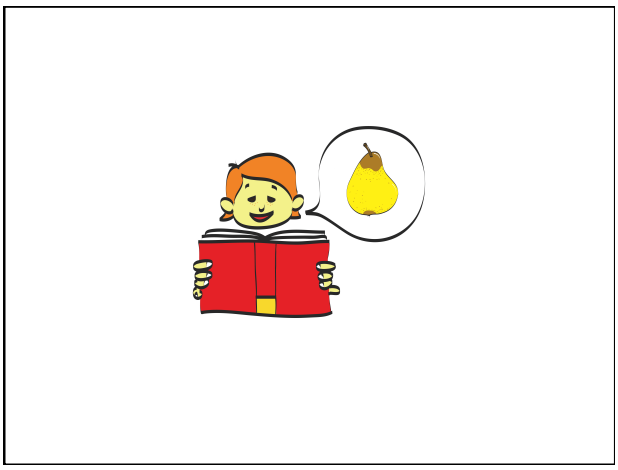

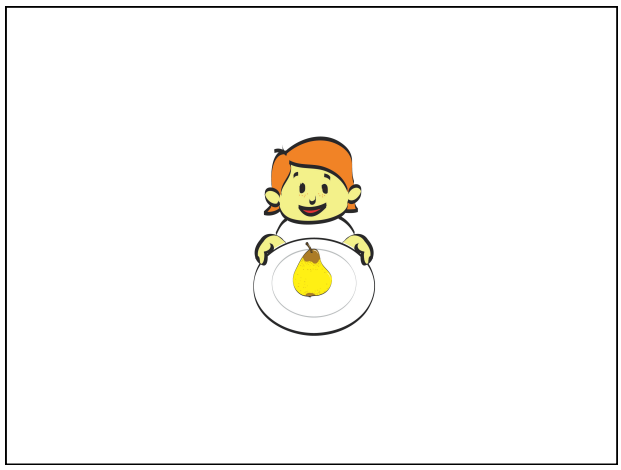

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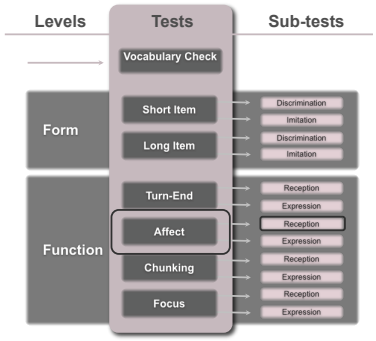
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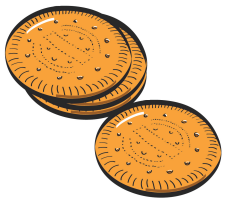

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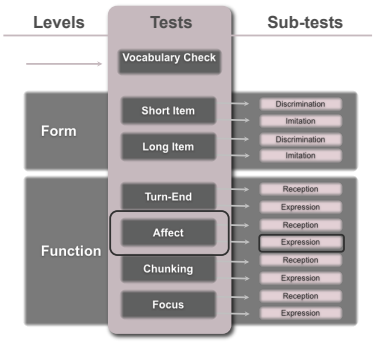
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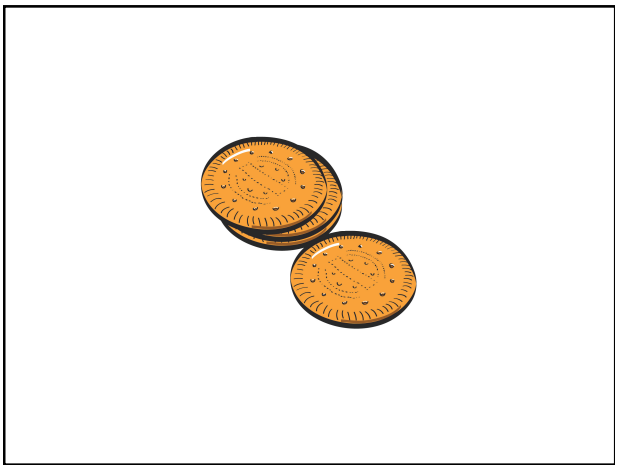

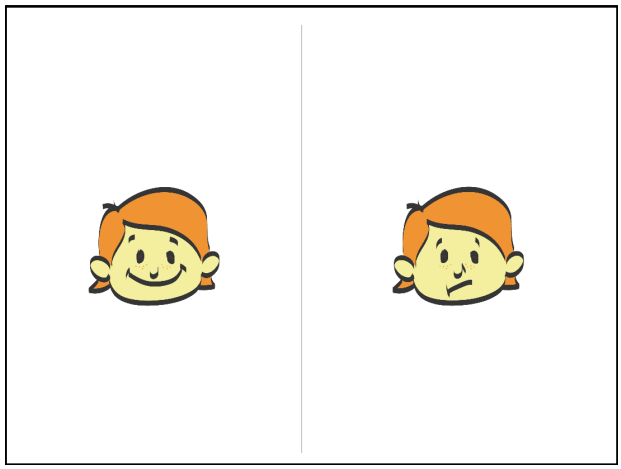

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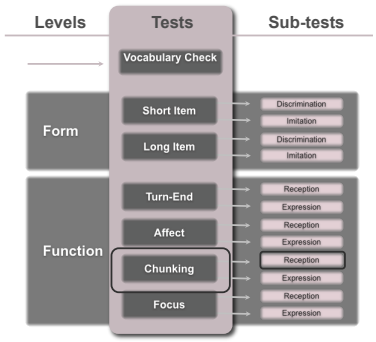
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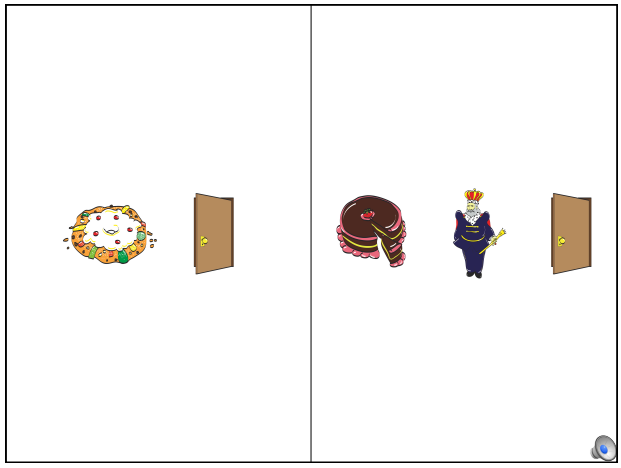

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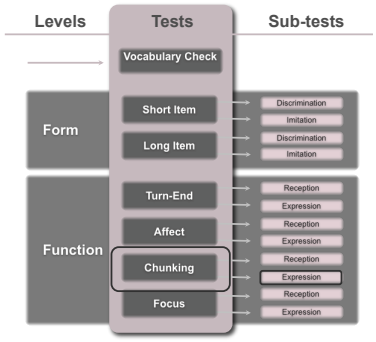
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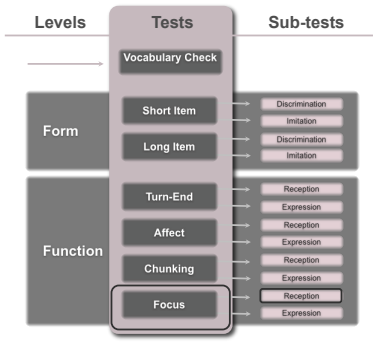
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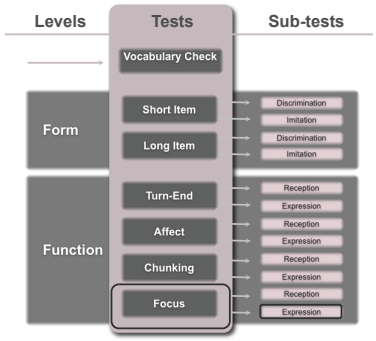
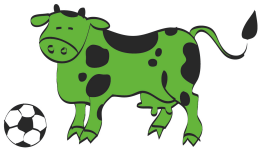




Studies with the PEPS-C: I

Prosodic Development in Typically Developing Children

Material & Procedure

- The administration of PEPS-C was performed in one session lasting approximately 45 minutes.
- Participants were assessed in a quiet room with adequate lighting conditions.
- The material administration order was the same for all the participants: Short-Item, Long Item, Turn-End, Affect, Chunking, and Focus. Half of the participants started with the receptive tasks and the other half with the expressive tasks.

Prosodic Development in Typically Developing Children

Participants:

Inclusion criteria:

(1) Were native speakers of EP, born and raised in monolingual homes in the north of Portugal;
(2) Had no significant visual or hearing problems;
(3) Had no history of language and/or learning difficulties according to teacher and/or parent reports; and
(4) Scored within the typical range in the Peabody Picture Vocabulary Test (Dunn & Dunn, 2007; Portuguese adaptation and norms by Vicente, Sousa, & Silva, 2011) and in the Raven's Coloured Progressive Matrices (Raven, 1995; Portuguese adaptation and norms by Simões, 2000).

Age range (Years; months)	Age *M* (*SD*)	Number of participants
5;0-5;11	5;1 (0.10)	17
6;0-6;11	6;2 (0.30)	14
7;0-7;11	7;6 (0.30)	15
8;0-8;11	8;4 (0.50)	22
9;0-9;11	9;3 (0.48)	13
10;0-11;11	10;2 (0.42)	10
12;0-13;11	12;4 (0.50)	11
14;0-15;11	14;3 (0.46)	14
16;0-17;11	16;3 (0.48)	7
18;0-20;11	19 (1.06)	8
Total		131

Prosodic Development in Typically Developing Children

Results

- **Short Item Subtest:**
  - For the receptive tasks, the main effect of age group was significant ($F(9, 121) = 4.325$, $p < 0.001$, partial $\eta^2 = 0.243$;). Difference and Helmert contrasts showed significant differences between the performance of 5 to 6 year-olds ($M = 13.7$, $SD = 1.79$; $M = 13.7$, $SD = 2.40$, respectively) and older participants (older age group means between 14.1 and 16.0; $p < 0.001$, 95% CI [-2.34, -6.83]; $p < 0.001$, 95% CI [-2.69, -8.62], respectively).
  - For the expressive task, the main effect of age group was significant ($F(9, 121) = 5.13$, $p < 0.001$, partial $\eta^2 = 0.276$). Difference and Helmert contrasts also showed significant differences between the performance of 5 to 6 year-olds ($M = 10.9$, $SD = 2.99$; $M = 12.2$, $SD = 3.53$, respectively) and older participants (older age group means between 13.5 and 15.9; $p < 0.001$, 95% CI [-4.47, -2.07]; $p \leq 0.001$, 95% CI [-3.57, -0.93], respectively).

Prosodic Development in Typically Developing Children

- **Long Item Subtest:**
  - For the receptive task, the main effect of age group was significant ($F(9, 121) = 7.064$, $p < 0.001$, partial $\eta^2 = 0.344$). Difference and Helmert contrasts showed significant differences between the performance of 5 to 7 year-olds ($M = 10.5$, $SD = 2.98$; $M = 10.5$, $SD = 3.15$; $M = 11.9$, $SD = 2.15$, respectively) and older participants (older age group means between 13.2 and 15.1; $p \leq 0.001$, 95% CI [-3.94, -1.74]; $p \leq 0.001$, 95% CI [-4.37, -1.95]; $p \leq 0.001$, 95% CI [-3.17, -0.79], respectively).
  - For the expressive task, the main effect of age group was significant ($F(9, 121) = 8.85$, $p < 0.001$, partial $\eta^2 = 0.397$). Difference and Helmert contrasts showed significant differences between the performance of 5 to 6 year-olds ($M = 10.9$, $SD = 3.12$; $M = 11.0$, $SD = 3.48$, respectively) and older participants (older age group means between 13.9 and 15.7; $p < 0.001$, 95% CI [-4.57, -2.29]; $p < 0.001$, 95% CI [-4.98, -2.48], respectively). Additionally, a contrast was founded between 9 year-olds ($M = 13.4$, $SD = 2.49$) and older participants (older age group means between 13.9 and 15.7; $p = 0.014$, 95% CI [-3.08, -0.35]).

Prosodic Development in Typically Developing Children

- **Turn-End Subtest:**
  - For the receptive task, the main effect of age group was significant ($F(9, 121) = 4.53$, $p < 0.001$, partial $\eta^2 = 0.252$). Difference and Helmert contrasts showed significant differences between the performance of 5 to 6 year-olds ($M = 13.4$, $SD = 2.80$; $M = 13.9$, $SD = 3.17$, respectively) and older participants (older age group means between 15.2 and 16; $p \leq 0.001$, 95% CI [-2.91, -1.27]; $p \leq 0.001$, 95% CI [-2.68, -0.87], respectively).
  - For the expressive task, the main effect of age group was significant ($F(9, 121) = 8.19$, $p < 0.001$, partial $\eta^2 = 0.378$). Difference and Helmert contrasts showed significant differences between the performance of 5 to 8 year-olds ($M = 8.1$, $SD = 4.75$; $M = 9.9$, $SD = 4.99$; $M = 12.5$, $SD = 3.70$; $M = 12.1$, $SD = 3.45$, respectively) and older participants (older age group means between 14.1 and 15.9; $p < 0.001$, 95% CI [-7.41, -3.96]; $p < 0.001$, 95% CI [-6.28, -2.46]; $p = 0.035$, 95% CI [-3.86, -0.140]; $p \leq 0.001$, 95% CI [-4.44, -1.16], respectively).

Prosodic Development in Typically Developing Children

- **Affect Subtest:**
  - For the receptive task, the main effect of age group was no significant ($F(1, 9) = 1.61$, $p = 0.117$; age group means between 15.5 and 16).
  - For the expressive task, the main effect of age group was no significant ($F < 1$; group means between 15.5 and 16)

Prosodic Development in Typically Developing Children

- **Chunking Subtest:**
  - For the receptive task, the main effect of age group was significant (F (9, 121) = 10.44, $p < 0.001$, partial $\eta^2 = 0.437$). Difference and Helmert contrasts showed significant differences between the performance of 5 to 7 year-olds (M = 11.6, SD = 1.65; M = 12.3, SD = 2.19; M = 12.5, SD = 1.92, respectively) and older participants (older age group means between 14.4 and 16.0; $p \leq 0.001$, 95% CI [-3.54, -1.67]; $p \leq 0.001$, 95% CI [-3.25, -1.41]; $p \leq 0.001$, 95% CI [-3.26, -1.47], respectively). Additionally, a contrast was found between 12/13 year-olds (M = 14.4, SD = 1.62) and older participants (older age group means between 14.5 and 16.0; $p = 0.043$, 95% CI [-2.33, -0.35]).).
  - For the expressive task, the main effect of age group was significant (F (9, 121) = 11.08, $p < 0.001$, partial $\eta^2 = 0.454$). Difference and Helmert contrasts showed significant differences between the performance of 5 to 13 year-olds (M = 8.8, SD = 2.11; M = 8.5, SD = 3.08; M = 11.6, SD = 2.16; M = 11.9, SD = 2.46; M = 11.7, SD = 2.46; M = 11.6, SD = 3.29; M = 13.1, SD = 2.84, respectively) and older participants (older age group means between 14.0 and 16; $p < 0.001$, 95% CI [-4.98, -2.45]; $p < 0.001$, 95% CI [-6.01, -3.23]; $p = 0.014$; 95% CI [-3.10, -0.36]; $p = 0.008$, 95% CI [-2.89, -0.44]; $p = 0.004$, 95% CI [-3.77, -0.74]; $p \leq 0.001$, 95% CI [-4.65, -1.21]; $p = 0.03$; 95% CI [-3.66, -0.19], respectively).

Prosodic Development in Typically Developing Children

- **Focus Subtest:**
  - For the receptive task, the main effect of age group was significant (F (9, 121) = 12.53, $p < 0.001$, partial $\eta^2 = 0.482$). Difference and Helmert contrasts showed significant differences between the performance of 5 to 8 year-olds (M = 8.5, SD = 2.06; M = 12.1, SD = 2.09; M = 11.6, SD = 2.97; M = 12.6, SD = 2.06, respectively) and older participants (older age group means between 13.4 and 15.6; $p < 0.001$, 95% CI [-5.92, -3.84]; $p = 0.007$, 95% CI [-2.72, -0.43]; $p < 0.001$, 95% CI [-3.47, -1.21]; $p = 0.003$, 95% CI [-2.51, -0.53], respectively).
  - For the expressive task, the main effect of age group was significant (F (9, 121) = 5.62, $p < 0.001$, partial $\eta^2 = 0.295$). Difference and Helmert contrasts showed significant differences between the performance of 5 to 7 year-olds (M = 2.94, SD = 3.36; M = 4.5, SD = 3.85; M = 6.9, SD = 4.34, respectively) and older participants (older age group means between 6.6 and 15.0; $p < 0.001$, 95% CI [-7.98, -3.15]; $p \leq 0.001$, 95% CI [-7.16, -1.86]; $p = 0.010$, 95% CI [-6.04, -0.83], respectively). Additionally, a contrast was found between 12/13 year-olds (M = 6.6, SD = 5.51) and older participants (older age group means between 9.5 and 15.0; $p = 0.005$, 95% CI [-8.03, -1.42]); as well as a contrast between the 16/17 and 18/20 years-olds (M = 9.5, SD = 5.38; M = 15.0, SD = 2.07, respectively; $p = 0.026$, 95% CI [-10.19, -0.66]).

Prosodic Development in Typically Developing Children

- **Results showed prosodic performance improving with age:**
  - the 5 year-olds reach ceiling effects in the affective prosodic tasks;
  - the 7 year-olds reach adult-like performance in the ability to discriminate and produce short prosodic items, as well as in the ability to understand question versus declarative intonation;
  - the 8 year-olds reach adult-like performance in the ability to discriminate long prosodic items;
  - the 9 year-olds reach adult-like performance in the ability to produce question versus declarative intonation, as well as in the ability to identify focus;
  - the 10/11 year-olds reach adult-like performance in the ability to produce long prosodic items;
  - the 14/15 year-olds reach adult-like performance in the ability to comprehend and produce syntactically ambiguous phrases disambiguated by prosody; and
  - the 18/20 year-olds reach adult-like performance in the ability produce focus.
- Some prosodic contrasts (namely, focus expression) are hard to achieve for younger children.

Studies with the PEPS-C: II

A prosodically annotated corpus of utterances produced by children with autism and typically developing peers (PAC-C)

We developed a prosodically annotated corpus of 2304 utterances produced by children with typical and atypical development: the "**P**rosodically **A**nnotated **C**orpus of utterances produced by **C**hildren" (PAC-C)

Eighteen children with high-functioning autism (12 boys; 5 - 15 years, M = 8.06, SD = 2.31) and 18 typically developing peers matched on age, gender, and nonverbal intelligence participated in this study.

The utterances were collected with the European Portuguese Version of the Profiling Elements of Prosody in Speech-Communication .

For the phonological analysis of the nuclear contour patterns, we adopted the Autosegmental-Metrical Model of intonational phonology (Ladd, 2008) and the Tones and Break Indices framework (Beckman, Hirschberg, & Shattuck-Hufnagel, 2005; Frota, 2014, for European Portuguese).

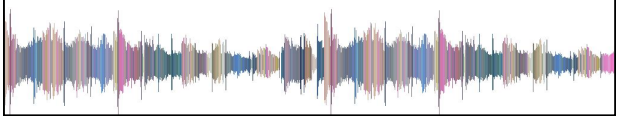
Studies with the PEPS-C: III

Prosody in Children with Asperger Syndrome

(Filipe, Frota, Castro, & Vicente, 2014; JADD)

Conclusion

- The Portuguese Version of the PEPS-C and the results from typically and non-typically developing Portuguese children should be useful for researchers, educators, teachers, therapists, and other professionals.



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Thank You!