Exploring Emotional Prosody Recognition in Children: Familiar vs. Unfamiliar Languages

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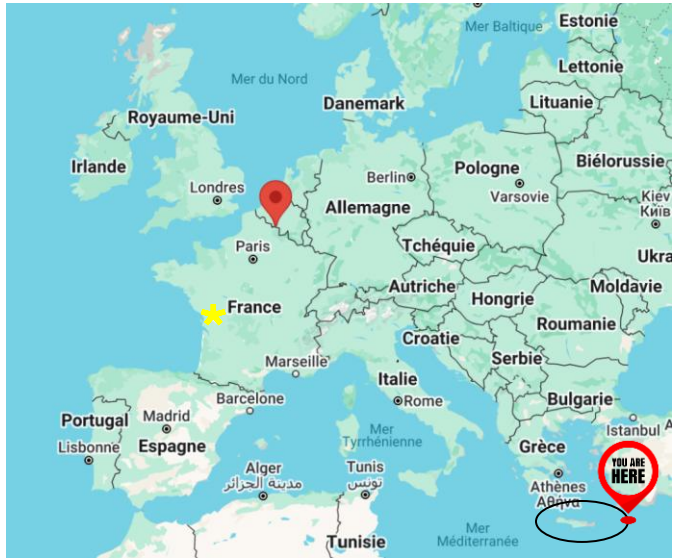
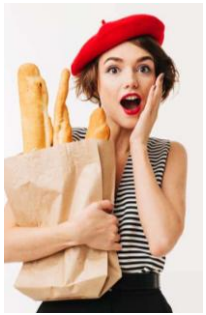
1. INTRODUCTION
1.1. Who am I?

- Currently working in Mons (Belgium), Faculty of Psychology and Educational Sciences, department of Metrology and Language Sciences
- Born in France. Bachelor and master degree in Poitiers (France)
- Various stays in Spanish-speaking countries (Spain, Chili…)
- Interests: bilingualism, child development, prosody, LX acquisition (first, second or foreign languages)





1.2. PhD Project

perception

emotions

emotional prosody

- In a population of children (French monolinguals, Spanish monolinguals and French-Spanish bilinguals)
- **Objective**: to determine the developmental trajectory of emotion recognition based on emotional prosody in children with varied language profiles

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THEORETICAL FRAMEWORK

2. THEORETICAL FRAMEWORK

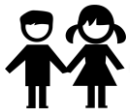
2.1 Literature review

About emotion recognition through emotional prosody in children…

- A few studies among monolinguals in their **native language** (Filippa et al., 2022; Amorim et al., 2021; Neves et al., 2021; Griffiths et al., 2020; Grosbras et al., 2018; Chronaki et al., 2018; Gil et al, 2016; Zupan, 2015; Aguert et al., 2013; Sauter et al., 2010; Quam & Swingley, 2012; Morton & Trehub, 2001) and 3 studies in **"unknown" languages** (Ma et al., 2022; Chronaki et al., 2015; Nelson & Russel, 2011)

Some results:

- **Emotion**: some emotions are better recognized than others (e.g., Filippa et al. 2022)
- **Type of stimuli**: non-verbal vocalizations are better recognized than pseudo sentences or sentences → different types of processing mobilized (Neves et al. 2021; Castro and Lima, 2010)
- **Language of stimuli**: between 3 and 5 years old, emotions are recognised equally in all languages (Ma et al. 2022) and from the age of 8, subjects perform better when the stimuli are in their mother tongue than in an unknown language (Chronaki et al. 2018)



- **Participants' language**: children ability to perform the same task linked to prosody (emotional or linguistic) reaches a level of mastery at different ages depending on their mother tongue (Filippe et al. 2017; Peppe et al. 2010)
- **Sex**: depends on the study (no consensus in the literature)
- **Age**: developmental trajectory of vocal emotion recognition (Amorim et al. 2021)

2.2. Research question & hypotheses

The developmental trajectory depends on the **type of stimulus**, the **target emotion** and the participants' **mother tongue**.

Literature gap: No studies have been conducted on bilingual subjects, except for Roseberry-McKibbin and Brice (1999).

Research question

What is the developmental trajectory of emotion recognition based on emotional prosody in 4- to 8-year-old children with varied language profiles (bilingual and monolingual)?

Hypothesis 1: results would vary in terms of emotion type
Hypothesis 2: results would vary in terms of stimulus type
Hypothesis 3: results would vary in terms of stimulus language
Hypothesis 4: performances would improve with age

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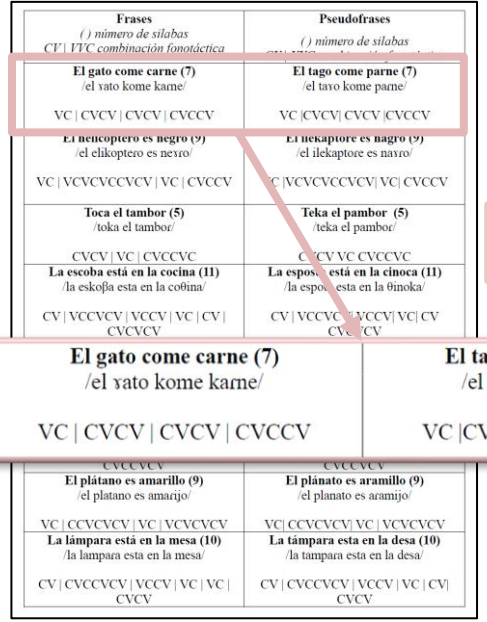
METHOD

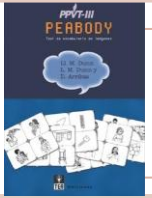
3.1. Construction & validation of stimuli corpus

(inspired by Castro and Lima, 2010)

- Creation of sentences and pseudosentences in French and Spanish
- Recording and selection of various stimuli in Spanish (N=136) and French (N=126)
- Francophone (N=37) and hispanophone (N=33) judges made a forced-choice recognition task
- Audios with >80% of accuracy were selected for the final corpus of audios



8 sentences and 8 pseudosentences in French
8 sentences and 8 pseudosentences in Spanish
8 non-verbal vocalizations (Montreal Affective Voices, Belin et al. 2008)



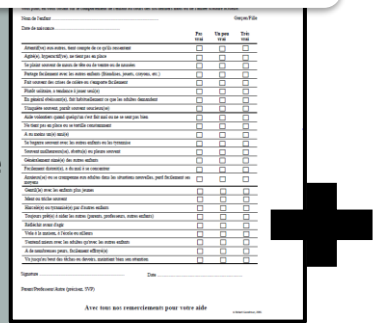
Based on receptive vocabulary (PEABODY III; EXALANG)
Lexical frequency
Phonotactic combination

3.2. Data collection

1. Familiarization

2. Parental information

Strenght and Difficulties Questionnaire (SDQ) (Goodman, 2001)



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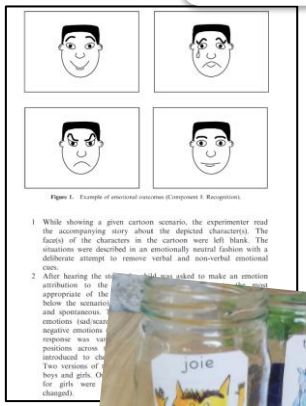
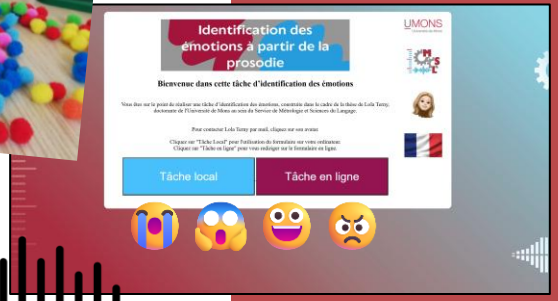
Anamnesis

3. Tasks



Control of overall emotional competence (*Test of Emotion Comprehension*, TEC, Pons & Harris,2000)

Our task: emotion identification through audios



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PRELIMINARY FINDINGS

4.1. Sample characteristics (French-speaking group)

Table 1: descriptive characteristics of the French-speaking group (sex and age)

			Age (in years)		
	Sexe	**N**	**Age range**	**Mean**	**S-D**
French-speaking (N=46)	Girls	24	5-8	6,68	0,974
	Boys	22	4,9-7,9	6,58	0,828

Table 2: descriptive characteristics of the French-speaking group (sex, age and level of education)

Characteristics			**Age (in years)**			
Level of education	Sex	N	Mean	S-D	Min	Max
M2	Girl	4	5.13	0.09	5	5.2
	Boy	1	4.9	NA	4.9	4.9
M3	Girl	3	5.77	0.45	5.3	6.2
	Boy	7	5.76	0.32	5.5	6.2
P1	Girl	10	6.82	0.17	6.5	7.1
	Boy	10	6.91	0.24	6.5	7.3
P2	Girl	7	7.76	0.32	7.2	8
	Boy	4	7.63	0.26	7.4	7.9

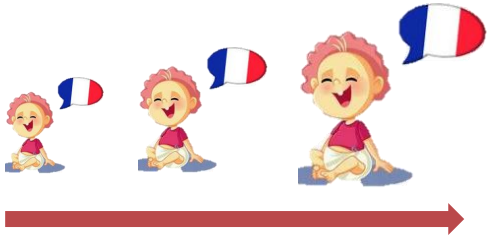
M2: second year of preschool
M3: third year of preschool
P1: first year of primary school
P2: second year of primary school

4.2. Global results

Age (age group)	**S (p<.001)**
Language	**S (p<.001)**
Types of stimuli	**NS**
Emotion	**S (p<.001)**
Language*Age	**S (p=.011)**
Types of stimuli*Age	NS
Emotion*Age	**S (p<.001)**
Language*Emotion	**S (p<.001)**
Language*Types of stimuli	**S (p<.001)**
Types of stimuli*Emotion	NS

Performance improves significantly with age

Significant differences between 5 and 6, 5 and 7 and 6 and 7 years old (*p= <.001*) regarding **emotion** and **language** but not **types of stimuli**



4.3. Detailed results

Emotion effect per age group

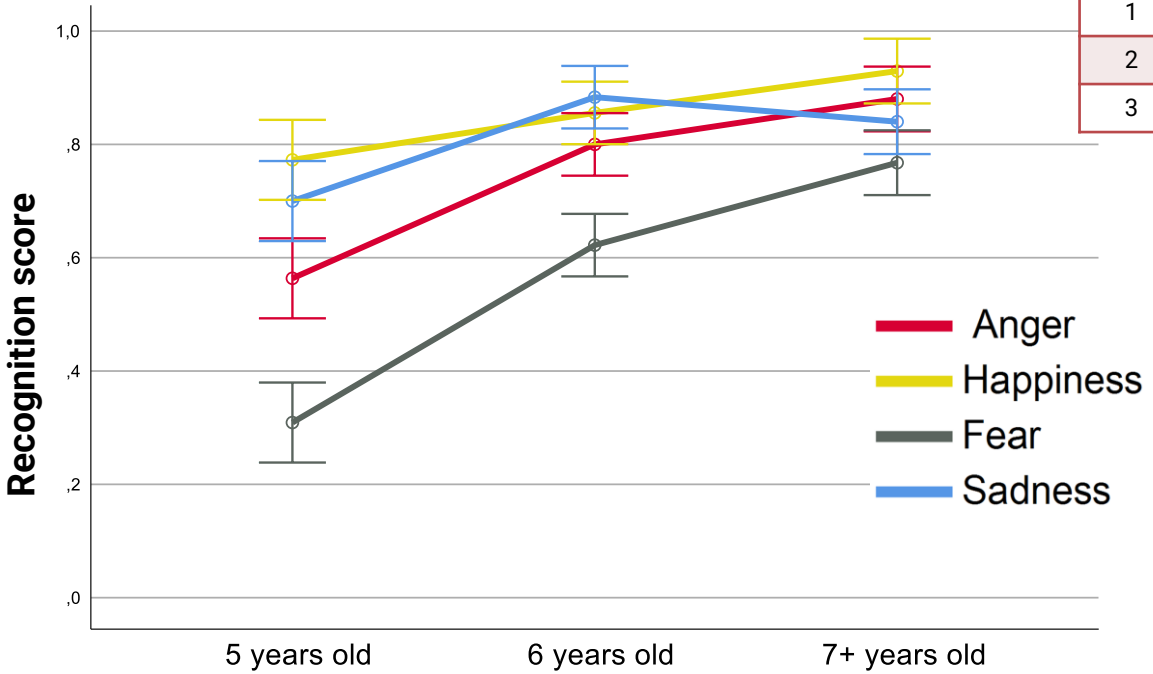


Figure 1: Line graph with error bars showing the recognition score for each emotion per age group (all languages and types of stimuli together)

Table 3: Characteristics of age groups for statistic analysis

Age (in years)					
Group	**N**	**Mean Age**	**S-D**	**Min**	**Max**
1	11	5.32	0.268	4.9	5.8
2	16	6.58	0.299	6	6.9
3	19	7.44	0.406	6.9	8

- Differences between 5 and 6, 5 and 7 and 6 and 7 years old ($p < .001$)
- Happiness: better recognized
- Fear: less well recognized

4.3. Detailed results
Language and types of stimuli (all emotions included)

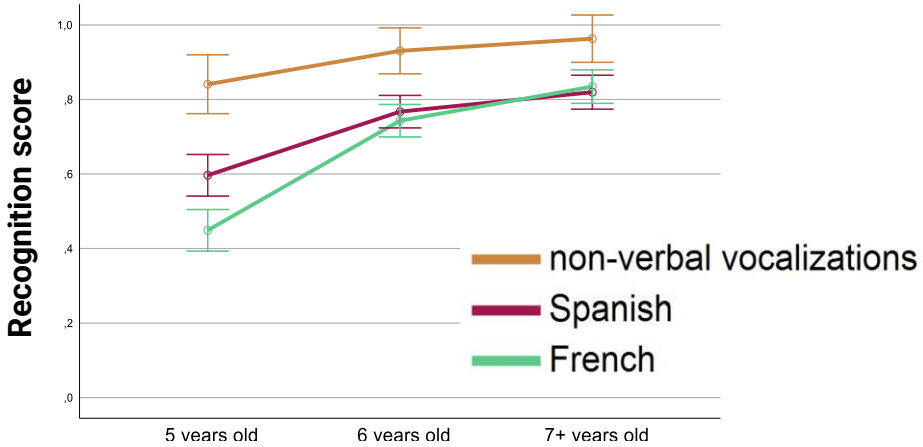


Figure 2: Line graph with error bars showing the recognition score for each language per age group (all emotions and types of stimuli together)

- Interaction between age and language (*p= .011*)

More specifically, regardless the age groups…

- Significant differences between **non-verbal vocalizations** vs. Spanish (*p= .018*) vs. French (*p=.003*)
- No significant differences between French vs. Spanish

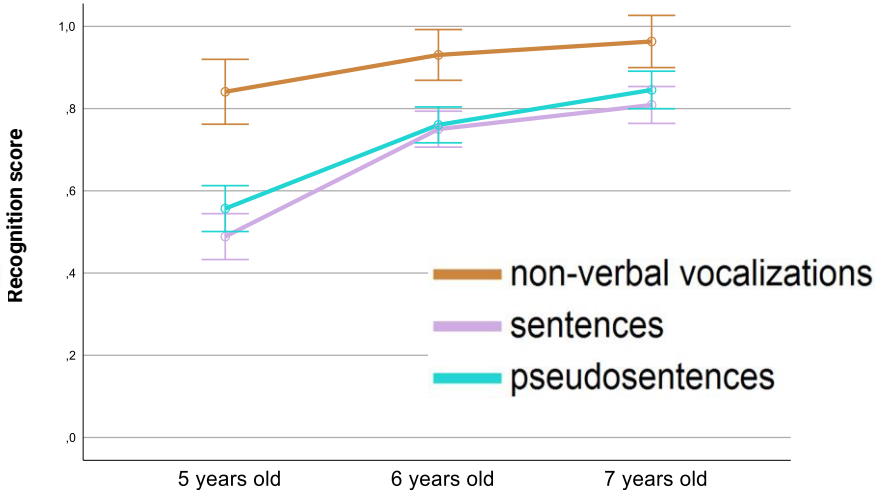


Figure 3: Line graph with error bars showing the recognition score for each type of stimuli per age group (all languages and emotions together)

- No interaction between age and type of stimulus

More specifically, regardless the age groups…

- Significant differences between **non-verbal vocalizations** vs. sentences (*p*=.010) vs. pseudosentences (*p*=.006)
- No significant differences between sentences vs. pseudosentences

4.3. Detailed results

Emotion*language and emotion* types of stimuli

After removing non-verbal vocalizations

Mother tongue = French

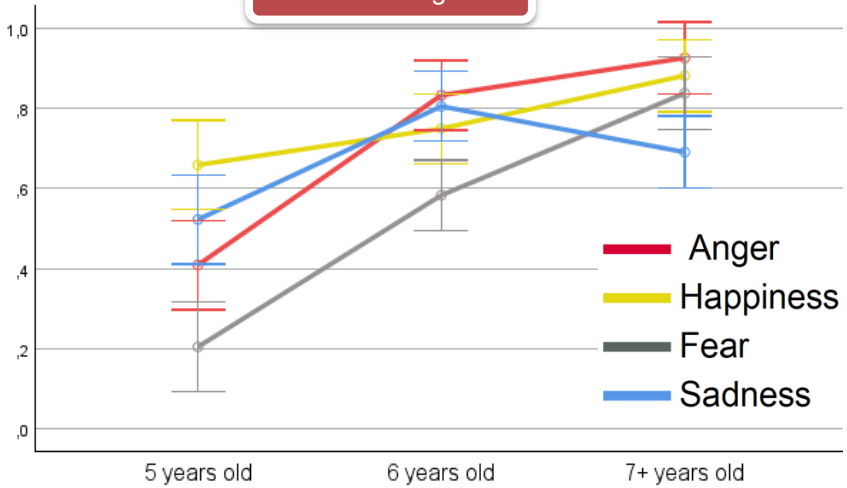


Figure 4: Line graph with error bars showing the recognition score for each emotion in French stimuli per age group

Unfamiliar language = Spanish

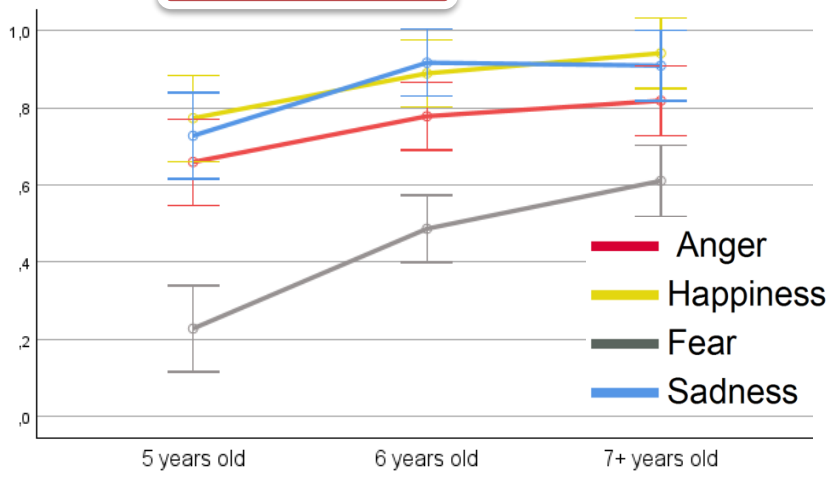


Figure 5: Line graph with error bars showing the recognition score for each emotion in Spanish stimuli per age group

Types of stimuli (sentences vs. pseudosentences)	NS
Language	S (p=.015)
Age*types of stimuli	NS
Age*language	S (p=.011)

Emotion*language (p=.014)

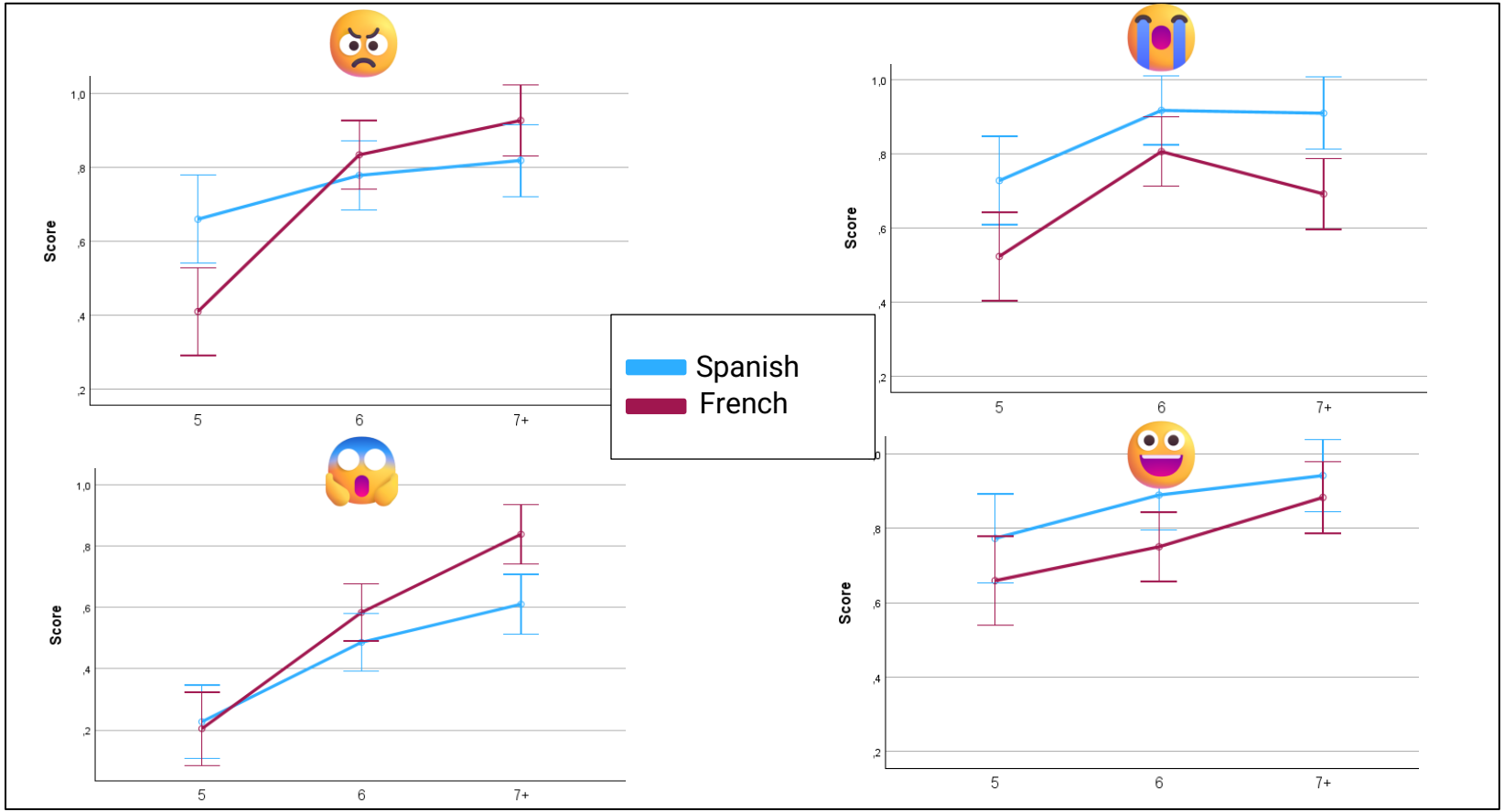


Figure 6 : Line graph with error bars showing the recognition score for each emotion in each language per age group (sentences and pseudosentences together)

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DISCUSSION & PERSPECTIVES

4.1. Discussion

- Participants' performance improved with **age** (Amorim et al. 2021)
- Younger children tend to be **more variable** but gradually become **more accurate**

- There is an emotion effect (*fear* less well recognized and *happiness* better) and emotion recognition improved for all emotions (in Filippa et al. 2022 and Chronaki et al. 2018, anger is the best recognized)

- Emotions conveyed by vocalizations are better identified than those conveyed by sentences and pseudosentences (Neves et al. 2021)

- At this stage, **no in-group advantage** regarding languages (contrary to Chronaki et al. 2018, but in line with Ma et al. 2022)

4.2. Perspectives

1. Conduct an in-depth study of **the developmental trajectory** of emotional prosody in relation to **stimulus-related variables** and **data collected from parents**

2. We have tested 14 Spanish-speaking children, but we would like to increase the sample size of and vary their ages to investigate **cross-effects** in more detail, such as certain emotions being recognized more easily depending on the **language** and **type of stimulus**

3. Data collection is underway on French–Spanish **bilingual children**

4. Conduct **acoustic analyses** to determine whether emotions that are better or less well recognized have acoustic 'patterns' that predict their recognition. Distinguish between perception and acoustic reality to determine a profile for each emotion depending on the language.

THANK YOU!

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