An Exploratory Study: Comparing Facial Emotion Recognition and Emotional Inference Abilities in Young Bilingual and Monolingual Children

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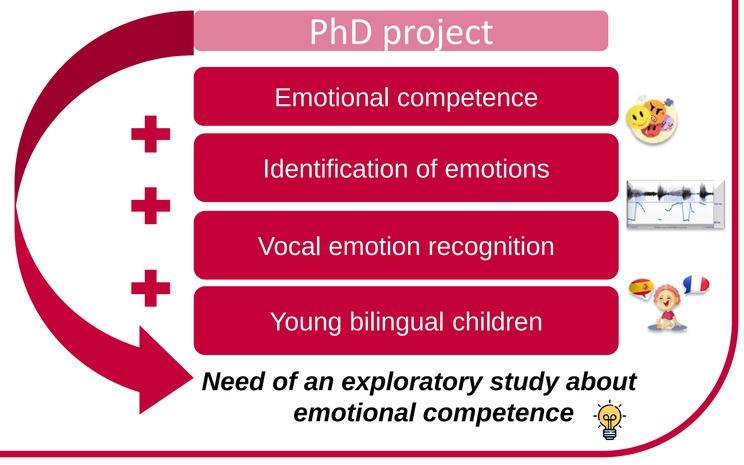
Introduction

- Bilingualism is a complex, dynamic and multifaceted reality (De Cat & al., 2022) ;
- Numerous studies have investigated bilingualism over the 50 past years (children VS adults ; pathological VS healthy; linguistic VS non-linguistic tasks);
- Numerous variables moderate the results : inherent to bilingualism such as the degree of exposure and use of languages (Crespo & al., 2019) or the level of proficiency (Kheder & Kaan, 2021), or related to the characteristics of the experimental design (Grosjean, 1999; Lopez-Rojas & al., 2023) ;
- One domain remains relatively unexplored: developmental trajectory of emotional competence for young bilingual individuals

Research context

- Larger PhD project : emotional prosody recognition and bilingual children
- Research work in collaboration with students in speech therapy (3rd year of bachelor degree)
- For monolinguals, the processing of vocal emotions recognition varies with:
  - Age (Aguert & al., 2013; Chronaki & al., 2015 ; Grosbras & al., 2018; Amorim & al., 2021; Filippa & al., 2022)
  - Mother tongue (Filipe & al., 2017; Ma & al., 2022; Morton & Trehub, 2001; Chronaki & al., 2018)
  - Presented emotion (Amorim & al., 2021)
  - Privileged channel (Nelson & Russel, 2011)
  - Gender (Filippa & al. 2022)

What about bilingual children?



General exploratory question

How do bilingual and monolingual children perform in a facial emotion recognition task and an emotional inference task?

We would expect no differences in performance between bilingual and monolingual children in a facial emotion recognition task (non-linguistic data)

We would expect no differences in performance between bilingual and monolingual children in an inference task (pragmatic skills and cognitive development)

There is an effect of age, gender and emotion type on the rate of emotion recognition for each task

There is a relation between SDQ scores and QCEE scores

Method

Participants

	Profile	Gender	N
Participants (n=36)	Monolingual	Girl	8
		Boy	10
	Bilingual	Girl	13
		Boy	5

	Profile	N	Mean	SD
Age (months)	Monolingual	18	60.1	8.94
	Bilingual	18	65.4	8.40

Tests χ^2

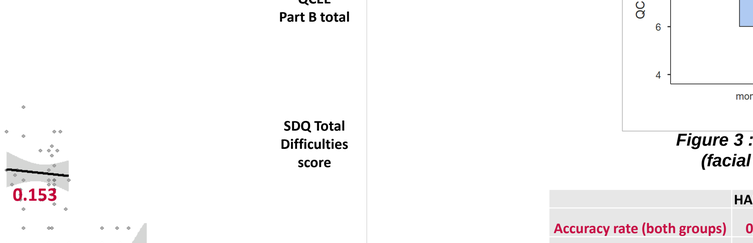
	Value	ddl	p
χ^2	2.86	1	0.091
N	36		

T-test for independent sample

		Statistic	p
Age	U de Mann-Whitney	102	0.057

Note. H_a, $\mu_{monolingual} \neq \mu_{bilingual}$

Languages



Material

- ***Anamnesis*** : to get general information about monolingual and bilingual children (development, background information, etc.)
- ***Q-Bex*** (De Cat & al., 2022) ***(only for bilinguals)***
  To document bilingual profiles of bilingual children
  Current exposure score (home, school, community and holidays) in %
  Richness score in %
- ***SDQ*** (Goodman, 2000)
  Strength and Difficulties Questionnaire : measure of behavioural and emotional difficulties in children and young people aged 4-17 years
  Total Difficulties score (score 0-40)
  Emotional symptoms score (score 0-10)
- ***QCEE*** (Thommen & al., 2021)
  Questionnaire de **C**ompréhension des **E**motions pour **E**nfants
  (Children Emotion Comprehension Questionnaire) : a tool for studying the development of children's understanding of emotions
  Part A: facial emotion recognition task (score 0-12)
  Part B: emotional inference task (score 0-28)

Results

Q-BEx datas

Participants	HOME L1 Exposure	HOME L1 Use	HOME L2 Exposure	HOME L2 Use	SCHOOL L1 Exposure	SCHOOL L1 Use	SCHOOL L2 Exposure	SCHOOL L2 Use	COMMUNITY L1 Exposure	COMMUNITY L1 Use	COMMUNITY L2 Exposure	COMMUNITY L2 Use	HOLIDAYS L1 Exposre	HOLIDAYS L1 Use	HOLIDAYS L2 Exposure	HOLIDAYS L2 Use
2971																
2934																
2917																
3073																
3180																
3147																
2930																
2966																
3055																
3062																
2883																
3133																
3137																
3158																
2929																
2948																
3066																
2921																

0 | 1 to 25 | 26 to 50 | 51 to 75 | 76 to 100

Table 1: Current language exposure and use (L1 and L2) in 4 contexts (in %)

	L1	L2	L3
2971			
2934			
2917			
3073			
3180			
3147			
2930			
2966			
3055			
3062			
2883			
3133			
3137			
3158			
2929			
2948			
3066			
2921			

0 | 0 to 29 | 30 to 49 | 50 to 100

Table 2: Richness language scores (in %)
Calculation includes activities in L1/L2, caregiver(s) education, estimated number of speakers and proficiency thresholds

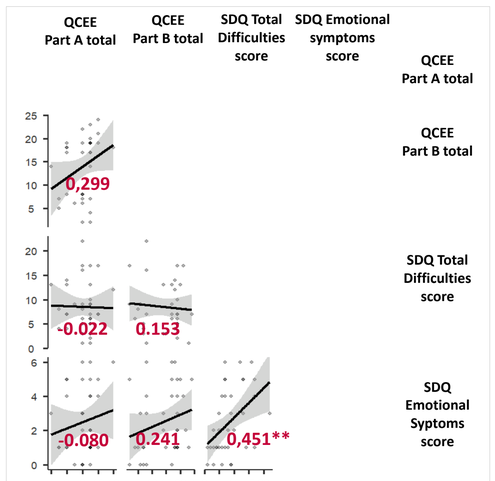


Figure 1 : Correlation matrix of SQD scores and QCEE scores

0= fail ; 1= partly successful ; 2= successful

QCEE scores

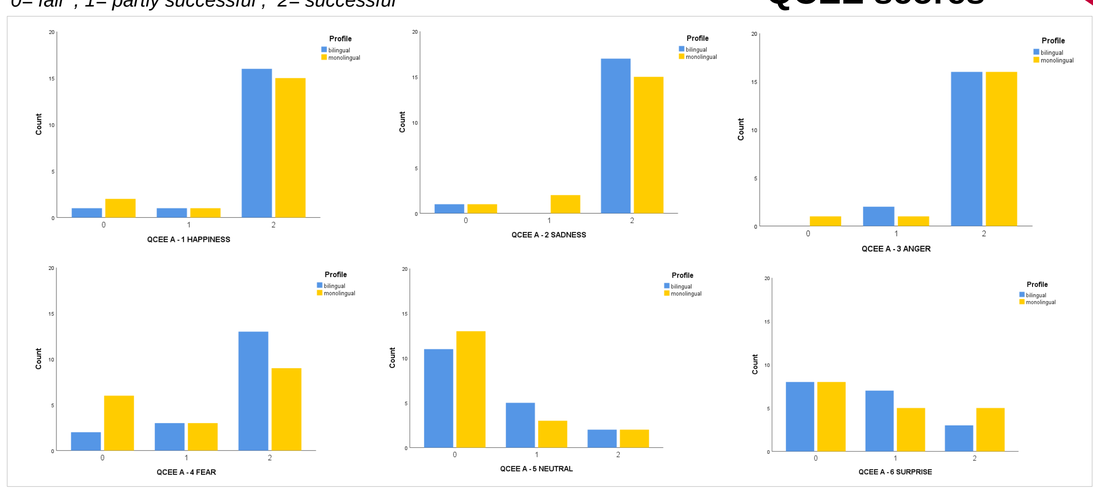


Figure 2 : QCEE scores in a facial emotion recognition task in 6 emotions for each group (Part A)

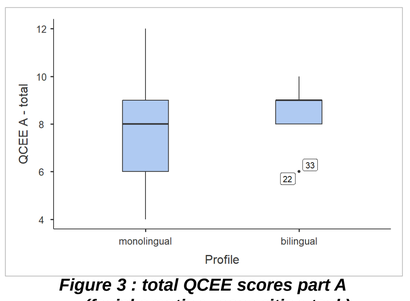


Figure 3 : total QCEE scores part A (facial emotion recognition task)

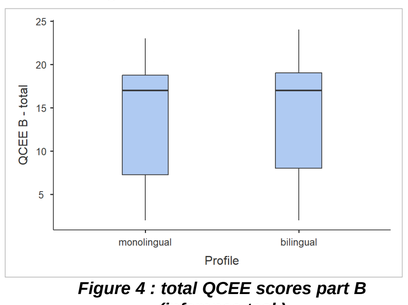


Figure 4 : total QCEE scores part B (inference task)

	HAPPY1	SAD1	ANGER1	FEAR1	SURPRISE1	GUILT1	GUILT2	NEUTRAL1	NEUTRAL2	SURPRISE2	FEAR2	ANGER2	SAD2	HAPPY2
Accuracy rate (both groups)	0,85	0,92	0,57	0,79	0,36	0,21	0,33	0,38	0,41	0,5	0,65	0,78	0,98	0,98
Accuracy rates monolinguals	0,83	0,89	0,56	0,75	0,33	0,25	0,28	0,38	0,29	0,5	0,63	0,79	0,96	0,96
Accuracy rates bilinguals	0,86	0,94	0,58	0,83	0,38	0,18	0,38	0,39	0,55	0,5	0,68	0,77	1	1
N total	36	36	36	36	35	35	33	26	23	23	23	23	23	23
N monolingual	18	18	18	18	18	18	16	12	12	12	12	12	12	12
N bilingual	18	18	18	18	17	17	17	14	11	11	11	11	11	11

Table 3: Accuracy rate scores for each item (QCEE, Part B) and groups size
Protocol : if the child fails 3 times, the task stops. N= number of children who actually did the task

Discussion & perspectives

- No significant differences between the two groups in the two tasks
- **Emotional inference task** -> global emotional competence task (cognitive, pragmatic) VS **emotional prosody** -> more specific to language?
- QCEE task: task protocol (Part B) leads to exclusion of many children
- Q-BEx has proved to be a good tool for documenting bilingual profiles
- Many different L2s: further research needed on a specific combination of languages (but diverse degrees of exposure and use -> documented with Q-BEx)
- Future research needed on **vocal emotion recognition** in bilingual children
- Creation of an emotional task based on **emotional prosody** and **different vocal stimuli**

Bibliography : Aguert, M., Laval, V., Lacroix, A., Gil, S., & Le Bigot, L. (2013). Inferring emotions from speech prosody: Not so easy at age five. *PLoS One*, *8*(12), e83657 ; Amorim, M., Anikin, A., Mendes, A. J., Lima, C. F., Kotz, S. A., & Pinheiro, A. P. (2021). Changes in vocal emotion recognition across the life span. *Emotion*, *21*(2), 315 ; Antoniou, M. (2019) « The Advantages of Bilingualism Debate ». *Annual Review of Linguistics* 5 (1), 395-415 ; Crespo, K., Gross, M., & Kaushanskaya, M. (2019). « The Effects of Dual Language Exposure on Executive Function in Spanish–English Bilingual Children with Different Language Abilities ». *Journal of Experimental Child Psychology* 188, 104663. ; Chronaki, G., Garner, M., Hadwin, J. A., Thompson, M. J., Chin, C. Y., & Sonuga-Barke, E. J. (2015). Emotion-recognition abilities and behavior problem dimensions in preschoolers: evidence for a specific role for childhood hyperactivity. *Child Neuropsychology*, 21 (1), 25-40 ; De Cat, C., Kaščelan, D., Prévost, P., Serratrice, L., Tuller, L., Unsworth, S., The Q-BEx Consortium. (2022). « How to Quantify Bilingual Experience? Findings from a Delphi Consensus Survey ». *Bilingualism: Language and Cognition* 26 (1), 112-24. ; Filipe, M. G., Peppé, S., Frota, S., & Vicente, S. G. (2017). Prosodic development in European Portuguese from childhood to adulthood. *Applied Psycholinguistics*, *38*(5), 1045-1070 ; Filippa, M., Lima, D., Grandjean, A., Labbé, C., Coll, S. Y., Gentaz, E., & Grandjean, D. M. (2022). Emotional prosody recognition enhances and progressively complexifies from childhood to adolescence. *Scientific Reports*, *12*(1), 17144 ; Goodman, R., Ford, T., Simmons, H., Gatward, R., & Meltzer, H. (2000). Using the Strengths and Difficulties Questionnaire (SDQ) to screen for child psychiatric disorders in a community sample. The British journal of psychiatry, 177(6), 534-539; Grosbras, M. H., Ross, P. D., & Belin, P. (2018). Categorical emotion recognition from voice improves during childhood and adolescence. *Scientific reports*, *8*(1), 1-11. ; Grosjean, F. (1998). Studying bilinguals: Methodological and conceptual issues. *Bilingualism: Language and cognition*, *1*(2), 131-149 ; Kheder, Souad, et Edith Kaan. (2021). « Cognitive Control in Bilinguals: Proficiency and Code-Switching Both Matter ». *Cognition* 209, 104575; López-Rojas, C., Marful, A., Pérez, A. I., & Bajo, M. T. (2023). « Prospective Memory in Bilinguals: Recalling Future Intentions in First and Second Language Contexts ». *Bilingualism: Language and Cognition*, 1-16; Luk, G. (2022). « Justice and Equity for Whom? Reframing Research on the "Bilingual (Dis)Advantage" ». *Applied Psycholinguistics*, 1-15 ; Ma, W., Zhou, P., & Thompson, W. F. (2022). Children's decoding of emotional prosody in four languages. *Emotion*, *22*(1), 198; Morton, J. B., & Trehub, S. E. (2001). Children's understanding of emotion in speech. *Child development*, *72*(3), 834-843; Nelson, N. L., & Russell, J. A. (2011). Preschoolers' use of dynamic facial, bodily, and vocal cues to emotion. Journal of experimental child psychology, 110(1), 52-61.; Poarch, G. J., & Krott, A., (2019). « A Bilingual Advantage? An Appeal for a Change in Perspective and Recommendations for Future Research ». *Behavioral Sciences* 9 (9), 95 ; Thommen, E., Baggioni, L., Veyre, A., & Guidetti, M. (2021) « Le QCEE : un nouvel outil pour étudier le développement de la compréhension des émotions par l'enfant: » *Enfance* 4 (4), 413-34 ;Voltmer, K., & von Salisch, M. (2017). Three meta-analyses of children's emotion knowledge and their school success. *Learning and Individual Differences*, 59, 107-118

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