



LISBOA
UNIVERSIDADE
DE LISBOA



LETRAS
LISBOA



Lisbon Baby Lab

*XXXV Encontro Nacional da Associação
Portuguesa de Linguística*
Braga, 9 - 11 October 2019



Measuring early development of language skills in infants and toddlers learning Portuguese and an Additional language: Implications for language assessment in Bilinguals

Nuno Paulino & Sónia Frota
University of Lisbon



FCT

Fundação
para a Ciência
e a Tecnologia

U LISBOA

UNIVERSIDADE
DE LISBOA



LETRAS
LISBOA

Introduction

Introduction

Background

- CDI Short form I & II

- Normative Study

- CDI application with bilinguals

Method

- Participants

- Materials & Procedure

- Data analysis

Results

Discussion



Background

McArthur-Bates Communicative Development Inventories short forms (CDI SFs) are widely used to assess language skills in both toddlers and infants.

Parental Report.

CDI is one of the most well known tools that uses parental report to assess language skills, and it was adapted to more than 60 languages.

Short forms have been described as easier to apply due to the length and complexity of the long forms (LFs), in research, educational and clinical settings.

Data shows that SFs' reliability is comparable to the LFs.

CDI SF has been adapted to European Portuguese (EP) and a norming study with monolingual children has already been published.

SFI – 8 – 18 months.

SFII – 16 – 30 months.

Fenson et al. (1993; 2007), Jackson-Maldonado et al. (2013), Frota et al. (2016)



Background

EP-CDI SFs :

One page questionnaire and easy to fill.

CLUL FLUL FCT Fundação para a Ciência e a Tecnologia LISBON BABY LAB

CDI para o Português Europeu – Forma reduzida: Nível I
Adaptação autorizada de MacArthur Bates (2003, Copyright 2003, ISBN 978-0-805-8713-9-5
http://www.fda.gov/oc/ohrt/infantstimulation/infantstim.pdf, Portugal, 2009, 2010)

Nome da criança _____ Sexo ☐ F ☐ M ☐

Data de nascimento ____/____/____ Data de hoje ____/____/____

Instruções

Para palavras que a criança compreende mas ainda não diz, assinala a primeira coluna (Compreende). Para palavras que a criança compreende mas também diz, assinala a segunda coluna (Compreende e diz). Se a criança usa uma forma diferente de dizer a palavra, assinala-a na mesma (ex: 'tata' para banana). No caso de palavras que podem ter uma forma masculina e feminina, ou singular e plural (ex: bonito, bonita, bonitos, bonitas), responde considerando qualquer uma das formas. Inclua ainda as formas com -inho/a (ex: bonitinho, bonitinha, bonitinhos, bonitinhas). Considere também as várias formas do mesmo verbo (ex: dar, dá, deu).

Compreende	Compreende e diz	Compreende	Compreende e diz	Compreende	Compreende e diz
ai	<input type="checkbox"/>	biberão	<input type="checkbox"/>	calçar	<input type="checkbox"/>
ão	<input type="checkbox"/>	colher	<input type="checkbox"/>	canta/cantar	<input type="checkbox"/>
(sem do xingo)	<input type="checkbox"/>	copo	<input type="checkbox"/>	dá/der	<input type="checkbox"/>
burru-burru	<input type="checkbox"/>	escova	<input type="checkbox"/>	espera/esperar	<input type="checkbox"/>
plu-plu	<input type="checkbox"/>	garfo	<input type="checkbox"/>	gosta/gostar	<input type="checkbox"/>
(sem do xingo)	<input type="checkbox"/>	luz	<input type="checkbox"/>	para/parar	<input type="checkbox"/>
cão	<input type="checkbox"/>	manta	<input type="checkbox"/>	puxa/puxar	<input type="checkbox"/>
galinha	<input type="checkbox"/>	cadeira	<input type="checkbox"/>	ri/rir	<input type="checkbox"/>
gato	<input type="checkbox"/>	cama	<input type="checkbox"/>	salta/saltar	<input type="checkbox"/>
leão	<input type="checkbox"/>	cozinha	<input type="checkbox"/>	tem/ter	<input type="checkbox"/>
pato	<input type="checkbox"/>	mesa	<input type="checkbox"/>	toma/tomar	<input type="checkbox"/>
rato	<input type="checkbox"/>	televisão	<input type="checkbox"/>	acai	<input type="checkbox"/>
carro	<input type="checkbox"/>	água	<input type="checkbox"/>	bom	<input type="checkbox"/>
triciclo	<input type="checkbox"/>	árvore	<input type="checkbox"/>	bonito	<input type="checkbox"/>
bola	<input type="checkbox"/>	casa	<input type="checkbox"/>	depressa	<input type="checkbox"/>
boneco	<input type="checkbox"/>	chova	<input type="checkbox"/>	foto	<input type="checkbox"/>
lupa	<input type="checkbox"/>	flor	<input type="checkbox"/>	grande	<input type="checkbox"/>
banana	<input type="checkbox"/>	lua	<input type="checkbox"/>	já está	<input type="checkbox"/>
bolo	<input type="checkbox"/>	pedra	<input type="checkbox"/>	mau/má	<input type="checkbox"/>
papa	<input type="checkbox"/>	rosa	<input type="checkbox"/>	hoje	<input type="checkbox"/>
sopa	<input type="checkbox"/>	avó/vovó	<input type="checkbox"/>	noite	<input type="checkbox"/>
chapéu	<input type="checkbox"/>	bebé	<input type="checkbox"/>	este	<input type="checkbox"/>
fralda	<input type="checkbox"/>	mãe/mamã	<input type="checkbox"/>	meu/minha	<input type="checkbox"/>
meia(s)	<input type="checkbox"/>	menina	<input type="checkbox"/>	mim	<input type="checkbox"/>
sapato(s)	<input type="checkbox"/>	banho	<input type="checkbox"/>	onde	<input type="checkbox"/>
cabeça	<input type="checkbox"/>	chichi	<input type="checkbox"/>	quem	<input type="checkbox"/>
cabelo	<input type="checkbox"/>	colo	<input type="checkbox"/>	ali	<input type="checkbox"/>
dentes	<input type="checkbox"/>	curu	<input type="checkbox"/>	fora	<input type="checkbox"/>
olho(s)	<input type="checkbox"/>	não	<input type="checkbox"/>	algum	<input type="checkbox"/>
pé	<input type="checkbox"/>	olá	<input type="checkbox"/>	mais	<input type="checkbox"/>

CLUL FLUL FCT Fundação para a Ciência e a Tecnologia LISBON BABY LAB

CDI para o Português Europeu – Forma reduzida: Nível II
Adaptação autorizada de MacArthur Bates (2003, Copyright 2003, ISBN 978-0-805-8713-9-5
http://www.fda.gov/oc/ohrt/infantstimulation/infantstim.pdf, Portugal, 2009, 2010)

Nome da criança _____ Sexo ☐ F ☐ M ☐

Data de nascimento ____/____/____ Data de hoje ____/____/____

Instruções

As crianças compreendem mais palavras do que dizem. Neste questionário, estamos interessados em saber as palavras que o/a seu/sua filho/a DIZ. Por favor, assinala as palavras que ouvia a criança dizer. Se ela diz a palavra de uma maneira diferente, assinala-a na mesma (ex: 'tata' para banana). No caso de palavras que podem ter uma forma masculina e feminina, ou singular e plural (ex: bonito, bonita, bonitos, bonitas), responde considerando qualquer uma das formas, bem como as formas com -inho/a (ex: bonitinho, bonitinha, bonitinhos, bonitinhas). Considere também as várias formas do verbo (ex: dar, dá, deu).

ei	<input type="checkbox"/>	caixa	<input type="checkbox"/>	dá/der	<input type="checkbox"/>
mã-mã	<input type="checkbox"/>	computador	<input type="checkbox"/>	deixa/deixar	<input type="checkbox"/>
mama	<input type="checkbox"/>	gelado	<input type="checkbox"/>	gosta/gostar	<input type="checkbox"/>
pumba	<input type="checkbox"/>	luz	<input type="checkbox"/>	penha/penhar	<input type="checkbox"/>
tão-tão	<input type="checkbox"/>	olhos	<input type="checkbox"/>	pilha/pilha	<input type="checkbox"/>
cão	<input type="checkbox"/>	tapete	<input type="checkbox"/>	quer/querer	<input type="checkbox"/>
cavalo	<input type="checkbox"/>	toalha	<input type="checkbox"/>	salta/saltar	<input type="checkbox"/>
gato	<input type="checkbox"/>	cadeira	<input type="checkbox"/>	vê/ver	<input type="checkbox"/>
pato	<input type="checkbox"/>	cama	<input type="checkbox"/>	acai	<input type="checkbox"/>
rã	<input type="checkbox"/>	escada(s)	<input type="checkbox"/>	bom	<input type="checkbox"/>
urso	<input type="checkbox"/>	frigorífico	<input type="checkbox"/>	bonito	<input type="checkbox"/>
banco	<input type="checkbox"/>	quarto	<input type="checkbox"/>	depressa	<input type="checkbox"/>
carro	<input type="checkbox"/>	árvore	<input type="checkbox"/>	foto	<input type="checkbox"/>
helicóptero	<input type="checkbox"/>	balão	<input type="checkbox"/>	frio	<input type="checkbox"/>
bola	<input type="checkbox"/>	edu	<input type="checkbox"/>	já está	<input type="checkbox"/>
brinquedo	<input type="checkbox"/>	chova	<input type="checkbox"/>	maior	<input type="checkbox"/>
lupa	<input type="checkbox"/>	lar	<input type="checkbox"/>	pequeno	<input type="checkbox"/>
água	<input type="checkbox"/>	círculo	<input type="checkbox"/>	depois	<input type="checkbox"/>
banana	<input type="checkbox"/>	escala	<input type="checkbox"/>	dá	<input type="checkbox"/>
bolacha	<input type="checkbox"/>	amigo	<input type="checkbox"/>	hoje	<input type="checkbox"/>
carne	<input type="checkbox"/>	mãe/mamã	<input type="checkbox"/>	isto	<input type="checkbox"/>
iguarite	<input type="checkbox"/>	professor	<input type="checkbox"/>	mim	<input type="checkbox"/>
pão	<input type="checkbox"/>	banho	<input type="checkbox"/>	nosso	<input type="checkbox"/>
queijo	<input type="checkbox"/>	não	<input type="checkbox"/>	tu	<input type="checkbox"/>
sumo	<input type="checkbox"/>	obrigado(a)	<input type="checkbox"/>	onde	<input type="checkbox"/>
casaco	<input type="checkbox"/>	olá	<input type="checkbox"/>	aqui	<input type="checkbox"/>
chapéu	<input type="checkbox"/>	por favor	<input type="checkbox"/>	dentro	<input type="checkbox"/>
meia(s)	<input type="checkbox"/>	acaba/acabar	<input type="checkbox"/>	em cima	<input type="checkbox"/>
sapato(s)	<input type="checkbox"/>	termina/terminar	<input type="checkbox"/>	muito	<input type="checkbox"/>
mãe	<input type="checkbox"/>	cabeça/cabeça	<input type="checkbox"/>	sentado	<input type="checkbox"/>
olho(s)	<input type="checkbox"/>	calçar	<input type="checkbox"/>	sem/sem	<input type="checkbox"/>
perna	<input type="checkbox"/>	compra/comprar	<input type="checkbox"/>	porque	<input type="checkbox"/>
unha(s)	<input type="checkbox"/>	correr/correr	<input type="checkbox"/>	palavras terminadas em -inho (ex: seiscinho)	<input type="checkbox"/>

A sua criança começou a combinar palavras, como por exemplo, "bolo amarelo", "quero pintar" ou "meu pai voa"?

Não ☐ Às vezes ☐ Muitas vezes ☐

Frota et al., 2016



Background

EP-CDI SFI Normative Study

Main findings:

Comprehension precedes production.

Gender differences, Girls > boys - advantage throughout all age groups.

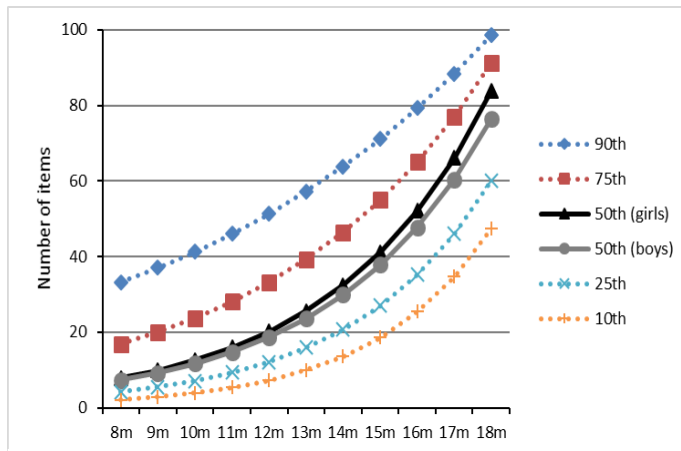


Figure 1. Words understood as a function of age (months), gender and percentile level. Fitted score (infant short form, EP-CDI SFI).

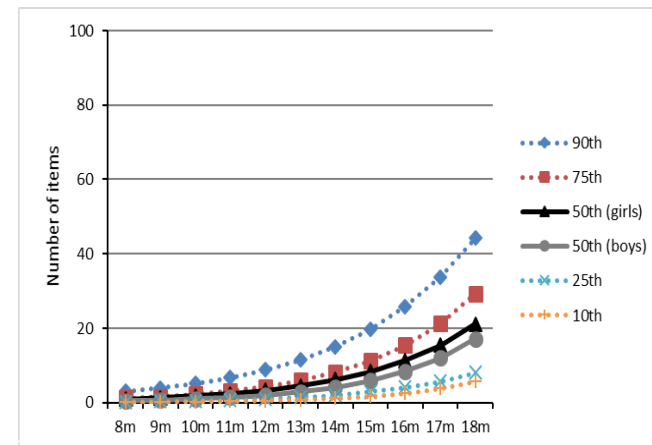


Figure 2. Words produced as a function of age (months), gender and percentile level. Fitted score (infant short form, EP-CDI SFI).

Frota et al. (2016)



Background

EP-CDI SFII Normative Study

Main findings:

Steady vocabulary increase with age, being more visible after 24 months; Gender difference, Girls > boys

Production shows a ceiling effect at 27 months (same as found for American English, Spanish and Galician)

Correlation between expressive vocabulary and word combinations.

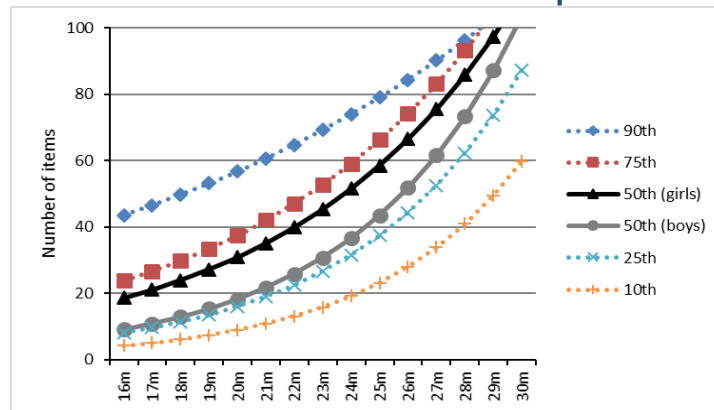


Figure 3. Words produced as a function of age (months), gender and percentile level. Fitted score (toddler short form, EP-CDI SFII).

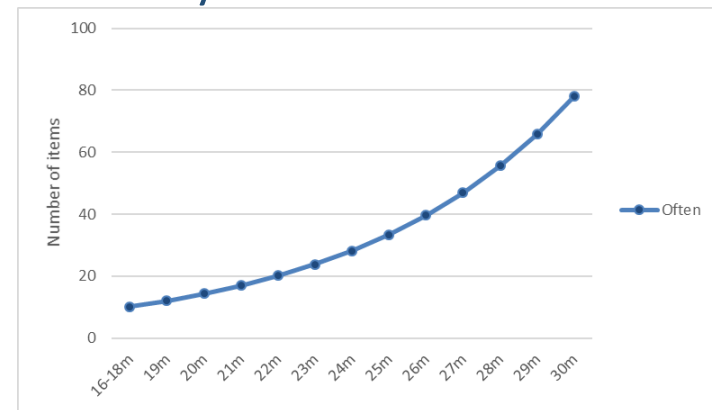


Figure 4. Word combinations (often) as a function of age (months). Median score (50th percentile) (infant short form, EP-CDI SFII).

Frota et al. (2016)



Background

Studies with bilinguals

Studies show similar development between monolinguals and bilinguals when tested in both languages.

Studies done with English and one additional language conclude that the amount of exposure to each language is important.

Gender differences between participants: girls have better scores than boys.

In general, bilinguals produce and understand less words than monolinguals when tested in the same language: different norms for bilinguals are needed.

Core et al. (2013), Floccia et al. (2018).



Method

Data collection

Questionnaires filled by the caregiver - children visited the Baby Lab for other studies, and the CDI was filled.
Collaboration with 71 nurseries across Portugal.

Exclusion Criteria

Medical - Down Syndrome, deafness, a.o.
Monolinguals.
Incomplete Questionnaire.
Age outside of the interval.



Method

SFI - 56 Infants

CDI SFI				
Month	Boys	Girls	Total	
	N	N	N	
8, 9 months		9	3	12
10, 11 months		3	10	13
12, 13 months		6	7	13
14, 15 months		4	4	8
16, 17, 18 months		6	4	10
Total	28	28	56	

Table 1 - Data distribution by age and gender, SFI

SFII - 88 Toddlers

CDI SFII			
Month	Boys	Girls	Total
	N	N	N
16, 17, 18 months	5	7	12
19, 20 months	6	4	10
21, 22 months	6	8	14
23, 24 months	9	8	17
25, 26 months	3	10	13
27, 28 months	4	5	9
29, 30 months	7	6	13
Total	40	48	88

Table 2 - Data distribution by age and gender, SFII



Method:

Geographic distribution

EP-CDI SFI: Bilinguals



Figure 5. Data collection points (infant short form, EP-CDI SFI).

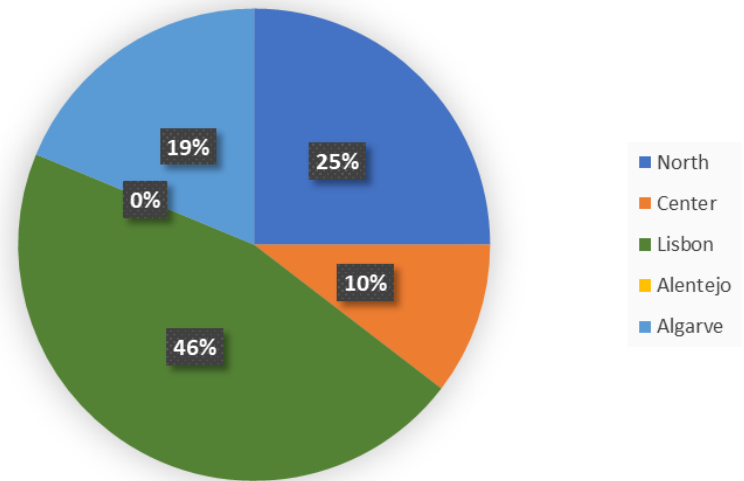


Figure 6. Participant distribution by area (infant short form, EP-CDI SFI).



Method:

Geographic distribution

EP-CDI SFII: Bilinguals

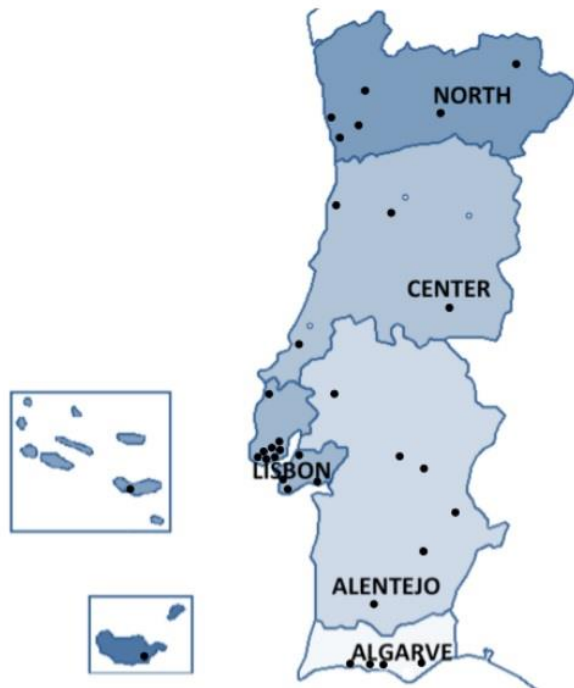


Figure 7. Data collection points (infant short form, EP-CDI SFII).

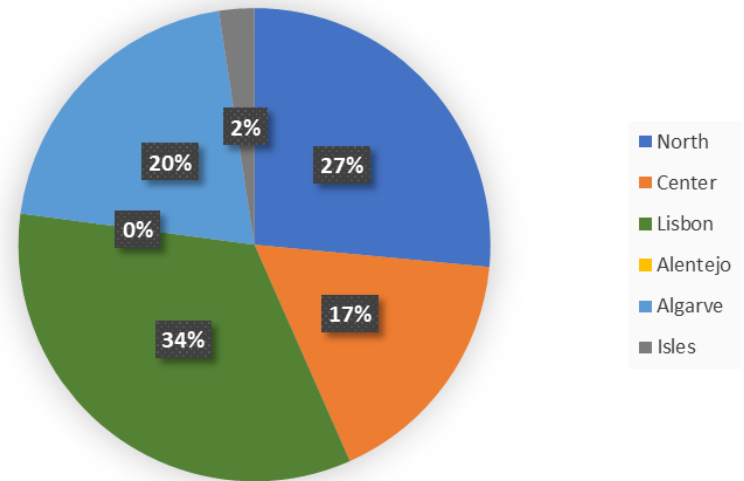


Figure 8. Participant distribution by area (toddler short form, EP-CDI SFII).



Method: Additional Languages

EP-CDI SFI: Over 40% of the children had English as an additional Language.

Four main languages: English, German, Spanish and French.

9 Languages with a small number of participants.

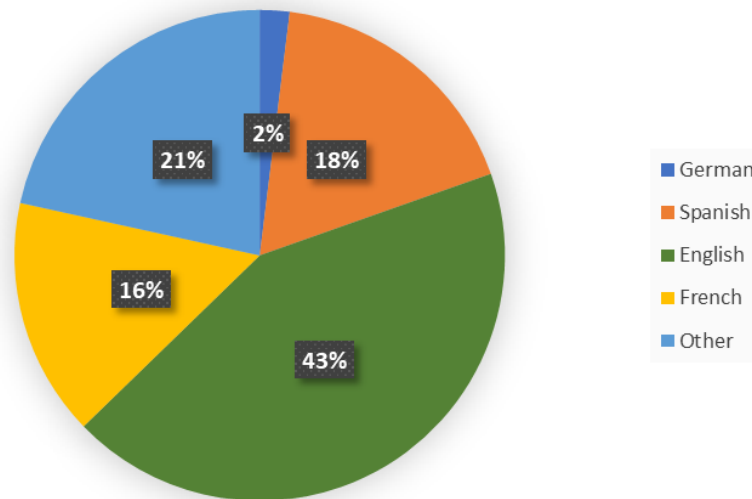


Figure 9. Participant distribution by language (infant short form, EP-CDI SFI).



Method: Additional Languages

EP-CDI SFII: Very similar distribution as EP-CDI SFI.

20% of the distribution divided into several different languages: Dutch, Italian, Ucranian, Russian, Croatian, Polish, Romanian, Chinese, Creole.

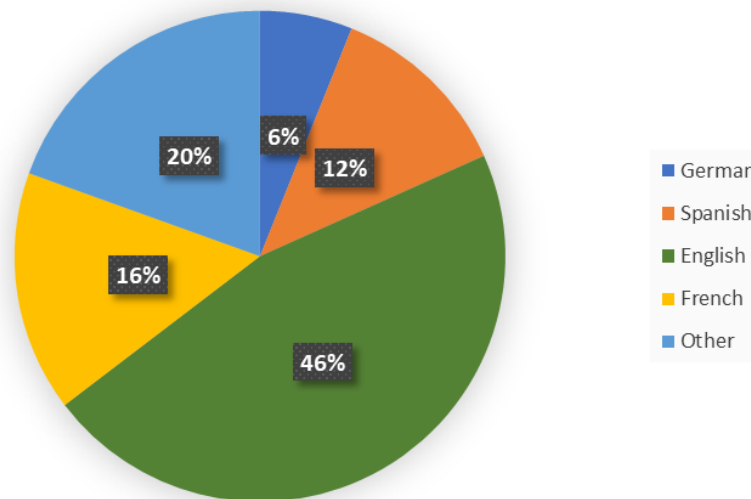


Figure 10. Participant distribution by language (toddler short form, EP-CDI SFII).



Method: Employment Status

Data distribution

Monolinguals vs. Bilinguals

Parental Employment Status

Language Group	CDI-I		CDI-II	
	N(463)	%	N(517)	%
Monolingual	407	89%	429	84%
Bilingual	56	12%	88	17%

Table 3 - Data distribution Monolingual vs. Bilingual

Parental Employment Status	CDI-I		CDI-II	
	N(56)	%	N(88)	%
Highly Qualified	31	55%	33	38%
Medium Qualified	16	29%	35	40%
Low Qualified and Workers	7	13%	11	13%
Unemployed	2	4%	9	10%

Table 4 - Sociodemographic characteristics of the Bilingual CDI sample

- Around 15% of the data collected was from bilingual children.
- Relates with data from INE - for Portuguese + foreign marriages.
- Around 80% of caregivers had medium to high qualifications.
- Similar to the normative study and other languages.

Frøta et al. (2016), Jackson-Maldonado et al. (2013), Kristoffersen et al. (2012), Simonsen et al. (2014)



Results

EP-CDI SFI results for bilinguals - Comprehension

At 16-18 months bilinguals understand around 45 words, less 10 than the monolinguals (55).

Comprehension increases with age ($t(55) = -3.887, p < .05$).

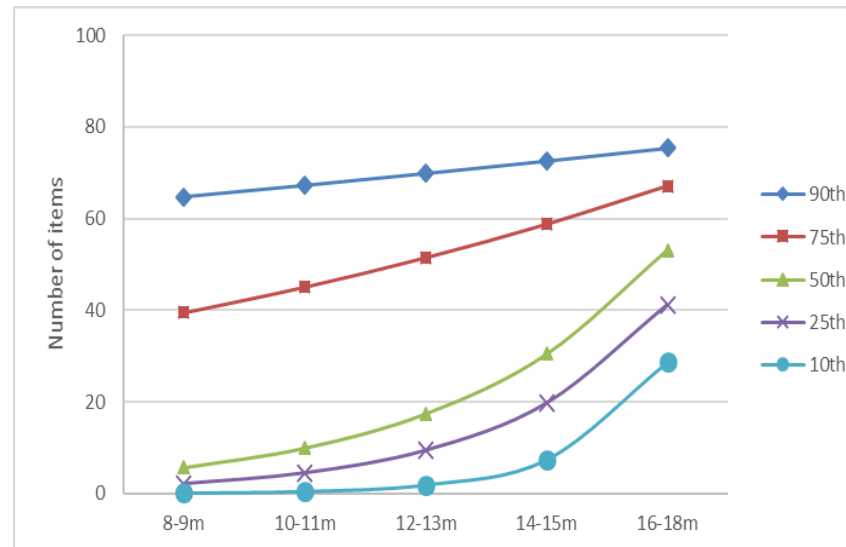
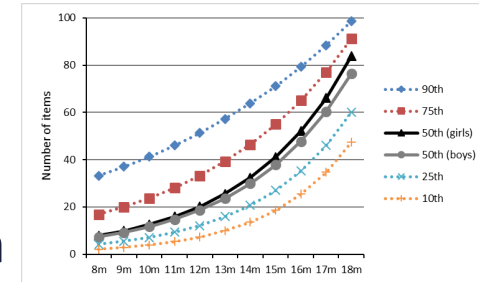


Figure 11. Words understood as a function of age (months) and percentile level. Fitted score (infant short form, EP-CDI SFI).



Results

EP-CDI SFI results for bilinguals - Production

At 16-18 months bilinguals produce around 15 words, less 7 than the monolinguals (22).

Production also increases with age ($t(55) = 2.537, p < .05$).

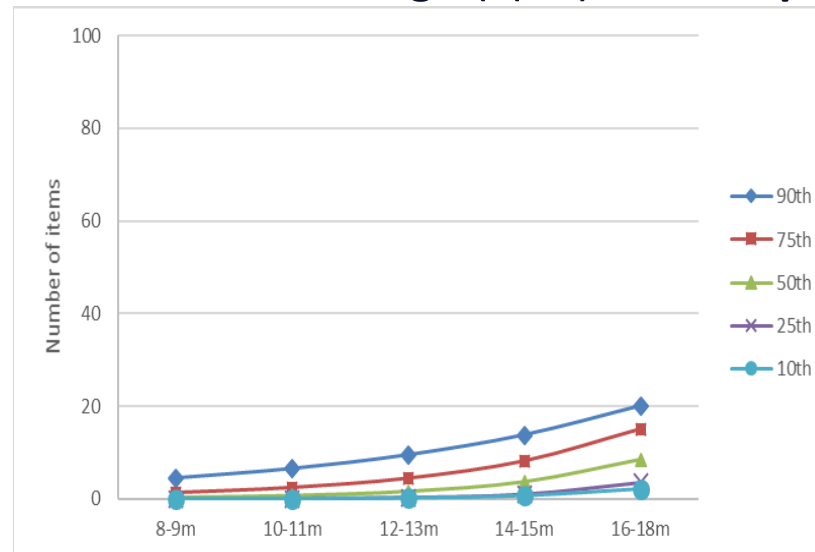
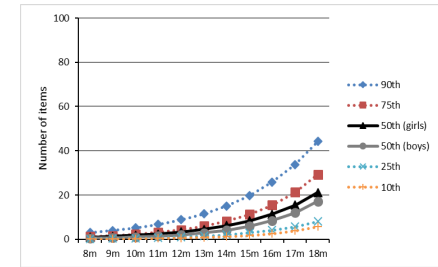


Figure 12. Words understood as a function of age (months) and percentile level. Fitted score (infant short form, EP-CDI SFI).



Results

EP-CDI SFI results for bilinguals and monolinguals

Similar development, but monolinguals have better scores throughout.

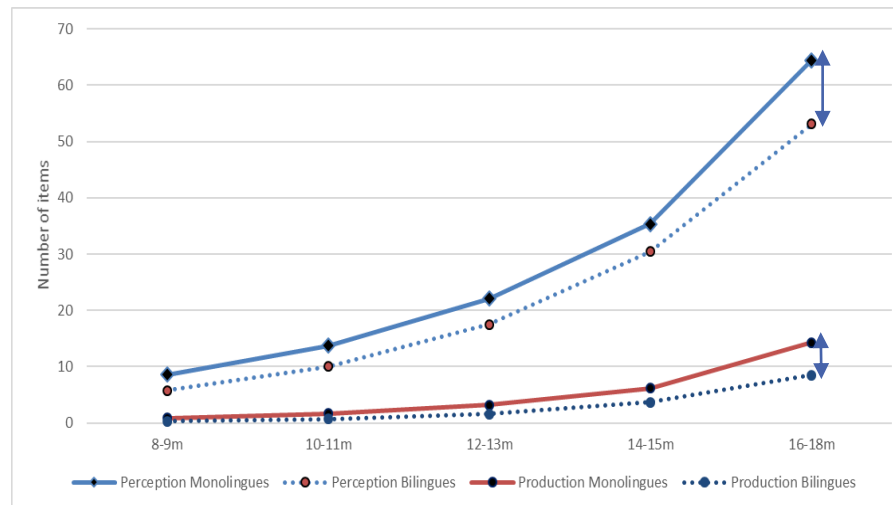


Figure 12. Words produced and understood as a function of age (months) and Bi vs. Mono. Median score (50th percentile) (infant short form, EP-CDI SFI).

Language group (monolinguals vs. bilinguals, $F(1,464) = 18.79$, $p < .05$) and age group (8-12 vs. 13-18, $F(1,464) = 46.12$, $p < .05$) significant effect for **words understood**; a significant effect for age group ($F(1,464) = 25.29$, $p < .05$) but not for language group ($F(1,464) = 0.0002$, $p = .962$) for **words produced**.



Results

EP-CDI SFII results for bilinguals - Production

At 29-30 months, bilinguals produce around 70 words, while monolinguals already have a ceiling effect by this age.

Developmental trend in all the percentiles: An age group (16-20, 21-25, 26-30) significant effect for **words produced** was found ($F(2.86)= 11.70$, $p<.05$) .

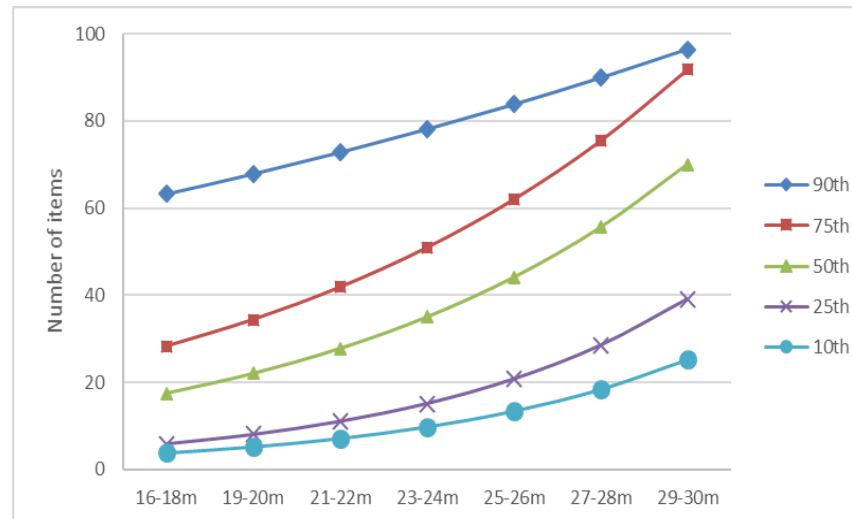
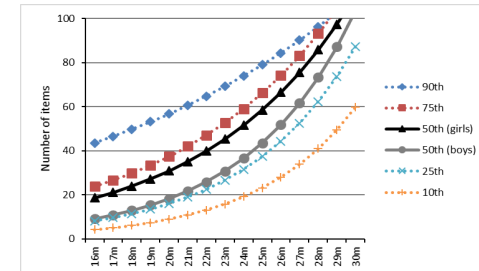


Figure 13. Words produced as a function of age (months) and percentile level. Fitted score (infant short form, EP-CDI SFII).



Results

EP-CDI SFII results for bilinguals and monolinguals

Bilinguals underperform compared to the monolinguals.

Bilinguals produce less 30 words on average than monolinguals.

Language group ($F(1,517) = 6.55$, $p < .05$) and age group ($F(2,517) = 71.66$, $p < .05$) yielded significant main effects for **words produced**, with no interaction.

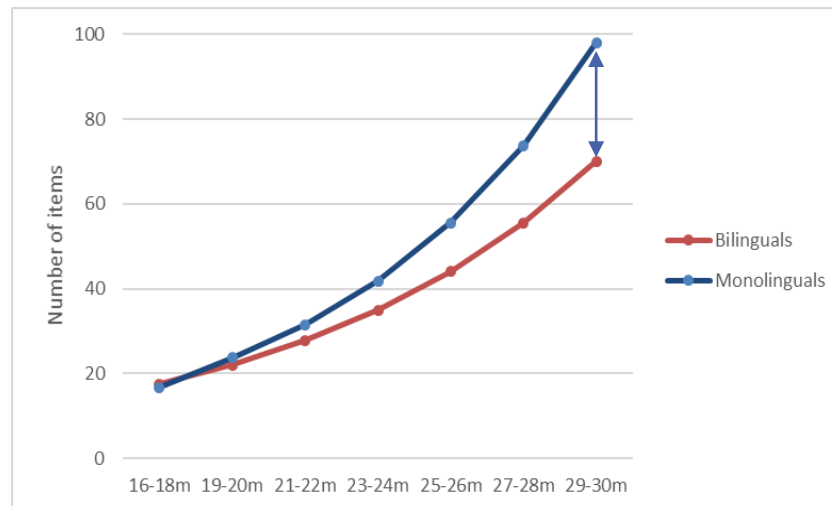


Figure 14. Words produced as a function of age (months) and Bi vs. Mono. Median score (50th percentile) (infant short form, EP-CDI SFII).



Results

EP-CDI SFII results for bilinguals and monolinguals - word combination

Bilinguals underperform compared to the monolinguals.

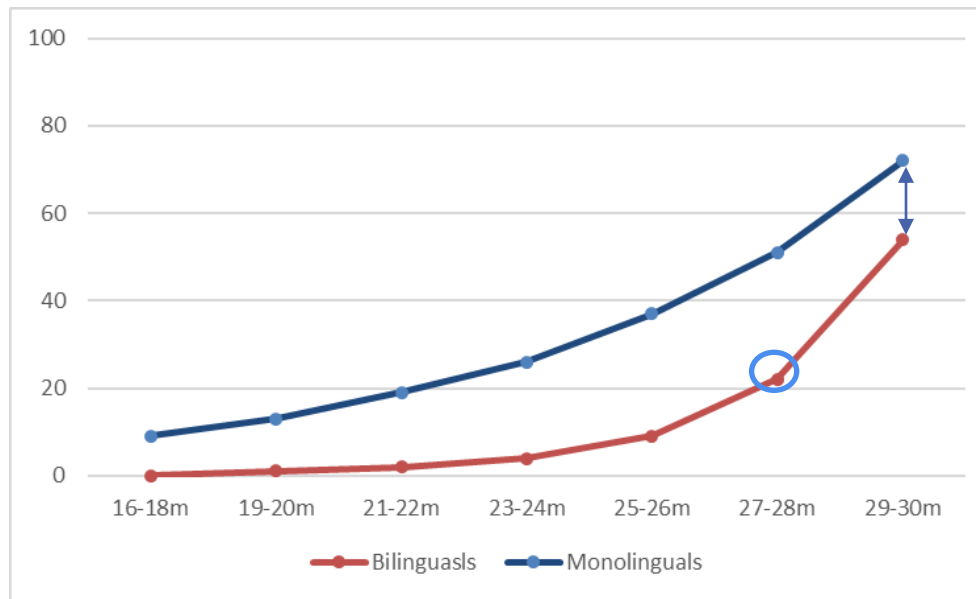


Figure 15. Word combinations (often) as a function of age (months). (months) and Bi vs. Mono. Median score (50th percentile) (infant short form, EP-CDI SFII).



Discussion

Bilingual children score lower in vocabulary development than their monolingual peers.

In line with previous studies, when children are assessed in their main language of exposure, bilinguals score lower.

The difference in scores is extended to both SFI and SFII and word combinations. However, the difference is greater for SFII than the SFI.

Highlights the need to develop specific norms for children learning Portuguese and an Additional Language (AL)

Amount of exposure to the AL was not considered in this study. In future work, the application of a language exposure questionnaire (already in development) is planned.



Thank you!

This research was supported by the Portuguese Foundation for Science and Technology and the European Regional Development Fund from the EU, Portugal 2020 and Lisboa 2020 (FCT Grant - SFRH/BD/138535/2018, Grant PTDC/LLT- LIN/29338/2017)

npaulino@campus.ul.pt
sfrota@campus.ul.pt

<http://labfon.letras.ulisboa.pt/babylab/pt/CDI/index.html>

References

- Core, C., Hoff, E., Rumiche, R., & Señor, M. (2013). Total and conceptual vocabulary in Spanish–English bilinguals from 22 to 30 months: implications for assessment. *Journal of Speech, Language, and Hearing Research*.
- Fenson, L., Dale, P. S., Reznick, J. S., Thal, D., Bates, E., Hartung, J. P., ... Reilly, J. S. (1993). *The MacArthur Communicative Development Inventories: User's guide and Technical manual*. San Diego, CA: Singular Publishing Group.
- Fenson, L., Marchman, V. A., Thal, D. J., Dale, P. S., Reznick, J. S., & Bates, E. (2007). *The MacArthur Communicative Development Inventories: User's guide and technical manual* (2nd ed.). Baltimore, MD: Brookes Publishing.
- Frota, S., Butler, J., Correia, S., Severino, C., Vicente, S. & Vigário, M. (2015). Questionários MacArthur-Bates CDI para o Português Europeu: formas reduzidas. Lisboa: Laboratório de Fonética, CLUL/FLUL. [<https://labfon.lettras.ulisboa.pt/babylab/pt/CDI/index.html>].
- Frota, S., Butler, J., Correia, S., Severino, C., Vicente, S. & Vigário, M. (2016) Infant communicative development assessed with the European Portuguese MacArthur-Bates Communicative Development Inventories short forms, *First Language* 36, 5: 525-545.
- Floccia, C., Sambrook, T.D., Luche, C.D., Kwok, R., Goslin, J., White, L., ... Plunkett, K. (2018) Vocabulary of 2-year-olds Learning English and an Additional Language: Norms and effects of Linguistic Distance. *Monographs of the Society for Research in Child Development* (83).
- Jackson-Maldonado, D., Marchman, V. A., & Fernald, L. C. (2013). Short-form versions of the Spanish MacArthur–Bates Communicative Development Inventories. *Applied Psycholinguistics*, 34(4), 837-868.
- Kristoffersen, K. E., Simonsen, H. G., Bleses, D., Wehberg, S., Jørgensen, R. N., Eiesland, E. A., & Henriksen, L. Y. (2013). The use of the Internet in collecting CDI data—an example from Norway. *Journal of child language*, 40(3), 567-585.
- Simonsen, H. G., Kristoffersen, K. E., Bleses, D., Wehberg, S., & Jørgensen, R. N. (2014). The Norwegian Communicative Development Inventories: Reliability, main developmental trends and gender differences. *First Language*, 34(1), 3-23.

