



# Trissomia 21: Novos Conhecimentos CountDOWN

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## ***Early markers of language development***

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EXCL/MHC-LIN/0688/2012; PTDC/MHC-LIN/3901/2014



*Do Olhar ao Cérebro: marcadores precoces no desenvolvimento da linguagem*

Eyes and Brain: Early markers of Language development

<http://labfon.letras.ulisboa.pt/babylab/EBELa/>



Horizon21: Early language development in Down Syndrome



<http://labfon.letras.ulisboa.pt/babylab/horizon21/>

Horizonte21: Desenvolvimento da linguagem em bebés com Síndrome de Down

**Ethics Statement:** Ethical approval obtained from Comissão de Ética do Hospital de Santa Maria and from Comissão de Ética da Administração Regional de Saúde de Lisboa e Vale do Tejo; Written informed consent obtained from parents or legal guardians of all participants according to the principles explained in the Declaration of Helsinki

# Why early markers



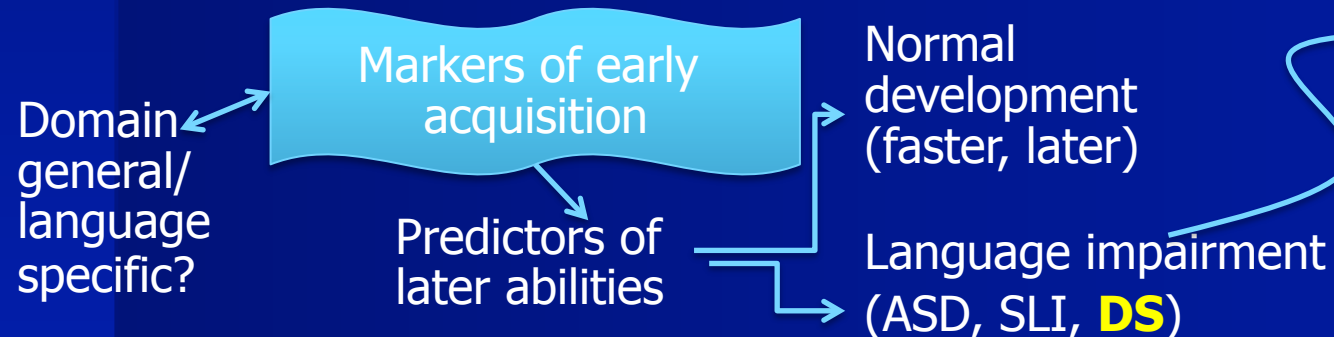
Research on early markers of language development

→ using both standard behavioral measures and ERP measures



Infant's task in learning a language >> a stronger commitment to the native language as development proceeds

What the early markers for European Portuguese are  
How they correlate and at which time-point with later language skills



# Why early markers



Research on early markers  
of language development



Infant's task in learning a language >>  
a stronger commitment to the native  
language as development proceeds

Typical development

TD

WHAT MARKERS?  
Support early  
intervention

At-risk infants (AR)

**DS**

Domain  
general/  
language  
specific?

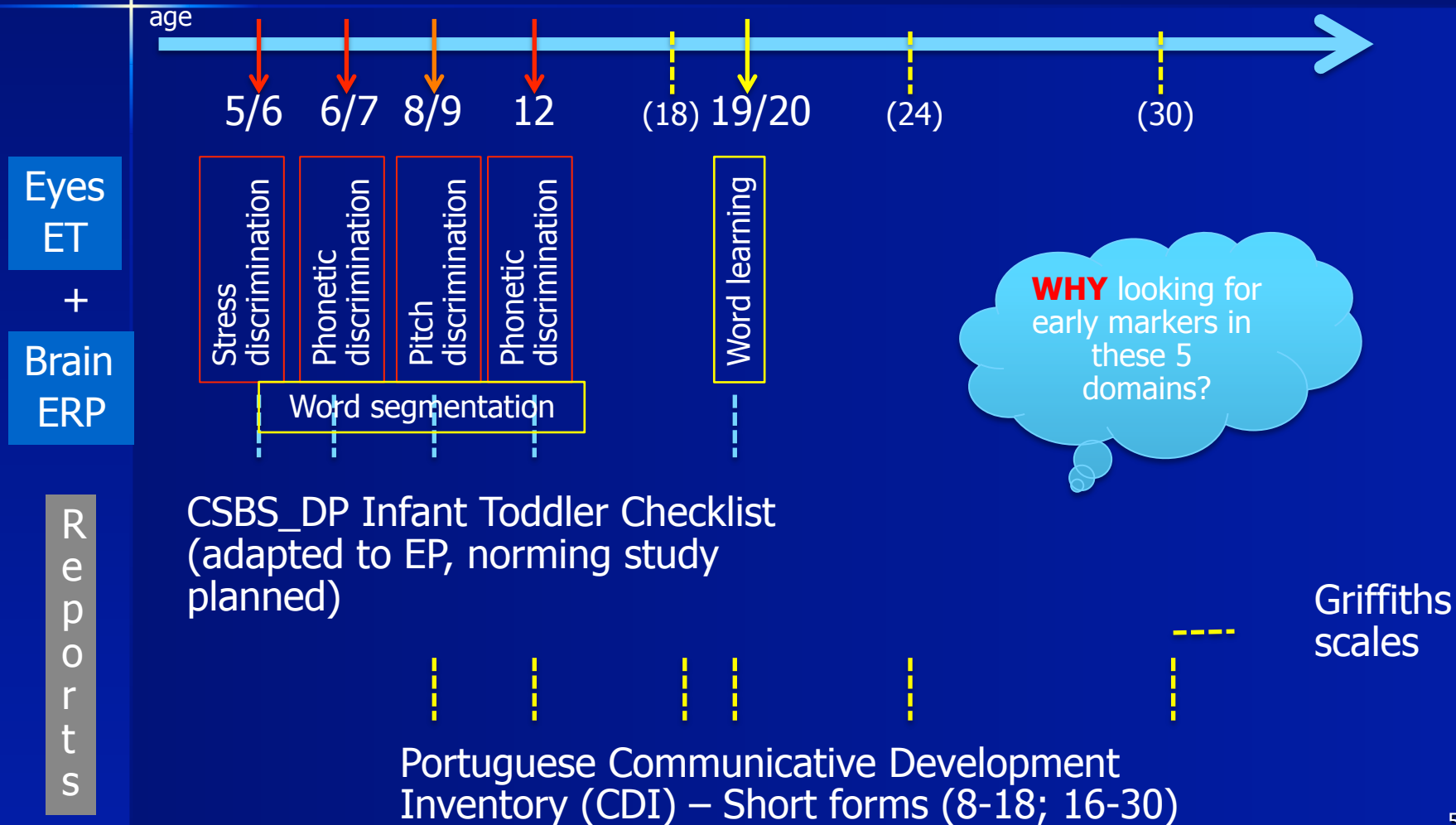
Markers of early  
acquisition

Predictors of  
later abilities

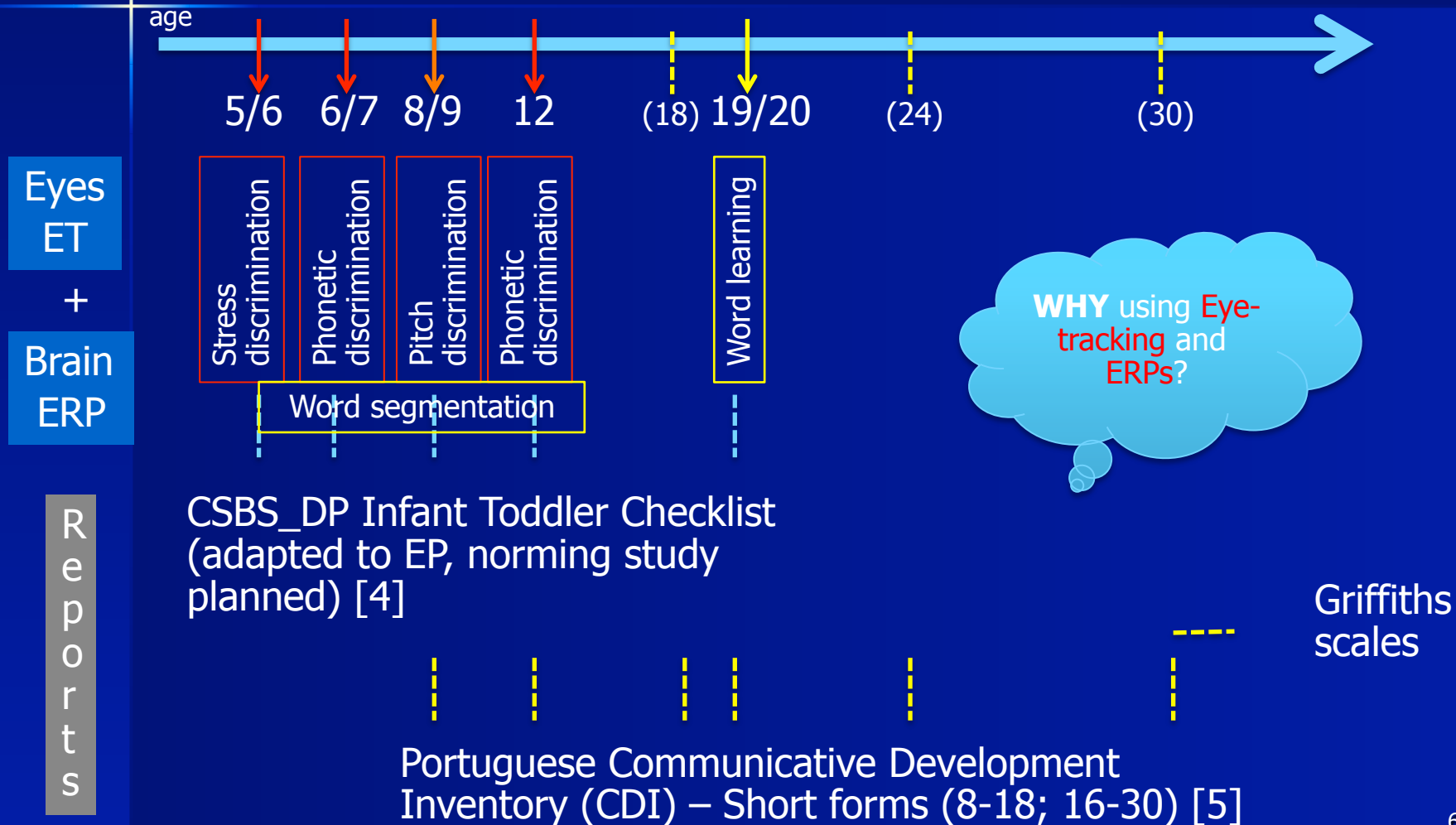
Normal  
development  
(faster, later)

Language impairment  
(ASD, SLI, **DS**)

# Prospective study in 5 domains (speech perception)

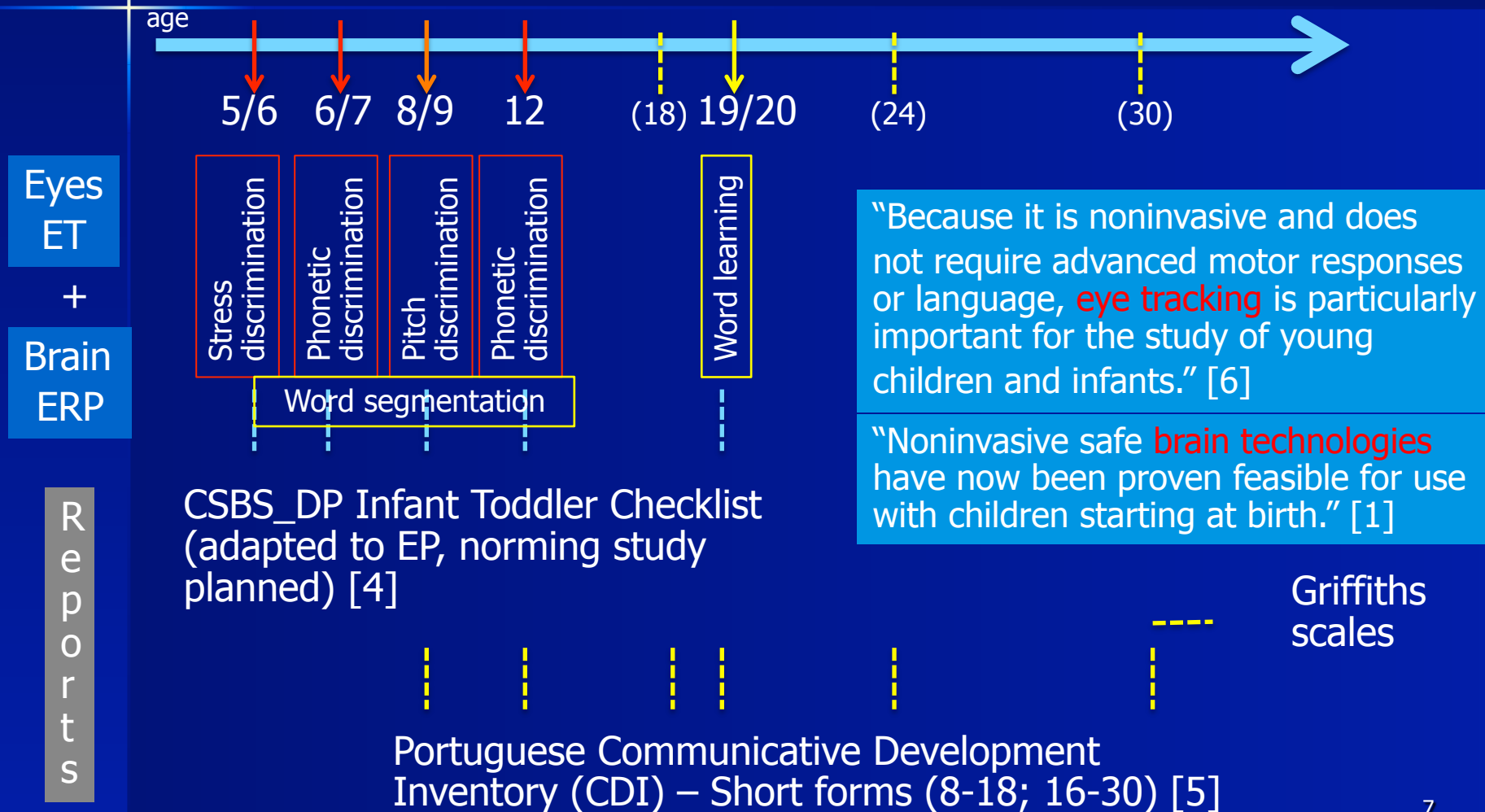


# Prospective study in 5 domains





# Prospective study in 5 domains



# Prospective study in 5 domains

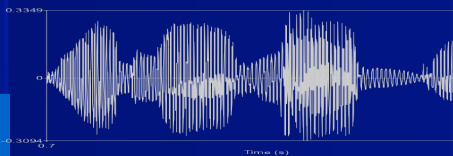
**WHY** looking for  
early markers in  
these 5  
domains?



Eyes  
ET

+

Brain  
ERP



Speech perception abilities in the  
1<sup>st</sup> year, namely early sensitivity to  
**Prosody** (word stress, pitch/  
intonation, prosodic grouping)

Speech segmentation

Word segmentation

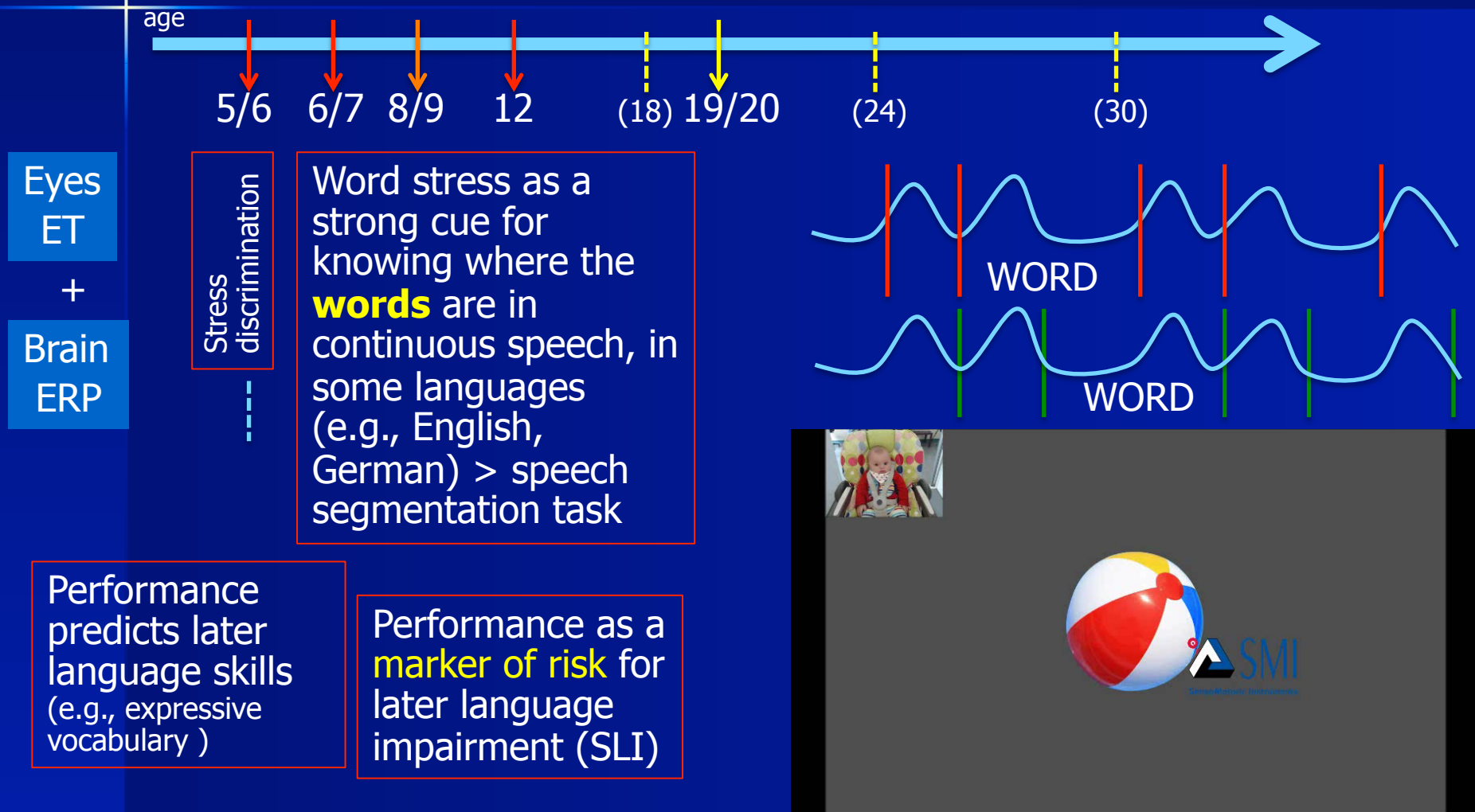
Word learning

Syntactic processing

R  
e  
p  
o  
r  
t  
s



# Prospective study in 5 domains: Stress



# Prospective study in 5 domains: Stress



Eyes  
ET

+

Brain  
ERP

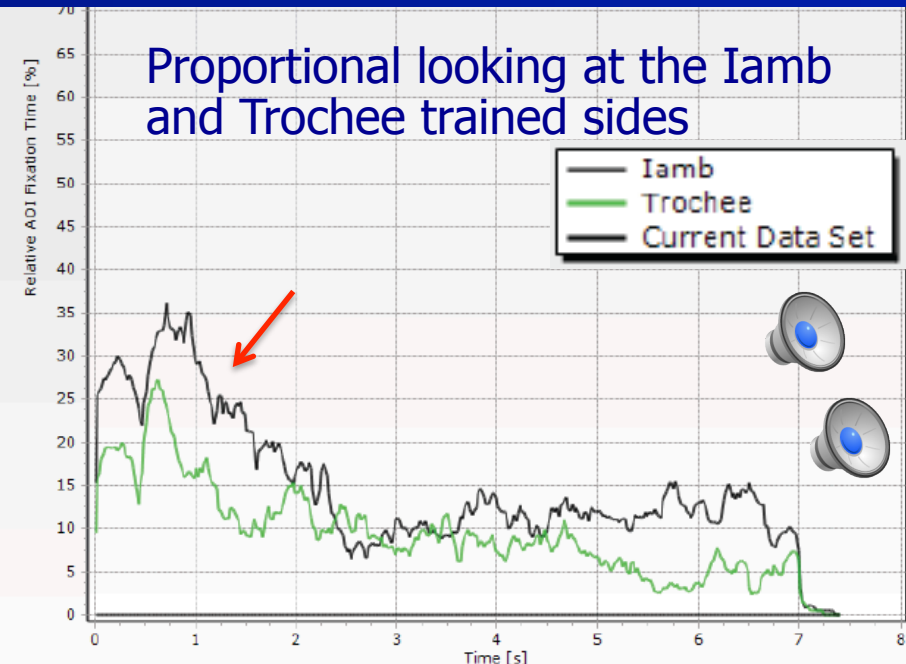
Stress  
discrimination

New findings for  
**Portuguese in TD**  
**infants at 5-6 months**  
showing an early  
preference for the  
pattern Weak-Strong  
(≠ English, German,  
French, Spanish...)

Whether  
performance  
predicts later  
language skills  
(e.g., expressive  
vocabulary )

And could be a  
marker for (later)  
language  
impairment

Proportional looking at the Iamb  
and Trochee trained sides



STUDY IN PROGRESS

# Prospective study in 5 domains: Pitch



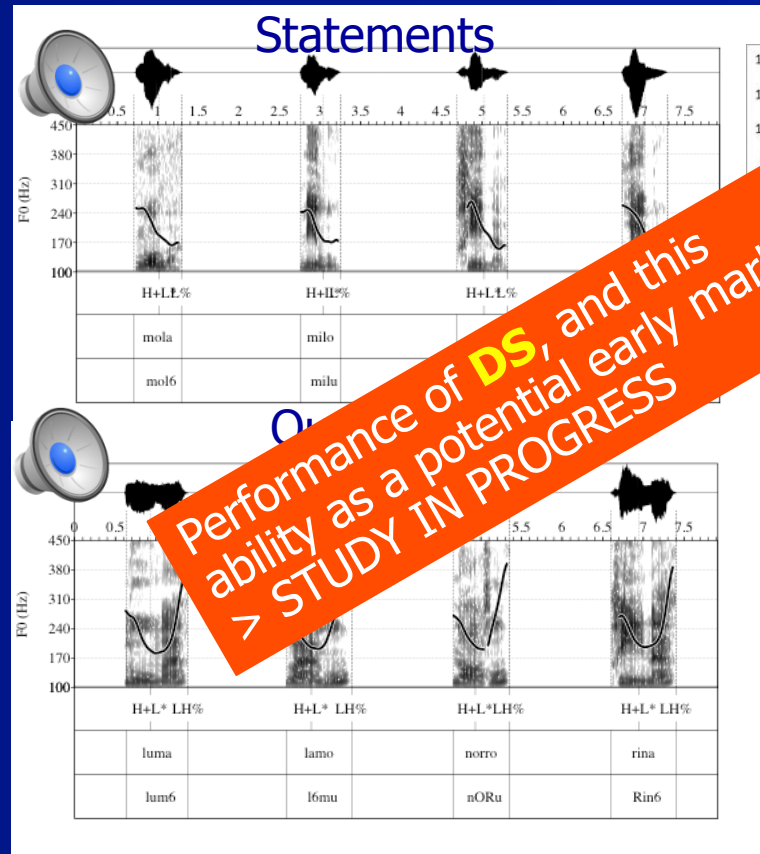
Eyes  
ET  
+  
Brain  
ERP



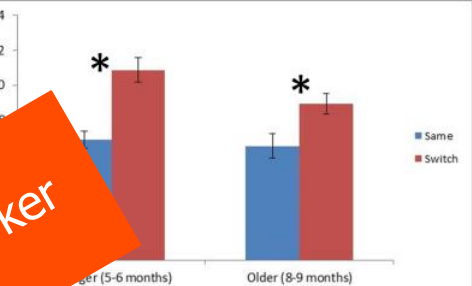
Pitch  
discrimination

Pitch  
discrimination

Pitch cues **sentence types** (statements and questions): distinguishing them is crucial for syntax, social interaction, communication

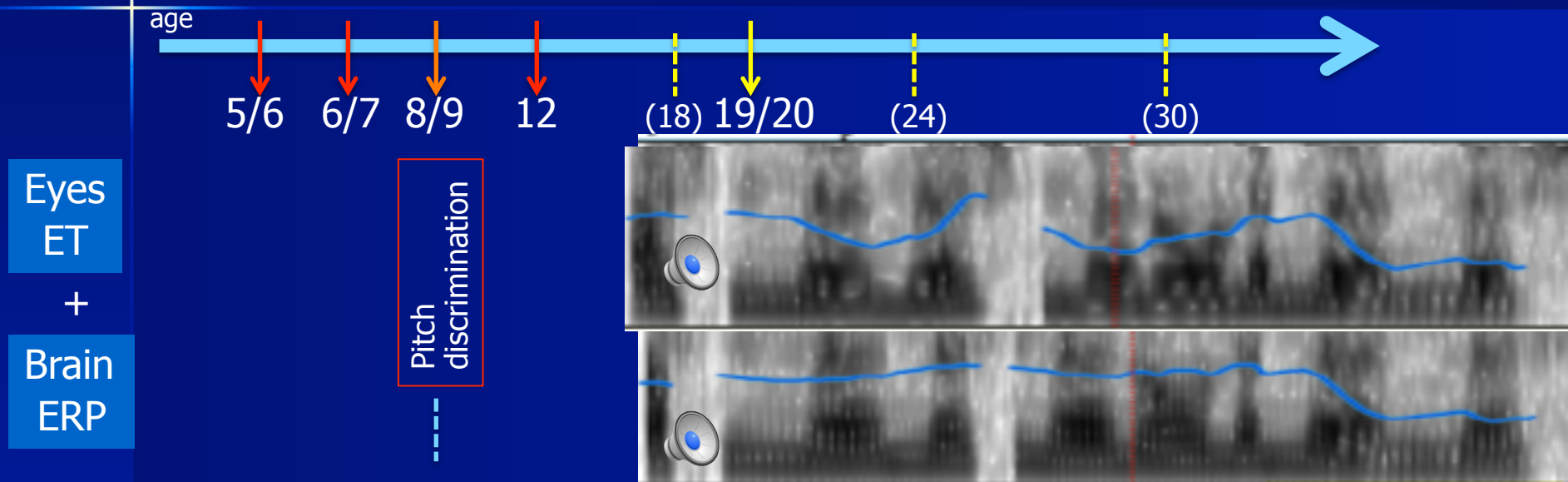


Performance of **DS**, and this ability as a potential early marker  
> STUDY IN PROGRESS



Portuguese Infants (TD) are able to discriminate utterances that differ only in the prosodic features that cue statements and questions, as early as 5 months

# Prospective study in 5 domains: Pitch



Intonation Phrase boundaries are crucial for both **lexical and syntactic segmentation**

Given infants' early sensitivity to pitch, this field suggests promising results as predictive markers

Às meninas] deram bonecas]  
As meninas deram bonecas]

Word segmentation next to boundaries + phrasing

# Prospective study in 5 domains: **Word segmentation**



Eyes  
ET

+

Brain  
ERP



Infants exposed to passages with target words in different positions in the utterance: end (boundary), middle (no boundary)

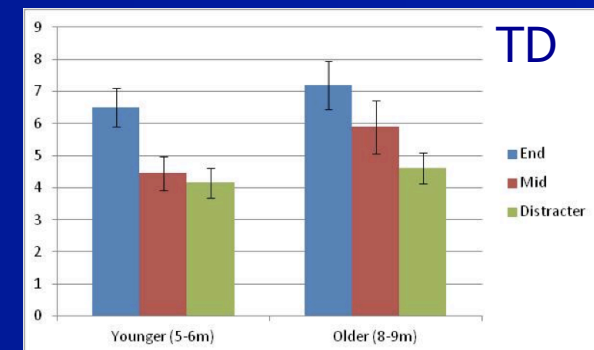
Word segmentation



Intonation Phrase boundaries are crucial for both **lexical and syntactic segmentation**

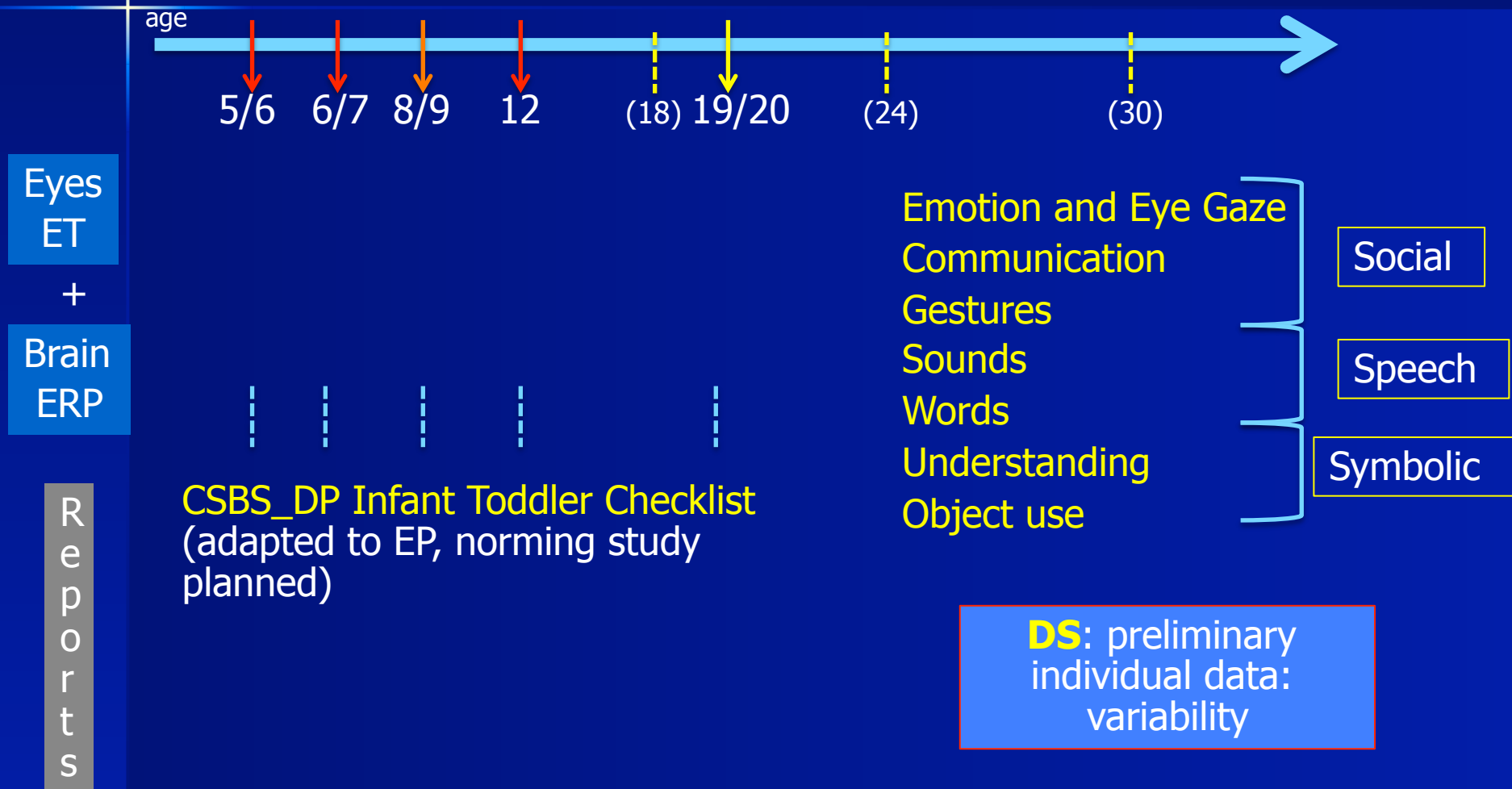
**TD infants:** Word segmentation next to boundaries >> other

**DS:** preliminary individual data



	Average Looking Time (ms)		
	End	Mid	Distracter
8m	5,25	8,09	6,44
9m	2,70	8,05	5,38
11m	4,00	5,97	6,54
12m	7,69	6,87	5,70

# Prospective study in 5 domains: Parental reports





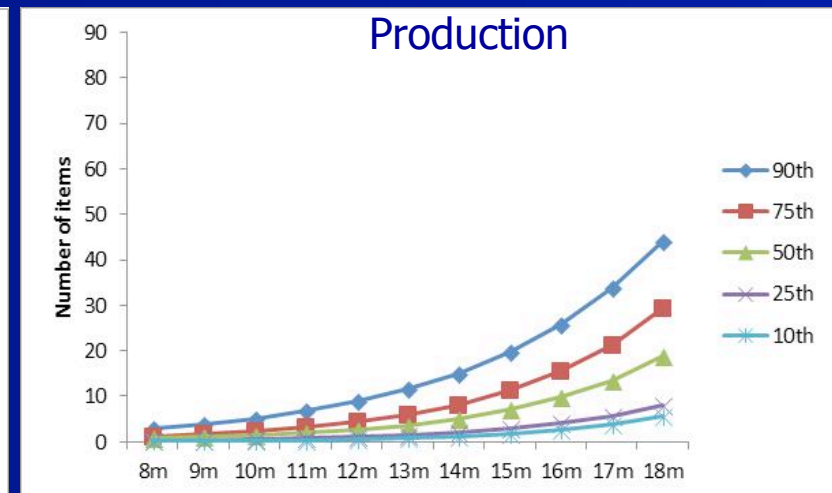
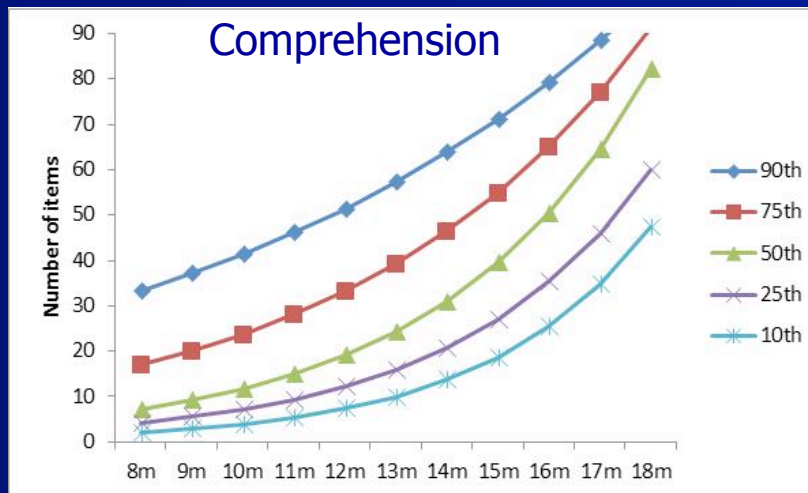
# Prospective study in 5 domains: Parental reports

<http://labfon.lettras.ulisboa.pt/babylab/pt/CDI/>



Eyes  
ET  
+  
Brain  
ERP

R  
e  
p  
o  
r  
t  
s



Words understood/produced as a function of age and percentile level (fitted scores):  
EP-CDI SFI (8-18 months)

Portuguese Communicative Development  
Inventory (CDI) – Short forms (8-18; 16-30)





### CDI para o Português Europeu – Forma reduzida: Nível I

Adaptação autorizada do MacArthur-Bates CDI. Copyright 2012, ISBN 978-989-95713-5-8  
http://www.fl.ul.pt/laboratoriofonetica/babylab/pt/CDI\_Portugues\_Europeu.html

Nome da criança \_\_\_\_\_

Sexo F o M o

Data de nascimento \_\_\_\_/\_\_\_\_/\_\_\_\_

Data de hoje \_\_\_\_\_

#### Instruções

Para palavras que a criança compreende mas ainda não diz, assinale a primeira coluna (Compreende). Para palavras que a criança compreende mas também diz, assinale a segunda coluna (Compreende e diz). Se a criança usa uma forma diferente de dizer a palavra, assinale-a na mesma (ex.: 'nana' para banana). No caso de palavras que podem ter uma forma masculina e feminina, ou singular e plural (ex.: bonito, bonito, bonitos, bonitas), responda 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"/>	<input type="checkbox"/>	biberão	<input type="checkbox"/>	<input type="checkbox"/>	cai/cair	<input type="checkbox"/>	<input type="checkbox"/>
ão (som do animal)	<input type="checkbox"/>	<input type="checkbox"/>	colher	<input type="checkbox"/>	<input type="checkbox"/>	canta/cantar	<input type="checkbox"/>	<input type="checkbox"/>
brum-brum	<input type="checkbox"/>	<input type="checkbox"/>	copo	<input type="checkbox"/>	<input type="checkbox"/>	dá/dar	<input type="checkbox"/>	<input type="checkbox"/>
piu-piu (som do animal)	<input type="checkbox"/>	<input type="checkbox"/>	escova	<input type="checkbox"/>	<input type="checkbox"/>	espera/esperar	<input type="checkbox"/>	<input type="checkbox"/>
cão	<input type="checkbox"/>	<input type="checkbox"/>	garfo	<input type="checkbox"/>	<input type="checkbox"/>	gosta/gostar	<input type="checkbox"/>	<input type="checkbox"/>
galinha	<input type="checkbox"/>	<input type="checkbox"/>	luz	<input type="checkbox"/>	<input type="checkbox"/>	pára/parar	<input type="checkbox"/>	<input type="checkbox"/>
gato	<input type="checkbox"/>	<input type="checkbox"/>	manta	<input type="checkbox"/>	<input type="checkbox"/>	puxa/puxar	<input type="checkbox"/>	<input type="checkbox"/>
leão	<input type="checkbox"/>	<input type="checkbox"/>	cadeira	<input type="checkbox"/>	<input type="checkbox"/>	ri/rir	<input type="checkbox"/>	<input type="checkbox"/>
pato	<input type="checkbox"/>	<input type="checkbox"/>	cama	<input type="checkbox"/>	<input type="checkbox"/>	salta/saltar	<input type="checkbox"/>	<input type="checkbox"/>
rato	<input type="checkbox"/>	<input type="checkbox"/>	cozinha	<input type="checkbox"/>	<input type="checkbox"/>	tira/tirar	<input type="checkbox"/>	<input type="checkbox"/>
carro	<input type="checkbox"/>	<input type="checkbox"/>	mesa	<input type="checkbox"/>	<input type="checkbox"/>	toma/tomar	<input type="checkbox"/>	<input type="checkbox"/>
triciclo	<input type="checkbox"/>	<input type="checkbox"/>	televisão	<input type="checkbox"/>	<input type="checkbox"/>	azul	<input type="checkbox"/>	<input type="checkbox"/>
bola	<input type="checkbox"/>	<input type="checkbox"/>	água	<input type="checkbox"/>	<input type="checkbox"/>	bom	<input type="checkbox"/>	<input type="checkbox"/>
boneco	<input type="checkbox"/>	<input type="checkbox"/>	árvore	<input type="checkbox"/>	<input type="checkbox"/>	bonito	<input type="checkbox"/>	<input type="checkbox"/>
livro	<input type="checkbox"/>	<input type="checkbox"/>	casa	<input type="checkbox"/>	<input type="checkbox"/>	depressa	<input type="checkbox"/>	<input type="checkbox"/>
banana	<input type="checkbox"/>	<input type="checkbox"/>	chuva	<input type="checkbox"/>	<input type="checkbox"/>	fofo	<input type="checkbox"/>	<input type="checkbox"/>
bolo	<input type="checkbox"/>	<input type="checkbox"/>	flor	<input type="checkbox"/>	<input type="checkbox"/>	grande	<input type="checkbox"/>	<input type="checkbox"/>
leite	<input type="checkbox"/>	<input type="checkbox"/>	lua	<input type="checkbox"/>	<input type="checkbox"/>	já está	<input type="checkbox"/>	<input type="checkbox"/>
pão	<input type="checkbox"/>	<input type="checkbox"/>	pedra	<input type="checkbox"/>	<input type="checkbox"/>	mau/má	<input type="checkbox"/>	<input type="checkbox"/>
papa	<input type="checkbox"/>	<input type="checkbox"/>	rua	<input type="checkbox"/>	<input type="checkbox"/>	hoje	<input type="checkbox"/>	<input type="checkbox"/>
sopa	<input type="checkbox"/>	<input type="checkbox"/>	avó/vovó	<input type="checkbox"/>	<input type="checkbox"/>	noite	<input type="checkbox"/>	<input type="checkbox"/>
chapéu	<input type="checkbox"/>	<input type="checkbox"/>	bebé	<input type="checkbox"/>	<input type="checkbox"/>	este	<input type="checkbox"/>	<input type="checkbox"/>
fralda	<input type="checkbox"/>	<input type="checkbox"/>	mãe/mamã	<input type="checkbox"/>	<input type="checkbox"/>	meu/minha	<input type="checkbox"/>	<input type="checkbox"/>
meia(s)	<input type="checkbox"/>	<input type="checkbox"/>	menina	<input type="checkbox"/>	<input type="checkbox"/>	mim	<input type="checkbox"/>	<input type="checkbox"/>
sapato(s)	<input type="checkbox"/>	<input type="checkbox"/>	banho	<input type="checkbox"/>	<input type="checkbox"/>	onde	<input type="checkbox"/>	<input type="checkbox"/>
cabeça	<input type="checkbox"/>	<input type="checkbox"/>	chichi	<input type="checkbox"/>	<input type="checkbox"/>	quem	<input type="checkbox"/>	<input type="checkbox"/>
cabelo	<input type="checkbox"/>	<input type="checkbox"/>	colo	<input type="checkbox"/>	<input type="checkbox"/>	ali	<input type="checkbox"/>	<input type="checkbox"/>
dentes	<input type="checkbox"/>	<input type="checkbox"/>	cucu	<input type="checkbox"/>	<input type="checkbox"/>	fora	<input type="checkbox"/>	<input type="checkbox"/>
olho(s)	<input type="checkbox"/>	<input type="checkbox"/>	não	<input type="checkbox"/>	<input type="checkbox"/>	algun	<input type="checkbox"/>	<input type="checkbox"/>
pé	<input type="checkbox"/>	<input type="checkbox"/>	olá	<input type="checkbox"/>	<input type="checkbox"/>	mais	<input type="checkbox"/>	<input type="checkbox"/>



### CDI para o Português Europeu – Forma reduzida: Nível II

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http://www.fl.ul.pt/laboratoriofonetica/babylab/pt/CDI\_Portugues\_Europeu.html

Nome da criança \_\_\_\_\_

Sexo F o M o

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, assinale as palavras que ouviu a criança dizer. Se ela diz a palavra de uma maneira diferente, assinale-a na mesma (ex.: 'nana' para banana). No caso de palavras que podem ter uma forma masculina e feminina, ou singular e plural (ex.: bonito, bonito, bonitos, bonitas), responda 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).

ai	<input type="checkbox"/>	caixa	<input type="checkbox"/>	dá/dar	<input type="checkbox"/>
mé-mé	<input type="checkbox"/>	computador	<input type="checkbox"/>	finje/fingir	<input type="checkbox"/>
miau	<input type="checkbox"/>	garfo	<input type="checkbox"/>	gosta/gostar	<input type="checkbox"/>
pumba	<input type="checkbox"/>	luz	<input type="checkbox"/>	pensa/pensar	<input type="checkbox"/>
tau-tau	<input type="checkbox"/>	óculos	<input type="checkbox"/>	põe/pôr	<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"/>	azul	<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"/>
barco	<input type="checkbox"/>	quarto	<input type="checkbox"/>	depressa	<input type="checkbox"/>
carro	<input type="checkbox"/>	árvore	<input type="checkbox"/>	fofo	<input type="checkbox"/>
helicóptero	<input type="checkbox"/>	baloço	<input type="checkbox"/>	frio	<input type="checkbox"/>
bola	<input type="checkbox"/>	céu	<input type="checkbox"/>	já está	<input type="checkbox"/>
brinquedo	<input type="checkbox"/>	chuva	<input type="checkbox"/>	maior	<input type="checkbox"/>
livro	<input type="checkbox"/>	sol	<input type="checkbox"/>	pequeno	<input type="checkbox"/>
água	<input type="checkbox"/>	circo	<input type="checkbox"/>	depois	<input type="checkbox"/>
banana	<input type="checkbox"/>	escola	<input type="checkbox"/>	dia	<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"/>
iogurte	<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"/>	brinca/brincar	<input type="checkbox"/>	muito	<input type="checkbox"/>
mão	<input type="checkbox"/>	cabe/caber	<input type="checkbox"/>	nenhum	<input type="checkbox"/>
olho(s)	<input type="checkbox"/>	cai/cair	<input type="checkbox"/>	sou/são/é	<input type="checkbox"/>
perna	<input type="checkbox"/>	compra/comprar	<input type="checkbox"/>	porque	<input type="checkbox"/>
unha(s)	<input type="checkbox"/>	corre/correr	<input type="checkbox"/>	palavras terminadas em -zinho (ex.: leãozinho)	<input type="checkbox"/>
A sua criança começou a combinar palavras, como por exemplo, 'bola amarela', 'quero pintar' ou 'menino voa'?					
Não <input type="checkbox"/>					Às vezes <input type="checkbox"/>
					Muitas vezes <input type="checkbox"/>

# Prospective study in 5 domains: Parental reports

<http://labfon.lettras.ulisboa.pt/babylab/pt/CDI/>

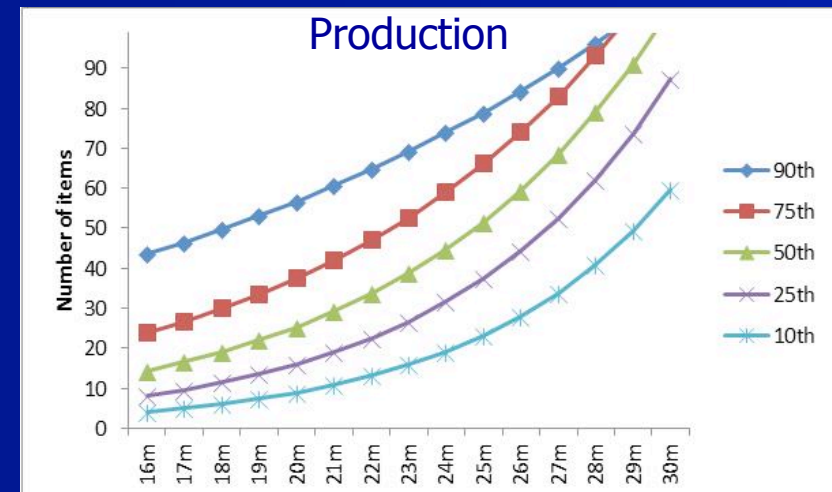
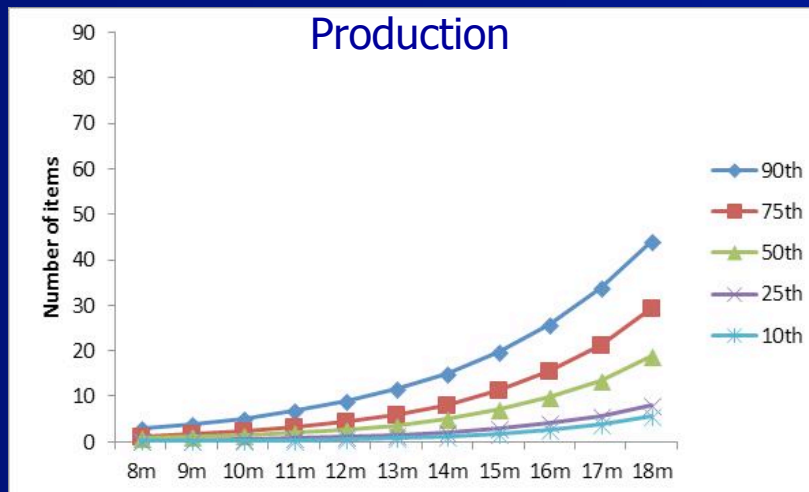
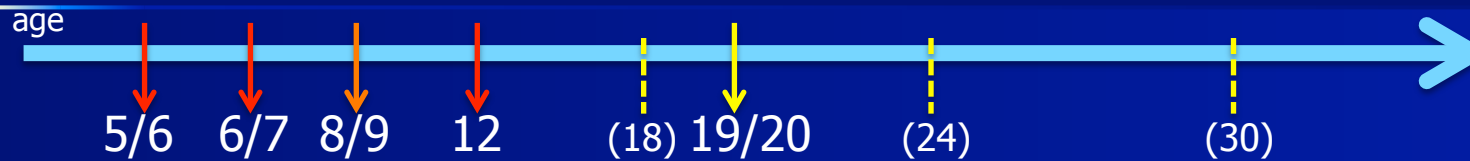


Eyes  
ET

+

Brain  
ERP

R  
e  
p  
o  
r  
t  
s



Words produced as a function of age and percentile level (fitted scores): EP-CDI SFI (8-18 months) and EP-CDI SFII (16-30 months)

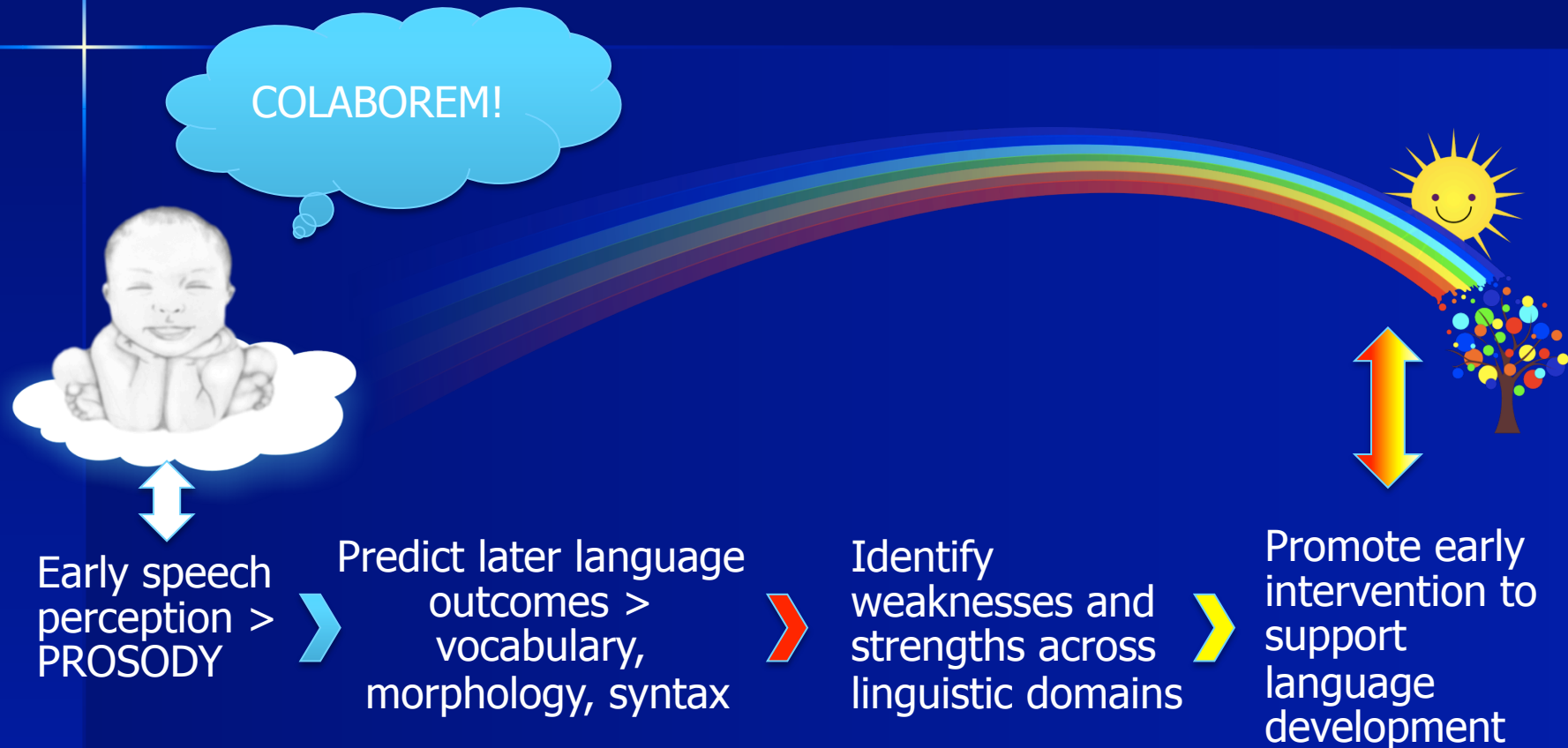
Portuguese Communicative Development Inventory (CDI) – Short forms

**DS:** preliminary individual data: variability

Comp 11% at 5<sup>th</sup>  
Prod 56% at 5<sup>th</sup>



# Goal: Early markers





# Obrigada

All infants and parents. All collaborating institutions (associations, hospitals, schools). The baby lab team: HSM-CHLN, FPCE-UP, LAPSO-CIS-ISCTE

<http://labfon.letras.ulisboa.pt/babylab/EBELa/>

<http://labfon.letras.ulisboa.pt/babylab/horizon21/>

[http://labfon.letras.ulisboa.pt/babylab/  
labfon@letras.ulisboa.pt](http://labfon.letras.ulisboa.pt/babylab/labfon@letras.ulisboa.pt)