

Language development in Portuguese children with cochlear implants: Benefits of bringing together a spontaneous speech measure and a formal test of language development

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Purpose of the study: This exploratory study aims to analyze oral language development of 18 Portuguese children with prelingual deafness after 2 to 7 years of cochlear implant use.

Material and methods used: 18 Portuguese children, ten girls and eight boys with bilateral prelingual deafness, who underwent implantation at 38 months of age or younger were included in this exploratory study.

Oral language development was tested using a widespread spontaneous speech measure - Mean Length of Utterance in words (MLU-w) and a language development test validated for Portuguese children - *Teste de Avaliação da Linguagem na Criança (TALC)*. For spontaneous samples collection in order to compute MLU-w, each child was audio and video recorded twice a year for a period of 30 minutes in a role-playing interaction with the examiner, with an interval of six months between each session. The interactions examiner-children were audio and video recorded with a SONY DCR-SR 37 camera. Concerning the role-playing interaction, each examiner was trained to avoid leading the interaction with many utterances and to elicit a variety of grammatical structures and sentence types in children using a set of age appropriate-toys. The collected data were transcribed using the multimedia annotator - EUDICO Linguistic Annotator (ELAN). For Mean Length of Utterance in words (MLU-w) counting, it was adopted the European Portuguese rules (e.g. Lynce, 2013). In addition to the spontaneous language samples, each child was assessed with *TALC*. This test evaluates language comprehension and production in Portuguese children aged between 2;06 - 5;11.

A linguistic analysis of deaf children with cochlear implants should consider a set of socio and clinical factors identified as determinants in the oral language development (e.g. age of implantation).

Results: The results indicate that with 2 years of hearing age, cochlear implanted children produced on average 2 to 3 words per utterance and with 7 years of hearing age produced on average 4 to 5 words (Table 1). The Wilcoxon test reveals a significant increase between the mean of each age group at the two moments of the MLU-w assessments ($w = -2.20$; $p < 0.03$).

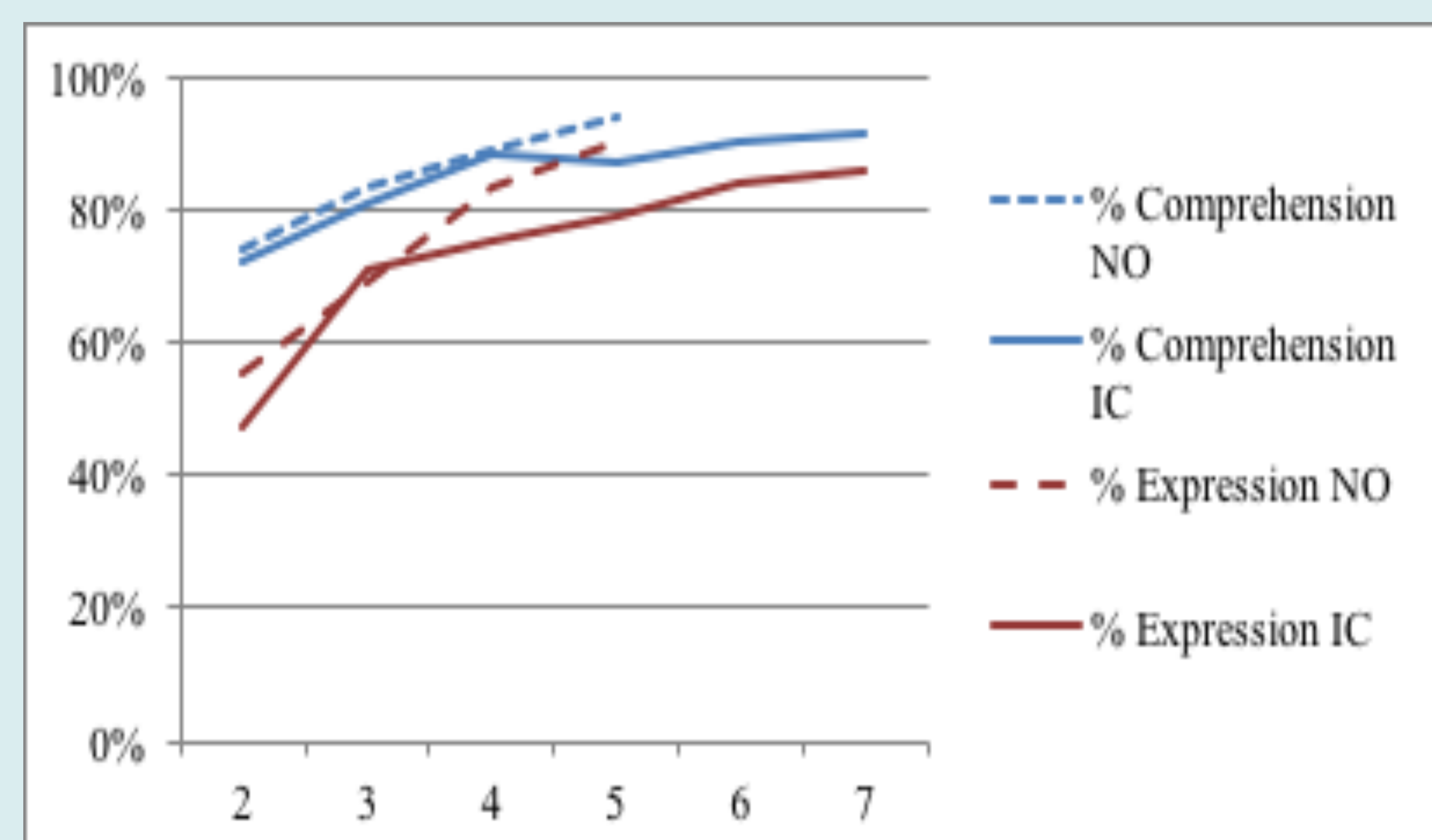
The total scores for comprehension and expression in the *TALC* for cochlear implanted children considering their hearing age were close to the values obtained by the normative sample of this test, i.e., the values achieved by normal-hearing children (Figure 1).

High positive and significant correlation ($\rho = .72$; $p = .001$) between *TALC* (production) and MLU-w was confirmed.

Regarding the factors identified as determinants in the oral language development and proficiency by cochlear implanted children, only the age of implantation seems to have influence in the average values of the extension of the utterance. The Spearman test reveals a moderate negative and significant correlation ($\rho = -.47$; $p = .05$) between the age of implantation and MLU-w, i.e., children who received the implant at the youngest ages reached the highest values on MLU-w.

Table 1. MLU-w for cochlear implanted children in 1st and 2nd evaluations

Hearing age (age group)	1 ST EVALUATION		2 ND EVALUATION	
	N	MLU-w	N	MLU-w
[2;00 – 2;11]	1	2,22	1	2,80
[3;00 – 3;11]	8	3,47	2	3,33
[4;00 – 4;11]	1	3,76	6	3,89
[5;00 – 5;11]	5	3,59	6	3,76
[6;00 – 6;11]	3	3,68	1	3,74
[7;00 – 7;11]	-	-	2	4,44
Total	18	3,49	18	3,78



Legend:
NO- Normal-Hearing children
IC - Cochlear implanted children

Figure 1. Total scores for cochlear implanted children and normal-hearing children concerning comprehension and expression in language development test – *TALC*.

Conclusion: The study indicates that prelingual deaf children with 2 to 7 years of implant experience reached a MLU-w ranging between 2 and 5 words per utterance, therefore they are capable of combining words to form utterances. A positive and significant correlation between MLU-w and *TALC* was confirmed for language production, which stresses the validity of MLU-w as a measuring instrument for language development in cochlear implanted children.

This exploratory study provides confirmation that children who receive cochlear implants benefit in the form of improved Portuguese language, both comprehension and production.

References:

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