Communicative-pragmatic ability development in children with Cochlear Implants

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Introduction

Communication represents one of the most important activities in human life, since it allows to express meanings, organize thoughts and forge relationships. Although language ability is intact in children with hearing loss, the impossibility of perceiving the verbal stimuli coming from the outside and the non-exposition to natural interactions may have important negative consequences on the cognitive, linguistic and social development of subjects affected by hearing loss [1-4]. It is therefore essential to undertake very early, during the development, a diagnostic process and a prosthetic intervention [5]. Currently, one of the most effective prosthetic devices is the Cochlear Implant (CI), which converts sound into electrical signals and transmits them to electrodes surgically implanted in the cochlea [6]. Technological progress and new rehabilitation methods have enabled many hearing impaired children to enhance their hearing and spoken language [7]. Moreover, in 2007, the Joint Committee of Infant Hearing [8] recommended to perform the auditory screening within the first month of life, diagnosing potential hearing impairments within three months from birth and starting speech rehabilitation programs within the six months of the child's life. Scientific evidences support these three guidelines and have shown that an early diagnosis followed by a CI implant at an early stage of life allow children with hearing impairment to develop linguistic skills as their normal hearing peers do [9, 10]. However, the benefits of the CI on the communicative-pragmatic ability development in children with CI has not yet been sufficiently studied. Pragmatic communication is the ability to communicate appropriately in a specific context [11], using different expressive means, as language, non-verbal (extralinguistic), and paralinguistic ones [12].

The aim of the present research is to evaluate the communicative-pragmatic ability in children with hearing impairment fitted with bilateral Cochlear Implant activated within 24 months from birth. Specifically, we want to provide preliminary empirical evidences supporting that an early diagnosis and prosthesis implant promote a normal development of communicative skills in subjects with hearing loss.

Methods

Participants

Thirteen children diagnosed with hearing impairment, fitted with CI within 24 months of age were included in the experimental sample (CIG), and compared to a control group (CG) matched for gender and chronological age (see *Table. 1* for more demographic data). Children were aged from 7 years old to 9 years and 11 months. The CIG was recruited from the Audiology Clinic of the Martini Hospital in Turin (Italy) while children of the control group were recruited from elementary schools in Turin. Inclusion criterion for all children was to be Italian native speakers. Concerning CIG, further inclusion criteria were applied: 1) diagnosis of severe or profound congenital deafness; 2) application of the CI within the first 24 months of birth. Exclusion criteria for all children were: 1) neurological disease or neuropsychiatric illness; 2) communication or visual impairments.

	Age range	N		Age in months
		F	*M*	*Mean (Std. Dev)*
CI Group	7 y - 7 y 11 m	*3*	*2*	*87 (3,74)*
	8 y - 8 y 11 m	*1*	*3*	*106,5 (1,00)*
	9 y - 9 y 11 m	*3*	*1*	*111,5 (3,42)*
	Total	**7**	**6**	**100,54 (11,67)**
Control Group	7 y - 7 y 11 m	*3*	*2*	*88,6 (4,67)*
	8 y - 8 y 11 m	*1*	*3*	*104,5 (2,65)*
	9 y - 9 y 11 m	*3*	*1*	*113,25 (1,71)*
	Total	**7**	**6**	**101,08 (11,31)**

Table.1 The table shows the total number of subjects, gender and age in months (standard deviation) for each age-range in both experimental group (CI Group) and control group (CG).

Material and procedure

To evaluate the communicative-pragmatic ability the Assessment Battery for Communication (ABaCo) was used [13-15]. ABaCo is a validated clinical battery that provides an overall evaluation of the communicative-pragmatic abilities. It is characterized by some *vis-à-vis* interactions and short video clips showing two people interacting. ABaCo is comprised of five scales (linguistic, extralinguistic, paralinguistic, contextual and conversational) each of them evaluating a different aspect of communication in comprehension and production. Children were asked to prove their understanding of some interactions by answering to some questions or alternatively by completing the interaction.

To investigate differences in general intelligence we administered the Coloured Progressive Matrices (CPM) [16] to the two groups (CIG and CG). In this test, children had to solve 36 coloured puzzles by choosing the missing part among six alternatives.

Tests were administered the children in two sessions (approximately one hour each).

Results

No significant difference was observed between the CIG and CG on CPM ($t_{(24}$ =.271, p=.789). Concerning the general pragmatic performance evaluated by ABaCo, we conducted an independent sample t-test to detect any difference between the two groups (CIG and CG). Results showed no significant difference ($t_{(24)}$= -1.536; p=.138). Additionally, t-tests on the performance of ABaCo's five scales did not reveal any significant difference (-1.922 < $t_{(24)}$ < .717; .067 < p < .693).

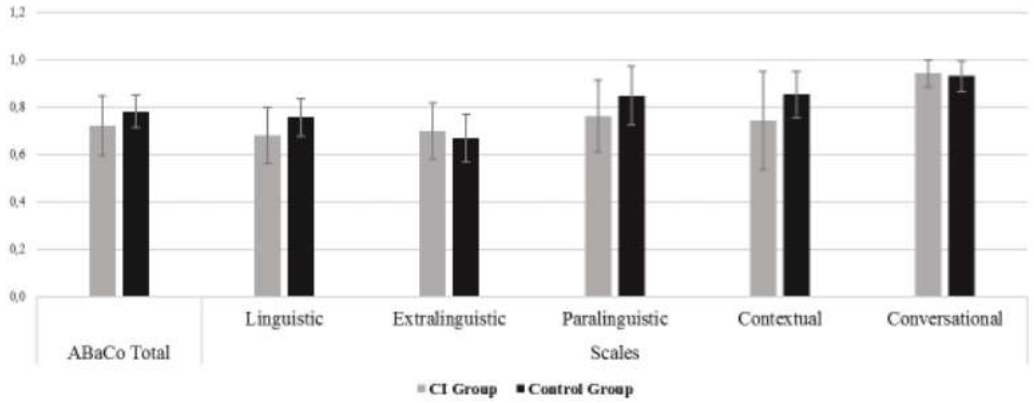

Table 2. Participants' mean scores at ABaCo performance and at each scale, (error bars indicate standard deviations).

Discussion

Literature shows that children with HI have difficulties in communicative-pragmatic ability [2-4]. However, pragmatic ability in children fitted with bilateral CI at an early age has not been fully investigated. Our research provides preliminary results on this field and shows that children with CI develop communicative abilities as their normal hearing peers. Therefore, early implanted bilateral CI does promote a typical communicative-pragmatic development. By the way, the small number of subjects may represent a limit in the present study in terms of statistical power and thus further researches are needed.

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