Desenvolvimento cognitivo e da linguagem expressiva: diversidade e complexidade das produções infantis****

Expressive language and cognitive development: diversity and complexity of children's productions

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Abstract
Background: objective and systematized analysis of cognitive and expressive language development. Aim: to characterize expressive language and cognitive development considering the diversity and complexity of children's productions. Method: this study involved 20 subjects (10 male and 10 female), who were adequate for gestational age and birth weight and had no pre, peri or post natal intercurrences. Participants were submitted to 30-minute sessions, once a month, for the observation of expressive language and cognitive development. The observations were made during the period that went from eight to 18 months of age, using the material and application procedures suggested by the PELCDO-r. Results: the amount of different schemes, gestures and verbalizations that children were capable of producing (diversity and complexity) are presented and analyzed considering each one of the 30-minute sessions as well as the overall total during the period of observation (from eight to 18 months). Conclusion: the PELCDO-r allowed the characterization of expressive language and cognitive development by means of the objective observation of this process concerning the diversity and complexity of subjects' productions, considering the period between the fourth phase of sensorimotor stage and the beginning of preoperational stage.
Key Words: Child Development; Language; Cognition; Protocols.

Resumo
Tema: análise objetiva e sistematizada do processo de desenvolvimento cognitivo e da linguagem expressiva. Objetivo: caracterizar o desenvolvimento cognitivo e da linguagem expressiva considerando a diversidade e complexidade das produções realizadas por crianças com desenvolvimento típico. Método: o presente estudo compreendeu 20 sujeitos (10 do gênero masculino e 10 do feminino), com peso e idade gestacional adequados ao nascimento e ausência de intercorrências pré, peri e pós-natais. Os participantes foram submetidos a sessões mensais de observação da cognição e linguagem expressiva, com duração de 30 minutos cada, dos oito aos 18 meses de idade, utilizando-se o material sugerido de acordo com os procedimentos de aplicação do PODCLE-r. Resultados: é apresentada e analisada a quantidade de esquemas, gestos e verbalizações diferentes produzidos pelas crianças (diversidade e complexidade), tanto em uma única sessão de 30 minutos a cada mês de idade, quanto de forma cumulativa, dos oito aos 18 meses. Conclusão: o PODCLE-r permitiu caracterizar o desenvolvimento cognitivo e da linguagem expressiva por meio da observação objetiva desse processo em termos da diversidade e complexidade das produções das crianças estudadas, considerando-se o período compreendido entre a quarta fase do período sensóriomotor e início do pré-operatório.
Palavras-Chave: Desenvolvimento Infantil; Linguagem; Cognição; Protocolos.

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Introduction

The Protocol for Expressive Language and Cognitive Development Observation - revised version (PELCDO-r) 1 was proposed due to the need of taking into account the diversity and complexity of children's productions concerning expressive language and cognitive development observation, during the sensorimotor period and beginning of pre-operational period. In that sense, the PELCDO-r allows the characterization of this process not only in terms of the presence or absence of certain development indicators, as proposed in its first version 2, but also in terms of the quality of the productions regarding the indicators of expressive language and cognitive development.

Such proposal complies with the important role of providing protocols that allows objective and systematized analysis of observational data.3-6, which are usually considered in a qualitative and subjective way, especially concerning the child early development process 7-10.

Therefore, the objective of this study was to characterize the expressive language and cognitive development in typically developing children, examining the diversity and complexity of children's productions, using the PELCDO-r.

Method

This research was approved by the Ethics Committee of the University Hospital of the University of São Paulo (CEP HU-USP) under protocol nº 592/05, and by the Ethics Committee for Research Projects Analysis of the Clinical Hospital of the School of Medicine of the University of São Paulo (FMUSP) under protocol nº 082/07. The consent form was signed by all participants' legal guardians.

This study was carried out with 20 children (10 female and 10 male; mean weight: 3291g, mean gestational age: 39 1/7w) that were attending the Puericulture Ambulatory and/or the daycare of the University Hospital of the University of São Paulo (HU-USP). The inclusion criteria were: adequate weight and gestational age at birth, absence of pre, peri and pos natal intercurrences, and children being raised as monolingual Brazilian Portuguese speakers.

To verify if the sample size was representative, we calculated the sampling error based on the sample descriptive statistics. The results revealed a sampling error of 2,5%.

The participants underwent monthly 30-minute sessions for expressive language and cognitive development observation, using the material suggested in the PELCDO-r administration manual. The subjects were followed from one to 18 months of age, totalizing 360 sessions. All sessions were recorded in video, transcribed, and analyzed according to PELCDO-r procedures.

For the purposes of the present study, we considered only the sessions regarding the period from eight to 18 months (220 sessions), because the development indicators that allow the diversity analysis concerning both cognition (imitation of motor schemes, use of simple symbolic schemes, and use of combined symbolic schemes) and expressive language (use of deictic gestures, use of representative gestures, production of verbalizations combined with gestures, and production of isolated verbalizations - not combined with gestures) started to be observed in the subjects during the 8th month of age, when they were all placed at the fourth phase of sensorimotor period 11.

According to the PELCDO-r procedures for data analysis, we considered not only the amount of different schemes, gestures and verbalizations produced by the children in each session, but also the evolution of their productions complexity throughout the sessions.

In order to assure the reproducibility of the analysis, the results were validated by determining inter-rater reliability. Two speech-language pathologists with doctoral degree and experience on observational methods served as judges. The inter-rater reliability was 88.6% for judge 1 and 90.0% for judge 2. Non-parametrical tests (test for Equality of Two Proportions, Friedman, and Wilcoxon) were used for the statistical analysis. The significance level adopted was 0.05.

The descriptive statistics (mean, median, and standard deviation) were used for determining the confidence intervals concerning the diversity for each indicator of expressive language and cognitive development.

Results

The longitudinal analysis of the diversity and complexity of children's productions concerning the indicators of expressive language and cognitive development revealed significant results for all the comparisons month by month throughout the period considered in this study (p-value < 0.001). These results are presented in the Figures 1 and 2.

The results regarding the diversity of the indicators of expressive language and cognitive development and their subtypes for each month, from eight to 18 months, are presented in the Table 1.

TABLE 1. Diversity of the subjects' productions from the eighth to the 18th month of age, concerning the indicators of expressive language and cognitive development and their subtypes.

			8th mo	9th mo	10th mo	11th mo	12th mo	13th mo	14th mo	15th mo	16th mo	17th mo	18th mo
Cognition	IMS	ISVO	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1
		ISNV	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1
		ISDF	0-1	0-1	0-1	0-1	1-2	1-2	1-2	2	1-2	1-2	1-2
	USSS	AB	0	0-1	0-1	1-2	2-3	2-3	2-3	3-4	4-5	4-5	5-6
		AFO	0	0	0-1	0-1	1-2	2-3	2-3	3	3-4	3-4	3-4
		ANFO	0	0	0	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1
	UCSS	TAC	0	0	0	0	0-1	0-1	0-1	1-2	1-2	1-2	2-3
		NOTA	0	0	0	0	0	0	0	0	0	0	0-1
		OTA	0	0	0	0	0	0	0	0-1	0-1	0-1	0-1
Expressive Language	UDG	SI	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1
		SICV	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1
		DI	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1
		DICV	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	1	0-1
	URG	SI	0-1	0-1	0-1	1-2	2	1-2	1-2	1-2	1-2	1-2	1-2
		SICV	0	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1
		DI	0	0	0-1	1-2	1-2	2-3	3-4	3-4	3-4	4-5	4-5
		DICV	0	0	0-1	0-1	0-1	1-2	0-1	0-1	0-1	0-1	0-1
		DISO	0	0	0	0-1	0-1	0-1	1-2	1-2	1-2	1-2	1-2
	PVCG	MS	0	0	0	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1
		MWI	0	0	0-1	0-1	0-1	0-1	0-1	1-2	1-2	1-2	1-2
		ONW	0	0	0	0	0	0-1	0-1	0-1	0-1	0-1	0-1
		MSW	0	0	0	0-1	0-1	0-1	0-1	0-1	1-2	1-2	2-3
		TWC	0	0	0	0	0-1	0-1	0-1	0-1	0-1	0-1	1-2
	PIV	MTWC	0	0	0	0	0-1	0-1	0-1	0-1	0-1	0-1	0-1
		MS	0	0	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1
		MWI	0	0	0-1	0-1	0-1	0-1	0-1	1-2	1-2	1-2	1-2
		ONW	0	0	0	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1
		WMS	0	0	0	0-1	0-1	0-1	1-2	1-2	3-4	4-5	5-6
		TWC	0	0	0	0	0	0	0-1	0-1	1-2	1-2	1-2
		MWC	0	0	0	0	0	0	0	0-1	0-1	0-1	0-1

Label: IMS – Imitation of motor schemes; ISVB – Imitation of schemes visible in the body; ISNV – Imitation of schemes non visible in the body; ISDF – Imitation of schemes that designate function; USSS – Use of simple symbolic schemes; AB – Apply in the body; AFO – Apply in figurative objects; ANFO – Apply in non-figurative objects; UCSS – Use of combined symbolic schemes; TAC – Two-action combinations; NOTA – Non-ordered three-action combinations; OTA – Ordered three-action combinations; UDG- Use of deictic gestures; UGR – Use of representative gestures; SI – Simple imitation; SICV – Simple imitation combined with vocalizations; DI – Deferred imitation; DICV – Deferred imitation combined with vocalizations; DISO – Deferred imitation combined with meaningful syllables or vocal onomatopoeias; PVCG – Production of verbalizations combined with gestures; PIV – Production of isolated verbalizations; MS – meaningful syllables; MWI – Monosyllabic words and interjections; ONW – Onomatopoeic words; WMS – Words with more than one syllable; TWC – Two-word combinations; MWC – Multi-word combinations.

FIGURE 1. Subjects' evolution concerning the diversity and complexity of productions referred to the indicators of cognitive development.

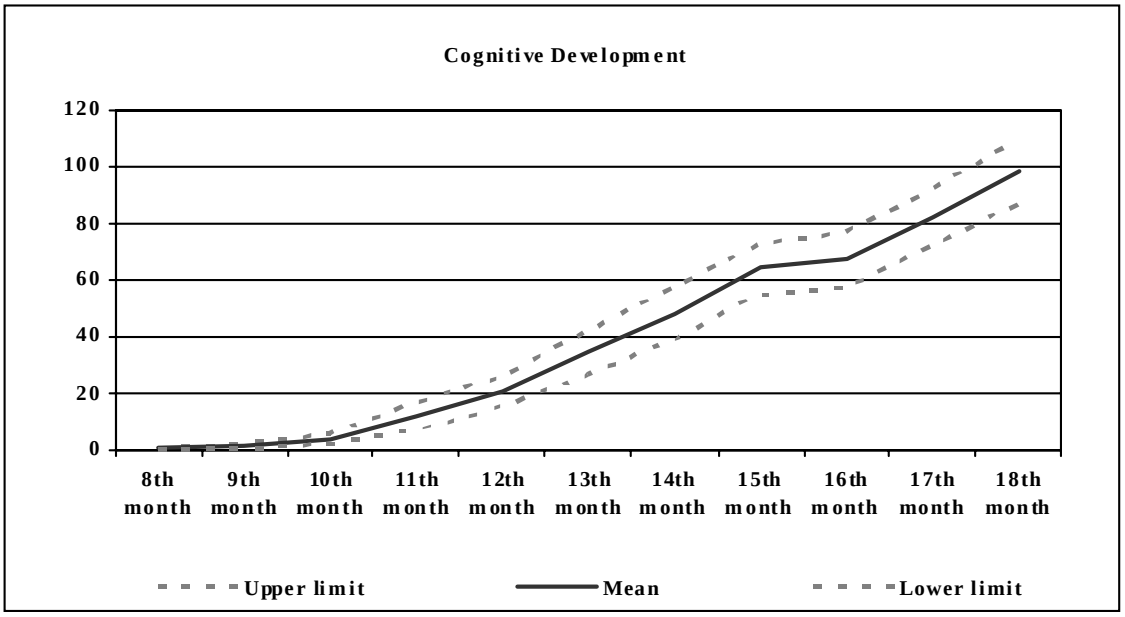
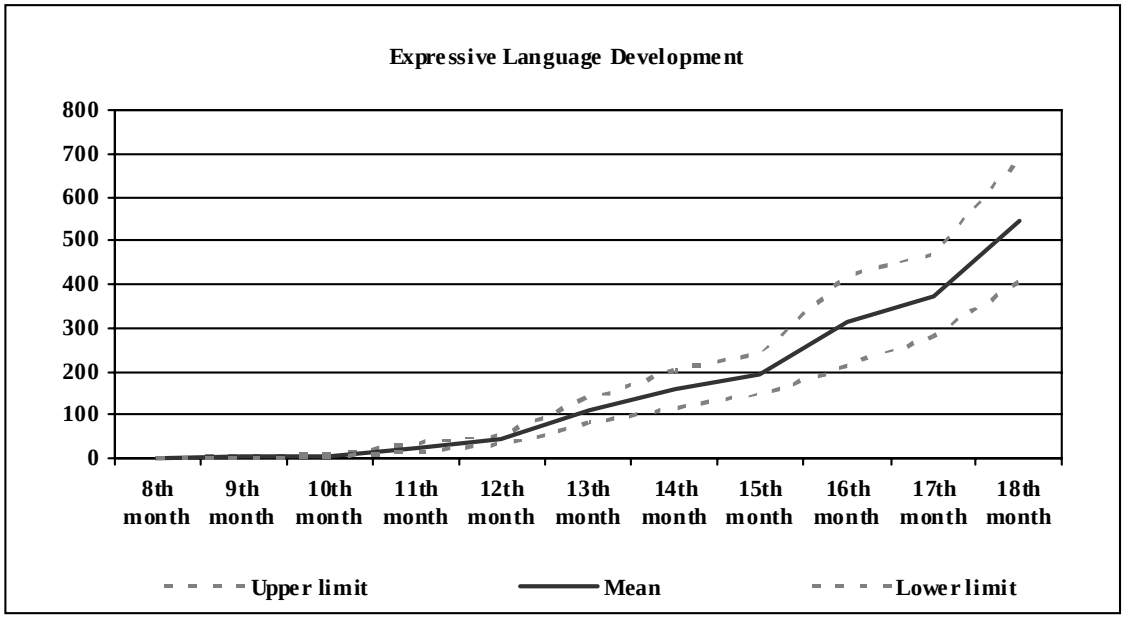


FIGURE 2. Subjects' evolution concerning the diversity and complexity of productions referred the indicators of expressive language development.



Discussion

The aim of this study was to characterize the expressive language and cognitive development considering the diversity and complexity of the productions by typically developing children, using the PELCDO-r 1.

In the first analysis, in which we examined the subjects' evolution throughout the sessions, the data were considered in a cumulative way, that is, we verified how many different schemes, gestures and verbalizations the children were capable of producing from eight to 18 months of age. Such analysis allows investigating the size of children's repertoire for each indicator of expressive language and cognitive development, at the end of a settled period of observation. The weighting attribution reflects the complexity of children's productions, that is, the more complex are the productions, the higher is the weight attributed, and therefore, the higher is the total score.

This first form of analysis can be used for examining the child's rhythm of development concerning the diversity and complexity of his or her productions, making possible to carry out comparisons between research and control groups, as previously reported by a recent study 12. Such form of analysis also allows monitoring the effectiveness of intervention programs regarding expressive language and cognitive development, after an intervention period.

The second form of analysis allowed the establishment of reference scores for diversity of the subitems that compound the indicators of expressive language and cognitive development, for each session, that is, how many different schemes, gestures, and verbalizations are expected to be produced by the child in a 30-minute session, at each month of age. This type of analysis can be used as a reference for punctual assessments.

We observed that besides producing more complex schemes, gestures and verbalizations with age, the children also showed a progressive increase in the diversity of their productions 13-14 concerning both the longitudinal analysis from eight to 18 months, and the analysis of the productions carried out in a single observation session for each month of age.

These findings corroborate the principles of Genetic Epistemology that served as the basis to the PELCDO and PELCDO-r constitution. According to such theoretical model, the development is a result from a dynamic and continuous process, in which each phase is at the same time resulting from the previous and preparatory for the next 11; 15.

The quantification of the qualitative analysis proposed by the PELCDO-r is supported by other studies 3; 16-18, which also suggest the weighting and scoring attribution for qualitative items and subitems, in a way that the data can be analyzed and compared objectively, but without dismissing important qualitative aspects of the development process followed by the children. Thus, the global and objective analysis is complemented by the specific and qualitative analysis, so as to value the child's productions according to their complexity and importance to the development process.
Concerning especially the language and cognitive development, other studies have been carried out using the quantification of qualitative data, in an attempt to systematize the observation of child development and to analyze data in an objective way 19-22.

In the present study, the objective analysis of the subjects' evolution regarding the initial phases of expressive language and cognitive development was made possible through the PELCDO-r, without dismissing important qualitative aspects of this process, such as the diversity and complexity of children's productions.

The results of this study provide an idea of what is expected regarding the production of schemes, gestures and verbalizations by typically developing children with ages between eight and 18 months. However, although the sampling error obtained for this study is considered to be within the acceptable range (0-5%), a larger sample size would be necessary for obtaining more accurate references for normal development.

Conclusion

The PELCDO-r allowed the characterization of expressive language and cognitive development by means of the objective observation of this process in terms of the diversity and complexity of children's productions. Thus, the establishment of parameters complies with the objective of systematizing assessments and therapeutic processes based on scientific evidences, which are imperative to the practice of speech-language pathology.

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