A Fourth-Generation Methodological Practice on A Study of Speech Dysfunctions of Children with Cerebral Palsy

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Abstract

This article has a concern on marginalization due to problems in linguistic education of children with Cerebral Palsy (CP). These children are affected on their development and gross motor functions. We observed Bengali children - age between 3 and 18 and from different socio-economic status -, while attend diagnostic and intervention in Tertiary level hospital. Their verbal and nonverbal communications based on their expressive language functioning and the nature of speech problem in Bengali children with cerebral palsy and autism. This article follows a fourth-generation methodological research to propose a contemporary view of linguistic education more responsive to the difficulties of these children and to monitor their development in order to bring benefits to society.

Key words: Cerebral Palsy, Speech, Methodology, Children

Introduction

Children with cerebral palsy (CP) frequently demonstrate difficulties in communication as a result of impaired language skills, which are often influenced by motor speech disorders (Straub & Obrzut 2009). The etiology of CP most likely is multifactorial, arising directly from the motor impairment and linked to the cognitive and/or sensory processing deficits associated with CP (Pennington et al. 2005). In contrast, several studies have demonstrated average verbal abilities of higher-functioning children with cerebral palsy (CP) (Straub & Obrzut 2009; Pirila et al. 2004; Sigrudardottir et al. 2008) and even children with early left-sided brain damage may exhibit sparing of language skills (Lidzba et al. 2006).
The prevalence of cerebral palsy is approximately 2.5 per 1000 live births in countries with neonatal intensive care facilities (Colver 2000; Yeargin-Allsopp 2008; Himmelmann 2010). Prevalence is higher in children born with very low birth weight. However, a decline in prevalence in this group from 60.6 (99% CI 37.8-91.4) per 1000 live births in 1980 to 39.5 (28.6-53.0) per 1000 in 1996 has recently been observed in Europe (Platt 2007).

Communication difficulties can be associated with any type of cerebral palsy and may relate to limitations in the production of movements for speech, gesture and facial expression; receptive or expressive language; hearing; vision; or a combination of limitations in these functions. Speech impairments are estimated to affect approximately 36% of children with cerebral palsy and communication difficulties are observed in around 42% (Parkes 2010). Prevalence of speech, language and communication impairment increases with severity of motor and intellectual impairment (Kennes 2002; Bax 2006; Parkes 2010; Sigurdardottir 2010).

Children may experience communication difficulties from early infancy and, as cerebral palsy is a persistent condition, communication impairments are chronic and children may require long term intervention. In a review of speech and language therapy caseloads in the UK, Enderby 1986 estimated that cerebral palsy was the sixth most common medical cause of speech disorder, and the proportion of referrals of children with this diagnosis remains static (Petheram 2001).

In Katherine et al. (2014) work, based on detailed speech and language assessment data from a cohort of 4.5-year old children with CP, 75% of participants had clinical speech and/or language impairments (Hustad et al. 2010). Communication challenges of any kind can lead to educational and social isolation (Romsli & Sevcik 2005) and can have a detrimental impact on nearly all aspects of development (Sevcik et al. 2004; Light et al. 2004; Light et al. 2007). Thus, identifying and treating specific speech and language problems at the earliest possible age is of the utmost importance. Speech and language therapists (also known as speech therapists, speech-language pathologists) assess, diagnose and treat the communication disorders associated with cerebral palsy. Speech and language therapy may be delivered in a range of settings, including clients’ homes, community clinics, hospitals and schools (Royal College of Speech and Language Therapists 1999). We intend to observe whether this availability is sufficient to meet the learning needs of children with cerebral palsy.

In a fourth-generation research the understanding of communication difficulties and speech and language assessment must take into account the body of the child which carries a disability.

The subject of language and thought is linked to operations that structure him/her. Previous processes and relationships are necessary for language acquisition, and they are not confused with language itself. In such translinguistic practices, language and its subject constitute only moments. All pre-sign and pre-syntactic processes and relationships (the field of neurolinguistics) articulate in a continuum as regards subject constitution and, for this reason, they work in a synchronous fashion within the subject’s signifying process. These processes are propelled within the field of social practice, and the body is understood as part of such process, in which impulses of different orders indistinctly combine in the practice that involves signification (Monte-Serrat, 2017).

Speech and language profiles of children with cerebral palsy

The majority of children with cerebral palsy show evidence of speech and language impairments later in the preschool years, we wondered whether we could identify those problems earlier so that we could begin to work toward delivering earlier in-
tervention or even prevention of later problems. Because of the expected range of variability among children and the fact that the presence or absence of speech motor involvement (a fundamental differentiator in classification system for children with cerebral palsy) may not yet be discernible belonged to 3 – 18 years of age, we used a broader descriptive approach to characterization of early communication abilities. We observed specific questions as: (1) What are the speech and language profiles of children with cerebral palsy? (2) Do children in different profile groups vary with regard to a select set of speech and language measures?

It is usual for speech and language therapists to liaise with families and teaching staff regarding therapy to ensure that intervention goals are incorporated into daily life, where possible (Calculator 1991). Therapy may be delivered on an individual basis or in groups. Interventions may also vary in duration and intensity.

Once cerebral palsy (CP) is diagnosed, speech therapists assess the best ways to improve communication and enhance a person’s quality of life. Throughout therapy, the speech-language pathologist also works closely with the family, school, and other professionals. If someone with CP is nonverbal or has major trouble with speech, the speech therapist may introduce alternatives to speech.

**Speech and language development in the literature review**

Hustad et al. (2014) examined early speech and language development in children who had cerebral palsy. Questions addressed whether children could be classified into early profile groups on the basis of speech and language skills and whether there were differences on selected speech and language measures among groups. Eighty-five percent of 2-year-old children with CP in this study had clinical speech and/or language delays relative to age expectations. Findings suggest that children with CP should receive speech and language assessment and treatment at or before 2 years of age.

Surveillance registers monitor the prevalence of cerebral palsy and the severity of resulting impairments across time and place. The motor disorders of cerebral palsy can affect children’s speech production and limit their intelligibility. Pennington et al. (2013) described the development of a scale to classify children’s speech performance for use in cerebral palsy surveillance registers, and its reliability across raters and across time.

Nordberg et al. (2012) described speech ability in a population-based study of children with cerebral palsy (CP), in relation to CP subtype, motor function, cognitive level and neuroimaging findings. A retrospective chart review of 129 children (66 girls, 63 boys) with CP, was carried out. Speech ability and background information, such as type of CP, motor function, cognitive level and neuroimaging data, were collected and analysed. Speech disorders were found in 21% of the children and were present in all types of CP. Forty-one per cent of the children with speech disorders also had mental retardation, and 42% were able to walk independently. A further 32% of the children were nonverbal, and maldevelopment and basal ganglia lesions were most common in this group. The remaining 47% had no speech disorders, and this group was most likely to display white matter lesions of immaturity. More than half of the children in this CP cohort had a speech disorder (21%) or were nonverbal (32%). Speech ability was related to the type of CP, gross motor function, the presence of mental retardation and the localization of brain maldevelopment and lesions. Neuroimaging results differed between the three speech ability groups. Speech articulatory disability or dysarthria can arise from a number of conditions including cerebral palsy, multiple sclerosis, Parkinson’s disease and others (Menendez-Padial et al.
1996). Any of the speech subsystems like resonance, prosody, respiration, phonation and articulation can be affected. Cerebral palsy describes a group of chronic disorders affecting muscle coordination and body movement which is "Cerebral" means brain and "Palsy" refers to problem in muscle movement (Baram and Lenger 2009). Cerebral palsy affected area of the brain most likely involves connections between the cortex and other parts of the brain such as the cerebellum. Cerebral palsy can cause physical disability in human development and also speech (Pokhariya et al. 2006).

When a child has an articulation disorder, he or she has difficulty making certain sounds. These sounds may be left off, added, changed or distorted which makes it hard for people to understand the child, leaving out or changing certain sounds is common when young children are learning to talk, of course. A good example of this is saying "wabbit" for "rabbit". The incorrect articulation isn't necessarily a cause for concern unless it continues past the age where children are expected to produce such sound correctly. (It's not that the muscles of his tongue, lips, and jaw are weak. The difficulty lies in the brain and how it communicates to the muscles involved in producing speech).

Subjects read aloud 18 bisyllabic words containing the vowels /i/, /a/, and /u/ using their normal speaking rate. Each talker's words were identified by three normal listeners. The percentage of correct vowel and word identification were calculated as vowel intelligibility and word intelligibility, respectively. Results revealed that talkers with cerebral palsy exhibited smaller vowel working space areas compared to ten age-matched controls. The vowel working space area was significantly correlated with vowel intelligibility ($p=0.632$, $p<0.05$) and with word intelligibility ($p=0.684$, $p=0.05$). Experiment 2 examined whether tokens of expanded vowel working spaces were perceived as better vowel exemplars and represented with greater perceptual spaces than tokens of reduced vowel working spaces. The results of the perceptual experiment support this prediction. The distorted vowels of talkers with cerebral palsy compose a smaller acoustic space that results in shrunken intervowel perceptual distances for listeners.

Though vowel errors can decrease speech intelligibility, they seem less severe when compared to more problematic consonant contrasts (Platt, Andrews, and Howie, 1980; Platt et al., 1980).

A combination of both perceptual and acoustic analyses has revealed that using phonetic contrasts to explore dysarthric speech is a valid, sensitive, and reliable method to identify the critical acoustic-phonetic distortions that contribute to speech intelligibility deficits (Kent et al., 1989; Kent et al., 1997; Weismer and Martin, 1992; Yorkston, Dowden, and Beukelman, 1992).

Composite IQ scores are presented as well as scores on the verbal subtests, which reflect various aspects of language functioning such as verbal fluency, abstract and numerical reasoning, word and factual knowledge, social judgement, and attention. High scores on the vocabulary subtest are encouraging as the test, a marker of word knowledge and verbal fluency, can be influenced by the child's home environment and educational experience (Sattler 2001).

Speech impairments where a child's slow of speech is disrupted by sound, syllables and words that are repeated, prolonged or avoided and where there may be silent blocks or inappropriate inhalation, exhalation or phonation patterns. The speech problem most children with CP have is called dysarthria. That means it is hard for them to control and coordinate the muscles needed to talk. Speech therapists work with children on communication skills. Communication skills may mean talking, using sign language, or using a communication aid. Children with CP who are able
to talk may work with a speech therapist on making their speech clearer, (easier to understand) or on building their language skills by learning new words, learning to speak in sentences, or improving their listening skills. Children who are not able to talk because of their difficulty controlling the muscles needed for speech may learn sign language or use some kind of communication aid. A communication aid might be a book or poster with pictures that show things the person might want, or an alphabet board that the person can use to spell out their message. There are also computers that are used as communication aids that actually talk for the person.

Phonation is the production of vocal sounds resulting from the passage of currents of air through the larynx. The strength, tone, pitch and resonance of the voice area like-wise dependent on the structure and neuro-muscular control of the laryngeal and respiratory systems” (Espir and Rose, 1983). “Inappropriate vocal components” may involve respiration (shallow, breathy etc.), phonation (hard glottal attacks, glottal fry, diplophonia), resonation (hypernasal, hyponasal, assimilative nasality, cul-de-sac nasality), pitch (too high, too low, monotone), loudness (too loud, too soft), and rate (too fast, too slow) (Stemple, [1998] 2017).

Language stimulation should be part of child’s overall early intervention program. Early language intervention and the establishment of a consistent way for child to communicate (speech, alternate communication system, i.e. manual sign, photographs, picture communication symbols or PCS, low tech voice output communication aids or VOCA’s) will provide a good foundation for learning to read and write and for participating in classroom discussions. Because of the relative strength of vocabulary skills, building these skills can help facilitate the use of augmentative communication devices and the onset of reading skills. Children with cerebral palsy may experience multiple sensory, physical, visual, and cognitive deficits. The relative strengths and weaknesses in these areas are different for each child. Assessment and intervention procedures should reflect these individual differences. Careful assessment in each of the language, motor, cognitive, and sensory areas is needed to create individual profiles of performance for children with cerebral palsy (Redmond & Johnson, 2001).

Language intervention programs should provide opportunities for children to communicate through alternate means, and numerous opportunities to express concepts. Providing these opportunities as early as possible facilitates both language learning and advancement in academic subjects (Olswang & Pinder, 1995; Pinder & Olswang, 1995).

The production of speech, language and gesture for communication is often affected by cerebral palsy. Communication difficulties associated with cerebral palsy can be multifactorial, arising from motor, intellectual and sensory impairments. Children with this diagnosis can experience mild to severe difficulties in expressing themselves. They are often referred to speech and language therapy (SLT) services to maximize their communication skills and help them to take as independent a role as possible in interaction activities. Therapy can include introducing augmentative and alternative communication (AAC) systems, such as symbol charts or communication aids with synthetic speech, as well as treating children’s natural forms of communication. Various strategies have been used to treat the communications disorders associated with cerebral palsy. Pennington et al. (2011) determined the effectiveness of SLT that focuses on the child or their familiar communication partners, as measured by change in interaction patterns. Methodological flaws and small sample sizes prevent firm conclusions being made about the effectiveness of therapy.
Although positive trends in communication change were shown, such researches urgently need to ensure clinically effective provision for this group of children, who are at severe risk of social and educational exclusion.

A fourth-generation methodological research

The quantitative approach to data is based on tests on an ideal, standardized individual, impossible to match reality. In this article we propose the observation of a particular subject to go further: We observe subjects whose body carries a cerebral dysfunction, which is not, therefore, an idealized body.

These subjects, with damaged brain, feel, think and have emotions, elements that can and should be considered in the research and evaluation of language education. The discursive approach of the data of our research (Monte-Serrat, 2015), besides not sanitizing the ways and desires of the observed subjects, supports the pluralities: this practice takes quantitative evaluation and transforms it into effective social work.

This perspective, called "fourth-generation qualitative evaluation" (Campos & Furtado, 2011, p. 143) reinforces the importance of thinking of evaluations as acts of transformation of the world, practices involved in discovering to transform, refuting the studies of shelf because of its cooling, silencing and paralyzing sense for the subjects and the organizations (Patton: 1997 apud Silva & Brandão: 2011, 143).

A new perspective for the study of language learning on children with cerebral dysfunction

Monte-Serrat et al. (2015) study provides a new perspective for language learning diverging from other studies based on traditional clinical practice. The latter ones work with quantitative approach to data collected based on an ideal and standardized subject who cannot possibly correspond to reality. Monte-Serrat et al. (2014) collected language data from the speech in course, that is, from discourse, during the signification processes (children’s enunciation), with a particular form of signification that children with hydrocephalus apply to their speech under certain production conditions. The authors (Monte-Serrat et al, 2014) understand that without mastering discursive practices, children with cerebral dysfunction can hardly reach situations of social inclusion. Their assessment moves apart from pedagogical standards of “right” and “wrong” and concentrates on the subject as the author of language in oral narratives. Oral narratives take the place of cognitive tests because they make it possible to place literate and illiterate (and children with cerebral dysfunction are not literate) subjects on the same level. They state that: “The fact that children with alterations (in their bodies, body functions and structures) have less access to education and health care perpetuates their condition of non-social inclusion. Writing, in these children’s case, has to do with their survival” (Monte-Serrat et al., 2014).

The signification process involves the body

A fourth-generation research cannot assess language development without taking in account the body, especially when children learning disability are observed (Monte-Serrat, 2015). This perspective observes, on one hand, language alterations which lead to alterations in the subject regarding his/her relationship with his/her body, his/her peers and objects; on the other hand, brain lesions or dysfunctions which cause difficulties in language learning. Such interrelation occurs due to the articulation between the process of signification (which involves the body), external materiality and language itself.

The lack of careful attention to the language of an individual showing disability in this field causes the body to be led to a displacement which, in turn, causes blocks and even function cessation. Monte-Serrat (2015) states that researchers need to make their observation beyond neurolinguistics.
and need to look at the child with brain dysfunction in their organic-biological perspective. This perspective offers the possibility of forming a framework of each child, establishing their strengths and weaknesses, considering the best way to subject it to the process of learning the spoken and written language, in order to better define his/her possibilities of learning and to maximize this learning by combining the child's strengths with the child's needs and interests (Rose & Meyer, 2013).

Linguistic follow-up allows for rhythmic, lexical and syntactic modifications so that the signifying chain can be put in order in the subjects' oral or written production. Successful linguistic intervention acts on subjectivity formation by always taking into account the fact that the investment on neuronal capacity reorganizes the functions involved in language use, stimulates discursive functioning and plays a protective role in relation to pathologies. (Monte-Serrat, 2017).

Conclusion

This descriptive observational study was carried out firstly with an aim to describe the socio-demographic characteristics of Bengali children with cerebral palsy and, on a second moment, it was associated to the fourth-generation qualitative research to observe speech dysfunctions in children with cerebral palsy in order to insert them in their social context and to give them quality of life.

In the first part of this study it was observed that assess the different types of speech profiles in children with cerebral palsy. This perspective of study found that mean age was 8.9±4.82 years in cerebral palsy group. It was found that detailed speech and language assessment data from a cohort of 4.5-year old children with CP, 75% of participants had clinical speech and/or language impairments (Hustad et al., 2014). It was found that motor dysfunction affected 90% of a small sample of children with CP aged 1 to 6 years (Reilly et al., 1996) and that parent perception about communication and parental stress may play roles in augmented language intervention (Romski & Sevcik, 2005). This descriptive examination of information regarding intervention provided by parents of children (Hustad et al., 2014) indicated that only a very small proportion of children in this study were established talkers who appeared to be developing speech and language skills that were roughly commensurate with age expectations.

The authors studied found that the presence of mental retardation was strongly associated with the level of speech ability, but for them was unclear whether these children catch up on their own, or whether intervention leads to advances in skill development that bring children in line with developmental expectations. What has been practiced by the specialists is Speech & language therapy which typically begins shortly after a child is diagnosed with cerebral palsy (CP). The role of the speech therapy is to help children speak clearly, communicate effectively & control the muscles involved in speaking. The first step of the speech therapist is to conduct a thorough assessment of a child's physical & cognitive functionary. This assessment will determine the nature of a child's speech and communication abilities identifying causative factors to determine the best approach to therapy. Researchers are encouraged to gather information on language development along with motor or cognitive functioning in order to better understand the interrelationships between the development of motor, cognitive, and language skills in children with cerebral palsy.

In the second part of this study, under the perspective of the fourth-generation qualitative research (Campos e Furtado, 2011) we find out that language has to do with meanings, rather than sounds. A language disorder refers to an impaired ability to understand and/or use words in context. A child may have an expressive language disorder (difficulty in expressing ideas or
needs) a receptive language disorder (difficulty in understanding what other are saying) or a mixed language disorder (which involved both). Speech disorders refers to impairment in the articulation of speech sounds, fluency and voice as well as to language disorders as impairments in the use of the spoken (or signed or written), in the use of grammar and phonology), the content of language (semantics), and the function of language (pragmatics). These may also be described more generally as communication disorders which are typically classified by their impact on a child’s receptive skills (with the ability to understand what is said or to decode, integrate, and organize what is heard) and expressive skills (with the ability to articulate sounds use appropriate rate & rhythm during speech, exhibit appropriate vocal tone and resonance and use sounds, words and sentences in meaningful contexts).

A fourth-generation methodological practice has a concern: to go beyond the detection of what causes dysfunction in communication of children with language impairment. This concern is not based on as assessment of “right” and “wrong” patterns of an ideal subject. The fourth-generation research on cerebral dysfunction is compelled to believe, according to Carter (2012, p. 193), that brain cells and neuronal circuits were immutable and although the impairment, researchers are claimed to be able to demonstrate that "experience and learning reshape brain circuits" due to the fact that neuronal plasticity lies in "long-term empowerment, in which memory and learning generate new circuits" (op. cit., p.193). "The brain apparently has some ability to repair itself, continue to grow and develop throughout life" (Carter, 2012, p.193). This is the hope for the inclusion of children with cerebral palsy and the hope of giving them a better quality of life.

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The author declared no conflicts of interest with respect to the research, authorship and/or publication of this article.

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