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EFFICACY OF ORAL SENSORY MOTOR EXERCISE FOR FACILITATING SPEECH PRODUCTION IN CHILDREN WITH CEREBRAL PALSY - A SINGLE CASE ILLUSTRATION

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Abstract

Cerebral Palsy is a group of non-progressive permanent disorders of movement and posture in the developing infant or foetal brain often accompanied by disturbance in sensation, perception, cognition, behaviour and communicative skills. Professionals tend to focus mainly on motor coordination issues during the process of intervention. Advancements in research have highlighted the importance of sensory approaches over motor functions. The present study tries to disseminate the relevance of Oral Sensory Motor Exercises on speech production. The case report aims to understand the efficacy of Oral Sensory Motor Exercises on speech production and clarity in a child with quadripareitic spastic Cerebral Palsy. ABAC research design was employed in this biphasic study which consisted of a baseline assessment, an intervention period and a post therapy assessment with a period of 5 months as withdrawal phase. The efficacy of Oral Sensory Motor Exercises along with Traditional Speech and Language Therapy over Non-Speech Oro motor exercises with Traditional Speech and Language Therapy were understood with a substantial improvement in spontaneous speech production along with language skills and an improvement in mean length of utterance after post therapy evaluation in phase II. The overall progress in expressive speech and language skills emphasized the significance of integrating Oral Sensory Motor approach with other traditional approaches.

***Keywords**: Non-Speech Oro Motor Exercise, Oral Sensory Motor Exercise, Traditional Speech and Language Therapy, Quadriparietic Spastic Cerebral Palsy*

INTRODUCTION

Cerebral Palsy (CP) describes a group of permanent disorders due to brain insult during prenatal, perinatal or postnatal period, causing movement and postural activity limitations which are attributed to non - progressive disturbance in brain development accompanied by disturbance in sensation, perception, cognition, behavior and communicative skills (Rosenbaum et al., 2006, Bax et al., 2017). Children with CP tend to exhibit a variety of such motor dysfunctions depending on the site of cortical damage (Lagunju, et al., 2010). Frontal lobes of the brain coordinate motor activities such as voluntary movements, speech, intellectual and behaviour. Lesions to Broca's area (left hemisphere -frontal lobe) can have control and coordination issues, oromotor dysfunction in feeding and communication which in turn interfere with motor functions and daily activities (Ostensjo et al., 2004). Hence early interventions concentrate mainly on improving motor function through oromotor, non-speech exercises and other traditional approaches (Kulak et al.,2016).

The use and efficacy of Non-Speech Oral Motor Exercise (NSOME) in resolving speech related motoric issues has been reported before (Ruscello, 2008, Ballard et al., 2015). A survey done in 2011 in India substantiates the feasibility of this approach in improving various motor aspects in articulatory movement (96%), feeding (85%) and in improving sensory issues (65%) Thomas & Kaipa, 2015). but not about remediating the sensory issues involving neural pathways for speech and non-speech mechanisms. Considering the differences in these two mechanisms, this approach couldn't quantify the improvement in speech production and clarity (Duffy, 2013, Kollia et al., 2019, Maas, 2008. The disadvantage in recovering motor function could be due to the fact that children with CP do not receive proper sensory feedback leading to neglect in the affected extremities and associated difficulties with learning a new movement (Chorna, et al., 2015).

Sensory deficit is a common parlance that defines a wide range of symptoms which includes difficulties with one or multiple senses. A study done in the year 2009 reports sensory and neurocognitive impairment in children with CP as a major therapeutic challenge (Lagunju, et al., 2010, Pavao et al., 2017). The cardinal determinant of sensory deficits is white matter lesions which are detrimental in development of cortical and thalamic regions (Pavao et al., 2017). Evidence suggests a combination of sensory and motor-based approaches has a greater influence in feeding and gross motor functioning compared to that of other interventional approaches. This could be because of the involvement of the same neuronal pathways in sensory-motor integration and speech representation (Wan et al., 2010). The systematic evaluation of sensory processing allows Speech Language Therapist (SLT) to adapt oral sensory motor goals into therapeutic interventions which helps in integrating the sensory input and improvement in motor performance of children with CP (Pavao et al., 2017, Bahr & Banford, 2012). There exists scanty scientific support about the efficacy of Oral Sensori Motor Exercise (OSME) as well its effect on speech production skills in children with CP.

This study aims to investigate the efficacy of Oral Sensori Motor Exercise (OSME): Traditional Speech and Language Training (TSLT) combination in improving speech production and clarity viz improvements in oral awareness and oro motor movements in facilitating speech production in children with quadripareitic spastic CP.

CASE REPORT

The research was approved by the Research and Review Authority of National Institute of Speech and Hearing (NISH), under Kerala University of Health Sciences (KUHS). Subject was a single male child of 7 years with quadripareitic spastic cerebral palsy, who had not received any form of speech and language intervention. A written consent was obtained from the parent before commencing the intervention program.

Initial baseline assessment of the subject revealed a significant perinatal history of premature birth (6.5 months) and low birth weight of 1.5kg with NICU admission for 65 days. Postnatal history revealed a single episode of epileptic seizure 48h after birth. Parents reported remarkable delay in motor & speech and language milestones. Before commencement of therapy, a baseline assessment was conducted. The baseline assessment was performed using Receptive and Expressive Emergent Language Scale (REELS) and Extended REELS (eREELS), Communication DEALL Developmental Profile (cDEALL), Communication DEALL Oro Motor Assessment (cDEALL OMA) and Pre-requisite

Learning Behaviour (PLB). The same measures were utilized for post therapy assessment as well. The intervention planned after the baseline assessment focused on two main treatment approaches; NSOME and TSLT in phase I which was for period of 6 months and OSME and TSLT in phase II which again constituted a period of 6 months. After phase I, the patient discontinued the intervention program for a period of five months (considered as withdrawal period). TSLT targets mainly on speech and language aspects (Comprehension & expression of common lexical items, following simple commands, functional communication, vowels, consonants, consonant - vowel, vowel consonant, phrase level - 2 words productions etc) whereas the NSOME focused on improving the oromotor skills (cheek muscle strengthening exercise, range and strength of lip movement and tongue movements). The OSME approach included sensory as well as motor aspects in which the motor goals were the same as that of Phase I. The sensory goals were to reduce hypersensitivity/ hyposensitivity and accept sensory input to the oral facial areas needed for muscle-based speech therapy. In Phase II sensory assessment was also included based on Oral Placement Therapy (OPT) wherein the OPT was done in a hierarchical pattern using sensory bean bags, gloved finger/ towel, toothet and vibration/ sensory toys and the responses were recorded.

RESULTS AND DISCUSSION

The OSME approach was introduced in phase II in order to work on the underlying sensory issues which have restricted the motor movements for speech production while working with NSOME. The results of phase I and II post therapy are summarized in Table -1. The major findings from the study are as follows. The eREELS for phase II showed better results than phase I. Slight improvements in receptive and expressive language age and social skills was noted (phase-II cDEALL) with slight reduction in drooling and improvement in lip closure (cDEALL OMA phase II). The OPT- sensory assessment showed overall changes in sensitivity. Other observations include improvements in production and imitation of vowels with minimal prompts, tongue movements (restricted speed and range of motion), mastering most of consonants, two-word utterances with minimal prompts, substantial head control without additional support (movements of head to both sides), pointing etc. The findings evidenced that sensory processing not only influences overall behaviour and wellbeing, but can also affect the performance of motor functions and functional tasks in achieving adaptive success in children with CP. The improvement in speech production abilities as well as other skills post therapy is attributed to the effect of integrating sensory approach with other traditional approaches which correlates well with the studies related to sensory therapeutic approach in children with speech disorders (Padnani & Arunachalam, 2019), motor impairment (Weiss-Lambrou, 1989) and underlines the feasibility and efficacy of OSME over NSOME.

Table 1: Results of pre-& post therapy

Post-therapy Assessment	Phase I	Phase II
eREELS	RLA: 6-7 Years ELA: 13-14 months	RLA: >7 years (Adequate) ELA: 18-20 months
cDEALL	GMS :0-6 months FMS :0-6 months ADL:0-6 months RLA :60-66 months ELA :12-14 months CS :60-66 months	GMS :0-6 months FMS :0-6 months ADL :0-6 months RLA :66-72 months ELA :12-18 months. CS :66-72 months

	SS :66-72 months ES :60-66 months	SS :66-72 months ES :60-66 months
cDEALL OMA	Reduced drooling Reduced jaw mobility and stability Improved lip closure Poor lip rounding and retraction Reduced tongue elevation and lateralization:	Drooling absent Jaw stability and mobility- improved Lip closure, rounding, protrusion- present Lateral movement, tongue elevation and retraction possible
SA		Reduced hypersensitivity in the alveolar region, edge of the mouth and corners of the lips Sensitivity improved in the middle of the tongue.

eREELS- Extended Reels; c DEALL- Communication DEALL; c DEALL OMA- Communication DEALL Oro Motor Assessment; SA- Sensory Assessment; RLA- Receptive Language Age; ELA- Expressive Language Age; GMS- Gross Motor Skill; FMS- Fine Motor Skills; ADL- Activities of Daily Living, CS- Cognitive Skill; SS- Social Skill; ES- Emotional Skill

SUMMARY AND CONCLUSION

The present study was a preliminary attempt to focus on integrating OSME approach into clinical practices for the intervention of children with CP. The study provides an insight about the restriction in motor functions for speech production and clarity due to sensory issues in children with CP. Even though CP is known as a motor disorder, it can have coexisting sensory impairment. Hence integration of OSME has to be employed during the intervention in CP for speech production and clarity.

CP- Cerebral Palsy; NSOME- Non-Speech Oral Motor Exercise; OSME- Oral Sensori Motor Exercise; TSLT- Traditional Speech and Language Training; REELS- Receptive and Expressive Emergent Language Scale; eREELS- Extended REELS; cDEALL- Communication DEALL Developmental Profile; cDEALL OMA - Communication DEALL Oro Motor Assessment; PLB- Pre-requisite Learning Behaviour.

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