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Correlation Between Feeding Dysfunction And Communication In Early Childhood With Autistic Traits

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ABSTRACT
Autistic traits begin to emerge in the first year of life and can be detected between 6 and 18 months of age. Children with ASD often exhibit feeding and communication difficulties in early childhood, which may be indicative of underlying developmental challenges. While occurrence of feeding dysfunction and communication difficulties is well established, the relationship between these two variables in early childhood is poorly understood. Children in the age range of 11 to 24 months, were taken for the study. PediEAT (Pediatric Eating Assessment Tool) and CSBS-DP (Communication and Symbolic Behavior Scales Developmental Profile), questionnaires were administered. Feeding intervention (aroma therapy with oro-motor stimulation) were given to all 30 participants for five days a week for six weeks for 30 minutes. After six week of therapy post data was collected by administering PediEAT and CSBS DP in all the children. After the statistical analysis the overall findings indicated that the presence of feeding dysfunction is having moderate positive correlation (r .31, $p \leq 0.04$) with communication in early childhood with risk for autistic traits.

Keywords: Autistic Traits, Feeding dysfunction, Communication Difficulties

1. INTRODUCTION

Autistic traits begin to emerge in the first year of life and can be detected between 6 and 18 months of age. Earlier identification allows correct diagnosis, timely intervention leading to better prognosis, which is a vital point for maximizing a child's potential and achieving optimal outcomes. Optimal outcomes in children with Autistic traits are linked to the age at which intervention begins, with the most significant improvement being observed in children who begin intervention before 2 years of age. [1]
Improper brain development and function are evident in the first year in high-risk infants who are later diagnosed with autism spectrum disorder (ASD) using magnetic resonance imaging (MRI) and electroencephalogram (EEG). Prospective studies indicate impairments appear early in the development for sensory and motor function, visual attention, socio-emotional regulation and communication. Thus, it becomes necessary to develop earlier identification to coincide with earlier intervention and improve lifelong outcomes for these children. Subsequently, progress has been made in establishing the efficiency of intervention for toddlers as young as 15 months. [2]

Mostly 90% of children with ASD exhibits atypical feeding behaviors. [3] Evidences suggests that oral defensiveness and presence of sensory oversensitivity in the oral region are commonly seen in these children, which leads to food selectivity in them. [4, 5] Oral sensory development is a vital aspect of childhood development that must be considered when assessing infants. These are the elements that make up the sensory-motor patterns, gained during the formation of both basic and complex skills such as eating and speaking. Children with ASD struggle to register and modulate sensory inputs in more than one sensory systems (these systems are affected in varying degrees). [6] Thereby, it is difficult to initiate, execute and control movements with a lack of a feedback system. Evidence from clinical practices has revealed that hyposensitivity and hyper-sensitivity symptoms coexisted, potentially leading to feeding issues and poor speech intelligibility. [7]

There have been differences in prelinguistic communication development observe between infants later diagnosed with ASD. During their first year, infants typically move from non-syllabic to syllabic vocalizations, showing the emergence of canonical syllables around seven months and increasing thereafter. Around nine to twelve months, infants who will later be diagnosed with ASD generate fewer canonical vocalizations and more non-canonical ones. [8] Inappropriate vocalization patterns, particularly reduced canonical babbling, have been noted in these infants along with later language delays. [9] Caregiver responses are more likely to occur in reaction to canonical vocalizations, these are essential for refining babbling and enhancing communication. [10] Consequently, early vocal production problem leads to diminished social feedback, impacting communication and language development. Siblings of the infants diagnosed with ASD often show fewer socially directed vocalizations. [11] Unusual crying patterns have also been noted in these infants as early as one month of age. [12] Infants who are subsequently diagnosed with ASD shows a unique upward trajectory in gestural development. In between eight and fourteen months, they demonstrate a decreased use of gestures, especially deictic gestures like pointing with fingers, and demonstrate less gesture-vocal coordination compared to neuro-typical peers. [13, 14] Gesture usage at 1 years is indicative of an autism diagnosis and positively correlates with both expressive language skills at that age and later language abilities. [15]

A number of authors hypothesized improper sensory behaviors as a factor constraining verbal communication development in autistic children. They stated that hypo-responsiveness and behaviors related to sensory seeking were associated with the verbal communication of the child. Observational evidence had suggested that preschool autistic children have hypo-responsiveness to stimuli including social stimuli, which is positively correlated with impaired communication. [16] Recent researches shows that non-verbal children have substantially worse outcomes than verbal autistic children. Acquiring functional verbal communication or development of speech before 5 years of age predicted educational success, occupational independence, and social interactions. [17]

Researchers used cluster analysis and identified elevated levels of hypo-responsiveness and sensory-seeking behaviors, which were associated with poor communication in autistic children. [18] Evidences suggests that the severity of the social communicative symptoms is linked to the three sensory response trends i.e., hypo-responsiveness, hyper-responsiveness and sensory seeking. [19] One of the studies reported that hypo-responsiveness had a positive correlation with social communication, whereas language and adaptive skills were negatively correlated. [20]

Recent pilot study concluded that the combination of oro-motor stimulation and aroma therapy is an effective intervention in decreasing oral sensory issues and improving feeding skill in children with

ASD. [21] Recent findings indicates that the presence of oral sensory issues are associated with feeding and communication deficits in autistic children. [22]

Literature has shown that the children with ASD often exhibit feeding and communication difficulties in early childhood, which may be indicative of underlying developmental challenges. While occurrence of feeding dysfunction and communication difficulties is well established, the relationship between these two variables in early childhood is poorly understood. However, there is lack of evidence in the correlation of feeding and communication. Therefore, we attempt to understand correlation between feeding and communication in early childhood with Autistic traits. Through examining the relationship between these two critical variables, this research seeks to contribute to the development of early identification and intervention strategies for children with Autistic traits, ultimately improving their long-term outcomes.

2. METHODOLOGY

Children having autistic traits as per DSM-V criteria along with feeding dysfunction in the age range 11 to 24 months of age, were selected for the study. Informed consent were obtained from the all the parents/caregivers of the children. A correlation study design was adopted for this study. The sample selected for this study was done by using convenient sampling. The study was conducted in the Department of Occupational Therapy, Swami Vivekanand National Institute of Rehabilitation Training & Research (SVNIRTAR). Children undergoing medication (sedatives), auditory and visually impaired and other associated orthopedics and neurologic condition were excluded for this study.

Pre data of PediEAT (Pediatric Eating Assessment Tool) and CSBS-DP (Communication and Symbolic Behavior Scales Developmental Profile), questionnaires were administered. Feeding intervention (aroma therapy with oro-motor stimulation) were given to all 30 participants for five days a week for six weeks for 30 minutes. After six week of therapy post data was collected by administering PediEAT and CSBS DP in all the children. Total scores for each of the test materials were summed up and compared with the normative to identify the issues and deficit. Pre and post data of each component were taken for statistical analysis.

PediEAT: The PediEAT is a 78-item parent-report measure of symptoms of problematic feeding intended for children between 6 months and7 years of age who are eating at least some solid foods. There are four subscales of the PediEAT: Physiologic Symptoms, Problematic Mealtime Behaviors, Selective/Restrictive Eating, and Oral Processing. The Physiologic Symptoms subscale contains 27 items. Problematic Mealtime Behaviors is a 23-item subscale that assesses food acceptance and refusal behaviors. The Selective/ Restrictive Eating subscale contains 15 items that assess symptoms of preferences for food textures and temperatures. Finally, the Oral Processing subscale contains 13 items that assess symptoms of oral processing dysfunction. The PediEAT was developed and content validated with professionals caring for children with feeding difficulty as well as with parents of children with and without feeding problems. The PediEAT has acceptable internal consistency reliability for all subscales (Cronbach's $\alpha = .83–.92$) as well as the total scale (Cronbach's $\alpha = .95$), acceptable test–retest reliability between scores taken 2 weeks apart ($r = .87$, $p < .001$), and construct validity with the Mealtime Behavior Questionnaire ($r = .77$, $p < .001$). Parents completing the PediEAT were asked to rate each item on a 6-point scale (i.e., Never, Almost Never, Sometimes, Often, Almost Always, and Always). Scores were assigned with more symptoms receiving a higher score. [23]

Temporal stability was demonstrated through test-retest reliability (r=.95, *p* <.001). Strong psychometric properties support the use of the PediEAT in research and clinical practice. [24]

CSBS DP: Communication and Symbolic Behavior Scales Developmental Profile Infant/Toddler Checklist (CSBS-DP) The test had 24 questions with points ranging from 0 to 4 in seven language predictors. Items marked "Not Yet" received a score of 0, "Sometimes" received one point, and "Often" received two points. "None" received 0 points, and questions with numbered choices received 1 to 4 points. The sum of the points in each cluster yielded seven distinct cluster scores, namely "emotion and use of eye gaze," "use of communication," "use of gestures," "use of sounds," "use of words," "understanding of words," and "use of objects". The cluster scores were added up to create three composite scores including "communication composite," "expressive speech composite," and "symbolic composite". These scores when added together provided the final score that was then compared to the normative score. The lesser the score, the more at risk for developing communication impairment. [25]

3. RESULTS

The present study included 30 children with autistic traits having feeding and communications problems between the age group of 11 months to 24 months. The pre and post data was collected by PediEAT and CSBS DP. The score of each scale were subjected to statistical analysis. All the statistical analysis was done by using SPSS version 23. Paired sample T test was used to analyze the effect of feeding intervention on PediEAT and CSBS DP. Pearson correlation coefficient was used to analyze the correlation between feeding and communication among children with ASD.

TABLE 1: depicts the descriptive statistics

GENDER	N	% SUBJECTS	AGE (MEAN ± SD)
MALE	30	63.30%	17.06 ± 3.9
FEMALE	30	36.60%	

The descriptive statistics shown in Table 1 represents the mean age (17.06 ± 3.9) of 30 children with autistic traits, comprising of 63.3% males and 36.6% females which is graphically represented in Fig. 1.

Fig. 1:

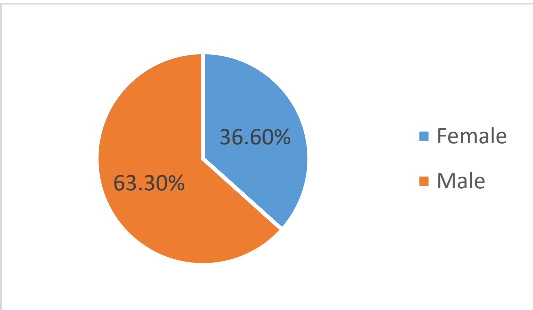


TABLE 2: shows the result of Paired sample T test

Variables	Test	N	Mean ± SD	Paired differences (Mean ± SD)	95% Confidence Interval		*t*	*df*	*p*
					Lower	Upper			
PediEAT	PRE	30	117.1 ± 16.9	19.6 ± 14.7	14.1	25.1	7.2	29	.000
	POST	30	97.5 ± 8.3						
CSBS DP	PRE	30	42.8 ± 6.1	12.1 ± 3.7	3.7	13.5	17.8	29	.000
	POST	30	30.7 ± 5.0						

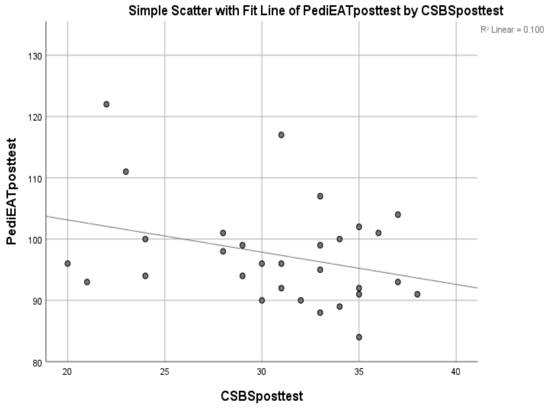
The effect of feeding intervention in PediEAT and CSBS DP was done by using paired sample T test as shown in Table 2. The above result shows that the '*t*' value is 7.2 and '*p'* is <.000 in PediEAT and the '*t*' value is 17.8 and '*p*' is <.000 in CSBS DP, representing a significant improvement in both the groups. The level of significance was set at 0.05, the '*p*' value calculated was found to be <.000 in PediEAT and CSBS DP. Thereby, suggesting a significant improvement in feeding as well as in communication among children with autistic traits after feeding intervention.

TABLE 3: present the correlation among feeding and communication

VARIABLES	N	*r*	*p*
PediEAT	30	-.31	0.04
CSBS DP	30		

Pearson correlation coefficient was used to find out the correlation among PediEAT and CSBS DP as shown in Table 3 and graphically represented in Fig. 2. The above results (r = -.31 ; p = 0.04) suggests that there is a statistically significant moderate negative linear relationship between the two variables. This means that as one variable increases, the other variable tends to decrease. However, in CSBS DP the lesser the score, the more at risk for developing communication impairment, whereas, in PediEAT scores assigned with more symptoms received a higher score in feeding dysfunction. Thus, this correlation suggests that the two scales are measuring two different constructs with different approach for scoring. Therefore, consistent with the results it is suggested that there is a statistically significant moderate positive relationship between the two variables. This means that as one variable increases, the other variable tends to increase. This rejects the null hypothesis. Thereby, the proposed hypothesis is acknowledged.

Fig. 2



4. DISCUSSIONS

This study investigated the correlation between feeding dysfunction and communication in early childhood with autistic traits. The place of study was the Department of Occupational Therapy, SVNIRTAR. 30 parents/caregivers participated in this study and the data was collected using PediEAT and CSBS DP. The results indicate a significant positive correlation between feeding dysfunction and communication difficulties in this population.

During the first two years of life, gross motor, fine motor and oral motor development are the prerequisite skills for subsequent development of self-feeding skills. [26] It was also found that infants make rapid and substantial progress in both the perception of speech and the production of vocalizations. Recent research has also stated that infant vocalizations are related to oral motor function such as sucking, chewing and swallowing. [27]

In addition oral sensory development must be considered when assessing infants. These are the elements that make up the motor-sensory patterns, learned during the formation of both basic and complex skills such as eating and speaking. Autistic children struggle to register and modulate sensory inputs in one or more sensory systems to varying degrees. [28]

The three primary phases in the development of lip and jaw coordination for speech are: integration, differentiation and refinement. Each of these developmental processes entails the existence of distinct coordinative constraints on early articulatory movement. It is suggested that these constraints will have predictable consequences for the sequence of phonologic development. [29]

Evidence suggests that children often reject geometric textural properties presented as pieces or bits in food. It is suggested that such texture aversions may be linked to the child's autonomous reflexes dealing with the control of chewing and swallowing, which required repeated training. Oral physiological development continues throughout the childhood and children keep refining their oral processing skills. It was reported that children's chewing efficiency for solid, viscous, and pureed textures improved and matured between the years of 2 and 8. Children's bite force increases progressively between 3 and 17 years. However, little is known about how the maturation in masticatory performance affects children's food texture acceptance. Oral development may support the acceptance of harder foods. Evidence showed that with increasing age, children's preferences for hard foods become aligned with their adult counterparts. Contrarily, having a positive attitude to hard foods may improve children's masticatory performance and support healthy orofacial development. [30]

Neurophysiological process of feeding explained that the essential elements controlling trigeminal moto-neurons lie between the trigeminal and facial motor nuclei. Feeding requires the rhythmical contraction of muscles in the upper aero-digestive tract. Although the muscle groups that take part may vary, the muscles innervated by the trigeminal cranial nerve are involved in all species. In mammals, there are three major groups of jaw-closing (JC) muscles innervated by the trigeminal nerve (the temporalis, masseter and pterygoid groups) and one jaw-opening (JO) muscle group (the digastric muscles). Masticatory movements vary depending on the type of food and differ between the start and the end of the chewing sequence. Nevertheless, the basic patterns of mastication are controlled by a brainstem central pattern generator (CPG). [31]

Mastication results from the interaction of an intrinsic rhythmical neural pattern and sensory feedback from the mouth, muscles and joints. The pattern is matched to the physical characteristics of food and also varies with age. The intrinsic rhythmical pattern is generated by an assembly of neurons called a central pattern generator (CPG) located in the pons and medulla. The CPG receives inputs from higher centers of the brain, especially from the inferio-lateral region of the sensorimotor cortex and from sensory receptors. Mechanoreceptors in the lips, oral mucosa in muscles, and in the periodontal ligaments around the roots of the teeth have particularly powerful effects on movement parameters. The central pattern generator includes a core group of neurons with intrinsic bursting properties, as well as variety of other neurons that receive inputs from oral and muscle spindle afferents. In addition to controlling moto-neurons supplying the jaw, tongue, and facial muscles, the CPG also modulates reflex circuits. It is proposed that these brainstem circuits also participate in the control of human speech. The basic pattern of mastication is produced by a brainstem central pattern generator that operates under the control of higher centers and that is subject to sensory feedback. The author also propose that these circuits are also used in the control of orofacial movements during speech. [32]

A review on experimental findings on centrally patterned movements, sensory and descending modulation of central pattern generators (CPGs) in a variety of animal and human models specifically emphasizes toward speech production muscle systems, including the chest wall and orofacial complex during patterned motor output. They concluded that CPGs sub-serving orofacial motor behavior can be modulated via descending and sensory inputs. This feature of control may also operate in the control of other centrally patterned motor behaviors including speech breathing, suck, mastication, and the recombination of CPG processes for the development and production of speech. [33]

Longitudinal study on EMG pattern for chewing development in children from 12 to 48 months also suggested that the basic chewing pattern of reciprocally activated antagonistic muscle groups is established by 12 months of age. Chewing efficiency appears to be improved through a variety of changes in the chewing pattern throughout early development. Coupling of activity among the jaw elevator muscles was shown to strengthen with maturation, and the synchrony of onset and offset of these muscles also increased. Co-activation of antagonistic muscles decreased significantly with development. This decrease in antagonistic co-activation and increase in synchrony among jaw elevators, and a parallel decrease in EMG burst duration, were taken as increased chewing efficiency. Additional considerations include the appropriateness of this coordinative infrastructure for other developing oro-motor skills, such as speech production. [34] As the prerequisite skill, textural acceptance of food, neurophysiological development and EMG study of feeding and communication during early phase of development is somewhat similar. So, it may be the reason that these two are showing moderate positive correlation. As intervention was given in one domain, therefore, prognosis was found in both.

5. LIMITATIONS & RECOMMENDATIONS

An important limitation of this study was the limited sample, for which the relationship or extent to which behavior aligns with feeding and oral communication requires further investigation with larger sample of children with autistic traits have feeding and communication issues. However, only limited studies on feeding and communication have been published. This calls for future studies focusing on the same. Effective feeding and communication intervention strategies may be developed based on early identification for ultimately improving their long-term outcomes.

6. CONCLUSION

Although, a small sample size was used for this study, the overall findings indicated that the presence of feeding dysfunction is having moderate positive correlation with communication in early childhood with autistic traits.

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