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Effect of functional chewing training via telemode in children with cerebral palsy: A preliminary study

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Abstract
In the area of pediatric feeding disorders, studies investigating the efficacy of feeding therapy delivered through telepractice are very much limited. The present study attempts to assess the effects of a chewing training program across timelines via clinician-delivered telepractice in children with Cerebral Palsy (CP). The baseline was established by using various tools including Test of Mastication and Swallowing Solids in Children and surface electromyography. Also, the texture progression and functional feeding abilities were assessed. Using the framework provided, 20 sessions of intensive Functional Chewing Training (FCT) was conducted via tele-mode (online). FCT is a multicomponent program to improve chewing abilities which integrates impairment-based and adaptive components. The results revealed that chewing therapy via telepractice led to improved masticatory efficiency, food texture progression and functional feeding abilities. The results of the Friedman test revealed a significant improvement in parameters in the pre-versus post-therapy and pre-versus follow-up conditions ($p \leq 0.05$). Thus, the program carried out as telepractice is a feasible and cost-effective option for children with CP who have compromised locomotory abilities.

Keywords: Cerebral palsy, chewing efficiency, electromyography, functional chewing training, telepractice

Introduction

Mastication or chewing is one of the most important functions in the oral phase, essential for food ingestion [1]. It is a complex and dynamic action of mechanical breakdown of solid food and preparing it for swallowing. The act of chewing can be divided into two stages including food transportation and food processing. The food transportation stage begins with holding and biting the food and continues with transporting the bolus from the front part of the mouth to the molars by the tongue. The food processing stage involves a sequence of masticatory cycles, which leads to softening the texture of food for easier swallowing.

Deficits in chewing abilities is one of the most common oral phase deficits seen in children with cerebral palsy (CP) with the prevalence ranging from 40-80% [2-4]. Food transportation from the front of the mouth to the molar area, where it is processed through several masticatory cycles, is the most affected aspect of chewing in children with CP [5]. Specifically, these deficits may reflect uncoordinated tongue movements, poor labial integrity and jaw stability and disruption in the functioning of the oral sensorimotor mechanism due to poor neuromuscular development [6,7]. These difficulties can have an impact on optimal nutrition and growth of the child, thereby affecting the overall health and quality of life.

Since the last three decades, clinicians have used various strategies designed to improve chewing skills. In the earlier approaches, oral-motor and behavioural strategies were employed to advance chewing skills [8-12]. In recent years, multicomponent treatment approaches including behavioral modification techniques, non-nutritive oral motor tools and nutritive elements have become popular. One such program is the functional chewing training (FCT) program which was proposed to improve chewing abilities in children with CP [13]. This program is unique because it is an integrated and a systematic treatment approach which includes impairment-based and adaptive components. The impairment-based components include proper seating, food positioning in the molar regions, orosensory stimulation and masticatory exercises with oromotor tools and the adaptive component includes food consistency progression in a hierarchical manner.

The study assessed the efficacy of FCT on 80 children with CP, who had chewing deficits and were randomly assigned into the FCT and control group [13]. The FCT group was compared with the control group, which received traditional oral motor exercises including passive and active exercises of lips and tongue. To provide chewing exercise, the feeders placed a chewing tube in the child's molar area, alternating between two sides, to facilitate chewing. In later stages, food of varying textures was given in a graded manner to provide practice and to master the chewing skills. The chewing functions were analyzed using video recordings and were assessed using the Karaduman Chewing Performance Scale (KCPS). The authors reported that FCT was found to be more effective in comparison to traditional oral-motor exercises. However, empirical studies investigating the efficacy of this technique through various modes of service delivery including telepractice does not exist, which is necessary in today's post-pandemic context.

Telepractice has been changing the face of Speech-Language Pathology during and after the pandemic. Factors such as rapid developments in technology, the audio-visual nature of the interaction between the Speech-Language Pathologist (SLP) and the clients, improving access to care, and equitable access, make delivery of services eminently suitable for telepractice [14]. To date, a handful of studies have investigated the use of telepractice in the diagnosis and rehabilitation of adult patients with dysphagia [15-17].

In the area of pediatric feeding disorders, the first study was a single case study reporting the feasibility of telepractice in the rehabilitation of feeding deficits [18]. The authors evaluated the usage of telepractice in treating feeding issues in a child with Aspergers syndrome. Multiple activities including swallowing and eating a variety of foods and flavors were used as a method to improve swallowing skills. Evidence-based motor learning strategies, [19] such as blocked practice, immediate feedback, positive and negative reinforcement, etc., were also employed in a very systematic manner for practicing all motor tasks targeted. The results showed a decrease in latency for oral acceptance/tolerance and voluntary saliva swallows, increased texture acceptance and improved quality of life.

Studies investigating the efficacy of FCT delivered through the telemode do not exist, which is very relevant in today's post-pandemic context. Till date, no such studies have been done on children with CP. Only a single case study has been carried out to assess the feasibility of telepractice in feeding therapy in a child with Asperger's syndrome [18]. However, the study worked on improving the behavioral and swallowing variables and chewing was not targeted. Keeping this in view, the present study was planned to assess the effects of FCT using subjective and objective measures via clinician-delivered telepractice in children with CP.

Aim and Objectives

To evaluate the effect of FCT delivered through tele-mode by the clinician in children with CP by comparing the pre-, post-treatment and follow-up changes in various outcome measures. The specific objectives were:

1. To compare jaw, lip and tongue scores and total mastication scores across the three timelines.
2. To compare the number of masticatory cycles, discrete bites, number of swallows and total time taken across the three timelines.
3. To compare the mean amplitude, chew duration and inter chew duration across the three timelines.
4. To compare the changes in food texture levels and functional feeding levels across the three timelines.

Materials and Methods

A time series design was employed to study the treatment effects within the group.

Participants

Ten children (7 males and 3 females) with a confirmed diagnosis of oral dysphagia secondary to CP in the age range of 3 to 9 years (mean age = 5.3 years; SD = 1.9 years) formed the participant group. The feeding assessment was carried out at the Motor Speech Disorders (MSD) Unit by an experienced SLP. Children who exhibited difficulties with solid food management such as food packing, mashing food between tongue and palate, early swallowing and solid food refusal were selected for the study. The chewing abilities of the participants were assessed based on the Karaduman Chewing Performance Scale (KCPS) [20]. Participants with a score of 3 indicating 'bites but cannot chew' or 4 indicating 'no biting and chewing abilities' were selected. The children had an IQ of at least 40 and were able to follow simple instructions. They had adequate head and neck control and appropriate dentition.

Procedure

Prior to commencement of the training, a detailed baseline evaluation was carried out. Mastication Observation Evaluation (MOE), [21] which consists of 8 items, was used to assess the functioning of lip, law and tongue in chewing. Each item is provided a score of 1 to 4 depending on the level of functioning and a higher score indicates better functional use. Masticatory efficiency was quantified using Test of Mastication and Swallowing Solids in Children (TOMASS) [22]. Various quantitative parameters such as discrete bites (number of bites taken to finish a biscuit), masticatory cycles (up and down movements of the mandible), number of swallows (one up and down hyolaryngeal movement is considered as one swallow) and total duration (time from when the biscuit reaches the child's lips till it is swallowed) were measured during the process of ingestion of a biscuit.

Masticatory performance was also quantified using surface electromyography (sEMG, Delsys Trigno-Power Lab 8/36) by recording the electrical signals emitted by the masseter muscles while chewing a biscuit. The sEMG device contains wireless electrodes, which will pick up the electrical muscle activity and record the muscle tissue contractions while the participant is chewing. Outcome measures recorded were mean amplitude, duration of a chew and inter-chew duration of both right and left masseter muscles. A sample of the sEMG waveform in amplitude versus time domain, which was used to elicit the various measures have been depicted in the figure 1 below.

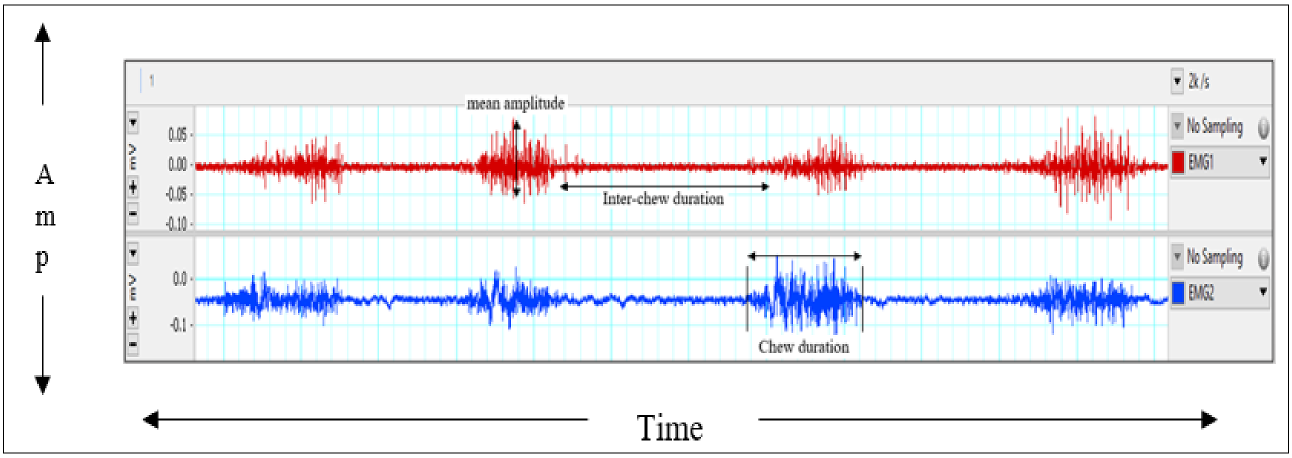

Fig 1: Waveform of sEMG signal in time vs. amplitude domain

The International Dysphagia Diet Standardization Initiative (IDDSI) framework was used to determine the food texture level consumed by the children [23]. The IDDSI has classified food textures into 8 levels between 0 and 7 based on the consistencies. Liquid textures are classified into 5 levels and provided a score from 0 to 4. Food textures varying from liquidized to regular are divided into 5 levels with scores ranging from 3 to 7. Based on this classification, the highest level of food texture consumed by the child at different timelines was determined.

The functional feeding abilities was assessed using the Eating and Drinking Ability Classification System (EDACS) [24]. The EDACS describes the functional eating and drinking abilities of children with CP, using five distinct levels based on the level of assistance required. It refers to key features of 'safety' (aspiration and choking) and 'efficiency' (amount of food lost and time taken to eat).

Treatment stage

Before the commencement of chewing training sessions, a written consent was obtained from the parents and all the testing and training procedures were carried out by adhering to the guidelines of the Ethics Approval Committee of the institute (DOR.9.1/Ph.D/KV/921/2020-21). The mothers were oriented regarding the physiological aspects of chewing, the pre-requisites for achieving adequate chewing abilities, use of oromotor tools and the importance of regular home training for the same.

Using the framework provided, 20 sessions of intensive FCT was conducted via tele-mode (online) with each session lasting for about 30-40 minutes, prior to mealtimes. Around 3-4 sessions were conducted per week. The telepractice system used to conduct the chewing therapy sessions consisted of two computers/smart phones (one at the researcher end and the other at the participant end) and was equipped with Zoom meetings video conferencing platform which is compatible with Windows. The caregiver guided by the researcher, carried out activities including impairment-based (positioning, oral sensorimotor treatment, chewing exercises) and adaptive (oromotor appliances, texture progression) components. The caregivers were provided with the training tools and were instructed to carry out the FCT prior to every meal (at least 3 times in a day).

The training program included 5 steps such as proper seating position of the child, orosensory stimulation including massaging the gingival region, chewing exercises using chewy tubes of varying hardness, food placement using food feeders and generalization to different food consistencies. The assessments were repeated after intervention and at 4 weeks post-discharge, during which no intervention or home training was provided.

Data Analysis

The data obtained from various perceptual and instrumental analyses for all the participants was tabulated and statistical analysis was applied using the Statistical Package for Social Sciences (SPSS) Version 26.0. Descriptive statistics was computed to obtain median and interquartile range for all the outcome measures. Due to the small sample size, a non-parametric Friedman's Two-Way Analysis of Variance was used for pairwise comparisons between treatment timelines. Based on Post-hoc Bonferroni's adjusted significance, a p-value less than 0.05 was considered to be statistically significant and a value less than 0.1 was considered to be marginally significant. Effect size was calculated using the formula $|Z|/\sqrt{N}$.

Results

Comparison of jaw, lip, tongue scores and total mastication score across timelines

There was an increase in the median values of the jaw, lip, tongue and overall mastication scores in the pre-versus post-therapy, pre-versus follow-up and post-therapy versus follow-up conditions ($p \leq 0.07$). The results of Bonferroni corrected pairwise comparisons of Friedman test revealed a significant difference on all the scores across the pre and the follow-up conditions. There was a significant improvement in the lip and tongue scores as well between the pre-therapy and post-therapy conditions. The jaw scores and overall mastication scores across the pre-versus post-therapy and post-therapy versus follow-up conditions was marginally significant ($p \leq 0.09$). However, in the lip and tongue scores, no significant difference was seen in the post-therapy versus follow-up condition. The effect size obtained across parameters was 0.5, suggesting a medium magnitude of change. The results have been represented in table 1 below.

Table 1: Median, Inter Quartile Range (IQR), Friedman test statistic across treatment timelines for the scores obtained on Mastication Observation Evaluation

MOE parameters		Median	IQR	Treatment comparisons	Test statistic	P-Value (*p≤0.05; **p≤0.09)	Effect size (r)
Jaw	I	2.0	0.0	I-II	2.23	0.07**	0.5
	II	5.5	2.0	II-III	2.23	0.07**	0.5
	III	6.5	2.0	I-III	4.47	0.00*	0.5
Lip	I	1.0	1.0	I-II	3.13	0.005*	0.5
	II	3.0	0.75	II-III	0.44	1.00	-
	III	3.0	0.0	I-III	3.57	0.001*	0.5
Tongue	I	4.0	1.75	I-II	2.68	0.02*	0.5
	II	8.0	2.75	II-III	1.34	0.53	-
	III	9.5	1.75	I-III	4.02	0.00*	0.5
Total	I	7.5	2.0	I-II	2.23	0.07**	0.5
	II	15.5	5.25	II-III	2.23	0.07**	0.5
	III	19.5	3.75	I-III	4.47	0.00*	0.5

Note: I - Pre-treatment, II - Post-treatment, III - Follow-up; Effect size (r) <.3 denotes low effect size, r=.3-.5 denotes medium effect, r>.5 denotes high effect

Comparison of the TOMASS measures across timelines

There was an increase in the median values of all parameters on TOMASS, except number of swallows, between pre-versus post-therapy and pre-versus follow-up conditions ($p \leq 0.05$). The results of the Friedman test revealed a significant improvement in the number of masticatory cycles, discrete bites and total time in the pre-versus post-therapy and pre-versus follow-up conditions ($p \leq 0.05$). However, with respect to the number of swallows, no significant difference was seen in the three conditions. The effect size obtained was 0.5, suggesting a medium magnitude of change. The results are represented in table 2.

Table 2. Median, Inter Quartile Range (IQR), Friedman test statistic across treatment timelines for TOMASS parameters

TOMASS parameters		Median	IQR	Treatment comparisons	Test statistic (Xr^2)	P-Value (*p≤0.05)	Effect size (r)
Bites	I	3.5	5.25	I-II	3.35	0.002*	0.5
	II	9.5	7.75	II-III	0.00	1.00	-
	III	11.0	6.75	I-III	3.35	0.002*	0.5
Masticatory cycles	I	6.5	3.0	I-II	3.57	0.001*	0.5
	II	58.0	24.0	II-III	0.44	1.00	-
	III	53.0	25.5	I-III	3.13	0.005*	0.5
Swallows	I	9.5	3.5	I-II	2.00	0.15	-
	II	12.0	7.75	II-III	0.50	0.48	-
	III	12.5	7.25	I-III	2.00	0.15	-
Time (s)	I	403.0	106.5	I-II	2.68	0.02*	0.5
	II	285.5	166.0	II-III	1.34	0.54	-
	III	268.0	135.0	I-III	4.02	0.00*	0.5

Note: I - Pre-treatment, II - Post-treatment, III - Follow-up; Effect size (r) <.3 denotes low effect size, r=.3-.5 denotes medium effect, r>.5 denotes high effect)

Comparison of the amplitude and duration measures of sEMG across timelines

With respect to the sEMG parameters, the results of the Friedman test revealed that there was a significant improvement across all the three timelines for mean amplitude, duration of a chew and inter-chew duration. The mean amplitude increased, while duration of a chew and inter-chew duration decreased. It should be noted however, that in the amplitude and duration parameters, the pre-versus post-therapy and post-therapy versus follow-up conditions showed a marginally significant improvement ($p \leq 0.09$) as opposed to the pre-versus follow-up condition which showed a statistically significant difference ($p \leq 0.05$). The effect size obtained across all the parameters was 0.5, suggesting a medium magnitude of change. The results of sEMG have been represented in table 3 below.

Table 3: Median, Inter Quartile Range (IQR), Friedman test statistic across treatment timelines for sEMG parameters

sEMG parameters			Median	IQR	Treatment comparisons	Test statistic (Xr^2)	P-Value (*p≤0.05; **p≤0.09)	Effect size (r)
Amplitude (µV)	Rt	I	22.5	12.4	I-II	2.23	0.07**	0.5
		II	45.8	8.6	II-III	2.23	0.07**	0.5
		III	54.5	4.8	I-III	4.47	0.00*	0.5
	Lt	I	21.9	10.5	I-II	2.23	0.07**	0.5
		II	44.1	9.9	II-III	2.23	0.07**	0.5
		III	50.6	9.6	I-III	4.47	0.00*	0.5
Chew Duration (ms)	Rt	I	2765.7	917.3	I-II	2.23	0.07**	0.5
		II	549.0	305.9	II-III	2.23	0.07**	0.5
		III	441.9	275.2	I-III	4.47	0.00*	0.5
	Lt	I	2000.3	1098.8	I-II	2.23	0.07**	0.5
		II	604.2	407.5	II-III	2.23	0.07**	0.5
		III	445.8	191.0	I-III	4.47	0.00*	0.5

Inter Chew Duration (ms)	Rt	I	1440.6	630.6	I-II	2.23	0.07**	0.5
		II	386.0	282.0	II-III	2.23	0.07**	0.5
		III	323.4	54.8	I-III	4.47	0.00*	0.5
	Lt	I	1479.4	635.6	I-II	2.23	0.07**	0.5
		II	441.6	276.4	II-III	2.23	0.07**	0.5
		III	324.0	104.7	I-III	4.47	0.00*	0.5

Note: I - Pre-treatment, II - Post-treatment, III - Follow-up; Effect size (r) <.3 denotes low effect size, r=.3-.5 denotes medium effect, r>.5 denotes high effect

Comparison of the food texture level and functional feeding level across timelines

The component of food texture advancement was evaluated using the IDDSI framework, which assesses the highest level of solid food texture accepted by the participants. Additionally, the functional eating and drinking abilities of children with CP was evaluated using the EDACS system. The results revealed that there was a significant improvement with respect to the food texture progression and functional feeding level in the pre-versus post-therapy and pre-versus follow-up conditions ($p \leq 0.05$). The effect size obtained in both the feeding parameters was 0.5, suggesting a medium magnitude of change. The results of both the assessments have been represented in table 4 below.

Table 4. Median, Inter Quartile Range (IQR), Friedman test statistic across treatment timelines for food texture and feeding level

Feeding parameters		Median	IQR	Treatment comparisons	Test statistic (Xr^2)	P-Value (*p≤0.05)	Effect size (r)
Food texture level	I	4.0	1.0	I-II	2.46	0.04*	0.5
	II	6.0	1.0	II-III	1.78	0.22	-
	III	6.5	1.0	I-III	4.24	0.00*	0.5
Functional feeding level	I	4.0	0.0	I-II	2.68	0.02*	0.5
	II	2.5	1.0	II-III	1.34	0.53	-
	III	2.0	0.75	I-III	4.02	0.00*	0.5

Note: I - Pre-treatment, II - Post-treatment, III - Follow-up; Effect size (r) <.3 denotes low effect size, r=.3-.5 denotes medium effect, r>.5 denotes high effect

Discussion

The present study aimed to investigate the feasibility of providing feeding therapy and chewing training in particular, through tele-mode in children with CP. The study is the first of its kind to carry out chewing training in online delivery mode and also makes an attempt to quantify the treatment effects with the help of various perceptual and instrumental methods. The results of the study brought to light several notable findings. First, the results of MOE revealed a significant improvement in the functioning of oromotor structures during mastication including jaw, lip, tongue and also the overall masticatory performance. This could be attributed to the masticatory exercises and introduction of food of varying textures that are directly targeting the jaw movements. These findings lend credibility to the FCT carried out in tele-mode and support previous therapy carried out via in-person services, wherein an improvement in the stability of jaw, lip seal, and lateral tongue movements were noted [13, 25, 26].

The present study is the first to use TOMASS in the CP population to objectively quantify chewing parameters in the pre-versus post-therapy conditions after systematic tele-therapy. The notable improvements in the number of masticatory cycles, discrete bites and reduction in total time signify an encouraging outcome indicating the suitability of implementing chewing training via tele-mode. The reduction in the duration taken to ingest a biscuit could suggest that as the masticatory efficiency improved the participants took lesser time for food processing during chewing. Also, it is interesting to note that the number of swallows showed no significant changes after chewing therapy. This could be attributed to the fact that the swallowing function was not targeted as FCT works on improving the functioning of oral phase of swallow. These findings support the usage of telerehabilitation as an effective modality for children with CP when there is limited access to in-person services [27, 28].

A notable improvement was also observed in masticatory efficiency evinced by the scores across timelines in sEMG parameters. The significant difference in the pre-post and pre-follow up conditions for sEMG parameters indicates that the training program had the potentiality to stabilize and maintain the strength of the masseter muscle. A preliminary study conducted recently by the same team revealed a significant change in both the amplitude and duration measures of sEMG in the post-therapy and follow-up conditions when FCT was carried out in-person in children with CP [26]. The significant difference observed across timelines in the present study indicate an optimistic outcome with respect to the remote service delivery modality and duration of therapy.

The findings on the IDDSI levels measurement and EDACS indicate a significant improvement with respect to food texture and functional feeding. The participants progressed from having liquidized and pureed consistencies to consuming soft, bite-sized and easy-to-chew food textures. As these are the food textures that require chewing before ingestion, the findings underline the improvement in masticatory abilities. Also, on EDACS participants showed a significant change in their functional feeding abilities. The participants progressed from being able to eat and drink with significant limitations to safety in the pre-therapy condition to being able to eat and drink safely with some limitations to efficiency. The findings support studies which have illustrated that, various techniques including orosensorimotor sensorimotor intervention, proprioceptive neuro-developmental facilitation among others brings about significant changes in food textures and functional feeding [29-31]. The present study highlights that masticatory therapy carried out in tele-modality is beneficial in bringing about texture progression and improved functional feeding abilities.

In summary, chewing therapy via tele-mode is seen to be feasible for children with CP who have compromised locomotory abilities. It is also a viable approach during the pandemic scenario as experienced during the COVID-19 situation wherein patients can avail treatment without risk of exposure to infection. It will also overcome this barrier of travelling by providing flexibility with respect to time and location. This will also aid in reducing the financial burden to an extent, as it will reduce the cost of commuting to and fro and is a cost-effective option [32].

Conclusions

The present study throws light on the efficacy of carrying out feeding therapy specifically targeting the masticatory abilities via systematic telerehabilitation in children with cerebral palsy. To date, there are no studies in this regard and specifically in the Indian context focusing on providing holistic chewing training in tele-mode and assessing the effects and maintenance of such treatment. Therefore, in that context the present study makes an initiatory attempt in assessing the feasibility of telepractice in children with feeding deficits. The results are encouraging as significant improvements were noticed with respect to masticatory efficiency, texture progression, and functional feeding abilities. Telehealth feeding services are the need of the hour as they provide access to interventions for clients in various locations, with better generalization chances and at reduced travel costs. Future studies carried out on larger samples across other clinical populations and across various feeding skills, can elucidate the feasibility of service delivery modalities in pediatric feeding therapy.

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References

1. Quintero A, Ichesco E, Schutt R, Myers C, Peltier S, Gerstner GE. Functional connectivity of human chewing: An fMRI study. J Dent Res. 2013;92(3):272-278.
2. Arslan SS, Demir N, Inal O, Karaduman AA. The severity of chewing disorders is related to gross motor function and trunk control in children with cerebral palsy. Somatosens Mot Res. 2018;35(3-4):178-182.
3. Prathima S, Kumar P, Swapna N, Shabnam S. Feeding and oromotor problems in children with cerebral palsy: A survey. J All India Inst Speech Hear. 2015;34:36-47.
4. Volkert VM, Peterson KM, Zeleny JR, Piazza CC. A clinical protocol to increase chewing and assess mastication in children with feeding disorders. Behav Modif. 2014;38(5):705-729.
5. Benfer KA, Weir KA, Bell KL, Ware RS, Davies PS, Boyd RN. Clinical signs suggestive of pharyngeal dysphagia in preschool children with cerebral palsy. Res Dev Disabil. 2015;38:192-201.
6. Arvedson JC. Feeding children with cerebral palsy and swallowing difficulties. Eur J Clin Nutr. 2013;67(2):9-12.
7. Manno CJ, Fox C, Eicher PS, Kerwin ME. Early oral-motor interventions for pediatric feeding problems: What, when and how. J Early Intensive Behav Interv. 2005;2(3):145-159.
8. Baghbadorani MK, Soleymani Z, Dadgar H, Salehi M. The effect of oral sensorimotor stimulations on feeding performance in children with spastic cerebral palsy. Acta Med Iran. 2014;52(12):899-904.
9. Eckman N, Williams KE, Riegel KE, Paul C. Teaching chewing: A structured approach. Am J Occup Ther. 2008;62(5):514-521.
10. Gisel EG, Applegate-Ferrante T, Benson J, Bosma JF. Effect of oral sensorimotor treatment on measures of growth, eating efficiency and aspiration in the dysphagic child with cerebral palsy. Dev Med Child Neurol. 1995;37:528-543.
11. Gisel EG, Applegate-Ferrante T, Benson J, Bosma JF. Oral-motor skills following sensorimotor therapy in two groups of moderately dysphagic children with cerebral palsy: Aspiration vs nonaspiration. Dysphagia. 1996;11(1):59-71.
12. Sigan SN, Uzunhan TA, Aydinli N, Eraslan E, Ekici B, Caliskan M. Effects of oral motor therapy in children with cerebral palsy. Ann Indian Acad Neurol. 2013;16(3):342-346.
13. Arslan SS, Demir N, Karaduman AA. Effect of a new treatment protocol called Functional Chewing Training on chewing function in children with cerebral palsy: A double-blind randomized controlled trial. J Oral Rehabil. 2017;44(1):43-50.
14. Kumar S, Cohn ER. Telerehabilitation. Springer-Verlag, London, 2013,311-324.
15. Malandraki GA, Markaki V, Georgopoulos VC, Bauer JL, Kalogeropoulos I, Nanas S. An international pilot study of asynchronous teleconsultation for oropharyngeal dysphagia. J Telemed Telecare. 2013;19(2):75-79.
16. Perlman AL, Witthawaskul W. Real-time remote telefluoroscopic assessment of patients with dysphagia. Dysphagia. 2002;17(2):162-167.
17. Sharma S, Ward EC, Burns C, Theodoros D, Russell T. Assessing dysphagia via telerehabilitation: Patient perceptions and satisfaction. Int J Speech-Lang Pathol. 2013;15(2):176-183.
18. Malandraki GA, Roth M, Sheppard JJ. Telepractice for pediatric dysphagia: A case study. Int J Telerehabilitation. 2014;6(1):3-16.
19. Schmidt RA, Lee TD. Motor control and learning: A behavioral emphasis. Human Kinetics; c2005. p. 43-46.
20. Arslan SS, Demir N, Dolgun AB, Karaduman AA. Development of a new instrument for determining the level of chewing function in children. J Oral Rehabil. 2016;43(7):488-495.
21. Remijn L, Speyer R, Groen BE, Van Limbeek J, Nijhuis-van der Sanden MW. Validity and reliability of the Mastication Observation and Evaluation (MOE) instrument. Res Dev Disabil. 2014;35(7):1551-1561.
22. Athukorala RP, Jones RD, Sella O, Huckabee ML. Skill training for swallowing rehabilitation in patients with Parkinson's disease. Arch Phys M. 2014;95(7):1374-1382.
23. Cichero JAY, Lam P, Steele CM, Hanson B, Chen J, Dantas RO, *et al*. Development of international terminology and definitions for texture-modified foods and thickened fluids used in dysphagia management: The IDDSI framework. Dysphagia. 2017;32(2):293-

314.
24. Sellers D, Mandy A, Pennington L, Hankins M, Morris C. Development and reliability of a system to classify the eating and drinking ability of people with cerebral palsy. Dev Med Child Neurol. 2014;56(3):245-251.
25. Inal O, Arslan SS, Demir N, Yilmaz OT, Karaduman AA. Effect of functional chewing training on tongue thrust and drooling in children with cerebral palsy: A randomised controlled trial. J Oral Rehabil. 2017;44(11):843-849.
26. Vijayan K, Narayanan S. Effect of a clinician-delivered chewing program on masticatory function in children with cerebral palsy. Otolaryngol Open Access J. 2023;8(1):1-7.
27. Camden C, Pratte G, Fallon F, Couture M, Berbari J, Tousignant M. Diversity of practices in telerehabilitation for children with disabilities and effective intervention characteristics: Results from a systematic review. Disabil Rehabil. 2020;42(24):3424-3436.
28. Ogourtsova T, Boychuck Z, O'Donnell M, Ahmed S, Osman G, Majnemer A. Telerehabilitation for children and youth with developmental disabilities and their families: A systematic review. Phys Occup Ther Pediatr. 2023;43(2):129-175.
29. Kapoor P, Shivalingaiah SM. Improving swallowing function in a child with cerebral palsy: A single case study on the efficacy of intervention strategies. Indian J Child Health. 2023;10(2):26-28.
30. Valencia WME, Meza GLF, Zapata RH, Vazquez ZRE, Lizama EV, Salomon MR, et al. Oral motor treatment efficacy: Feeding and swallowing skills in children with cerebral palsy. Behav Neurol. 2021;1-6.
31. Yilmaz S, Basar P, Gisel EG. Assessment of feeding performance in patients with cerebral palsy. Int J Rehabil Res. 2004;27(4):325-329.
32. Burns RR, Alpern ER, Rodean J, Canares T, Lee BR, Hall M, Montalbano A. Factors associated with urgent care reliance and outpatient health care use among children enrolled in Medicaid. JAMA Netw Open. 2020;3(5).