

Critical Review: Is oral sensorimotor treatment an effective technique to improve feeding skills and promote growth in children with cerebral palsy?

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This critical review examines the effectiveness of oral sensorimotor treatment in improving feeding skills and promoting growth in children with cerebral palsy. A literature search was completed, and yielded the following types of study: three randomized controlled trials and one cohort study. Overall, the literature provided weak to moderate evidence to support the effectiveness of oral sensorimotor stimulation in improving feeding skills and maintaining growth; however, there was no evidence to support its effectiveness in promoting catch-up growth in this population. This intervention requires further research involving larger samples, double blinding, and more standardized assessment measures to ensure validity and reliability of results.

Introduction

Children with mild to moderate cerebral palsy (CP) exhibit characteristic, stereotyped motor movements, and those with severe CP demonstrate severe postural dysfunction in addition to a stereotyped motor repertoire (Gisel, 2008). In association with this altered motor behavior, children with CP often have difficulty with feeding and swallowing. These difficulties can include impairments in lip closure, tongue coordination, biting, chewing, drinking, spoon feeding, and all phases of swallowing (Logemann, 1998). Because of these feeding difficulties, children with CP often have difficulty ingesting food and consuming enough calories to meet growth demands (Reilly & Skuse, 1992), and t

sensorimotor stimulation on feeding skills and growth measures among children with CP. All articles were required to cite feeding or oral-motor skills or eating efficiency, as well as anthropometric or growth measures, as dependent variables. Studies were not included in this review if the participants were simultaneously receiving other types of treatment for dysphagia.

Data Collection

Results of the literature search yielded the following types of articles compatible with the aforementioned selection criteria: randomized controlled trial (RCT) (3) and cohort study (1).

Results

Gisel (1994) investigated the effect of oral sensorimotor intervention on feeding skills and anthropometric measures in 35 moderately eating impaired children with CP using a randomized controlled trial. The children studied ranged in age

Gisel, Applegate-Ferrante, Benson, and Bosma (1996) evaluated the effect of oral sensorimotor treatment on anthropometric measures and oral-motor skills in 27 moderately eating impaired children with cerebral palsy using a cohort design. Based on results from initial tests and videofluoroscopy, children were assigned to group A (aspiration) or NA (non-aspiration). Children ranged in age from 2.5 to 10.0 years. Both groups followed the school routine (described above) for feeding for 10 weeks (control) and then underwent 10 weeks of oral sensorimotor treatment. Weight and skinfold measures, as well as observations of children's feeding skills, were taken at the onset of treatment, and again at 10 and 20 weeks. Feeding skills were divided similarly as in Gisel's (1994) study, but with drooling being a separate, seventh domain. All methodology was the same as Gisel's (1994) study, with the exception of the chewing-only group, which was not included in the present study. A two-way mixed analysis of variance (ANOVA) was conducted, with group and time as a repeated factor. This analysis revealed significant differences in oral-motor competence between the two groups, with poorer oral-motor skills in children who aspirated. All feeding domains were weaker among children who aspirated, except cup drinking, clearing, and drooling. Among both groups, significant improvements were found in spoon feeding, chewing, and swallowing following oral sensorimotor treatment. There were no significant changes in drinking skills. In order to analyze weight gain over the course of the treatment period, a two-way mixed ANOVA was employed, with time (week 10 vs. week 20) as a repeated factor and group (NA vs. A) as a between-subjects factor. Children among both groups maintained pretreatment weight-age percentile but did not demonstrate catch-up growth. This study was successful in investigating the effect of oral sensorimotor treatment on growth measures and oral-motor skills among children with CP who were stratified according to aspiration and non-aspiration. Oral sensorimotor treatment was found to significantly improve oral-motor skills, specifically spoon feeding, chewing, and swallowing, among both groups of children. This treatment was not, however, successful in improving growth measures, as seen by the lack of catch-up growth observed among both groups of children.

In a randomized controlled trial study, Haberfellner, Schwartz, and Gisel (2001) examined the effects of one year of intraoral appliance intervention on functional feeding skills and anthropometric measures in 20 children with CP, ranging in age from 4.2 to 13.1 years. All children had tetraparesis (weakness of all four limbs) and moderately impaired motor ability. Children were

randomly assigned to immediate intraoral appliance treatment or a control period of six months prior to receiving the same treatment as those receiving the appliance immediately. Once tolerance for wearing the appliance was reached, children wore it on a nightly basis. The first treatment phase (6 months) focused on stabilizing the mandible. The second phase (6 months) aimed to facilitate ingestive skills. This was achieved by mobilizing the tongue through the addition of small beads to the appliance in order to elicit tongue lateralization, lifting, or tipping. Goals also included lip pursing and retraction. Weight, arm and leg lengths, and skinfold measures, as well as observations of functional feeding were taken at the start of the pre-treatment period, and at 0, 6, and 12 months. The FFA (Gisel & Alphonse, 1995) was used to rate functional feeding behaviours, which were divided into seven domains: biting, chewing, spoon feeding, cup drinking, straw drinking, clearing, and swallowing. A paired t-test of differences was conducted, and significant improvements in spoon feeding, biting, and cup drinking were found during Phase 1 of treatment. Results also indicated significant gains in chewing and swallowing during Phase 2 of treatment. There were no changes in straw drinking competence. Raw anthropometric measurements were converted to z scores in order to make comparisons between children of different ages and sex. Changes in z scores for children's weight over time were not significant during the control period or during both phases of treatment, indicating that children maintained growth trajectories. There was a slightly significant catch-up in length during the second phase of treatment. Gains in oral-motor skills were found to be roughly 15% above effects related to maturation, mediated by mandibular stabilization, facilitation of cup drinking, chewing, and biting. Overall, this study was successful in examining the effects of one year of intraoral appliance intervention on functional feeding skills and anthropometric measures in children with CP. This type of intervention was found to be effective in significantly improving feeding skills across five of the seven domains, and was also found to result in slightly significant catch-up growth during the second treatment phase.

Discussion

Subject Selection and Characteristics

Disease characteristics of participants were generally homogeneous – children across all studies had a diagnosis of CP with moderate to severe motor impairment. All children's weight was at or above the 5th percentile for their age, and skinfold measures were at or below the 35th percentile. All children required some level of assistance with activities of

daily living. Children across all studies ranged in age from 2.5 to 13.3 years. One advantage to having homogeneous disease characteristics is that any changes observed would likely be due to treatment and not to group differences, thus increasing the power of the study. There was no mention of the presence of additional disorders in any of the articles, which could affect the generalizability of results to children who have CP only. Sample sizes were small, varying from 20 to 35 children. Although no sample size calculations were included in the articles, it is evident that larger sample sizes are required in order to generalize results to the population of children with CP.

In terms of inclusion and exclusion criteria, children were only selected if they could eat a standard solid texture within 1 SD and a puree within 2 SD of established time norms (Gisel, 1988; Gisel, 1991). These criteria further increase the homogeneity of participant characteristics, thus, changes observed over the course of treatment would likely be a result of intervention, rather than group differences.

Gisel et al. (1996) recruited children from schools of the United Cerebral Palsy Association of Central Maryland and the Division of Special Education of Baltimore County. Children in the three other studies were recruited from “special schools” in Montreal, but no details were provided regarding the actual recruitment process, such as whether selection was random. It is possible that selection bias could have occurred in these studies, thus potentially affecting the generalizability of results. Also, there was no mention of children’s receptive language ability or cognitive level in the studies. While Haberfellner et al. (2001) did note that children’s communicative

statistical analysis in order to examine weight gain. One must question the validity of results when correct methods of data evaluation are not used. When comparing weight over the course of treatment, a suitable parametric test is the paired t-test, which should have been employed in this study, since weight is considered to be ratio (parametric) data. Haberfellner et al. (2001) converted raw growth measurements into z scores in order to analyze children's weight over time. Again, a more appropriate method of analysis would have been a paired t-test, which is suitable for analyzing weight changes over time. Gisel (1996) employed a paired t-test of differences to analyze differences between groups for eating time, clearing time, and duration of meal time. This was an appropriate statistical test since time is considered to be parametric data and the paired t-test is a parametric test. Gisel (1996) did not include the method of analysis used to analyze children's weight gain. When comparing weight over the course of treatment, a suitable parametric test is the paired t-test, which should have been used in this study, since weight is parametric data. Gisel et al. (1996) used a two-way mixed ANOVA to compare differences in oral-motor competence between the aspiration and non-aspiration groups. This test was appropriate given that this was a cohort study, and that the two-way ANOVA is used to examine the influence and interaction of two different covariates. Overall, most of the studies used appropriate statistical tests for the purposes of maximizing the data; however, there were some instances of inappropriate selection of statistical tests. None of the studies included power analysis, which should be included in order to determine the power of the study, that is, the probability that the test will reject the null hypothesis.

Levels of Evidence

power. Further research should also involve multi-site trials, double blinding to reduce bias, and the development of more instrumental, standardized assessment measures to ensure valid and reliable results. A more in-depth examination of the FFA is recommended in order to increase its validity and reliability in assessing feeding skills. Considering the fact that