Efficacy of oral motor exercise on tongue coordination and laryngeal airflow of children with tongue thrust

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Abstract: *Tongue thrust is a serious speech disorder that disturbs learning, leads to poor communication, involuntary control of oral movement, poor feeding, excessive drooling and swallowing. The adverse impact of this disorder demands a therapy to help the vulnerable child particularly where machine is not available. This study therefore investigated the efficacy of oral motor exercise (OME) on tongue coordination rate and laryngeal airflow of children with tongue thrust. A sample of fourteen (14) children was assigned to experimental and control groups for the investigation. The pre-test, post-test control experimental design was used for the study. Eight (8) participants were in the experimental group, while six (6) participants were in the control group. The treatment exercise took eight weeks of intensive oral motor exercise for the experimental group and normal word drill for the control. Data was collected using speech disorder diagnostic scale. The scale was validated and inter-rated by the two researchers with reliability co-efficient of .88 obtained from Scott's pi (π). The data collected were analyzed using ANCOVA. Findings of the study indicated that oral motor exercise was significantly effective in improving tongue coordination rate and laryngeal airflow. It was therefore recommended that speech therapist should be re-trained to use OME for children with tongue thrust and the clinic be equipped with OME facilities.*

Keywords: *tongue thrust, oral motor exercise, tongue coordination, laryngeal airflow*

1 Introduction

The appearance of a child with tongue thrust is characterised by a low muscle tone in lips and cheeks, breathing through the open mouth, incorrect speech sound production, dental abnormalities, weak tongue muscle, excessive drooling, poor swallowing and feeding habits. In most cases, the person with tongue thrust shows speech dis-

tortion, particularly a frontal lisp in which the tongue lies flat in the mouth against or between the teeth. Tongue thrust therefore is a disorder which is generally going with inappropriate capacity of the muscles of the tongue, lips, jaw and face. This often leads to a low forward resting posture of the tongue and upper lips. The fundamental problems that occur are connected to abnormal orofacial functions and postures. These connecting problems are many and must be attended to in order to prevent impairment of the dental arches (Masson, 2005).

From the researcher and clinical understanding tongue thrust occurs when the tongue goes forward in a detailed way amid discourse or potentially gulping. The tongue has the tendency to lie flat, too far ahead amid rest or project between the upper and lower teeth during swallowing, speech which indicates that there is low muscle tone of the tongue. Tongue thrust also has the ability to affect oral/facial muscles development/functions, dentition and oral health, appearances and speech. For this study, however, the concentration is on tongue coordination and laryngeal flow of children with tongue thrust.

Prevalence rate of tongue thrust reveals that it occurs in nearly all new-borns. About half of the children in the first grade could suffer from tongue thrust. However, the prevalence can be decreased gradually through early childhood intervention but is fairly constant in adolescent and adulthood. Statistically, around 30–40% of individuals in the human population have tongue thrust (Hanson & Mason, 2003). The symptoms of tongue thrust in youngsters varied to a great extent as far as clinical introduction, etiology, seriousness, multifaceted nature, and consequences for everyday living (Arvedson et. al, 2007). These disarranges extend from transitory formative to multidimensionality (America Speech Language, 2007; Prasse & Kikano, 2009). For instance, tongue thrust is normal in youngsters with an assortment of etiologies that incorporate, but not constrained to, cerebral paralysis (CP), separated lip and sense of taste, hereditary disorders, for example Down disorder, and craniofacial abnormalities. These clutters could likewise influence numerous parts of the sustaining, gulping and discourse process.

Tongue thrust might negatively affect the speech production in children, coordination of the articulators, open mouth posture, tongue coordination rate and laryngeal air flow in children. These difficulties could manifest into poor speech intelligibility and inappropriate oral production (Bahr, 2001). Tongue thrust could also manifest into formation of deficient bolus, deficient or ungraceful back exchange of a bolus through the oral cavity, utilization of superfluous facial muscles for the way toward starting a swallow, and additionally in the forward tongue development amid or quickly accompanying the swallow. This disorder has serious adverse effect on the speech of the vulnerable. The poor speech production is not only seen as a serious

social problem but also has a terrible effect on academics or educational development of a child. This therefore demands for urgent intervention to arrest the menace.

Tongue thrust can be treated with therapies like electropalatography (EPG), word drills, and oral motor exercise, but for this study the researcher focus on oral motor exercise as a technique used for speech therapy for children speech disorder. Electropalatography is a technique that is used to monitor contact between the tongue and hard palate during articulation and speech production; it has the potential of habilitating non speech orofacial myofunctional disorder. However the use of electropalatography is not common in Nigeria because of cost related imperatives. These palates are exceptionally costly and must be fabricated for every youngster, their time of utilization is likewise constrained in light of the fact that kids outgrow it, and access to these techniques is limited and can only be found in a few centres. Tongue thrust is also treated with the use of word drills by making an individual with this disorder to repeat words in many times. The oral motor exercise is also effective but its recommendation was controversial on the basis of its effectiveness.

Recent surveys in the US, Canada, and Great Britain (Hodge, Salonka & Kollias, 2005; Lof& Watson, 2008) recommend that oral engine practices should be broadly utilized for tongue thrust. Indeed, an extensive greater part of study respondents (> 70% in each of these three reviews) posited that they made use of oral machine drill. Experience shared by discourse dialect pathologists in the two North American overviews also gave the accomplishment of enhanced discourse creation, expanded attention to the articulators, reinforcing of mouth muscles and laryngeal air flow. As indicated by information gathered from the American Speech-Language and Hearing Association (ASHA, 2005), 70% of preschool kids with tongue thrust who got oral engine practice treatment showed enhanced ability to understand and produce speech. As good as this intervention is, the cost implication and the technical know-how is a big challenge in Nigeria. This is why the efficacy of the oral motor exercise on the tongue coordination and laryngeal air flow is worth investigation. Powell (2008) have confidence in confirm based practice and along these lines trust that Speech-Language Pathologists (SLPs) need to fuse prove based practice (EBP) so as to keep up the most noteworthy, most current models in their practices in the clinic.

It is against this background that the researchers considered it necessary to critically understand how oral motor exercise enhance stongue coordination rate and laryngeal air flow for children with tongue thrust, this study investigated the effects of oral motor exercise on tongue articulation and laryngeal flow of children with tongue thrust.

2 Statement of Hypotheses

Two null hypotheses were formulated and tested at .05 to guide the study. They are:

1. Oral motor exercise is not significantly effective in enhancing tongue coordination of children with tongue thrust.
2. There is no significant effect of oral motor exercise in enhancing the laryngeal air free flow for children with tongue thrust.

3 Method

The research design proposed for this study was a pretest–posttest, control experimental design. The experimental group was exposed to OME while the control group was allowed to use conventional speech therapy (word drills) as placebo. The study involved enhancing tongue coordination rate and laryngeal air flow of children with tongue thrust. The study was carried out in Igbobi Orthopaedic, LASUTH, and Psychiatric Hospital for children and adolescent all in Lagos State, Nigeria. The three selected hospitals used for this study were selected based on the fact that they are the major public hospitals that provide speech therapy services for children with tongue thrust in Lagos state. The study assumed that OME accounted for any significant enhancement in the tongue coordination rate and laryngeal air flow of the participants in the study hence any other moderator or intervening variable is held constant.

A sample of 14 participants was purposively selected comprising of 6 and 8 in the control and experimental group respectively. The instrument used for this study was Speech Disorder Diagnostic Scale (SDDS) developed by the researcher and validated by three experts in the field of speech and language pathology. SDDS is an observational rating scale to obtain the speech functioning of children with tongue thrust. The reliability of the instrument was obtained through trial testing by the two researchers for inter rate observation of five (5) children (clients) from Lagos State University Teaching Hospital. Their ratings were correlated using Pearson moment correlation. The result gives a correlation coefficient of .88 indicating that the instrument is reliable.

Permission was obtained to carry out this study from the three centres and from the parents of the participants. Parents of the participants were adequately informed of the purpose of the research work, the importance of the research to them and a promise that all personal information will be kept confidential. A consent form was given to the parent of the participants to attest their permission for the study. Four (4) research assistants were trained and used for the investigation. The speech therapist observed the children speech baseline through the instrument to ascertain the level of speech functioning of the participants as the pretest. The treatment was given to

the experimental group for six (6) weeks. The treatment was done as outlined in the treatment package. The participants were exposed to treatment in 3 days per week to ensure intensiveness of the therapy. The therapy took 40 minutes per each day for each participant. After the last therapy, the participants were observed for post treatment assessment, which was a repetition of the pre-test that was carried out before treatment in order to determine the effectiveness of the OME on the participant's tongue coordination rate and laryngeal air flow. The data collected from the study was analyzed using ANCOVA to test the null hypotheses stated at .05 level of significance.

4 Results

The results of the data analyses from which the findings are drawn are presented according to the stated hypotheses. The descriptive analysis of the variables of the post-test mean and standard deviation of the variables with respect to the participant groups are as shown in Table 1. The results showed that the oral motor exercise was very effective as it revealed a clear difference in the post treatment mean scores of the experimental (which were all higher) and control participants in the study.

Table 1: *Descriptive analysis of the post-test mean and standard deviations of the variable*

Variable	Group	Participant Groups	Mean	Std. Dev
Tongue Coordination	Treatment Group	10.88	.64	8
	Control Group	5.17	1.72	6
	Total	8.43	3.16	14
Air Flow	Treatment Group	10.50	1.51	8
	Control Group	5.00	1.26	6
	Total	8.14	3.13	14

Hypothesis 1: Oral motor exercise is not significantly effective in enhancing tongue coordination of children tongue thrust.

Table 2 revealed that at the $df_{(1, 12),}$ the $F\text{-}_{value} = 78.89$ and $p < .05$ against the data collected with respect to tongue coordination. The implication of the result is that the null hypothesis was rejected. Therefore the finding with respect to the alternative hypothesis was that oral motor exercise was significantly effective in enhancing tongue coordination of children with tongue thrust. The adjusted R^2 of .861 implies that the oral motor exercise treatment accounted for about 86.1% of the enhancement of the open mouth posture in the children. This showed the oral motor exercise is very efficacious in the enhancement of tongue coordination of children with tongue thrust.

Table 2: *ANCOVA of the effect of oral motor exercise on tongue coordination of children with tongue thrust*

Source	Type III Sum of Squares	df	Mean Square	F-rato	P-level
Corrected Model	114.19[a]	2	57.093	41.20	.000
Intercept	25.59	1	25.59	18.47	.001
Pretest	2.47	1	2.47	1.78	.209
Group	78.89	1	78.89	56.93	.000
Error	15.24	11	1.39		
Total	1124.00	14			
Corrected Total	129.429	13			

Note: [a] – R Squared = .882 (Adjusted R Squared = .861)

Hypothesis 2: Oral motor exercise is not significantly effective in enhancing free air flow of children with tongue thrust.

Table 3 revealed that at the $df_{(1, 12),}$ the $F\text{-}_{value} = 55.54$ and $p < .05$ against the data collected with respect to free air flow. This result also showed that the null hypothesis was rejected. Therefore the finding with respect to the alternative hypothesis was that oral motor exercise was significantly effective in enhancing free air flow of children with tongue thrust. The adjusted R^2 of .818 implies that the oral motor exercise treatment accounted for about 81.8% of the enhancement of the free air flow in the children. This showed the oral motor exercise is very efficacious in the enhancement of free air flow of children with tongue thrust.

Table 3: *ANCOVA of the effect of oral motor exercise on free air flow of children with tongue thrust*

Source	Type III Sum of Squares	df	Mean Square	F-ratio	P-level
Corrected Model	108.03[a]	2	54.01	30.18	.000
Intercept	16.05	1	16.05	8.97	.012
Pretest	4.32	1	4.32	2.41	.149
Group	55.54	1	55.54	31.04	.000
Error	19.69	11	1.79		
Total	1056.00	14			
Corrected Total	127.71	13			

Note: [a] – R Squared = .846 (Adjusted R Squared = .818)

5 Discussion of Findings

Oral motor exercise and tongue coordination

The finding with respect to the first hypothesis which states that oral motor exercise is not significantly effective in enhancing tongue coordination of children with tongue thrust is rejected and the alternative hypothesis is taken. This implies that oral motor exercise is significantly effective in enhancing tongue coordination of children with tongue thrust. The post treatment mean scores of the experimental and control groups revealed this finding. Again, the ANCOVA result showed that the mean difference between the experimental and control scores are significant while the adjusted R^2 also indicated that the oral motor exercise contributed very well to the improvement observed in the tongue coordination. This finding is related to the finding of Morrins and Dun-Klein (2000) that non-speech oral motor exercise is a better means of enhancing mouth and tongue muscles for speech. A unique implication from this study is that OME is more effective in enhancing tongue coordination than the mouth coordination for speech production. So, except with careful observation, one can easily conclude wrongly that there is equal improvement in the mouth and the tongue coordination.

Oral motor exercise and laryngeal air flow

The finding with respect to the hypothesis two which states that oral motor exercise is not significantly effective in enhancing free air flow of children with tongue thrust was also rejected and the alternative hypothesis upheld. This implies that oral motor exercise is significantly effective in enhancing free air flow of children with tongue thrust. The post treatment mean scores of the experimental and control groups also justified this finding. The ANCOVA result showed that the difference between the experimental and control mean scores are significant while the adjusted R^2 also indicated that the oral motor exercise contributed very highly to the improvement observed in the open mouth posture. This finding is in line with the finding of Lof (2006) that the laryngeal free air flow is better improved by the non-speech motor therapy.

Recommendations

The following recommendations were made from the findings of the study

1. Government of Nigeria should re-retrain speech therapist on the combination of OME and other speech therapies for optimum treatment of speech disorder in children with OMD as alternative therapy where sophisticated machines are available.
2. Nigerian government should also made available oral machine therapy and other needed facilities to improve the service provision for children with speech and language disorder.

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