Comparison of Abdominal Crunch with and without Tongue in Physiological Position in Improving Deep Cervical Flexors Endurance

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ABSTRACT

Introduction and Aim: To Compare the Effect of Abdominal crunch with and without Tongue in Physiological position in Improving Deep Cervical Flexor Endurance. The objective of the study i(a) To find the effectiveness of abdominal crunch with tongue in resting position in improving deep cervical flexor endurance.(b) To find the effectiveness of abdominal crunch without tongue in physiological position in improving deep cervical flexor endurance.(c) To compare the effectiveness abdominal crunch with and without tongue in physiological position in improving deep cervical flexor endurance.

Materials and Methods: Stop watch Examination couch. 60 subjects (students) from Physiotherapy College were selected based on the Inclusion and Exclusion Criteria. Subjects were divided into 2 groups: Group A-Abdominal crunch without tongue in Physiological position, Group B- Abdominal crunch with tongue in resting position.All participants were made to exercise for 10 repetitions for 4 sets with one session per day for 5 days a week for totally 8 weeks.Endurance of Deep cervical flexors measured by Deep Cervical Flexor Endurance Test.The collected data was tabulated & analyzed using descriptive & inferential statistics. Mean and Standard deviation (SD) were used for all parameters. Paired t-test was used to analyze significant changes between pre-test and post-test measurements. Unpaired t-test was used to analyze significant changes between two groups.

Results: From the statistical analysis made with quantitative data revealed statistically significant difference between the Group A and Group B, and also within the group.Thepost-test mean value of Deep cervical Flexor Endurance test in Group A is 28.27 and in Group B is 30. This shows Group B comparatively having mean value more than Group A.Statistical Analysis of the post-test, Deep cervical flexor Endurance test revealed that there is statistically significant difference seen between group A and group B.

Conclusion: From the result, it has been concluded that Abdominal crunch tongue in physiological position (Group B) is more effective than Abdominal crunch without Tongue in Physiological position (Group A) to improve deep cervical flexor endurance.

Key Words: Abdominal Exercise, Training, Endurance, Deep Cervical Flexors.

INTRODUCTION

The Suprahyoid muscles are four muscles located above the hyoid bone in the neck. They are the Digastric, Stylohyoid, Geniohyoid, and Mylohyoidmuscles. They are all pharyngeal muscles.TheInfrahyoid muscles (strap muscles) are a group of four pairs of muscles in the anterior (frontal) part of the neck. The four Infrahyoid muscles are; the Sternohyoid, Sternothyroid, Thyrohyoid and Omohyoid Muscles(1). The Infrahyoid muscles function to depress the Hyoid bone and larynx during Swallowingand Speech.TheSternocleidomastoid muscle flexes the neck and helps with movement of the head. The muscle originates at the central portion of the collarbone. It inserts into the temporal bone's mastoid process near the ear and the base of the skull, and it stretches the entire length of the neck. This muscle helps the neck to turn to the side, flex to the side, and bend forward(1). Proper tongue position is essential during repeated trunk flexion exercise against gravity. The physiological rest position of the tongue is the roof of the mouth, just behind the front teeth. If the tongue is not held in this position, as the head is lifted during a Crunch or Sit-ups, the only way to lift the head is with the sternocleidomastoid (SCM) muscle and deep cervical flexors. If the SCM muscles are used for this purpose, they will hypertrophy just like any other muscles being exercised. The SCM muscles are extensors of the upper cervical spine and flexors of

the lower cervical spine, and therefore, hypertrophy and hypertonicity can cause a forward head posture. Another problem with incorrect tongue position is that the deep cervical flexors must play a major role in lifting the head. These muscles are long, thin and slight. They fatigue easily, and excessive fatigue encourages spasm and hypertonicity. If shortened because of poor technique, these muscles flex the cervical spine, straightening it, thus reversing is natural curvature. This creates many unwanted problems. The supra and Infrahyoid muscles have a tremendous mechanical advantage over the deep cervical flexors. Also, the SCM are extensors of the upper cervical spine and are counter balanced by the supra and Infrahyoid muscles. This is a primary mechanism for maintaining a normal posture of the head.The cervical flexors should be allowed to help stabilize the head during abdominal exercises. This is a natural activity and is taught in this course. If you pull on your head during abdominal exercise, the cervical flexors don't contract. Such inactivity makes them weak and encourages a forward head posture.First of all, we must establish that the neck, or cervical spine, tends to work with the lumbar spine during human motion. This relationship is well established via reflexes such as the'pelvo-ocular' reflex, which ties together the eye motion with pelvic motion, and the vestibulo-spinal reflex, which relates the vestibular system with spinal muscular reactions. One key point of these reflexes is that looking down is associated with activation of the abdominals and front neck muscles, looking up with activation of the spinal muscles, which antagonize the abdominals(work in the opposite direction). Secondly, the muscles on the front of the neck have a tendency to lengthen and get weak. This allows the head to migrate forward into the ubiquitous 'forward head posture.' This posture allows the increased probability of neck pain, headaches, and shoulder dysfunction. Crunches, then, can also help train these muscles by forcing the neck to lift one's own head while during a crunch. In effect, we should think about 'nodding' as we crunch upwards, then reversing the nod on the way back down. This will help promote neck stabilization and good posture. All of this being said, what about the tongue? Well, it is interesting to note that some of these front neck muscles, which help us 'nod' our head, have an attachment at the tongue, specifically the supra and Infrahyoid muscles. With that in mind, a 'loose' tongue, or a tongue that is hanging loose in the mouth, provides a poor foundation for this muscle attachment. This can be illustrated by protesters who go limp at demonstrations to make the police exert more force in moving them. A stable, or tense, foundation would be much easier to move! Similarly, we want to have a solid base of motion for these all- important anterior neck muscles, making it easier for them to move the head. Research supports this notion as well.

Having said all that, there is something called flexor chain component like deep cervical flexors , abdominal flexors and hip flexors.If we do crunches without concentrating on deep cervical flexors we do over strengthen the abdominals relative to deep cervical flexor's strength, and this will lead to forward head posture, reduced subcostal angle, thoracic kyphosis and other biomechanical dysfunctions. Though it may not have greater influence in apparently normal and sedentary individuals, it does have a greater role in sports personnel for their high performances.

Crunches

The exercise lying flat on your back as soon as you lift your head from the floor, the abdominal muscles begin to work. This is because the muscles lifting the neck pull on the rib cage. To stop the ribs from moving and hold them firm, the abdominal muscles must tighten. As the exercise continue, you begin to lift your trunk from the floor to do this, your legs are lighter than your trunk, the tendency is always for the legs to lift unless the trunk is bent bending the trunk reduces the effect of leverage, and makes the trunk lighter (2).

MATERIALS AND METHODS

A total 60 male subjects Aged between 18-23 years. Samples will be selected from students of Saveetha college of Physiotherapy according to inclusion and exclusion criteria using Simple Random Sampling. Approved by the scientific review board and Institutional Human Ethical Committee at the Saveetha University before participating in the study.

Selection criteria for participants:Both genders aged between 18 and 23 years,apparently, normal individuals.

Procedure

Samples of 60 individuals were recruited from physiotherapy college student population. Both genders aged between 18 and 25 were included and people who are already into structured exercise program and people with cervical referring and or radiating were excluded from the study. For this study totally 82 subjects initially showed willingness. Among them to 60 subjectsare finally chosen. The principal researcher has explained the procedures to all the subjects.Pre and post functional outcome were obtained by Deep flexor endurance test for all subjects.

Subjects were divided into 2 groups:Group A-Abdominal crunch without tongue in Physiological position,Group B- Abdominal crunchwith tongue in resting position.

Participants in Group A were taught to do abdominal crunches in crook lying. The exercise begins lying on floor on the back,Lifting head from the floor. Here participants were not taught about the tongue position, they were just asked to do regular Abdominal Crunches in right technique.Participants were instructed to do crunch till their shoulder blade comes off the floor or simply by keeping their arm on floor and drag or slide the arm till it reaches both the heels. And they were taught not to hold the breath during crunches instead they were asked to blow the air out though mouth during crunch and inhale through nose when they back to starting position, and keep their eyes facing ceiling. All participants were made to exercise for 10 repetitions for 4 sets with one session per day for 5 days a week for totally 8 weeks.

Where Participants in Group B were thought to do abdominal crunches as like the participants in Group A, with additional instruction onplacing the tip of tongue on base on roof of the mouth, they were asked to maintain the tongue position throughout the exercise session, Same exercise parameters followed as for Group A.

Outcome Measures

Participantswere supine positioned with tuck chin in and lift off table 1 inch. Then they were asked to hold as long as they can and time duration is noted. The pre-test and post-test values were taken and the average was considered for statistical analysis.

Data Analysis

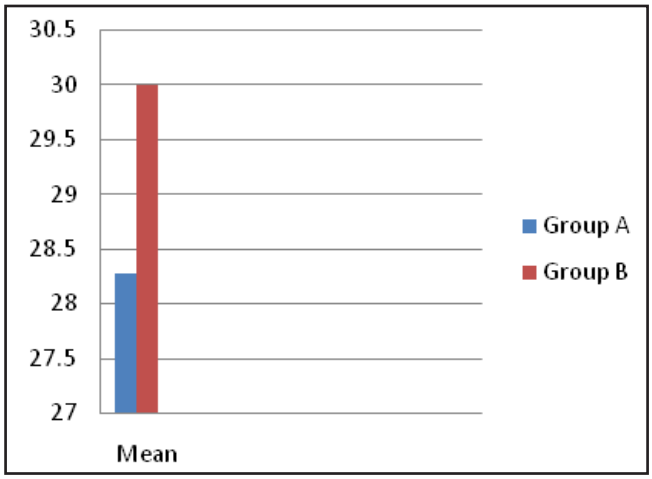
The collected data were tabulated and analyzed using descriptive and interferential statistics. To all parameters mean and standard deviation (SD) will be used. A paired t-test will be used to analyze significant changes between pre-test and post-test measurements. Unpaired t-test will be used to analyze significant changes between two groups.

Table 1: Comparison of Deep cervical flexor endurance test between Group A&B

Parameter	Post test values				T test	Significance
	Group A		Group B			
	Mean	Standard deviation	Mean	Standard deviation		
Deep cervical flexor endurance test	28.27	3.67	30.00	2.62	1.4881	0.1479

The data from the above table shows the post-test values of Deep cervical endurance test in Group –A and Group-B subjects.The post-test mean value of Deep cervical flexor endurance test in Group A is 28.27 (SD3.67) and post-test mean value of deep cervical flexor endurance test is Group-B is 30.00 (SD 2.62).This shows that Group-B is greater than Group-B with the P value (0.1479).

Figure 1: Comparison of the Deep Cervical Flexor Endurance Test Post-test values



RESULTS

From the statistical analysis made with quantitative data revealed statistically significant difference deep cervical Flexor Endurance between the Group A and Group B, and also within the group.Thepost-test mean value of deep cervical Flexor Endurance test Group A is 28.27 and in Group B is 30. This show Group B was comparatively morethan Group A.Statistical Analysis of the post-test, shows that the Deep cervical flexor Endurance is more significantly increased in Group B than Group A.

DISCUSSION

This study was conducted with the aim of improving cervical endurance among normal individuals by comparing abdominal crunch with and without tongue in physiological position. The study was conducted for a period of 4 weeks and results showed significant result in Group A (i.e.) Abdominal crunch without tongue in resting position Group B i.e. Abdominal crunch tongue in physiological position. Major muscles are the neck flexor muscles-Suprahyoid, Infrahyoid and Sternocleidomastoid. Minor muscles Rectus Abdominis and Obliques.The supra and infrahyoid muscles have a tremendous mechanical advantage over the deep cervical flexors. Also, the SCM are extensors of the upper cervical spine and are counter balanced by the supra and infrahyoid muscles. This is a primary mechanism for maintaining normal posture of the head.Winnberg A Suggested that during upright head posture, the hyoid bone

exhibited on average an elliptical movement pattern and reached its most elevated position at the start of opening and its most depressed position at the start of closing. A small movement before opening an upward and forward direction and before closing in a further downward and backward direction was found. Suprahyoid EMG activity was registered before start of opening, during opening and during the first half of the open phase(6).The cervical flexors should be allowed to help stabilize the head during abdominal exercises. This is a natural activity and is taught in this course. If you pull on your head during abdominal exercise, the cervical flexors do not contract. Such inactivity makes them weak and encourages a forward head posture.Muscle endurance is the ability of a muscle or group of muscles to sustain repeated contraction against a resistance for an extended period of time. Muscular endurance is one of the components of muscular fitness, along with muscular strength and power. Proper tongue position is essential during repeated trunk flexion exercise against gravity. The physiological rest position of the tongue is the roof of the mouth, just behind the front teeth. Anders Winnberg, Hans Pancherz, *et al* 1983: Suggested that no absolute reciprocity was found between the Suprahyoid and Masseter muscle activity during chewing. Suprahyoid overlap at the end of the masseter, chewing phase was reduced when the head was flexed forward. Theamount of Masseter overlap at the end of the Suprahyoid chewing phase was unaffected by variation in head position(5).Domenech MA, Sizer PS, Dedrick GS, McGalliard MK, Brismee JM. Suggest that "The Deep Neck Flexor Endurance Test: normative data scores in healthy adults."(9)Deep Neck Flexor Endurance Test To assess the endurance of the deep neck flexors (Rectus Capitus Anterior, Rectus CapitusLateralis, LongusCapitus, LongusColli - "Muscle specificity in tests of cervical flexor muscle performance").Importance of the Test: Those with neck pain were found to have significantly decreased deep neck flexor endurance, average of 21.4 seconds ("Reliability of a measurement of neck flexor muscle endurance"). They tend to over-utilize other muscles (Platysma, Hyoid muscles, and especially the sternocleidomastoid) for postural maintenance, which leads to the commonly seen position of forward head postures-a position we commonly see in those who use computers frequently or engage in sedentary activity on a regular basis. This may lead you to think of some impairment that is contributing to the patient's pain. Be sure to assess a patient's posture and segmental mobility in the cervical spine. This study shows significant difference between Abdominal crunch without tongue in Physiological position and Abdominal crunch tongue in with resting position and reveals Abdominal crunch tongue in with resting position have superior effect than Abdominal crunch without tongue in Physiological position in improving deep cervical flexor endurance. We do exercise to keep our self fit and healthy but doing so should not open the door for other health problems which can easilybe prevented by adapting right techniques of exercises. Poor posture will affectthe functions of joints it involved and leads to even poor digestion and visceroptosis. Common cause for poor posture is doing a monotonous activity and or adapting a common posture for longer durations. Even among sports personnel, poor posture is quiet common because of their regular pattern of sporting activity and conditioning in sports and they usually use to come up with cross training to avoid the poor adaptations of body structure and function towards similar activity. Though it is common that most individuals do abdominal crunches unfortunately they do it with poor techniques.

CONCLUSION

From the result, it has been concluded that Abdominal Crunch with Tongue in resting position (Group B) is more effectivethan abdominal crunch without tongue in Physiological position (GroupA) in improving deep cervical flexor endurance.

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