Electromygraphycal Comparison of Concentric and Eccentric Phase during Selected Abdominal Exercise

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Abstract – The purpose of this study was to compare the electromygraphycal activity / amplitude variation of contractions during sit-up exercise on rectus abdominals. The amplitudes of contraction of all the quadrants during three different sit up were recorded. Ten male subjects selected for the experiment were of all India Inversely level players. Their mean age, height and weight was 20 years, 167.4 cm and 62 kg respectively. The student Physiographic for the group experimentation and research was used for EMG recording. All procedures were standardized. Three sets of observations were made on each subject. The electrodes were located over the belly of the muscles and oriented along its longitudinal axis. The concentric and eccentric phase of the sit-up exercises were undertaken and were analyzed by paired t-test, that revealed no significant difference Our finding support the concept that abdominal surrendering exercises can differentially activate various abdominal muscle groups, but contradict some rationally held assumptions regarding the effects of specific phase exercises.

INTRODUCTION

Fitness training exercises are design to overload specific muscles in order to increase muscular strength and endurance. Therefore, one of the greatest challenges physical educator's coaches, trainers, therapist exercise, phases and variation, to be isolate a targeted muscle or muscular groups.

An integrated component of most training programs is the use of exercises to increase abdominal strength, for example crunches various types of sit-up and other types of leg rises are all used to increase abdominal strength and endurance, and reduce the risk of lower back injuries.

In recent years numerous companies have capitalized on this trend by develop mind devices for abdominal exercise. Despite manufacturer claims that these abdominal devices are superior to traditional crunches, published research

Three types of muscle contraction accomplish all motor actions involving skeletal muscle activities; concentric eccentric and isometric of the three, isometric and concentric contractions are more widely studied, and the neural mechanisms that mediate isometric and concentric action are better understood.

CONCENTRIC CONTRACTION

During the concentric contraction, the working muscle shortens, pulling the bones on either side of the joint closer together. The amount of force that muscle is able to generate is increased with the number of motor units utilized.

At the start of this concentric contraction, only a small number of motor units are activated, generating minimal force. On repetition speed at which the movement is completely controlled then maximum recruitment of fibers is required to generate maximum force, but if you let momentum do some of the work then, you won't use

the many muscle fibers to left the weight. At the end of the concentric contraction, a muscle in its shortest position. Some exercise physiologists and many bodybuilders recommend that you pause here for second or two to contract the working muscle as intensely as possible, a technique called peak contraction. Others question the need to stop at money point during the repetition.

ECCENTRIC CONTRACTION

Whether or not you pause at the end of the concentric half of the repetition, eventually you have to return to start position. This half of the repetition is called the eccentric phase, which many bodybuilders mistakenly treat as an afterthought. As you lower a dumbbell during a curl, for example, the biceps lengthens, even though it's till contracted to some degree.

Eccentric contractions occur when activated muscles are lengthened. This mode of muscle function occurs frequently in the activities of daily living and in athletic competition.

This review examines the experimental evidence that provides the foundation for our current understanding of the benefits, consequences and control of the eccentric contractions. Over the past several decades, numerous studies have established that eccentric contractions can maximize the force exerted and the work performed by muscle; that they are associates with a greater mechanical efficiency; that they can attenuate the mechanical effects of impact forces; and that they reduce the tissue damaged associated with exercise.

Eccentric muscle contractions, which generate a significant proportion of our daily- living movements walking upstairs and down stairs raising a water glass to the mouth and returning it to the table, are less well understood.

A major advantage of eccentric muscle action is that this type of activity develops greater tensions than concentric action.

Numerous athletic training and recreational conditioning programs also include eccentric muscle activities as a major component of these programs.

Eccentric training induces adaptive change in the muscle, which may reduce future tissue damage and pain.

Eccentric contractions require less energy expenditure, and such energy efficiency may improve the functional capacity of an individual with limited physiological reserves.

REVIEW OF LITERATURE

Little is known about how eccentric training or exercise affects the CNS. The result of many studies suggest that the CNS. May control concentric and eccentric muscle action differently. One of the most reported observation is that for a give force to be generated, electromyography (EMG) activities are lower airing eccentric than concentric contraction (Big land and Lipoid 1954; Maritain et. 1992; Teach et al. 1990).

Despite abundant evidence that different nervous system control strategies may exist for human concentric and eccentric muscle contraction, no data are available to indicate that the brain signal differs for eccentric versus concentric muscle actions.

The kinetic and kinematics information from the music and joint movement-related cortical potential (MRCP) was derived from the electroencephalograph (EEG) signals of the eccentric and concentric muscle contractions. Although the elbow flexor muscle activation (EMG) was lower during eccentric than concentric actions, the amplitude of two major MRCP components was significantly greater for eccentric than for concentric action. The MRCP onset time for the eccentric task occurred earlier than that for the concentric task. The greater cortical signal for eccentric muscle action suggests that the brain probably plans and programs eccentric movements differently from concentric muscle tasks (Fang et al 2001).

HYPOTHESIS

Based on the previous research done it is hypothesized that there will be significant EMG differences between the concentric and eccentric phase of contraction in selected abdominal exercises.

PROCEDURE

Subject Ten selected male All India In tervarsity Level Players volunteered to participate in this study. The mean age, height, and body weight of the subjects was 20.6 yrs. 167 cm. and 62 kg, respectively. Subjects were instructed on how to perform each exercise properly prior to collection of data. After receiving an explanation of the experimental protocol, each subject practiced the proper technique; each subject selection was limited to individuals with sufficiently low subcutaneous adipose tissue in order to permit accurate measurement of muscle activity.

Experimental Device EMG recording were recorded from the upper and lower portions of the rectus abdomens. To ensure valid comparisons in our EMG data, range of motion (ROM) and velocity of movement were controlled across devices and subjects.

The skin over the target muscle was abraded and cleaned to assure a low skin resistance. The palpitation techniques were used to determine the muscular quadrants (Kelley, 1971). Bipolar surface electrodes were secured over the bellies of the Upper Umbilicus and Hypogastria. The ground electrode was secured slightly superior to the Lateral Malleolus of the right leg.

Muscle activity was measured using a standard EMG system (Student Physiographic for Group experimentation and research, Biodevices, Tambala). Bipolar silver chloride surface electrodes were placed on the skin overlying the right upper portion of the rectus abdominals (Upper Umbilical), right lower portion of the rectus abdominals (Hypogastria). An unshielded ground electrode was placed on the skin overlying the Lateral Alveolus. The electrodes were oriented parallel to the muscle fibers and an interelectrode distance was maintained consistent from subject to subject. Prior to electrode application, the skin over each muscle was shaved and cleansed with sprit to reduce the impedance at the skin electrode interface. EMG recordings were determined and the analysis was conducted as elaborated by Kelley, 1971.

EXPERIMENTAL DESIGN

After appropriate instruction on the proper technique for execution of the abdominal exercise, subject performed three abdominal exercises. The mechanics of performing abdominal exercises in this study used the traditional sit-up exercises. The traditional sit-up exercises Straight leg sit-up, bent leg sit-up exercises. The traditional sit-up exercises; Straight Leg sit-up, bent leg sit-up, and crunches with the hands clasped in font . All subject were tested from the supine lying position. Each subject was instructed to perform the exercise. Sufficient rest was allowed between sets to avoid fatigue. None of the subject commented that they felt fatigued at any point during their data collection session.

STATISTICAL ANALYSES

Statistical analyses performed on the mean EMG aptitude values using a paired t- test procedure for each of the 3 exercise. Reported differences were accepted as statistically non significant.

DISCUSSION

This study supports previous finding that there is no significant difference in abdominal muscle intensity between the concentric and eccentric contraction and on any traditional exercise without adding any external resistance during the course of exercises. But there is increase in abdominal muscle activity during the course of exercises.

The principal reason for the lower abdominal activity in the eccentric phase compared to the concentric phase, was that the vertical lift against the gravitational force provide enough resistance to require substantial muscle recruitment in the concentric contraction. The findings are similar to those reported by Clark it al.

The minimal abdominal muscle recruitment while performing downward motion in a supine lying position produced. Enough load to require comparable abdominal muscle activity due to the controlled motion as recorded during the abdominal exercise.

In order to provide greater overload to the abdominal musculature on a traditional abdominal exercise, additional resistance must be provided. In summary, all abdominal exercise elicited abdominal muscle activity during concentric and eccentric phase of contraction when used with proper technique. The perfect way to perform an abdominal exercise is to elicit significantly greater abdominal muscle recruitment.

PRACTICAL APPLICATIONS

The data collected in this study verify that abdominal exercise used in a supine position elicit abdominal muscle activity when performing a traditional abdominal exercise.

As the different traditional techniques of abdominal exercises do not differ significantly in the activation of the designated muscles, hence any one of these exercise techniques may be performed to enhance strength and / or endurance.

As there is no significant difference between the concentric and eccentric phase of contraction during the selected abdominal exercises, so the eccentric phase of contraction should be performed can maximize the force exerted and the work performed by muscle, associated with a greater mechanical effects of impact forces and reduce the tissue damage, pain and injuries associated with exercise.

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