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RESEARCH ARTICLE

THE EFFECT OF VARIOUS RELAXATION INTERVALS OF THE MODIFIED CONTRACT-RELAX TECHNIQUE ON PASSIVE KNEE EXTENSION RANGE OF MOTION IN HEALTHY ADULTS

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ABSTRACT

Objectives: To evaluate the effect of various relaxation intervals of the modified contract-relax technique on passive knee extension range of motion in healthy adults.
Design: Quasi-experimental and Pre & Post-test type.
Setting: The study was conducted at SRM Medical Hospital & Research Center, Kattankulathur.
Procedure: 30 Subjects of healthy college students are divided into three groups and given with various relaxation intervals of the modified contract-relax technique on passive knee extension range of motion.
Results: There was significant difference between the groups of range of motion on passive knee extension and the value of $P<0.001$.
Conclusion: The duration of the relaxation interval affects gains in ROM when applying modified contract-relax technique. Subjects using a 4 second relaxation interval achieved greater gains in passive knee extension ROM than those using either 0 or 8 second relaxation interval.

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INTRODUCTION

Range of motion (ROM) is a basic technique used for examination of movement and for initiating movement into a program of therapeutic intervention. Movement that is necessary to accomplish functional activities as muscles or external forces moving bones in various patterns or range of motions. When a person moves, the intricate control of the muscle activities that causes or controls the motion comes from the central nervous system. Bones move with respect to each other at the connecting joints. The structure of the joints, as well as the integrity and flexibility of the soft tissues that pass over the joints, affects the amount of motion that can occur between any two bones. The full motion possible is called range of motion (ROM). When moving a segment through its range of motion, all structures in the regions are affected (i.e.) muscles, joint surfaces, capsules, ligaments, fasciae, vessels and nerve. Range of available joint motion are usually measured with a Goniometer and recorded in degrees.

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To maintain normal range of motion, the segments must be moved through their available ranges periodically whether it be the available joint range or muscle range. Therapeutically, range of motion activities is administered to maintain joint and soft tissue mobility in order to minimize loss of tissue flexibility and contracture formation. Flexibility is the ability of the soft tissue structures such as muscle, tendon and connective tissue to elongate through the available range of motion. Flexibility describes the range of movement possible around the joint. Flexibility is considered as the essential element of the normal daily activities. To improve the flexibility to increase the extensibility of the muscles, different types of stretching techniques are used. The commonly used stretching are static, dynamic, proprioceptive neuromuscular facilitation technique. The study shows that PNF techniques produce greater improvements in flexibility than other static or dynamic types of stretching techniques. PNF as a means for increasing flexibility is actually a by-product of rehabilitation physiotherapy. PNF was developed in the USA in the 1940's as means of rehabilitating people who suffered from head or spinal injuries. PNF stretching involves alternating muscle contractions and relaxations to improve the range of motion.

PNF stretching helps strengthen the muscles that are contracted and therefore is good for increasing active flexibility as well as passive flexibility. A PNF technique is commonly used by physical therapists to relax muscles and thereby increases the range of motion. PNF has been stated by *Knott and Voss* to affect the neuromuscular mechanism through the stimulation of proprioceptors. The Golgi tendon organ is a special sensory organ located at the point where tendons and muscles meet. When the Golgi tendon organ is subjected to a force it sends signals to the brain which responds by inducing something called the lengthening reaction in the stretched muscle. The contractions in PNF activate the Golgi tendon organ and induce the lengthening reaction. The contract-relax stretching is one of commonly used PNF stretching to increase the range of motion because it is not only effective also a safer technique among the other PNF stretching techniques. Contract-relax are used when there is limitation in range of motion. This technique combines isotonic and isometric stretching. The therapist moves the limb passively to the new point of limitation, then instructs the client to try and move the limb in into a shortened range. The therapist resists but allows movement of the limb. All other effort by the client is isometric. The therapist then moves the limb passively into the new range of motion. After several engagements the client is instructed to move actively through the new range of motion. In this study various relaxation intervals of the modified contract-relax technique is used in the subjects with hamstring tightness increases the passive knee extension range of motion and also show which relaxation intervals of the contract-relax technique most effective than any other relaxation intervals of the contract-relax techniques because relaxation intervals affects gains in range of motion (Moore and Kukulka, 1991).

Aim of the Study

The aim of the study was to determine the effect of three relaxation intervals of the modified contract-relax stretching on passive knee extension range of motion.

Need for the Study

The need of the study was to achieve greater range of motion significantly with different groups using the contract-relax stretching on passive knee extension with proprioceptive neuromuscular facilitation technique.

MATERIALS AND METHODS

The study was conducted on SRM Medical Hospital & Research Centre of pre & post- test, 30 subjects were selected with convenient sampling of age group 18 to 24 years.

Inclusion Criteria

Subjects with age group of 18-24, healthy males especially with hamstring tightness with a defines limitation of 20 degrees or more from full extension as determined by the Active Knee Extension test (AKE) are taken.

Exclusion Criteria

- Subjects with history of orthopaedic or neurological problems.
- No hamstring muscle tightness
- Subjects below 18 and above 24 years.
- Females.
- Hypermobile joints
- The subjects engaged in long term analgesics course.

Materials

Universal Goniometer, Stop clock, Couch, Straps.

Methodology (Procedure)

30 subjects were selected randomly from the college students and further randomly divided into three equal groups.

- I group- 0 second relaxation interval
- II group- 4 second relaxation interval
- III group- 8 second relaxation interval

The whole of the sample underwent pretest measurement of passive knee extension range of motion. Passive knee extension test was used as a tool to measure hamstring flexibility and range of motion was measured using a standard Goniometer.

Pretest measurements were done using the following procedure

The subject was asked to lie supine and flex his hip and knee to 90°. The other limb was maintained in full extension by strapping at knee joint to flatten the back and prevent any arching. An assistant was asked to hold the limb to be measured and the knee was extended passively to the available joint range of motion. The passive knee extension range of motion was measured using a Goniometer with the fixed arm parallel to femur and movable arm parallel to tibia and fulcrum over the lateral femoral condyle and hence pretest measurement were recorded. After pretest measurement, each group receives modified contract-relax technique. In modified contract-relax technique, maximum voluntary isometric contraction given to the hamstring muscle for 3 seconds through resistance given by therapist in which slight movement allowed. After maximum voluntary isometric contraction (MVIC), groups I, II, III, receives 0, 4, 8 second relaxation interval respectively. Then, the hamstring muscle of each group passively stretched for 15 seconds by therapist. This, technique repeated two or three additional times and then final passive knee extension range of motion was measured and recorded as done pre-test measurement.

Goniometer Alignment

- Center of the fulcrum of the Goniometer over the lateral epicondyle of the femur.
- Align the proximal arm with the lateral midline of the femur, using the greater trochanter for reference.
- Align the distal arm with the lateral midline of the fibula, using lateral malleolus and fibular head for reference.
- The active knee extension range of motion (ROM) with final 20° of lag was considered as normal. The subject more than 20º of lag was taken for the study.

90°-90° TEST

The active knee extension range of motion was measured in the 90°-90º positions. The subject was positioned in supine

lying with both hip and knee joint in 90° of flexion (Fig. I). The subject was asked to grasp behind the knee with both hands to stabilize the hip in 90° flexion. Then the subject extended the knee actively upto the limit of tissue resistance (Fig. II). The attainted active knee extension range of motion was measured by using universal Goniometer.

RESULTS

The pre & post-test mean values of modified contract-relax technique of all groups showed shows increased Range Of Motion. The 4 second relaxation interval group achieved greater increases in passive knee extension ROM than 0 and 8 seconds group. All groups having p value of less than 0.001.

Conclusion

The duration of the relaxation interval affects gains in ROM when applying modified contract-relax technique. Subjects using a 4 second relaxation interval achieved greater gains in passive knee extension ROM than those using either 0 or 8 second relaxation interval.

Limitations of the Study

- The sample size may be small for the result to be generalized.
- The subjects with hamstring tightness were only selected and other orthopaedics or neurological diseases were excluded.
- Only healthy males selected for this study.
- Age limit is between 18 to 24 yrs.
- The variables studied only range of motion while pain, functional activities and muscle power are not studied.

Further Recommendations for the Study

- The long term effects can be analyzed
- A similar study can be done with an increased sample size and also in healthy female subjects.
- Comparisons of the effects between contract- relax and hold- relax PNF techniques may be studied further.

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