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## The evaluating effectiveness of ultrasound and cryotherapy in DOMS

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### Abstract

**Background:** Delayed onset of muscle soreness (DOMS) is a common phenomenon experienced after unaccustomed or high-intensity exercise, leading to pain, stiffness, and temporary functional impairment. Modalities such as ultrasound and cryotherapy are widely used in physiotherapy practice for pain relief and recovery, but their combined effectiveness in DOMS requires further evaluation.

**Objective:** The objective of this study was to evaluate the effectiveness of pulsed ultrasound and cryotherapy in reducing pain associated with DOMS.

**Methodology:** A total of 20 male subjects aged 20-25 years were selected and induced with DOMS in the non-dominant biceps using 2 kg dumbbells until fatigue. Subjects were randomly divided into two groups: Group A (control, n=10) received no treatment, while Group B (experimental, n=10) received pulsed ultrasound (0.8 W/cm<sup>2</sup> for 10 minutes) and cryotherapy (10 minutes) for three consecutive days. Pain intensity was assessed using the Visual Analogue Scale (VAS) before and after treatment.

**Results:** Group A showed a mean reduction of 1.5 points on the VAS, while Group B demonstrated a mean reduction of 3.5 points. Statistical analysis revealed a significant improvement in pain reduction in the experimental group compared to the control group (t=2.63).

**Conclusion:** The study concludes that the combination of pulsed ultrasound and cryotherapy is more effective in reducing pain associated with DOMS compared to no treatment. This combined approach may enhance recovery by improving blood flow, reducing muscle soreness, and facilitating early return to activity. Further studies with larger sample sizes and diverse populations are recommended.

**Keywords:** Delayed onset of muscle soreness, DOMS, Ultrasound therapy, Cryotherapy, Pain management, Physiotherapy

### Introduction

Delayed onset of muscle soreness (DOMS) is a common condition occurring 24-48 hours after unaccustomed or high-intensity exercise, particularly eccentric movements. It is characterized by muscle pain, stiffness, reduced range of motion, swelling, fatigue, and temporary loss of strength. DOMS results mainly from microscopic muscle fiber damage and subsequent inflammation, rather than lactic acid accumulation. It can affect individuals across all fitness levels and, while not necessarily an indicator of workout quality, it may hinder functional activities.

Management of DOMS includes rest, massage, topical agents, cold or warm baths, and anti-inflammatory strategies, though complete prevention is difficult. Among physiotherapy modalities, ultrasound therapy and cryotherapy are widely used. Ultrasound, delivered in continuous or pulsed mode, produces thermal and non-thermal effects such as improved blood flow, reduced spasm, pain modulation, and enhanced tissue repair. Cryotherapy, through cold application, reduces pain, spasm, swelling, metabolic activity, and inflammation while facilitating recovery through mechanisms like the Lewis hunting reaction.

Given the impact of DOMS on performance and daily activities, it is essential to evaluate effective treatment approaches. Therefore, this study aims to assess the effectiveness of pulsed ultrasound and cryotherapy in reducing pain associated with DOMS.

## 2. Materials and Methodology Required

### 2.1 Materials

- Pulsed ultrasound unit.
- Ice cubes /Ice packs.
- Dumbbells.
- Visual analogue scale.
- Treatment tray.

### 2.2 Methodology

#### 2.2.1 Selection Criteria

##### Inclusion criteria

- Subjects who are willing to participate in the study.
- Subjects capable of understanding the instructions given by the therapist.
- Subjects with no pre and post history of injury to the upper extremity.
- Subjects with DOMS which are caused by any activity.

##### Exclusion criteria

- Subjects having any surgical history of upper extremity.
- Any elite level athletes.
- Subjects who underwent chemotherapy.
- Pregnant ladies.
- Subjects with cardiovascular issues.
- Subjects having hypertension.
- Subjects with hyperpyrexia.
- Subjects with recent injury.
- Subjects with mentally retarded people.

#### 2.2.2 Treatment Technique

A total of 20 members are selected as the subjects. Here all 20 members are induced DOMS in the non -dominant biceps muscle, using 2kg dumbbells until pain is induced.

#### Control Group

The 10 subjects in the group are induced DOMS and left untreated.

#### Experimental Group

The 10 subjects in the group are induced DOMS and received ultrasound and cryotherapy treatment for the painful biceps muscles.

In this group each patient received pulsed ultrasound treatment of intensity 0.8W/sq.cm

And each patient received cryotherapy for 10 minutes.

The subjects in the control group were left untreated.

The total duration of treatment for the experimental group was three sessions for 3 consecutive days. The measurements were taken initially before receiving the intervention and at the end of every treatment session, by using visual analogue scale for pain.

#### Procedure

In this study 20 subjects are selected and divided into 2 groups; control group and experimental group.

The subjects are of age between 20 to 25 years.

A weight of 2kg dumbbell is given to both the groups and made to lift until they feel pain over the biceps muscle, as until the person is unable to lift the weight. After 24 or 44 hours of time the subject may feel pain over the muscle and he will have a decreased range of motion.

Now the treatment is going to be started; the study group A is treated with cryotherapy and group B is provided with ultrasound and cryotherapy.

Subjects are treated alternatively with ultrasound and cryotherapy.

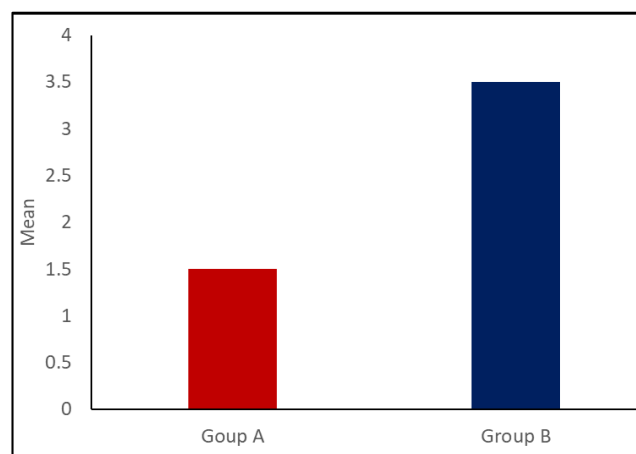
The total treatment duration for the experimental group is 3 sessions for 3 consecutive days.

The measurements are taken initially before the intervention and at the end of every treatment session using VISUAL ANALOGUE SCALE for pain.

In this study subjects received ultrasound treatment of intensity 0.8W/sq.cm for 10 minutes and cryotherapy for 10 minutes.

### 3. Results

Pre-test and post-test values of the study were collected and assessed for variations in improvement and their results were analysed using independent t test and paired t test. The statically analysis of the study showed that there is a significant difference between the control and experimental group and VAS shows that t value of 2.63



**Graph 1:** Mean difference between group-a and group b visual analogue scale

### 5. Discussion

The study was aimed to find the effectiveness of ultrasound and cryotherapy in the relief of DOMS. The study was conducted in 20 people, where 10 men were undergone the treatment with ultrasound and cryotherapy and this group were considered the experimental group. The other 10 members were left free without any treatment. After some sessions of treatment the results were shown that the members who had undergone treatment by ultrasound and cryotherapy had pain reduction earlier than members who had not undergone any treatment. The results shown that the mean difference for the pre-test and post-test for group A and B is, A-9 and B-11.39. The study shows that effect of ultrasound waves and cold therapy can reduce delayed onset of muscle soreness, thereby increasing the range of motion. It is also proposed that ice can be used as a first aid for injury or pain due to muscle soreness. This study concludes that the combination of ultrasound and cryotherapy can reduce muscle soreness effectively.

### 6. Conclusion

The study was conducted on 20 members in SRIPMS Campus, Coimbatore and the study concluded that a combination of ultrasound and cryotherapy has accelerated the cure of delayed onset of muscle soreness earlier than those members who had treated with cryotherapy. The mean difference are A-9 and B-11.39. (A= Member who were

treated by cryotherapy and B= Member who were treated by cryotherapy and ultrasound). As well as heating and relaxing the muscle, ultrasound therapy, breaks down scar tissue and increase local blood flow. All these combines to increase healing rate and reduction of pain.

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