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Effectiveness of Russian Current and Strengthening Exercise on Pain Strength and Performance in Sprinters with Calf Muscle Strain

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Abstract

Background and purpose: The purpose of this study was to find out the effect of Russian current and strengthening exercise on pain strength and performance in sprinters with calf muscle strain.

Materials and methods: 15 subjects randomly selected who fulfilled the inclusion and exclusion criteria. Pain intensity was measured using Numeric Pain Rating Scale (NPRS), Strength was measured using single leg calf raise test and speed was measured by using 100 M sprint test. These outcome parameters were measured at pre-intervention, post- intervention and at the end of 4 weeks of follow up.

Results: The result found significant statistical difference in pre-posttest value for the given sample.

Conclusion: The results of this study suggested that Russian current and strengthening exercise were effective on pain strength and performance in sprinters with calf muscle strain.

Keywords: Isometric strength • NPRS • Russian current • Single leg calf raise • Sprint test

Introduction

Sprint races were part of the original Olympic Games in the 7th century B.C. as well as the first modern Olympic Games which started in the late 19th century (Athens 1896) and featured the 100 meters and 400 meters [1]. The 1928 games were also the first games to use a 400-meters track, which became the standard for track and field. Sprinting is running over a short distance at the top-most speed of the body in a limited period of time [2]. Sprint also called dash in athletics. It is used in main sports that incorporate running, typically as a way of quickly reaching a target or goal, or avoiding or catching an opponent [3]. Races up to 100 meters are largely focused upon acceleration to an athlete's maximum speed. All sprints beyond this distance increasingly incorporate an element of endurance [4].

Russian scientist, Dr. Yakav Kots developed Russian current in 1977s, for increasing muscle forces that increases the maximum voluntary contraction. It is a medium frequency current. It is an intermittent alternating sinusoidal current with a carrier frequency of 2500Hz and delivered in bursts or series of pulses [5]. So it is known as medium frequency, burst alternating current. Total Physic uses Russian stimulation to stimulate motor nerves.

The calf is the name for the muscle bulk on the back of the leg between the knee and the ankle. The calf is made up of two muscles; the gastrocnemius (superficial) and the soleus (deep). A calf strain is a tear in one of these muscles. Physiotherapy is an effective treatment for a calf strain [6].

A calf strain can occur when the muscle is forcibly contacted whilst in a stretched position, such as when accelerating from a stationary position or when lunging forward. Factors which may contribute to a strain of the calf muscle include an inadequate warm-up, muscle stiffness or tightness, fatigue or overuse, an inadequate recovery period between training sessions, reduce muscle strength, and faulty biomechanics [7].

In a Numerical Rating Scale (NRS), patients are asked to circle the number between 0 and 10, 0 and 20 or 0 and 100 that first best to their pain intensity. The NPRS is a segmented numeric version of the Visual Analog Scale (VAS) in which a respondent selects a whole number (0-10 integers) that best reflects the intensity of his /her pain [8].

Statement of the study

A study to find out effectiveness of Russian current and strengthening exercise on pain, strength and performance in sprinters with calf muscle strain.

Hypothesis

It is hypothesized that there may be significant difference in pain, strength and performance following Russian current and strengthening exercise in sprinters with calf muscle strain.

Operational definition

Calf muscle strain: The calf refers to the posterior portion of the lower leg. The two largest muscles in this region include the gastrocnemius and the soleus. A pulled calf muscle occurs when you overstretch the muscles in the back of your lower leg.

Numerical pain rating scale: The Numeric Pain Rating Scale (NPRS) is a pain screening tool, commonly used to assess pain severity at that moment in time using a 0–10 scale, with zero meaning “no pain” and 10 meaning “the worst pain imaginable.”

Visual Analog Scale (VAS): Visual Analog scale is one of the basic pain measurement tools which consist of 10cm horizontal line with two end point labeled respectively. One end is labelled as no pain and other is labelled as severe pain.

Russian current: Russian current is a medium frequency electrotherapy modality, modulated sinusoidal alternating current with 25,000 Hz delivered in a series of the bust.

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Materials and Methods

Equipment required

Measuring tape or marked track, stopwatch or timing gates, cone markers. The single-leg squat movement that's performed only on one leg. It adds a balance and stability challenge to the traditional squat. These are sometimes called pistol squats. This type of squat is an intermediate to advanced exercise. Since balancing requires significant muscle activation, it can improve your mobility, balance, muscle coordination and core strength.

Study setting

The study was carried out at outpatient department TRCP in Perambalur.

Selection of subject

15 subjects were randomly selected who fulfilled the inclusion and exclusion criteria.

Variables

Dependent variable:

- Pain
- Strength
- Speed

Independent variable:

- Russian current

Measurement tools: The measurement tools are given in (Table 1).

Study design

The study design was pre and post-test experimental study.

Inclusion criteria

- Males sprint runners
- Age should be between 19 years to 21 years

Exclusion criteria

- History of upper or lower limb injury within past 6 months
- Systemic illness
- Musculoskeletal and neurological disorders
- Recent surgeries
- Marathon runners

Orientation to the patient

- Before the collection of data, all the subjects were explained about the purpose of the study. The investigator had given a detailed orientation about outcome measurement.
- The concern and full cooperation of each participant was sought after complete explanation of the condition and demonstration of the procedure involved in the study.

Materials used

- Russian current apparatus
- Strap
- Gel
- Leads
- Cone

Numerical Pain Rating Scale (NPRS)

The NPRS was used to capture the patient's level of pain. Patients were asked to indicate the intensity of their current pain level using an 11 point scale, ranging from 0 - 10. The patients were instructed to check the duration time of their pain. A stick mark indicated the duration time of their pain lasted; indicated a state of absent duration time of pain, while 24 indicated that pain lasted all day long.

Single leg heel raise test

Barefoot, using their fingers supported on a wall (SHOULDER HEIGHT) for balance with the elbow slightly flexed, keeping the spine in neutral position, feet apart (hip width), and knees extended. The participant raises his heels as high as possible, with knee fully extended, while the rater defines the range of movement using a square tool (used to support shelves) supported simultaneously at the top of his head and against the wall. The participant raises his heels vertically up to the maximum height possible and then lowers it completely into the ground, performing the highest number of repetition of this movement, in a predefined period of 30 second. The participant should touch his head at the square whenever he reaches the maximum height, and also touch with the heel on the ground at the end of the cycle. The number of correct elevations at the end of 30 seconds.

100 meter sprint test

The test involves running a single maximum sprint over 100 meters, with the time recorded. A thorough warm up should be given, including some practice start and acceleration. Start from a stationary standing position (hand cannot touch the ground), with one foot in front of the others. The front foot must be behind the starting line. Once the subject is ready and motionless, the starters give the instruction "set" then "go". The tester should provide hints for maximizing speed (such as keeping low, driving hard with the arms and legs) and the participant should be encouraged to not slow down before crossing the finish line.

The Russian current parameters and strengthening exercise are given in (Tables 2 and 3).

Data analysis

A Sample of 15 subjects where included for the study. Mean and mean difference calculated the test was applied to the group pre and post treatment values (Tables 4-9).

Results

Result show that Russian current along with strengthening exercise shows significant different in pre and post test value before and after application (Figures 1 and 2). Comparison of the mean value of pre and post of Russian current along with strengthening exercise.

Table 1. Measurement tools.

Variables	Tools
Pain	NPRS
Strength	Single leg heel raise test
Speed	100 meter sprint test

Table 2. Russian current parameters.

Amplitude	Tetanic Muscle Contraction
Burst frequency	50-70 Hz
Pulse duration	150-200

Table 3. Strengthening exercise.

S. No	Exercise Name	Type	Equipments	Sets	Repetation
1	Double leg calf raise	Isotonic	Wall support	3	10
2	Single leg calf raise	Isometric	Wall support	3	10
3	Seated calf raise	Isometric	Bar with weights	3	10
4	Standing calf raise	Isotonic	Dumbells	3	10
5	Wall sit calf raise	Isotonic	Weight plates	3	10

Table 4. Pre and post value of numerical pain rate scale.

Sl. No	Pre Test	Post Test
1	7	2
2	9	3
3	10	4
4	7	2
5	8	4
6	7	1
7	9	3
8	8	2
9	10	4
10	7	1
11	9	3
12	10	4
13	8	2
14	8	2
15	7	1

Table 5. Mean value of numerical pain rate scale.

	N	Mean	Mean Difference
Pre	15	8.2	5.7
Post	15	2.5	

Table 6. Pre and post value of single leg heel raise test.

Sl. No	Pre Test	Post Test
1	23	28
2	30	38
3	29	36
4	35	45
5	28	35
6	24	31
7	22	29
8	25	33
9	27	33
10	26	34
11	25	32
12	24	29
13	33	40
14	31	42
15	32	38

Table 7. Mean value of single leg heel raise test.

	N	Mean	Mean Difference
Pre	15	27.6	7.2
Post	15	34.8	

Table 8. Pre and post value of 100 meter sprint test.

Sl. No	Pre Test	Post Test
1	18	15
2	17	14
3	19	17
4	15	13
5	16	14
6	17	13
7	20	17
8	18	15
9	17	14
10	20	16
11	16	15
12	17	15
13	18	14
14	16	14
15	14	12

Table 9. Mean value of 100 meter sprint test.

	N	Mean	Mean Difference
Pre	15	17.2	2.7
Post	15	14.5	

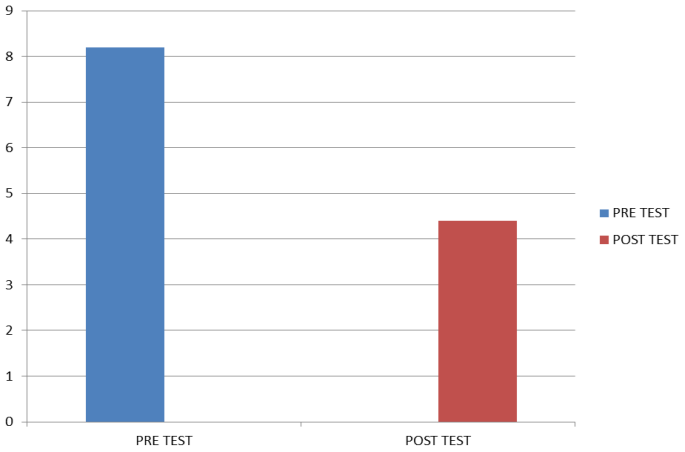

Figure 1. Mean value of numerical pain rate scale.

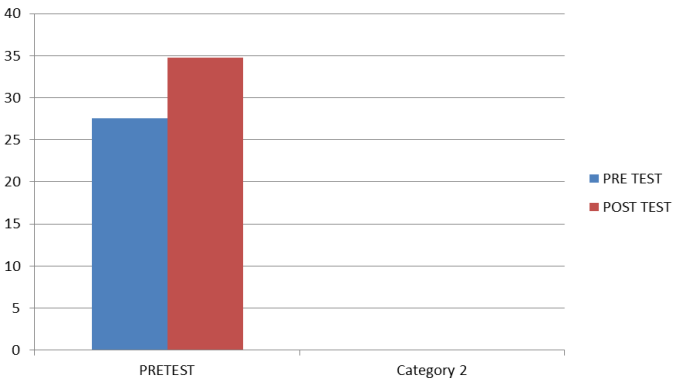

Figure 2. Mean value of single leg heel raise test.

- NPRS – Pretest value is 8.2 and posttest value 2.5
- Single leg calf rise – Pretest value is 27.6 and posttest is 37.8
- 100 meter sprint test-Pretest value is 17.2 and posttest value is 14.5

Discussion

Following application of Russian Current to 15 patients with calf muscle strain for 6 months of intervention proving Russian to be effective for patient with calf muscle strains. Application of the calf muscle strain technique for control of pain is interpreted to be effective for improving problems of patients with calf muscle strain [9].

Result of the study showed a significant improvement in post treatment scores of all measured showing the greatest improvement. In the study application of the Russian current technique to patient with calf muscle strain was confirmed to be effective in reducing the pain duration time [10]. Therefore application of the Russian current on the pain generating segmentum can be considered effective in reducing pain duration time in a positive way [11].

In the study measured NPRS of 15 patients with lesion in calf muscle

strain on sprinters. On the other hand this study measured 15 patients with calf muscle strain. In the average NPRS was 8.2 points before treatment and 2.5 points after treatment showing a significant decrease in pain. Application of the Russian current to calf muscle strain on sprinters is considered effective in reducing the duration time of pain as well as in development of neck function [12,13]. This study was aimed at proposing appropriate guidelines for application in further clinical practice and providing a base line data to be put to use.

Conclusion

The study was concluded that Russian current along with calf muscle strengthening exercise was significant reduce in pain and improvement on strength and performance in sprinters.

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