



EFFICACY OF STRETCHING EXERCISES AND STRETCHING WITH COLD PACK ON HAMSTRING PULL

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ABSTRACT

Aim: To study about the efficacy of stretching exercise and Stretching with cold pack on hamstring pull.

- For reducing the pain.
- For increasing the range of motion

Objective of the Study: The objective of our study is to compare the effect of stretching exercises and Stretching with cold pack on hamstring pull/strain in individuals. **Study Design:** 40 participants of age group 18-30 years divided into 2 groups (20 each). The pain scale is measured on 0 day & on 10th & 21st days.

Result: The comparative study of the simple stretching of the hamstring muscle verses stretching of the hamstring muscle with cold packs showed significant improvement in stretching exercise with cold pack has better result at the 21st day than the simple stretching exercise. **Conclusion:** Although there is decrease of VAS pain on both the group A & B, but the group B, VAS Pain score in stretching with cold packs shows better result in decreasing the VAS Pain.

Key words: Stretching Exercise; Cold Packs; Hamstring pull; Reduction of Pain; Significant improvement

Introduction:

Hamstring muscle is a group of 3 muscles which constitutes; - The biceps femoris, the semitendinosus and the semimembranosus muscles (1,2,3,4,5,6,7). The function of hamstring muscle is knee flexion and hip extension. (4,5,6,7). The most common muscle injuries are Hamstring Muscle Strain (4,5,8,9,10,11,12,13) In hamstring strain, there is pain and tenderness and decrease strength on isometric contraction and decrease length of hamstring muscle (14). Some potential risk factors are age, weakness of hamstring muscle, imbalancing of thigh muscle, flexibility of muscles and any previous hamstring injury.(10) Other risk factors includes ethnicity, strength imbalance, flexibility and fatigue.(11),Hamstring strain injuries in athletes by explosive activities such as sprinting and jumping or due to muscle fatigue.(13) HSI occurs during performing any activities like jumping, dancing, running, kicking, or can occur either both fast or slow movements that involves simultaneously flexion of the hip and extension of knee (13,15).Hamstring tightness can make individual prone to tear and limit their sporting function(16).

Epidemiology study showed that the only Hamstring injuries alone occurs between 6%-29% of all injuries (17).

STRETCHING: The moving of a limb to the end of its ROM and holding that position for 15-60 seconds is known as Stretching (18) Stretching is done to prevent injury (4,12,19,20) Stretching before exercise increases the muscle compliance and reduce stiffness (19,21) Both static and dynamic stretches are given (12) Increased flexibility of Hamstring muscle increases the muscle performance (20,22)

CRYOTHERAPY (Cold Packs): Cold Packs are mainly used to reduce pain, inflammation, temperature of the affected part, muscle spasm, circulation and symptoms of Delayed onset muscle soreness (DOMS) after acute musculoskeletal injury (23,24) By applying cold pack, Hamstring flexibility increases (16) Cold should never be applied for more than approx. 20-30 minutes duration at same time (25)

The primary goal of a hamstring muscle rehabilitation program is to make sure that the individual or athlete can return to sport at prior level of performance or normal lifestyle with very minimum risk of reoccurrence of the injury (26)

OPERATIONAL DEFINITIONS

- Muscle: A muscle is a contractile tissue due to which movement occur (28).
- Stretching: To expand flexibility of muscle for the joint range of motion, the word stretching is defined as the movement which is applied with the help of external and internal force (29).
- Cryotherapy: It's a therapy in which application of cold in various ways to reduce pain, swelling and tenderness (16).

HYPOTHESES

Experimental Hypothesis: - Stretching exercise of hamstring works in reduction of pain and tenderness.

Application of cold pack on hamstring works in reduction of pain, swelling and tenderness.

Null Hypothesis: - The stretching exercise will not work in reduction of pain and tenderness.

- The Application of cold packs will not work in reduction of pain, swelling and tenderness.
- There is no difference in reduction of pain in performing both stretching exercises and stretching with cold pack in hamstring pull/strain in individuals.

METHODOLOGY

Study design: Comparatively observational study.

Samples Selection: Random selection

Area of Sampling: Delhi NCR

Sampling Method:

* **No. of sample:** 40

* **Groups:** Two groups (20 subjects in each)

Group 1 – Individual treated with Stretching exercises

Group 2 - Individual treated with stretching and cold pack

* **Sample Pace:** - Individual involved in extracurricular activities like dance, sports, or other physical activities.

Demographic Data:- It includes;

- Name : - Age : - Gender : - Height :
- BMI : - Pain Scale - Weight:

Inclusion Criteria

- Age group (18-35)
- The Subject should be healthy.
- Hamstring pull/strain case
- recent acute injuries
- the subject should willing to take an interest in all tests sessions.

Exclusion criteria:-

- No Obese
- Neurological patients
- Hypertensive (chronic or recurrent)
- Individual with disability
- Uncooperative subjects

*Consent form is used.

Instruments

1. Body Mass Index (BMI): It is an approximate measurement of fat in a body which is obtained by using weight and height of individuals. It is calculated by formula in which weight (in kg) divided by square of height (in cm s).
2. Visual Analogue Scale (VAS): It is a instrument that measures the range of pain. The level of pain which an individual feels ranges from No pain to an extreme level of pain (32).

PROCEDURE

The participants volunteered to participate in our study. All members of our study were guaranteed about the confidential nature of the study. The following measures were introduced:

1. Consent was taken from the participant, the demographic data of age weight, height & BMI was calculated using SPSS 14 & one-way ANOVA was used to calculate the Comparative study stretching and stretching with cold packs.
2. A total of 40 subjects was considered which was assigned into 2 groups (20 each) i.e. Group A (individuals treated with stretching exercises); Group B (individuals with stretching with cold packs).
3. Firstly for the Group A those were asked to perform stretching exercises as treatment purpose.

Individuals are asked to wear comfortable clothes for performing stretching exercises. The stretching exercises are:

- (i) The Towel hamstring Stretch
- (ii) Standing Hamstring Stretch
- (iii) Slump Stretch
- (iv) Straight Leg Raise (SLR)
- (v) Seated Toe Touch
- (vi) Downward Facing Dog

Group A Individuals are asked to perform these exercises regularly. And advised to stretch till the pain limit and maintain that stretch for 10-30 seconds and relax. Initially patients are advised to do 10 repetitions twice a day for 3-4 days. Later on will gradually increase the sets and stretch hold duration later. Also advised to do rest and stretching exercises as recommended.

Data will be for the age, weight, height & BMI T-test and for the comparative analysis of group A & group B with one way ANOVA.



3.1 : Subject performing Towel Hamstring Stretch.



Figure 3.2 : Subject performing Standing Hamstring Stretch.



Figure 3.3 : Subject performing the Straight Leg Raise.



Figure 3.4 : Subject performing Seated Toe Touch



Figure 3.5 : Subject performing Downward facing Dog.

4. And then Group B individuals were asked to perform the same exercises (as mentioned above) and after then individuals are asked to apply cold pack regularly. Individuals are advised to apply cold pack for the duration of 10-15 minutes. They are advised to use cold pack four times a day. Also advised to do rest and apply cold pack after stretching as recommended.

Individuals will be evaluated at the 10th day of intervention, and at the 21st day of intervention.

Data will be analysed according to Individual's response and healing effects.

RESULT

Table 1: Test for the demographic data of the Age, Weight, Height, and BMI for the group A Stretching & group B stretching with cold packs of Hamstring Pull.

PARAMETERS	STRECHING Group A N= 20	STETCHING WITH COLD PACKS Group B N=20	T VALUE	Level of significance P value
AGE	22.55 ± 17.1	22.8 ± 4.48	0.240	0.405 non-significant
WEIGHT	63.1 ± 106.94	61.85 ± 61.4	0.430	0.334 non-significant
HEIGHT	167.75 ± 67.36	168.35 ± 55.92	-0.241	0.405 non-significant
BMI	22.31 ± 4.47	21.76 ± 2.6	0.925	0.180 non-significant

The table 1 shows the demographic data of Age, weight, height & BMI of the two group A & group B. Level of significance is at $P < 0.05$ is non -significant for all age, weight, height & BMI.

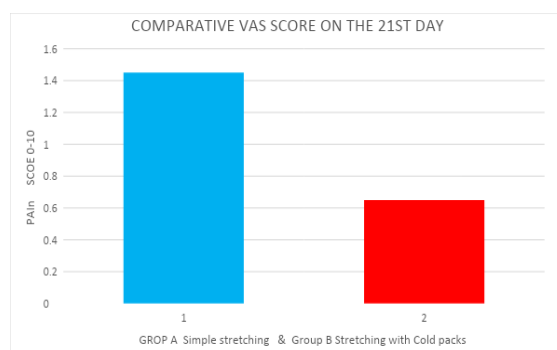
Table 2: One way ANOVA Comparative study stretching and stretching with cold packs of 0 day, 10th day & 21st day.

Parameters	Stretching exercise N=20	Stretching exercise with cold packs N=20	Level of significance
0 day	5.9 ± 1.25	5.5 ± 1.43	0.353 non-significant
10 day	3.75 ± 1.40	2.7 ± 1.41	0.241 significant
21 day	1.45 ± 1.05	0.65 ± 0.74	0.001* significant

Table no 2 shows that level of significance $P < 0.353$ for 0 day, 0.241 significant at 10 day & 0.001* on the 21 days.

The comparative study of the simple stretching of the hamstring muscle verses stretching of the hamstring muscle with cold packs post injury shows the result analysis that stretching with cold pack better result at the 21st day than the simple stretching exercise. The VAS scale of the stretching with cold i.e, on 0-10 scales shows that VAS Pain score on the 21st day 0.65 ± 0.74 and the simple stretching exercise the that VAS Pain score on the 21st days 1.45 ± 1.05.

The 3 D dimensional graph of the comparative study of the VAS Score of the group A & group B on the 21st day of the simple stretching exercise verses stretching with cold packs.



Graph 4.1: Shows the comparative study of the group A & group B VAS pain.

DISCUSSION

The results of our study support the findings of other studies (16,27) that the Stretching exercises with cold pack has greater effect as compared to simple stretching exercises. The results do not indicate that there is no effect of simple stretching or Stretching with cold pack. Our results are similar to Gary R. Brodowicz et., al, study who studied the Comparison of Stretching with cold, Stretching with Heat, and only Stretching on Hamstring Flexibility (27) Both the current study and the Gary R. Brodowicz et., al, found that simple stretching and stretching with cold pack has effect in dealing with hamstring pull. It not only reduces the pain, but also reduces swelling and increases range of motion. By going through several studies and related articles, we came to the point that cold pack with stretching has much better results as compared to simple stretching. There are various beneficial effects of cold application that effects on pain sensation, muscle spasm, tenderness, range of motion.

Our study found that healthy individuals who having hamstring pull due to any sport injury or other factors can heal faster by the method of Stretching with cold pack as it's effect has reduced pain and early regain to their normal activity as compared to other methods or simple stretching.

CONCLUSION

In conclusion, the results of our investigation suggests that the both stretching and stretching with cold pack has effects on hamstring pull. There is a minor difference in both methods. Although simple stretching has its good results. But stretching with cold pack shown better results as compared to simple stretching. The more improvement is shown in the stretching with cold packs as it is cleared by above results and graph. Although there is decrease of VAS pain on both the group A & B, but the group B, VAS Pain score in stretching with cold packs shows better result in decreasing the VAS Pain. As we have seen above the Pain scale on 0 day of both groups. And the VAS pain level decreases more in stretching with cold pack as compared to simple stretching on 10th day of intervention, & same on 21st day. The stretching with cold pack has greater effects; not only in reducing pain, but also in reducing swelling, tenderness and improving ROM and flexibility. Further research is required with more no of inclusion criteria and more no of subjects.

LIMITATION OF THE STUDY

- First limitation of our study is the sample size was small, there is a need for future research with more no sample size and more investigation in the efficacy of Stretching and Stretching with cold pack on Hamstring Pull.

Conflict of Interest; There was no any conflict of the interest of the researcher.

Ethical clearance from the ethical committee.

REFERENCES

1. George Koulouris, FRAZGR. David Connel, FRANZCR - Hamstring muscle complex: An imagining review; - Radiographics; 2005 - pubs.rsna.org
2. Stephanie J. Woodley Susan R. Mercer - Hamstring Muscles: Architecture and Innervation; January 25, 2005; Musculoskeletal Research Group, Department of Anatomy and Structural Biology, University of Otago, Dunedin, New Zealand
3. T. Kumazaki, Y. Ehara, T. Saka - Anatomy and Physiology of Hamstring Injury; Int J Sports Med 2012; New York
4. O'Hora, John; Cartwright, Abigail; Wade, Clive D; Hough, Alan D; Shum, Gary LK - Efficacy of Static Stretching and Proprioceptive Neuromuscular Facilitation Stretch on Hamstrings Length After a Single Session; Journal of Strength and Conditioning Research: June 2011 - Volume 25

5. Darryl G. Thelen, Elizabeth S. Chumanov', Dina M. Hoerth', Thomas M. Best', Stephen C. Swanson, LI LI3, Michael Young, and Bryan C. Heiderscheit' - Hamstring Muscle Kinematics during Treadmill Sprinting. *Med. Sci. Sports Exerc.*, Vol. 37, No. 1. pp. 108-114, 2005.
6. Murray E Maitland, Stanley V Ajemian, Esther Suter - Quadriceps Femoris and Hamstring Muscle Function in a Person with an Unstable Knee; *Physical Therapy*. Volume 79. Number 1 . January 1999
7. Yoshitsugu Takeda, Shinji Kashiwaguchi, Tetsuya Matsuura, Takeshi Higashida and Akira Minato - Hamstring Muscle Function After Tendon Harvest for Anterior Cruciate Ligament Reconstruction; Evaluation with T2 Relaxation Time of Magnetic Resonance Imaging; © 2006 American Orthopaedic Society for Sports Medicine
8. Jean-Louis Croisier, Be´ne´dicte Forthomme, Marie-He´le`ne Namurois, Marc Vanderthommen, and Jean-Michel Crielaard - Hamstring Muscle Strain Recurrence and Strength Performance Disorders; *Am J Sports Med* 2002 30: 199
9. Anthony G. Schache, Tim V. Wrigley, Richard Baker, Marcus G. Pandy - Biomechanical response to hamstring muscle strain injury; A.G. Schache et al. / *Gait & Posture* 29 (2009) 332–338
10. Grant Freckleton, Tania Pizzari - Risk factors for hamstring muscle strain injury in sport: a systematic review and meta-analysis; *Br J Sports Med*: first published as 10.1136/bjsports-2011-090664 on 4 July 2012.
11. Mr David A. Opar, Dr Morgan D. Williams, Dr Anthony J. Shield - Hamstring strain injuries: Factors that lead to injury and re-injury *Sports Medicine*; Volume 42; 209-226; 2012.
12. Kieran O'Sullivan, Elaine Murray & David Sainsbury - The effect of warm-up, static stretching and dynamic stretching on hamstring flexibility in previously injured subjects; *BMC Musculoskeletal Disorders* 2009,
13. Gavin Jon Pinniger, Julie Robyn Steele, and Herbert Groeller - Does fatigue induced by repeated dynamic efforts affect hamstring muscle function? *Med. Sci. Sports Exercise.*, Vol. 32, No. 3, pp. 647–653, 2000.
14. Charlie Kornberg, Paul Lew - The Effect of Stretching Neural Structures on Grade one Hamstring Injuries; *J Orthopaedic Sports Physical Therapy* 1989.10:481-487.
15. Askling C, Saartok T, Thorstenrson A. Type of acute hamstring strain; *Br J Sports Med*. 2006; 40:40-44.
16. Penny E. Bolton, Rachel L. Pittman- Kremmer, Sarah N. Stucky et., al, Effects of Cold Packs on Hamstring Flexibility; *Wichita State University*; 2008.
17. Jurdan Mendiguchia, Eduard Alentorn-Geli, Matt Brughelli - Hamstring strain injuries: are we heading in the right direction? *Br J Sports Med*: first published as 10.1136/bjism.2010.081695 on 15 June 2011.
18. David G. Behm, Anis Chaouachi - A review of the acute effects of static and dynamic stretching on performance; *European Journal of applied physiology*; 111(11); 2633-2651, 2011.
19. S.M. Weldon, R.H. Hill - The efficacy of stretching for prevention of exercise-related injury: a systematic review of the literature; *Manual Therapy*; Volume 8; 141-150; 2003.
20. Joel T. Cramer, Terry J. Housh, Glen O. Johnson, Joshua M. Miller, Jared W. Coburn, and Travis W. Beck – Acute effects of static Stretching on peak Torque in women; *Journal of Strength and Conditioning Research*, 2004, 18(2), 236–241
21. Sarah M Marek, Joel T Cramer and Julie Y Culbertson - Acute Effects of Static and Proprioceptive Neuromuscular Facilitation Stretching on Muscle Strength and Power Output; *J ATHL Train*. 2005 Apr-Jun; 40(2): 94-103
22. Teddy W. Worrell, Troy I. Smith, Jason Winegardner - Effect of Hamstring Stretching on Hamstring Muscle Performance; *J Orthop Sports Phys Ther* 1994.20:154-159.

23. Geeta Sharma and Majumi Mohamad Noohu - Effect of Ice Massage on Lower Extremity Functional Performance and Weight Discrimination Ability in Collegiate Footballers; Asian J Sports Med. 2014 Sep; 5(3): e23184.
24. Michael Andrew Kowal - Review of Physiological Effects of Cryotherapy; The Journal of Orthopaedic and Sports Physical Therapy; Copyright © 1983 by The Orthopaedic and Sports Physical Therapy Sections of the American Physical Therapy Association.
25. Oakley, Elizabeth T.; Pardeiro, Rafael B.; Powell, Joseph W.; Millar, Audrey L - The Effects of Multiple Daily Applications of Ice to the Hamstrings on Biochemical Measures, Signs, and Symptoms Associated with Exercise-Induced Muscle Damage; Journal of Strength and Conditioning Research; Volume 27; Issue 10; 2743-2751; October 2013.
26. BC Heiderscheit, MA Sherry, A Slider Elizabeth S caumanov, Darry/G Thelen : Hamstring Strain Injuries: Recommendations for Diagnosis, Rehabilitation, and Injury Prevention; Journal of Orthopaedic & sports, physical therapy; Volume 40(2); 67-81; 2010.
27. Gary R. Brodowicz, Robert Welsh, James Wallis. Comparison of Stretching with Ice, Stretching with Heat, or Stretching Alone on Hamstring Flexibility. Journal of Athletic Training, December 1996.
28. Chaurasia BD. Handbook of General Anatomy. 4th edi.
29. Weerapong P, Hume PA, Koly GS. Stretching: Mechanism and benefits for sport performance and injury prevention. Physical Therapy Reviews. 2004 Dec 1;9(4):189-206.
30. Yates M, Shastri-hurst N The Owestry Disability Index Occupational Medicine, Volume 67, Issue 3, 1 April 2017, Pages 241-242, <https://doi.org/10.1093/occmed/kqw051>
31. <http://www.euro.who.int/en/health-topics/disease-prevention/nutrition/a-healthy-lifestyle/body-mass-index-bmi>
32. Mary Ellen Sewers : A critical review of visual analogue scales in the measurement of clinical phenomena. Research in nursing and health, Volume 13, Issue 4, 1990.