



## CRYO-STRETCH- The potential novel treatment technique for enhancing muscular flexibility - A Narrative Review

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### ABSTRACT

*For a full range of motion and injury-free joints, the musculoskeletal system's flexibility is essential. The ability to move normally across the joints pain free or injury depends on the tissues' intrinsic flexibility. Flexibility is a biomechanical characteristic of bodily tissues that governs the range of motion possible at a joint or group of joints without injury. To increase flexibility, a variety of stretching methods can be utilized, including PNF, dynamic stretching, ballistic stretching, and static stretching. When a cold pack is used before stretching, local cooling instantly reduces stretch sensitivity and increases flexibility. There is a dearth in existing literature on the benefits of cryo-stretch technique. Aim of this narrative review was to describe and review the cryo-stretch technique. Online databases such as PubMed, Science direct, Wiley online, Google scholar, Cochrane Library were searched for clinical studies which included use of cryo-stretch as a technique to improve the pace of rehabilitation. All relevant articles from the bibliographies of these clinical articles were reviewed. The effects of cryo-stretch on various parameters were reported in this review. When compared cryo-stretch is beneficial than cryotherapy alone when considering injured rather than healthy muscles. Also, the findings of cryo-stretching indicated a larger increase in hamstring muscle flexibility with respect to static stretching. Myofascial release technique, as opposed to cryo-stretching, can be used for quick improvement in cervical ranges. Compared to stretching utilising the PNF hold relax approach with ice application, manual stretching and manual stretching with ice application were found to be more successful in increasing hamstring length in healthy young people. It can be concluded that cryo-stretch technique needs further evidence-based research to clearly define its role in improving flexibility over other flexibility techniques.*

**Key Words:** Cryo-stretch, flexibility, intrinsic flexibility

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### INTRODUCTION

For a full range of motion and injury-free joints, the musculoskeletal system's flexibility is essential. [1] The ability to move normally across the joints without pain or injury depends on the bodily tissues' intrinsic flexibility. [2] Flexibility is a biomechanical characteristic of bodily tissues that governs the range of motion possible at a joint or group of joints without injury [3] To increase flexibility, a variety of stretching methods can be utilized, including PNF, dynamic stretching, ballistic stretching, and static stretching. [4] Flexibility is influenced by a number of variables, including the muscle's capacity for stretching, its stiffness, the cross-sectional area of its fibres, and many more. [5] It has been proposed that employing various stretching techniques and protocols can increase flexibility. [6] Furthermore, it has been asserted that static stretching is a safer, more efficient way for increasing hamstring range of motion. [7] Recent advancements have shed light on cryo-stretch being a potential treatment modality for enhancing flexibility and improving overall muscular well-being.

When a cold pack is used before stretching, local cooling instantly reduces stretch sensitivity and increases flexibility. [8] The inhibiting effects of cold on pain and the depolarization of muscle spindles lead to a decrease in muscular spasm and an improvement in muscle relaxation. [9]

There is dearth in existing literature on the cryo-stretch technique. Thus this narrative review was undertaken with the aim to describe the cryo-stretch technique.

**MATERIAL AND METHODS**

Various pertinent databases such as PubMed, Science direct, Wiley online, Google scholar, Cochrane Library were searched for clinical studies which included use of cryo-stretch as a technique to improve the pace of rehabilitation. Databases were searched using keywords Cryo-stretch+flexibility+rehabilitation+athletic population. Boolean terms “AND” and “OR” were used to concentrate the search. During initial search 58 articles. On title screening we found 38 relevant articles. Further scrutinization according to the inclusion and exclusion criteria was done. Articles in English language, full text articles, articles that included any information or protocol of cryo-stretch, RCTs and reviews were included for this narration. Unpublished work/thesis/conference proceedings, chargeable articles or those in any other language were excluded. A total of 17 relevant articles from the bibliographies of these were reviewed and included in this study. The effects of cryo-stretch on various parameters were reported in this review.

**RESULTS AND DISCUSSION**

Cryo-therapy follows the theory of pain gate theory for reduction of pain. Local ice application leads to an increase in pain threshold and pain tolerance along with a decrease in the Nerve Conduction Velocity. [10] Although definitive mechanisms of pain reduction with stretching have not been discovered yet, various possibilities have been mentioned in the literature. It's possible that signals from nociceptive fibers are interfered with by non-nociceptive inputs coming from muscle and joint afferents, resulting in pain suppression. This is consistent with the pain gate control idea. The application of moderate stretching exercises causes changes in the muscle's biomechanical strength, which can also be linked to an improvement in functional status. Stretching, a crucial component of a mobilization programme, has been proven in experimental investigations to encourage more parallel orientation of muscle fiber and to restore the biomechanical strength of injured muscle to that of uninjured muscle. Psychological considerations are another viable explanation for the cryo-stretching group's enhanced function . [9]

**What is the cryo-stretch Technique?**

The Cryo-stretch technique was developed by Kenneth L. Knight (Table 1). Each exercise session consists of three sets of static stretches and isometric contractions lasting 65 seconds each, followed by a 20-second rest. Two or three treatment sessions should be administered each day, with each treatment requiring three bouts. A large cold pack can be used to numb the muscle for a maximum of 20 minutes. Move the injured limb or body part at first until the athlete feels tightness or pain. Hold the affected limb or body part in that position for 20 seconds after backing off until the discomfort has subsided. The athlete is directed to perform isometric contraction. The contraction should be as powerful as possible and persist for about five seconds. The muscle will be more relaxed than it was before the isometric contraction than it was afterwards. When the athlete begins to feel tightness or pain, the trainer should move the limb or body part again. The second contraction should last roughly five seconds, and the second static stretch should be held for ten seconds. The ten-second stretch, five-second contraction, and ten-second stretch are repeated for the third time. After 20 seconds of rest in the anatomical position, continue the 65-second set of exercises on the other limb. Before the following final and the third bout, the muscle will likely need to be renumb . [11]

Table 1- Cryo-stretch Technique [11]

1.	Numb with ice(15-20 minutes)
2.	Exercise(65 seconds) 20 sec- static stretch 5 sec isometric contraction 10 sec static stretch 5 sec isometric contraction 10 sec static stretch 5 sec isometric contraction
3.	Rest in anatomical position (20 sec)
4.	Repeat exercise (65 seconds)
5.	Re-numb (3-5 minutes)
6.	Repeat steps 2 through 5

**Cryo-stretch vs Cryotherapy**

Utilizing the sit-to-reach test as a measuring instrument, the effects of cryo-stretching and isolated cooling on hamstring flexibility were compared on 18 healthy males. Cryo-stretching involved 14 minutes of cold pack application followed by passive hamstrings stretch for 30 seconds on each leg. The isolated cooling

condition included passive cold pack application to hamstrings for 15 minutes straight. The study's findings revealed that cryo-stretching and isolated cold application both led to a larger gain in flexibility. The use of 30 seconds of static stretching followed by the application of a cold pack (Cryo-stretching) did not enhance hamstring flexibility any more than cooling conditions alone. [12] These isolated cryotherapy-induced improvements in flexibility can be ascribed to a decrease in the painful stretch sensation and an elevation in the muscles' pressure-pain threshold (PPT) after cryotherapy application. [13] Stretch sensitivity is decreased by ice's hypoalgesic action, which is known to increase PPT. [14]

On the other hand, cryo-stretching produced a greater improvement in function and passive knee extension range of motion than cryotherapy in a study on thirty seven elite athletes with an acute grade I or II hamstring strain using an Inclinometer. [9] This explains that though reasons unknown, cryo-stretch is beneficial than cryotherapy alone when considering injured rather than healthy muscles.

### **Cryo-stretch v/s Stretching**

#### Static Stretching

A study conducted on thirty young female who underwent the Active Knee Extension (AKE) test with goniometry and had tight hamstrings with at least a 10-degree deficit from 180 degrees revealed that both methods significantly improved hamstring muscle flexibility. However, compared to static stretching, the findings of cryo-stretching indicated a larger increase in hamstring muscle flexibility. [2]

#### Dynamic stretching

Cryo-stretch (with dynamic stretching) has proved to be more beneficial than dynamic stretching alone. In a study with 34 ramblers with plantar fasciitis, when compared to dynamic stretching alone, the group that received cryotherapy along with dynamic stretching had a significant decrease in discomfort and an improvement in foot function. [14]

### **Cryo-Stretch and Myofascial Release (MFR)**

Cryo-stretching and myofascial releases both work well to lessen discomfort. In comparison to cryo-stretching, myofascial release revealed an immediate higher improvement in cervical lateral flexion range of motion as seen in a study conducted by Parab et al, 2020 on subjects with point soreness or a tense muscle band, a local twitch reaction, a reproduction of typical pain, and a limited range of motion in the cervical spine. [15]

For trigger point treatment, MFR has been found to be more effective in improving joint range of motion. [15] By reducing the viscosity of the ground substance to a more fluid state, myofascial release relieves excess fascia pressure on pain-sensitive regions and returns the body to its correct alignment. [16] Therefore, myofascial release technique, as opposed to cryo-stretching, can be used for quick improvement in cervical ranges.

### **Cryo-stretch and PNF hold relax**

It has been reported that there occurs no significant difference between Muscle Energy Technique and Cryo-stretch in patients with mechanical neck pain. Similar increases in cervical range of motion (measured using universal goniometer) and reduction in pain (measured using Numerical Pain rating Scale) were found with both the interventions. [17]

Compared to stretching utilizing the PNF hold relax approach with ice application, manual stretching and manual stretching with ice application were found to be more successful in increasing hamstring length in healthy young people. The right lower limb of the individual was flexed to 90 degrees and the knee was extended to the limit of its range to perform the PNF hold relax technique. At the end of the range, the individual was asked to conduct a 7-second isometric contraction of the hamstrings, followed by a 5-second concentric contraction of the quadriceps (knee extension). The technique was then done three more times from the newly acquired range. Prior to the PNF hold, ice was applied for ten minutes. [18]

Muscle effort and muscle insufficiency can be used to explain this. This states that when SLR is performed passively, there is little to no fatigue when examining their range of motion. However, AKE is actively carried out, therefore it is quite plausible that the patients' muscles become weary, potentially leading to the ROM that was recorded decreased. Additionally, possessing the hips 90 degrees flexed The quadriceps does not have a position that is biomechanically effective for crushing the hamstrings a muscle to fully extend the knee. Consequently, these two elements could be the reason why the target muscle did not respond well to icing followed by PNF Hold relax. [18]

### **Cold v/s Heat**

A sit and reach test and the 90/90 active knee extension test were conducted on 30 female healthy participants to investigate the impact on hamstring flexibility of acute cryotherapy combined with stretching, heat combined with stretching, and stretching alone. The results from the heat and cryotherapy groups were seen to be comparable to those of the control group, indicating that stretching had the greatest immediate impact on hamstring flexibility. [19]

On the contrary, cold application combined with gentle stretching exercises had a significant difference in hamstring flexibility compared to heat application. The muscular belly of the posterior thigh of the cold group was exposed to ice wrapped in two layers of towel or an ice towel for 20 minutes. The posterior thigh muscle belly of the heat group received a 20-minute hot wet pack covered in a towel with seven layers. [20] These differences can be attributed to different methodologies as the former study design included simultaneous application of physical agents and stretching protocols while in the latter study stretching was followed by application of physical agents. This clarifies that subsequent stretching post application of cryotherapy shows better results.

## CONCLUSION

The current literature provides evidence that to some extent and in specific cases for example muscle strain and spasms, cryo-stretch is more effective than other techniques in improving range of motion and reducing pain.

Moreover, cryo-stretch technique needs further evidence based research to clearly define its role in improving flexibility over other flexibility techniques.

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