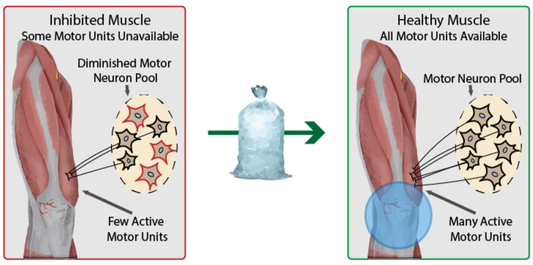
Cryotherapy
(AKA Focal Joint Cooling)

Nerve function is slowed at low temperatures. This makes icing a swollen and painful joint **THE BEST** way to address muscle inhibition. This has been shown in randomized controlled trials for patients with ACL reconstruction, as well as knee osteoarthritis. The bottom line: Use cryotherapy **BEFORE** exercise to improve efficacy of quadriceps strengthening work. Doing so has resulted in **38% increase** in strength in just 2 weeks (Hart et al, JAT 2014).

How does it work?

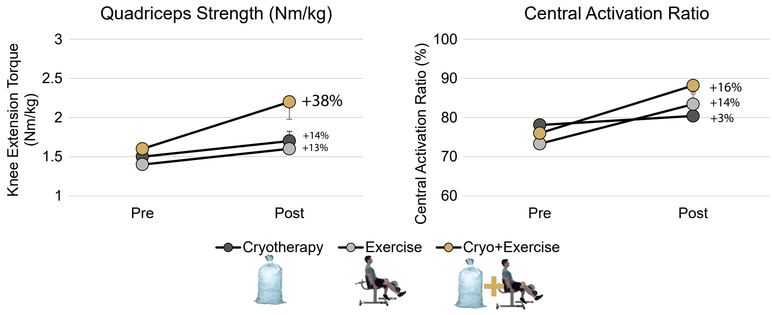
Remember this: as long as the sensory signal from the joint is disrupted, spinal reflexive inhibition is present. Inhibition is caused by pain and swelling signals flooding the spinal cord (think: tripped circuit breaker). Icing slows down nerve conduction, reducing impact of inhibition from the joint, and fixing the circuit breaker. This means neural access to the muscle is restored (but only for as long as the tissue is cold).



Seems crazy. Does it really work?

Back in 2014, Hart et al proved it works in patients after ACLR. In a randomized controlled trial, they assigned patients to 3 groups: 1) cryotherapy only, 2) exercise only, and 3) cryotherapy + exercise and trained for 2 weeks.
What happened? Groups 1 and 2 made similiar improvements in quadriceps strength (+14%).
Group 3 made **HUGE** improvements over the same time (**+38%**) - See for yourself below (left plot).

They also tested quadriceps volitional activation (e.g., ability to access full muscle capacity) and found improvements weren't different than exercise alone. So what it all mean? Cryotherapy doesn't fix activation failure overtime (e.g., when tissue is warm, inhibition persists), but it allows effective strengthening by creating a **therapeutic treatment window where our patients can access greater % of their motor units**.



When should I use it?

It is critically important to apply cryotherapy directly to the knee-joint **BEFORE** exercise.
20 minutes should be enough to numb the tissue and reduce sensory nerve conduction. If you are nervous about exercising with a numb knee, keep the exercises simple (e.g., open chain knee extension, leg press, etc) and save the more complex neuromuscular control exercises for later in the session.

How long does it last?

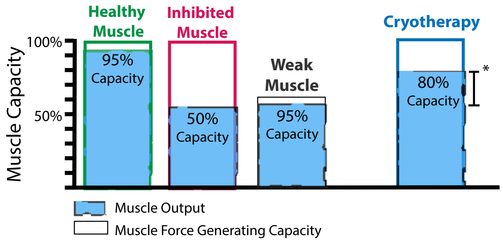
Only until the tissue re-warms. Cryotherapy creates a "**Therapeutic Window**" of about 45 minutes.

Barriers and Tips for Effective Use

- ☒ Time
- ☒ No Ice Machine
- ☒ Cold Intolerance/Allergy
- ☒ No Patient Buy-In
- ☒ Need to progress past isolated strengthening while patient in clinic.

- ☑ Come early or ice on the way.
- ☑ Freeze Sleeves (or other interventions [e.g., TENS])
- ☑ Use other disinhibitory interventions (e.g., TENS)
- ☑ Video Quad Pre/Post Intervention
- ☑ Continue cryotherapy during home exercise program.

A thought on compounding effects over time.



*Transient increases in muscle activation (~45 minutes) means more motor unit recruitment + higher mechanical and metabolic stress. **Strength exercise are more effective.** In 2 weeks of training, this translated into a 38% increase in quadriceps MVIC. If continued throughout the first 12 weeks of rehabilitation, what would that look like?

Created for the Live4 Clinician-Researcher Parternship Subkit Series

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