RAPID RESEARCH

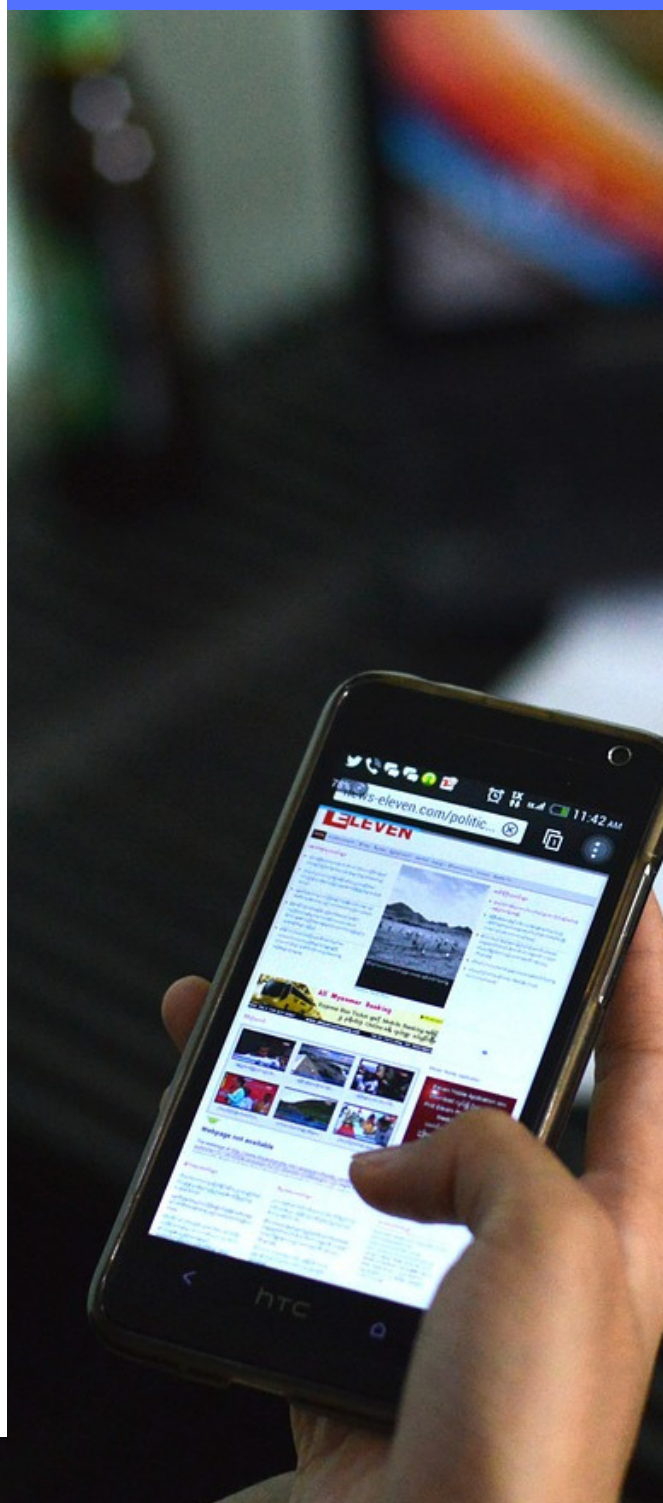
@physicaltherapyresearch

January 2022

Inside This Week:

Improving Tendon Health

- Injury & Performance Lessons from Engineered Ligaments
- Vitamin C–Enriched Gelatin for Tendon Health
- Isometric v. Isotonic Exercise for Tendon Pain

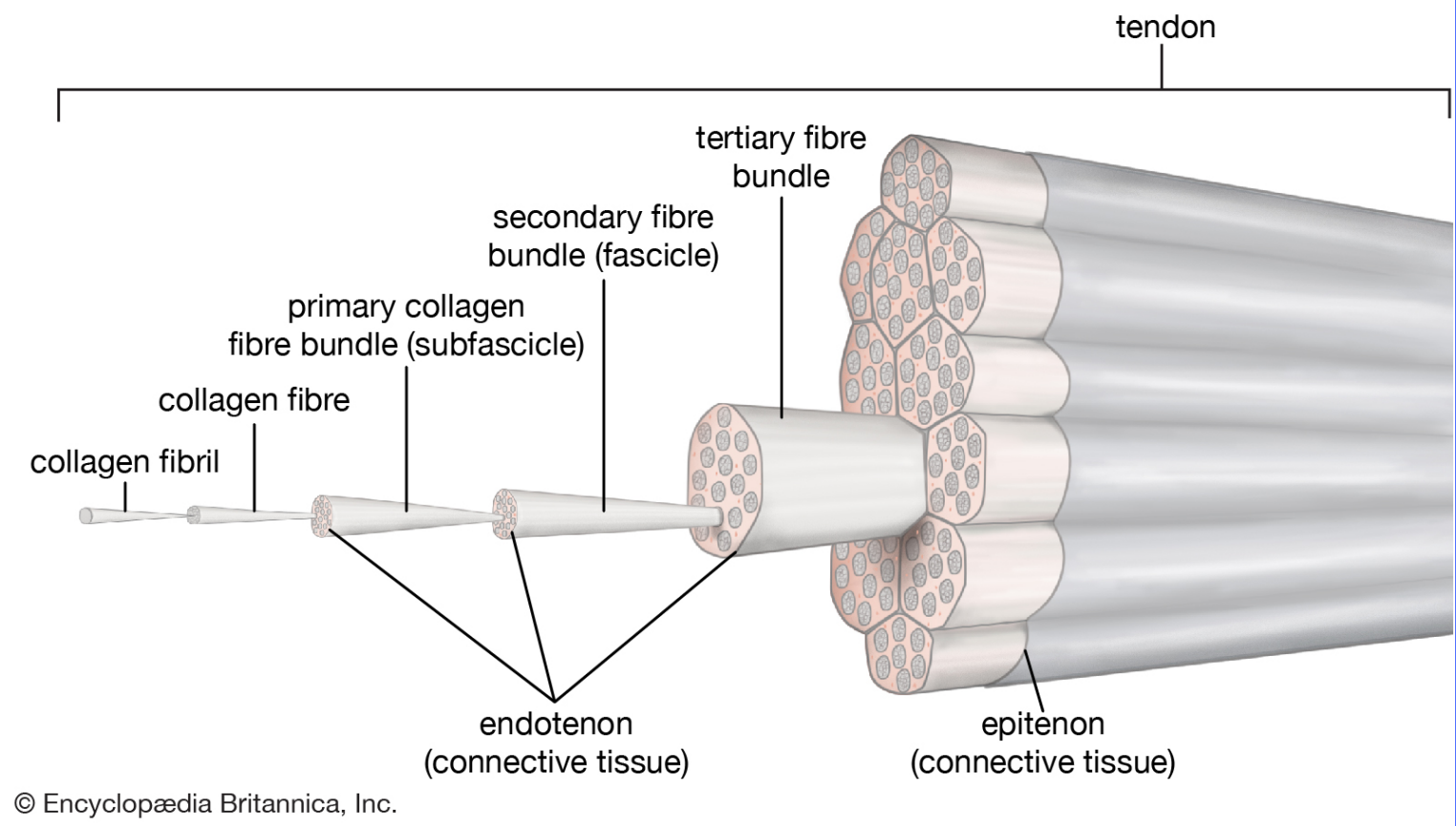


JANUARY 2022

INJURY & PERFORMANCE LESSONS FROM ENGINEERED LIGAMENTS

Click for Full Text (Barr et al 2017)

Recently, engineered ligaments have been developed using cells from human ACL or hamstring tendons. This research used this technology to learn how to best improve performance, prevent injury, and accelerate return to play in injured tendon/ligaments.



KEY FINDINGS

Loading Effects:
Tendons, like other forms of fibrous connective tissue such as bone and ligaments, adapt to their loading state.

Molecular adaptation to loading was independent of the frequency and intensity.

Time however DID alter the cellular response; Within 10 min of starting the activity, the molecular response peaks.

Hormonal Effects:
48 h of high estrogen level was enough to decrease the stiffness of ligaments without change in collagen content.

Exercise produces global hormonal signals, which improves connective tissue function.

Nutrition Effects:
Amino acids enriched in collagen & added together with vitamin C can improve collagen synthesis.

MAIN TAKEAWAYS

Connective tissue can be trained:
- 10 min of activity, targeted to a tendon/ligament.
- Exercises performed with a light weight either 6 h before or after any other training.

Following Injury:
- Begin training as soon as possible.
- Simple range-of-motion and light exercises (amplitude of the load is not important for stimulating collagen production).
- Ideally performed 3x/day. **Ex. Jump-rope for Achilles Tendon.**

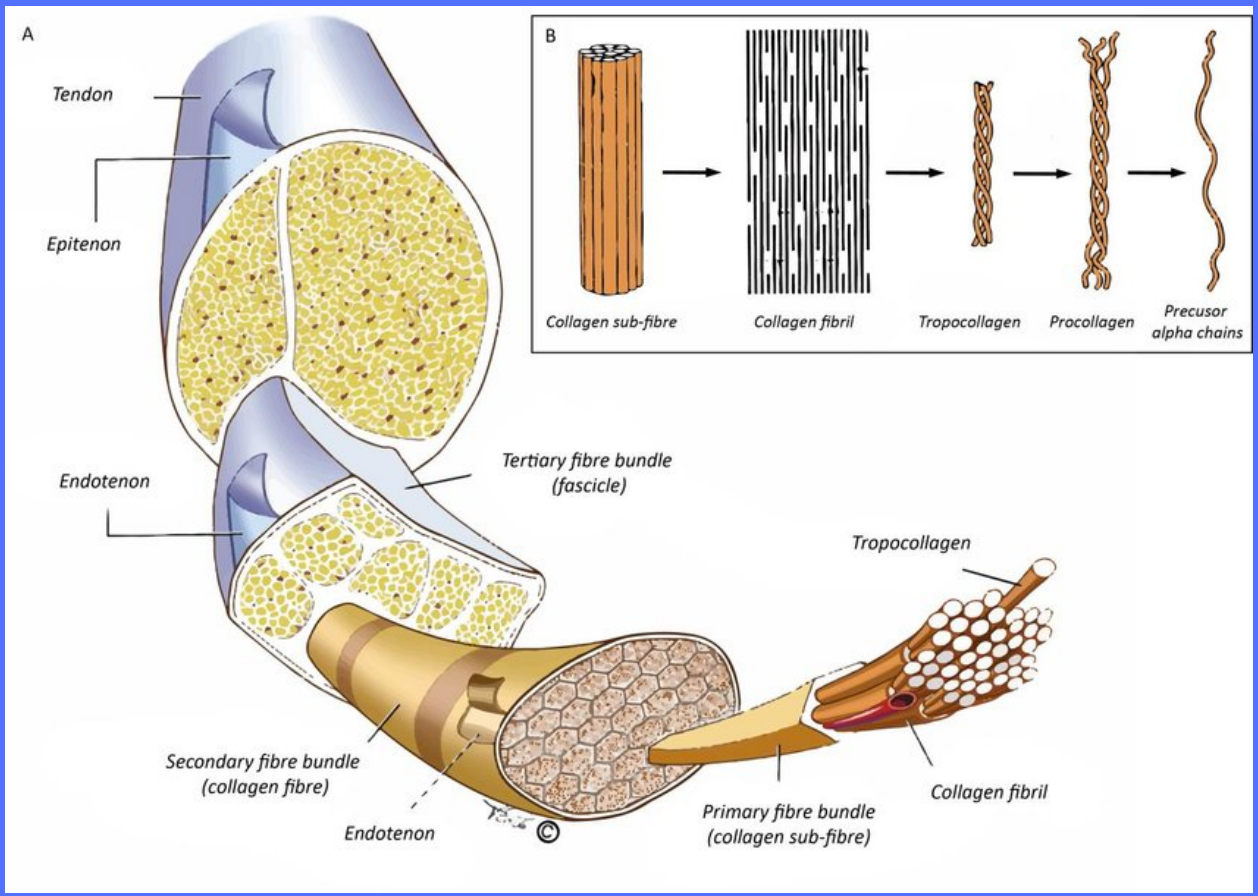
Best Nutritional Support:
- Consume leucine-rich protein as part of training to benefit from added muscle mass, strength and mTORC1 activation.
- Glucose uptake into tendons increases during exercise.
- 30-60min before training, consume 15 g of gelatin.

JANUARY 2022

VITAMIN C–ENRICHED GELATIN FOR TENDON HEALTH

Click for Full Text (Shaw et al. 2017

Nutritional and/or exercise interventions that increase collagen synthesis and strengthen these tissues could have an important effect on tendon injury rates. This RCT investigated whether consuming gelatin (a food derivative of collagen) and vitamin C combined with exercise could increase collagen synthesis.



KEY FINDINGS

Participants drank vitamin C–enriched gelatin or placebo.
Blood was taken every 30 min.
1 hour after the initial supplement, 6 min of rope-skipping.
Repeated 3x/day with 6 h between exercise for 3 days.

Increasing amounts of gelatin increased circulating:
Glycine, proline, hydroxyproline, and hydroxylysine.
Peaking 1 h after the supplement was given.

Engineered ligaments treated for 6 days showed increased collagen content and improved mechanics.

Subjects who took 15 g gelatin 1 hour before exercise showed 2x amino-terminal propeptide of collagen I in their blood, indicating increased collagen synthesis.

MAIN TAKEAWAYS

Supplementation with gelatin in humans augments collagen synthesis after exercise.

The accelerated rate of collagen synthesis was observed as early as 4 hours after the first bout of exercise.

This was maintained over the 72 h of the study.

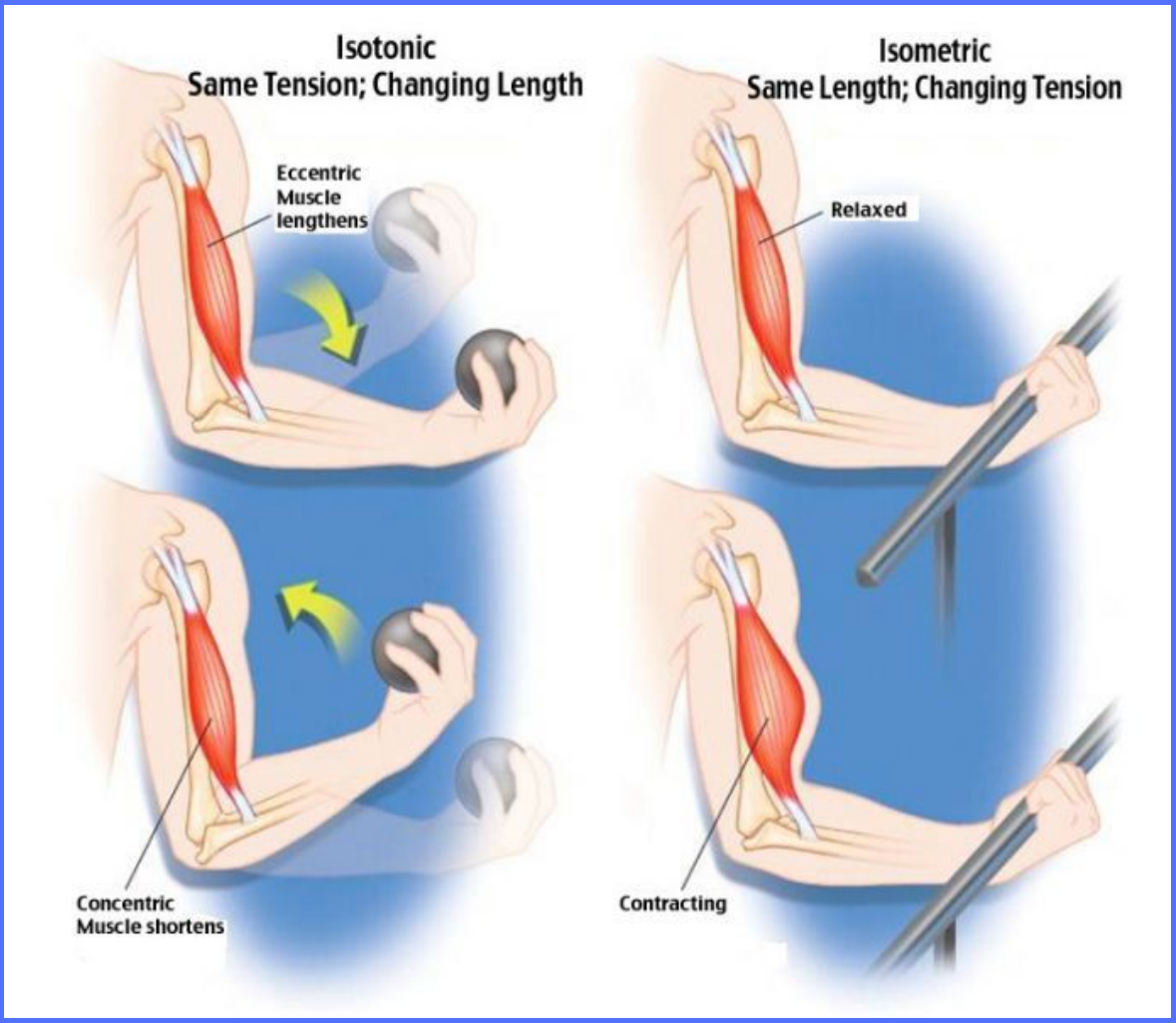
Adding gelatin and vitamin C to an intermittent exercise program could play a beneficial role in injury prevention and tissue repair.

JANUARY 2022

ISOMETRIC V. ISOTONIC EXERCISE FOR TENDON PAIN

Click for Full Text (Vang & Niznik 2021)

This research investigated how effective isometric contractions compared with isotonic contractions are in reducing pain for in-season athletes with patellar tendinopathy.



KEY FINDINGS

3 studies included which, directly compared isometric contractions with isotonic contractions for patellar tendinopathy.

All **3 studies reported a statistically significant reduction in pain with isometric and isotonic contractions** in the short term of 4 weeks.

Isometric contractions provided **statistically greater pain relief immediately, which remained up to 45 minutes** post-intervention compared with isotonic contractions.

MAIN TAKEAWAYS

Isometric and isotonic contractions **can reduce pain for in-season athletes with patellar tendinopathy.**

Heavy loaded isometrics or progressive heavy loaded isotonic exercises can reduce pain levels immediately and at 4-week follow-up.

Isometric contractions appear to **provide greater pain relief immediately** for up to 45 minutes.

Utilize a single-leg decline squat as a pretest and posttest to measure pain response.

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