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### Original Research

## The Magnitude of Tissue Cooling During Cryotherapy With Varied Types of Compression

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### Abstract

**Context:** Certified athletic trainers can choose different types of external compression (none, Flex-i-Wrap, and elastic wrap) when applying an ice bag to the body. However, which type facilitates the greatest magnitude of tissue cooling is unclear.

**Objective:** To compare the effects of 2 common types of external compression on the magnitude of surface and intramuscular cooling during an ice-bag treatment.

**Design:** Randomized controlled trial.

**Setting:** University research laboratory.

**Patients or Other Participants:** Fourteen college students (10 women, 4 men; age = 22.4 ± 1.8 years, height = 169.1 ± 8.2 cm, mass = 73.3 ± 18.5 kg, skinfold = 13.14 ± 1.61 mm) with previous cryotherapy experience and a posterior lower leg skinfold equal to or less than 15 mm.

**Intervention(s):** On 3 different days separated by 24 to 48 hours, an ice bag was applied to the posterior lower leg surface of each participant for 30 minutes with no compression, with elastic wrap, or with Flex-i-Wrap.

**Main Outcome Measure(s):** Posterior lower leg surface and intramuscular (2 cm) temperatures were recorded for 95 minutes.

**Results:** At 15 minutes, the elastic wrap produced greater surface temperature reduction than no compression ( $P = .03$ ); this difference remained throughout the protocol ( $P$  range, .03 to .04). At 30 minutes, surface temperatures were 14.95°C, 11.55°C, and 9.49°C when an ice bag was applied with no external compression,

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Flex-i-Wrap, and elastic wrap, respectively. Surface temperatures between Flex-i-Wrap and elastic wrap and between Flex-i-Wrap and no compression were never different. At 10 minutes, Flex-i-Wrap ( $P = .006$ ) and elastic wrap ( $P < .001$ ) produced greater intramuscular temperature reduction than no compression produced; these differences remained throughout the protocol. At 10 minutes, no compression, Flex-i-Wrap, and elastic wrap decreased intramuscular temperature by 1.34°C, 2.46°C, and 2.73°C, respectively. At 25 minutes, elastic wrap (8.03°C) produced greater temperature reduction than Flex-i-Wrap (6.65°C) ( $P = .03$ ) or no compression (4.63°C) ( $P < .001$ ). These differences remained throughout ice application and until 50 minutes after ice-bag removal.

**Conclusions:** During an ice-bag application, external compression with elastic wrap was more effective than Flex-i-Wrap at reducing intramuscular tissue temperature. Elastic wraps should be used for acute injury care.

**Keywords:** [intramuscular temperatures](#), [surface temperatures](#), [insulation](#)

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