HONG KONG SPORTS INSTITUTE 香港體育學院

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Comparison of Different Cryotherapy Recovery Methods in Elite Junior Cyclists

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Introduction

Cryotherapy is one of the recovery methods commonly used after elite sporting events, particularly in environments which are hot and humid, to prevent swelling after acute musculoskeletal injuries [1-3]. Cold water immersion (CWI) is a common form of cryotherapy. Previous research shows that CWI can induce vasoconstriction, stimulate venous return, aid metabolite removal after exercise, and reduce swelling and muscle soreness for better recovery during multiple exercise bouts [4-6]. However, implementing CWI protocols may be troublesome for some sports, as resting locations are not always in the same place and it may not be practical to move a CWI pool. In contrast, cold compression therapy (CCT) protocols can be implemented by applying a cold compression wrap over an injured or major muscle group. Without the associated inconveniences of CWI, CCT may be a more convenient option. However, little scientific evidence exists to substantiate its effectiveness on post-exercise recovery.

Methodology

Eight elite male junior cyclists (age 15.5 ± 1.2 year, height 167.7 ± 3.3cm, body mass 57.3 ± 3.5kg, peak oxygen uptake 64.7 ± 4.3ml/kg/min) completed a maximal cycling test at fixed cadence of 90 rpm on an electromagnetically braked lower extremity cycle ergometer (Lode, Excalibur, Groningen, The Netherlands) so as to determine their peak power output (PPO) and oxygen uptake.

Subjects then completed 3 tests on 3 separate days with randomized recovery strategies of CWI, CCT and active recovery therapy (ACT) for 15 minutes. All the tests were conducted in a temperature-controlled and humidity-controlled chamber (Welltech, Hong Kong) with ambient temperature set at 31.4°C and relative humidity at 74% on a stationary cycling ergometer (SRM, Germany). Each test consisted of two 35-min exercise bouts. Each exercise bout (E1 and E2) included a 5-minute warm up, followed by 15-minute time trial at 75% of their peak power output, then a 15-minute time trial at maximal effort. Participants were given a 55-minute rest period between E1 and E2, which included a 5-minute cool down period at 40% of their peak power output; a 10-minute preparation phase for treatment; 15 minutes of randomized recovery strategy and 30 minutes of passive recovery in the heat.

Results and Discussion

No significant differences were observed between average power output (Table 1), blood lactate (Figure 1), rating of perceived exertion (RPE) (Table 2) and heart rate (Table 3) for two time trial bouts for all recovery strategies. However, core temperature significantly decreased before the start of the second exercise bout for CWI (Figure 2). The core temperature also coincided with the thermal sensation scale during recovery strategies for CWI, CCT and ACT (2.64 ± 1.18, 3.25 ± 0.76 and 4.31 ± 1.03 respectively). The thermal sensation scale ranges from 0 (unbearably cold) to 8 (unbearably hot).

Table 1. Average power output during the two time trial bouts (E1 TT and E2 TT) for the three different recovery strategies

	Average power output (Watt)	
	E1 TT	E2 TT
CWI	221 ± 16	225 ± 22
CCT	219 ± 24	217 ± 30
ACT	227 ± 18	217 ± 27

Table 2. Rating of perceived exertion in TT1 and TT2 between the three recovery strategies

	RPE (scale 6-20)	
	TT1	TT2
CWI	18.88 ± 1.25	19 ± 1.31
CCT	18.25 ± 1.83	18.5 ± 1.41
ACT	18 ± 1.69	18.25 ± 1.98

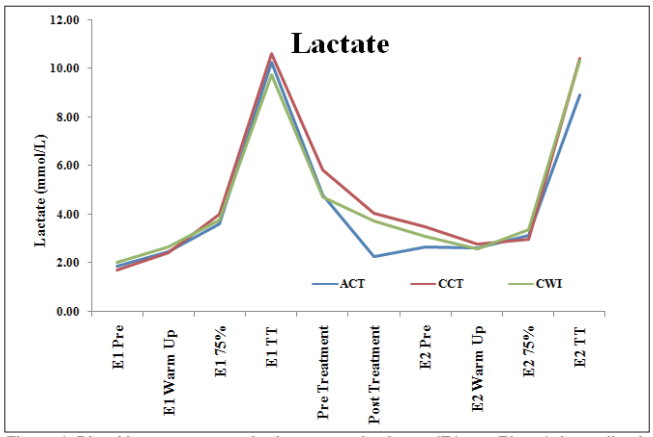

Figure 1. Blood lactate measured prior to exercise bouts (E1 pre, E2 pre), immediately after warm up (E1 warm up, E2 warm up), immediately after 75% PPO bouts (E1 75%, E2 75%), immediately after two maximum time trial bouts (E1 TT, E2 TT), immediately before and after the recovery strategies (pre and post treatment)

Table 3. Average heart rate during the two time trial bouts (TT1 and TT2) for the three different recovery strategies

	Average heart rate (bpm)	
	TT1	TT2
CWI	180 ± 11	184 ± 12
CCT	186 ± 12	180 ± 17
ACT	182 ± 11	179 ± 14

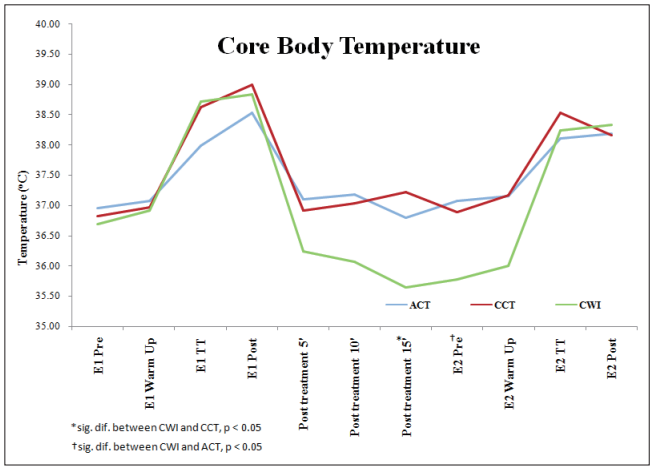

Figure 2. Mean core temperature measured immediately before two exercise bouts (E1 pre , E2 pre), during warm up (E1 warm up, E2 warm up), during the two 15 minutes time trial bouts (E1 TT, E2 TT), immediately after two exercise bouts (E1 post, E2 post), during recovery strategies and 5 min, 10min, 15 min after recovery strategies (Recovery 5', 10', 15')

The current findings suggest that all CCT, CWI and ACT are useful recovery strategies as they allow athletes to prepare for the next training bouts. However, CWI may cause thermal discomfort during treatment and lower the core temperature of athletes to below pre-exercise values; active recovery causes progressive glycogen depletion in Type I muscle fibers, while CCT needs special equipment. In order to find the best recovery strategy: athletes' preferences; duration of exercise; which facilities are available; and rest duration should all be taken into account.

Acknowledgement

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Reference

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