THE IMPACT OF HEAT EXTRACTION FROM ONE HAND ON REPEATED JUMP PERFORMANCE IN NCAA DIVISION I VOLLEYBALL PLAYERS

Mason Howard, Jason B. White, Jennifer Kaiser, Collen Herb, Jessica Pullen, Danielle N. Rennekamp
Northern Kentucky University, Highland Heights, KY

Figure 1: CoolMitt Product.

Figure 2: Hand In CoolMitt.

OVERVIEW

- Normal mechanisms to lower core body temperature are sweat evaporation and dilation of blood vessels to cool the blood near surfaces of skin in the limbs and head. However, these mechanisms are not sufficient during sustained high intensity muscle actions. Muscle exhaustion is temperature sensitive, and performance will decrease as muscles start to overheat. High temperatures can alter the basic cellular functions of the muscle.
- Heat extraction technology can slow the rate of body temperature increase, prolong conditions for normal muscle function, and delay the onset muscle fatigue, potentially improving anaerobic performance.

METHODS

- NCAA division I female volleyball players performed body composition assessment via BodPod, were assessed for vertical jump, and familiarized with the Bosco test during the first session.
- Players visited the lab for two identical sessions (separated by 72 hours) where each player was weighed and performed three Bosco tests; one visit with cooling occurring (via the CoolMitt device) between tests in the cooling treatment and a nonactivated CoolMitt being worn in the non-cooling treatment. The order of visits was randomized.
- Session description: 1) standardized warmup, 2) baseline lactate measurement, 3) 60-second BOSCO, 4) Seated cooling/non-cooling for 3 minutes, 5) lactate measurement, 6) rating of perceived exertion (RPE), 7) repeat steps 3-6 two more times. Athlete heart rate (HR) data was collected via HR monitor throughout to capture peak BOSCO HRs and recovery HRs after each BOSCO. Athletes performed the BOSCO on a force plate to record takeoff and landing forces.
- Two-way repeated measures ANOVAs were run to determine the effect of different treatments over time on physiological and force plate variables. Analysis of the studentized residuals showed that All variables were normally distributed ($p > .05$) except for jump height 6 ($p = 0.022$), LPEAK PGRF 5 ($p = 0.017$) and 6 ($p = 0.03$) as assessed by Shapiro-Wilk's test of normality on the studentized residuals. There were no outliers, as assessed by examination of studentized residuals for values greater than ±3. If Mauchly's test of sphericity was significant ($p > .05$), then the Greehouse-Geisser adjustment was utilized

Figure 3: Repeated Jump Testing (landing).

Figure 4: Repeated Jump Testing

Table 1: Descriptive Statistics (mean)

Northern Kentucky University Volleyball Players	
Age (years)	20.2
Height (in)	68
Body Mass (kg)	68.995
Body Fat (%)	23.13
Vertical Jump Height (cm)	51.08

RESULTS

Table 2: Multiple results of variable tests performed with and without the CoolMitt (mean).

Variable		Treatment	
		Cooling	Non-Cooling
Heart Rate (bpm)			
	Test 1	175.4	177.6
	Test 2	179.5	179.5
	Test 3	182.9	182.5
Number of Jumps			
	Test 1	37.4	39.8
	Test 2	36.1	35.1
	Test 3	36.6	34.6
Lactate (mmol/L)			
	Test 1	7.1	6.55
	Test 2	9.8	9.01
	Test 3	11.48	10.19
RPE			
	Test 1	6.0	6.7
	Test 2	6.9	7.8
	Test 3	8.2	8.6

RESULTS

Graphs

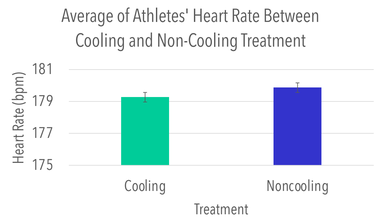

Figure 5: Heart Rate

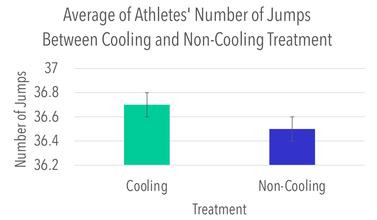

Figure 6: Number of Jumps

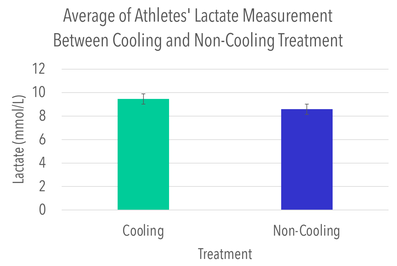

Figure 7: Lactate

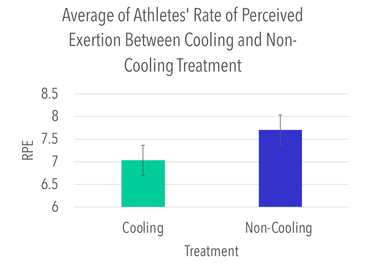

Figure 8: RPE

CONCLUSION

There were no statistically significant interactions between treatment and time for any dependent variables. Therefore, main effects were observed and indicated main effects for time but not treatment.

- RTIA: 1st sets different than 2 & 3
- RJH: 1st sets different than 2 & 3
- LTIA: 1st sets different than 2 & 3; 2nd set is different than 3rd
- Testing HRs: 1st and 2nd sets different than 3rd
- HR Recovery 2nd set: 1st sets different that 2 & 3
- HR Recovery 3rd set: 1st sets different that 2
- Number of Jumps: 1st sets different that 2 & 3
- Jump set Lactates: 1st sets different than 2nd; 2nd sets different from 3rd
- RPE: 1st sets different than 2nd; 2nd sets different from 3rd

PRACTICAL APPLICATION

There is no statistical improvement in physiological or force plate variables with palmar cooling in NCAA division 1 female volleyball players, but after cooling took place (after set one of BOSCO), on average the number of jumps completed during sets 2 and 3 BOSCO (set 2 of jumps: 2.9%, set 3 of jumps: 5.8%) and the lactate after sets 2 and 3 BOSCO (set 2 of jumps: 8.8%, set 3 of jumps: 12.7%) both increased compared to non-cooling, while RPE, on average, was lower after sets 2 and 3 of cooling as compared to non-cooling.

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