Effect of Pre Cooling and Warm up Programme on Speed Performance

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Abstract

The aim of the study was to find out the effect of pre cooling and warm up programme on speed performance. 15 students from YMCA College of Physical Education, Chennai were tested their Speed performance through 50 meters run which formed pre cooling test scores. After the pre test the subjects were subjected to cooling process and immediately after the cooling process, the subjects were tested for their speed performance. After three days gap, the subjects were tested for their speed performance which formed the pre warm up scores. After the test, the subjects were subjected to warm up process and immediately after the warm up the subjects were tested of their speed performance which formed the warm up test scores. The obtained scores were tested through Repeated Measures of Analysis of Variance. The statistical results proved that there was significant differences between the means as the obtained F ratio 7.00 ($P<0.05$) thus, it was found that pre cooling and warm up programmes significantly improved the speed performance of the subjects by reducing the timing. The paired mean comparisons proved that there was significant difference between pre cooling speed performance and cooling phase speed performance, and speed performances between pre cooling and warm up phases, cooling and pre warm up phases. Thus the results proved that the speed performance during cooling phase was superior than the pre cooling and pre warm up phases speed performance. However, there was no significant difference between cooling and warm up phases of speed performance. It was concluded that sportsmen can incorporated the pre cooling and warm up strategies in their training schedule to improve their speed endurance.

KEYWORDS: Pre Cooling, Cooling, and Warm up programmes, Speed Endurance

INTRODUCTION

The main benefit of pre-cooling is in enabling athletes to draw on reserves later in performance due to reduced thermal strain, allowing for different pacing strategies and increased intensity in the later stages. Undoubtedly, increases in Core Temperature create a problem in exercise of this nature, but the rest periods allow for some degree of cooling down.

Exercise causes one's body temperature to rise, and the harder one works the more rapid this rise will be. This rise in core temperature (Tc) can be modified by increased fitness but is exacerbated in hot and humid conditions. However, regardless of training state or climate, it is apparent that there is a critical limiting Tc, at which point athletes are forced to either reduce exercise intensity or risk heat-related illness. Because the amount of heat stored in the body will limit the duration of exercise at a given

intensity, it obviously makes sense to start exercising with as cool a body temperature as possible - i.e., by pre-cooling. In essence, the purpose of body cooling techniques is to increase the margin between one's starting Tc and the Tc that will force one to reduce one's pace.

Numerous studies have shown that pre cooling is advisable before prolonged exercise in hot temperatures, with evidence that it helps to sustain intensity and speed. In one study requiring subjects to run at 82% of max V02 in a heat chamber -24°C and 51% relative humidity (RH) - pre-cooling by cold air exposure (5°C) was shown to boost performance by a massive 16% (Arngrimsson S.A, et al., 2004). In another study, following a 20- minute cold water bath (23-24°C) the distance achieved during a 30-minute self-paced running test in hot humid conditions (32°C, 62%RH) increased by an average of 4%.(Cheung, S. and Robinson, A. (2004) The effect of pre-cooling on self-paced performance was investigated further by Kay and his research group (3). In this study, pre-cooling the skin alone (by 24°C water immersion) stretched 30 minutes of self-paced cycling in 31.4°C and 60.2% RH ambient conditions by 0.9km. Kay suggested that, although there was no reduction in Tc, Pre - cooling was effective in reducing thermal strain, thereby enabling the subjects to increase exercise intensity towards the end of the trial. Other researchers have also suggested that the main benefit of pre-cooling is in enabling athletes to draw on reserves later in a performance due to reduced thermal strain, allowing for different pacing strategies and increased intensity in the later stages.(**Cotter J.D., et al., (2001)**

The accumulation of blood lactate disturbs the excitation-contraction coupling and cross-bridge formation. In other words, the muscle's mechanical properties are disturbed. The result? A decrease in force production, peak force and velocity.(Astrand, 1986) Training can improve the clearance rate of lactate and reduce early lactate formation. Both submaximal aerobic exercise and interval training can improve the body's ability to buffer and tolerate lactate. However, only intense interval training can increase various important components of anaerobic power and capacity. Submaximal aerobic exercise does not and may even decrease anaerobic enzyme activity (not good for speed development!) **(Viru, 1995).** Speed endurance training is similar to speed or sprint training, however there are two important distinctions: Appropriate warm-up and cool-down periods are an important part of any exercise programme that aims to develop and maintain fitness.

Few studies have focused on whether body cooling between bouts of exercise can also improve performance. Undoubtedly, increases in Tc create a problem in exercise of this nature, but the rest periods allow for some degree of cooling down. In the real world, there is unlikely to be enough time to reduce Tc to resting levels, and the aim of any cooling strategy must be to gain a performance advantage by offsetting as much thermal strain as possible before the next bout.

A group of Texan scientists investigated the effects of body cooling during a 12-minute rest period between two bouts of exercise in a hot environment (38°C). They reported that pre-cooling (fan cooling with water spraying) resulted in a lower Tc and a reduced loss of body water throughout the second bout. However, another study reported

no significant physiological benefit from pre-cooling completed prior to the intermittent activity of a football game (2x45 minute periods, 15 minute intermission) **(Daanen H.A , et al., (2006) .**

More studies are needed to investigate fully the potential benefits of body cooling for intermittent exercise performance, whether cooling is carried out pre - exercise or during a rest period. The aim of this study was to find out the effect of pre cooling and warm up programme on speed performance.

METHODOLOGY

15 students from YMCA College of Physical Education, Chennai were selected as subjects. The subjects were in the age group of 21 to 25 years. Speed performance assessed through 50 meters run and scores recorded in seconds. The selected subjects were tested for their speed performance which formed pre cooling test scores. After the pre test the subjects were subjecting to cooling process and immediately after the cooling process, the subjects were tested for their speed performance. After three days gap, the subjects were tested for their speed performance which formed the pre warm up scores. After the test, the subjects were subjected to warm up process and immediately after the warm up the subjects were tested of their speed performance which formed the warm up test scores. The obtained scores were subjected to Repeated Measures of Analysis of Variance to find out the significance.

RESULTS

Tab I: Effect of Pre Cooling and Warm Up on Speed Performance

	Pre Cooling	Cooling	Pre Warm Up	Warm up	Source of Variance	Sum of Squares	df	Means Squares	F
Means	7.03	6.53	6.88	6.68	Subjects	11.72	14.00		7.00 *
					Trials	2.18	3.00	0.73	
					Residuals	4.35	42.00	0.10	
					Total	13.89	59.00		

Table F-ratio at 0.05 level of confidence for 3 and 59 (df) =2.76 .

* Significant at 0.05 level

Tab II: Multiple Comparisons of Adjusted Means of Pre Cooling, Cooling, Pre Warm up and Warm Up Scores and Results on Post Hoc analysis

Pre Cooling	Cooling	Pre Warm Up	Warm up	MD	REQD C I

7.03	6.53			0.50*	0.34
7.03		6.88		0.15	0.34
7.03			6.68	0.35*	0.34
	6.53	6.88		-0.35*	0.34
	6.53		6.68	-0.15	0.34
		6.88	6.68	0.20	0.34

* Significant at 0.05 level.

DISCUSSIONS

The statistical results presented in Table I proved that there was significant differences between the means as the obtained F ratio 7.00 was greater than the required table value of 2.76. Thus, it was found that pre cooling and warm up programmes significantly improved the speed performance of the subjects by reducing the timing. Since the obtained F value was significant, the results were subjected to statistical treatment using Scheffe's Confidence interval and the results presented in Table II. The results proved that there was significant difference between pre cooling speed performance and cooling phase speed performance, and speed performances between pre cooling and warm up phases, cooling and pre warm up phases. Thus the results proved that the speed performance during cooling phase was superior than the pre cooling and pre warm up phases speed performance. However, there was no significant difference between cooling and warm up phases of speed performance.

Duffield, and Marino, (2007) conducted a study on "Effects of pre-cooling procedures on intermittent-sprint exercise performance in warm conditions" and found the ergogenic benefits of effective pre-cooling procedures in warm conditions for team-sports may be predominantly evident during sub-maximal bouts of exercise. **Paul, et.al., (2005)** conducted a study on "Pre-cooling leg muscle improves intermittent sprint exercise performance in hot, humid conditions" and found the method of pre-cooling determined the extent to which heat strain was reduced during intermittent sprint cycling, with leg pre-cooling offering the greater ergo genie effect on peak power output (PPO) than either upper body or whole body cooling The previous studies proved pre cooling procedures in warm conditions contributes for ergogenic benefits and peak power output. The results of this study proved that pre cooling and warm up protocols suggested contributed for speed performance of the subjects which may be due to ergogenic benefits and peak power out put improvement among the subjects. Thus the findings of this study are in agreement with the findings of **Duffield, and Marino, (2007)** and Paul, et.al., (2005). It was concluded that sportsmen can incorporated the pre cooling and warm up strategies in their training schedule to improve their speed endurance.

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