Effect of Cryotherapy on some Blood contains and HIGH JUMP SHOOTING SKILL FOR FEMALE Handball players

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Abstract

Aim Of The Work:

Investigation of the impact of 3 minutes cold water immersion in the recovery in experimental group and compared to control group with passive recovery after the first half of the one hour exercise session on blood lactate , pyruvate concentrations and pH.

Methods:

14 healthy female handball players (Helwan University team) age average (19 ±1.56 years, weight 65±2.3 kg , height 171.21±8.8 cm and T- age12.3 ± 2.54 year) performed experimental after first of the half exercise session (80% Intensity) , (experimental) (n=7) were immersed in cold water (cryotherapy) adjusted at 8 C° for 3 minutes (According to most of researches 2 - 10C°), the second group (control) underwent passive recovery. The 14 players completed the exercise session again. Blood samples have been collected for measuring blood lactate, pyruvate concentrations and pH levels pre- exercise session, immediately after first half and after recovery each group.

Results:

revealed significant increase (P< 0.01) in blood lactate levels with decreased pH levels immediately after 1st. half time in both groups but decreased samples taken after three minutes from the first half of the exercise session should sign lower level of lactate with higher level of blood pH in the experimental group when compared with the same parameters

Discussion And Conclusion:

It is concluded that cold water (cryotherapy) immersion may help recovery from short maximal by decreasing cellular metabolism , decreasing the lactate production and increasing cellular survival .

Introduction:

Intensive exercise causes microtrauma, leading to muscle soreness. Exercise-induced muscle soreness can be classified as either acute (occurs during exercise and may last up to 6 hours) or delayed (has onset 8 to 24 hours post exercise) (McDermott et al., 2009). Delayed onset muscle soreness (DOMS), peaks after 24 to 48 hours post exercise (Isabell et al., 1992).

Many studies investigated the etiology of DOMS from which several theories have evolved (Jones et al., 1986). DOMS can be explained as strenuous activity -especially eccentric exercise- causes injury or trauma to the muscle, its musculotendinous junction, or both, releasing breakdown products of muscle containing lactate in the blood and urine leading to decreased pH (Clarkson, 1990), initiating trauma with inflammatory response resulting in muscles feeling painful and swollen (Ebbeling et al., 1990). It starts 8 hours post activity and gradually increases, peaking at 24 to 48 hours post exercise (Newham et al., 1988).

Pain is associated with decreased range of motion (ROM) and strength, result in muscle spasms (Dennegar and Perrin, 1990).

Because of the presence of pain and other possible debilitating performance factors, preventing or minimizing the effects of DOMS should be a concern for coaches, athletic trainers, physical therapists, and other sports medicine personnel. Little research, however, exists on the prevention or treatment of DOMS (Venter et al., 2010).

Performing Cryotherapy, cold water immersion, is treating this muscle damage and not only stimulates muscle cell activity but helps repair the damage and strengthen the muscle. It delays the onset of muscle pain and soreness (DOM.S) (Bailey et al., 2007).

Hence, this study was proposed to investigate the effect of cold water immersion (Cryotherapy) on blood lactate , pyruvate concentrations and pH in female handball team.

Subjects & Methods:

14 healthy female handball players (Helwan University team) age average 19 ±1.56 years, weight 65±2.3 kg and height 171.21±8.8 cm, T- age12.3 ± 2.54 year) constituted subjects of this study. They were subjected to (one hour) exercise session (80% Intensity) of two half with 10 minute interval break. they were divided into two equal groups (experimental group and control group) The experimental group was immersed in cold water (Cryotherapy) basin adjusted at 8 °C for 3 minutes and then completed the rest of the break interval in passive rest.

The control group was subjected to normal passive rest interval. Both groups completed the second half time of the exercise session.

Venous blood samples were collected from each player three times (1- at rest)

(2- after first half hour the exercise session) (3- at the end of 3 minutes cryotherapy in the experimental group and after 3minutes passive rest recovery for control group)syringes, kept on ice in icebox, transported to the lab to measure lactate, pyruvate concentration and blood pH, analysis in blood gases analyzer. Samples were collected at rest, after first half time of the exercise session and after recovery rest period between two halves of the exercise session,. The high jump shooting skill was recorded and compared twice times the first at the end of the first half exercise session, the second at the end of the exercise session for both groups

All revealed results were treated with a computerized statistical program (SPSS version 15) for means and standard deviation. Analysis of variance (ANOVA) were measured for difference between pre-exercise, after first half time and after recovery. Wilcoxon Sign Ranks Test was used to examine the difference between baseline and after exercise measurements for both experiments.

Results:

Results are showed as means and standard deviations (SD) in (Table 1).

Table (1):

difference in the statistics for investigated parameters between both groups.

groups / parameters	Experimental group (cryotherapy)	Control group (Passive recovery)
pH	Mean ± S. D.	Mean ± S. D.
Rest	7.402± 0.02	7.39± 0.03
After 1st. Half	7.31± 0.03	7.31± 0.03
After recovery	7.39± 0.03	7.34± 0.02
LACTATE (mmol/l)	Mean ± S. D.	Mean ± S. D.
Rest	1.26± 0.11	1.25± 0.09
After 1st. Half	4.73± 0.40	4.73± 0.43
After recovery	3.27± 0.28	3.76± 0.33
PYRUVATE (µmol/l)	Mean ± S. D.	Mean ± S. D.
Rest	63.42± 6.08	64.42± 5.50
After 1st. Half	224.28± 11.09	227.42± 16.07
After recovery	239±10.79	225.71± 8.83

Show significant difference ($p<0.05$) in blood lactate, pyruvate and pH in pre-exercise session or after 1st. halftime results

Table (2):

Wilcoxon signed ranks for experimental group compared to control group rest, after 1st. Halftime and after recovery.

REST	Z	P	Significance
pH	0	1	N. S.
LACTATE(mmol/l)	-0.59	0.55	N. S.
PYRUVATE(µmol/l)	-0.17	0.86	N. S.
After 1st. Half time	Z	P	Significance
pH	-0.34	0.74	N. S.
LACTATE(mmol/l)	-0.17	0.87	N. S.
PYRUVATE(µmol/l)	-0.17	0.87	N. S.
After recovery	Z	P	Significance
pH	-2.37	0.02	S
LACTATE(mmol/l)	-2.20	0.03	S
PYRUVATE(µmol/l)	-1.99	0.05	S

After recovery, the Experimental group (cryotherapy) immersion group showed higher normal pH and pyruvate levels with lower lactate levels compared to Control group(passive recovery).

Table (3):

The differences between experimental and control groups in high jump shooting skill.

High jump shooting skill	Experimental group (cryotherapy)	Control group (Passive recovery)	P	Significance
First half .	12± 2.16	12 ± 1.15	0.77	N. S.
Second half.	14,55 ± 1.99	12.29± 2.14	0.01	S.

The results achieved after of recovery was in high jump shoot skill (P< 0.01) since Experimental group had a highly significant higher results compared to that of control group.

Table (4):

Multiple Comparisons (ANOVA & LSD) for investigated groups.

	ANOVA		LSD			
Variable	F	Sig.	compared groups		P	Significance
Experimental group (Cryotherapy)						
pH	32.18	0.00	Rest	After 1st. Half	0.00	S.
				After recovery	0.39	N. S.
			After 1st. Half	After recovery	0.00	S.
LACTATE	258.62	0.00	Rest	After 1st. Half	0.00	S.
				After recovery	0.00	S.
			After 1st. Half	After recovery	0.00	S.
PYRUVATE	721.27	0.00	Rest	After 1st. Half	0.00	S.
				After recovery	0.00	S.
			After 1st. Half	After recovery	0.01	S.
Control group (Passive recovery)						
pH			Rest	After 1st. Half	0.00	S.
	14.12	0.00		After recovery	0.00	S.
			After 1st. Half	After recovery	0.07	N. S.
LACTATE			Rest	After 1st. Half	0.00	S.
	222.59	0.00		After recovery	0.00	S.
			After 1st. Half	After recovery	0.00	S.
PYRUVATE			Rest	After 1st. Half	0.00	S.
	502.21	0.00		After recovery	0.00	S.
			After 1st. Half	After recovery	0.78	N. S.

**The mean difference is significant at the 0 .05 level.*

Moreover, analysis of variance (ANOVA) with its LSD comparisons revealed return of pH to be around baseline results (P > 0.39) in cold water group which isn't achieved in the passive recovery group (P < 0.01). Same findings was observed in pyruvate where results after recovery were higher than that of after 1st. halftime (P< 0.01) but there was no significant difference in control group (P>0.78).

Discussion:

Cryotherapy is the local or general use of low temperature is used to decrease cellular metabolism, increase cellular survival, decrease inflammation decrease Pain and spasm and promote vasoconcentration and may help in the recovery after muscular exercise .

The present study aimed to investigate pact of cryotherapy on blood lactate, Pyruvate and pH.

The obtained data in this study show that the player who received cryotherapy treatment after exercise reported a diminished lactate levels with decrease pH. These findings are consistent with those of similar investigations using cryotherapy as a modality to treat exercise-induced muscle damage (Eston & Peters, 1999; Howatson & van Someren, 2003; Yanagisawa et al., 2003 and Bailey et al., 2007).

Baily et al., (2007) stated that the acute onset of muscle soreness observed immediately after exercise is related to the accumulation of by-products that are either metabolic or contraction induced (Miles & Clarkson, 1994) rather than DOMS, which is more commonly associated with muscle damage (Cheung et al., 2003). This study observed lactate as by product and pH value as metabolic induced parameter. This could account for the biphasic increase in muscle soreness observed following exercise and support the proposal that cryotherapy was effective in reducing muscle injury rather than facilitating removal of exercise-induced accumulation of by-products as reconverting lactate to pyruvate. Moreover, Yanagisawa et al., (2003) observed reductions in DOMS at 24 and 48 h post-exercise with cryotherapy.

Cryotherapy improved recovery of lactate and pH which was markedly less than that experienced by the control group. These findings provide support for the use of muscle function waste products as an applicable and reliable measurement tool for quantifying exercise-induced muscle damage (Warren et al., 1999). However, Warren and coworkers' (1999) endorsement of specificity when measuring muscle function was not supported, as assessment of isometric maximal voluntary contraction was more sensitive to decrements in muscular function than sprint and vertical jump assessments.

It is still unclear what mechanism is responsible for the difference in lactate-pyruvate concentrations following cryotherapy treatment. Some authors have postulated that cryotherapy might reduce post-exercise muscle damage via a decreased permeability of blood and lymph vessels due to an attenuated inflammatory response. This explanation could, in part, account for the lack of a treatment effect observed with creatine kinase activity. Also, as secondary damage to skeletal muscle resulting from inflammation may be more pronounced in the hours rather than days after exercise (Lapointe et al., 2002; Merrick et al., 1999).

The positive effect of cryotherapy in the reduction lactate concentration may occur through .it's effect on cellular metabolism .

Conclusion:

Cryotherapy may help the recovery from short maximal efforts by decreasing cellular metabolism and lactate production.

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