EFFICIENCY OF CRYO PROCEDURE AS REGENERATION MEANS FOR REACTION ABILITIES IN SOCCER PLAYERS

Milan MIČUCH – Vladimír PSALMAN

Department of Sport Kinanthropology, Faculty of Physical Education and Sports, Comenius University in Bratislava, Slovak Republic

Abstract:

One of the newest regeneration means at athletes is cryo procedure. This type of procedure improves resistance, accelerates regeneration process and inhibits pain. The aim of this work is to determine an efficiency of regeneration means for reaction abilities in soccer players with accent on disjunctive reaction time.
For testing of levels in disjunctive reaction abilities of low extremities we used FiTRO Agility check equipment. Our experiment confirmed positive effect of cryo procedure on level of disjunctive reaction abilities.

Key words:

Fatigue, Recovery, Regeneration, Cryo procedure, Reaction abilities

Introduction

Requirement of continual sport performance improvement and effort to achieve maximal performance bring a lot of risks which endanger functional ability of athlete and its health. Natural state which comes after every sport activity is fatigue. Opposite process, which reduces fatigue is recovery. Main component of recovery is regeneration of physical forces with the aim of eliminate fatigue, accelerating and removing of recovery processes, for overloading prevention, overtraining or health damage. All these are tied with incorrect sport activity. Regeneration should be a necessary part of each training process. That is why regeneration gains the most importance in sport, in training process and in competitions, especially at high level athletes. In modern training process should have even more regeneration than special training, ratio is from 1: 2 up to 1 : 3 on behalf of regeneration. This recommended ratio is clear evidence of regeration meaning (Štulrajter, Jánošdeák et al., 2003).

CRYO PROCEDURE – NEGATIVE TERMOTHERAPHY

British and North European countries term cryo therapy generaly understand as cooling down process with the help of ice, gel, etc. Authors in Japan, Germany, Poland and others define term cryo therapy as treatment by using extremly low temperatures – below level -100 °C (Caban, 2008). To avoid misunderstanding in definitions, Štulrajter (2007) recommends to call ice bath like cryo procedure. Cryo procedures or negative termotheraphies are procedures which influence human body by low temperature.

Cryo procedure like cooling down technique at athletes uses different elements: ice, ice cristals, ice cubes, ice pieces, all in combination with cold water. They are inserted into some suitable space (pictures 1 and 2) and cold water is added at the end. It is important that by

using extremly low temperatures of water, athletes should avoid of other loading. Cryo procedure is used in top level teams, for example Real Madrid (picture 1).

Pic. 1 : Space for cryo procedure at training camp of Real Madrid in Austria, photo by Križan (2007)

Pic. 2 : Different shape for ice pieces and cold water, used in our experiment

Regeneration of athletes

Low temperatures have positive influence for body circulation and metabolic tolerance during physical loading. Cryo procedures also delay of fatigue during muscle activity, especially at athletes in endurance sports. Malovič (1998) showed that low temperatures have important analgetic effect which is based on different application time. Authors Kampmiller and Vanderka (2007) recommend that application of cold temperatures should be immediately after finishing sport training (so called icing) and should not be too long – maximum 10 minutes.

REACTION ABILITIES (DISJUNCTIVE REACTION ABILITIES)

Reaction abilities can be characterized as ability to react or to start motion activity for certain signal in the shortest possible time. This abilitydepends only on continuance of participating nerve processes. Those are influenced by quality of nerve tracks, size of signal,

kind of reflex and by receptor sensibility. Quick reaction time markantly influences performance in some sports. This can be occured also in soccer and acts as ability to start and perform intentive short time activity for certain signal of co-player, oponent, ball, referee. In the game we can find all spectrum of signals from which needs to be chosen only essential ones for the next development of situation. Reaction has to be done in the best moment and by speed which is adequate for the role. As a signal can be defence gap, free co-player, ball trajectory, whistle of the referee, etc. (Šimonek, 1985). Reaction in sport represents not only body motion response but also lower and upper extremities responces. Reaction ability can be seen by fast and surprising shooting, passing, moving about, running into the defence gap, blocking, fast offens after the gaining the ball and in the all activities of goalkeeper. For successful solutions in game situations reaction time is one of the key factors (Holienka, 2004). It is important for goalkeeper but also for field players.

Reaction speed includes:
- perception speed
- anticipation speed
- decision making speed and its preparation phase
- latent time
- realisation phase

Reaction time represents psychomotoric reactivity that central part is geneticly determined, meanwhile its peripheral, motoric part is influenced by training. As shorter reaction time, as better creativity of central nervous system. We can distiguish simple reaction time that can be determined as a reaction speed and disjunctive reaction time (Komadel-Štulrajter, 1997). Disjunctive reaction time is indicated as a selective one (Šimonek-Štulrajter, 1995). By disjunctive reaction time the selection of certain motion reaction is directed by quality of signal.

Sport praxis mainly requires complex speed (speed of the whole motion) not only its elementary forms. Based on many researches, monitoring of reactions and speed abilities are recommended in sport games and in complex fitness diagnostics in the whole population (Zemková - Hamar, 2001).

AIM

Aim of this research was to find effect of regeneration means – cryo procedure for level of raction abilities in soccer

HYPOTHESIS

H – We assume that cryo procedure as a new regeneration means has positive effect on the level of disjunctive reaction abilities.

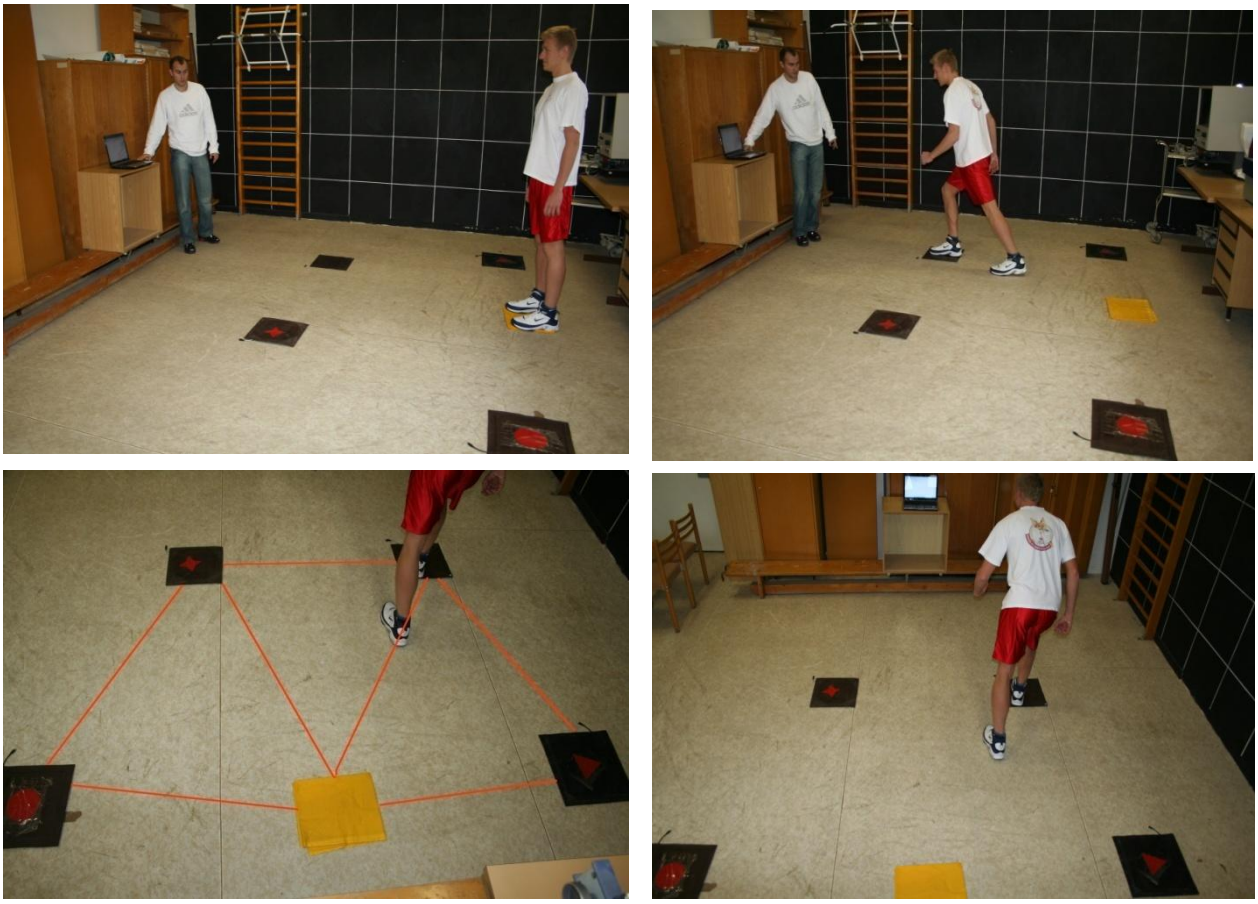
METHODS

Characteristics of tested group

Fifteen top level soccer players participated in our research. They were in age from 17 up to 19 years old and played 1. Junior leaugue in team SK Slovan Bratislava.

Agility test – test for disjunctive reaction abilities

For diagnostics of disjunctive reaction abilities we used Agility test with equipment FiTRO Agility check (Zemková - Hamar , 2001). This equipment consists of the personal computer and four mattresses located on the ground (picture 3). The tested persons had to touch with right or left lower extremity one of four mattresses (size 0,35x0,35 m each) mas it was seen on display, so the task of tested person is to process the optical stimulus (sensoric and decision component) and execute the correct motoric response (motoric component). The advantage of this test is that it also covers the speed of the lower extremities (Zemková, 2008). There were two series of 20 random generated stimuli, 5 to each direction with time interval of 800 ms. The mean of better serie was taken into the consideration (Hamar, Zemková, 1998).



Picture 3 Agility test – testing of disjunctive reaction time

Sterting position was in the middle of all touch points, distances were 3 meters among them and 3 meters from athlete.

Experimental factor

Cryo procedure was the experimental factor in our research and athletes had to insert their lower extremities into basin with cold water and pieces of ice. During application of cryo procedure we followed in this way: athlete stood on the chair, then into basin which was prepared and fullfiled with cold water and ice. Water temperature achieved approximately

plus 7 degrees Celsius. Duration of one session was 10 minutes which was based on previous experiences. Procedures were realized under the control of head researcher as it is seen in pictures 5 and 6. Preparation phase is illustrated in Picture 4.

Picture 4

Picture 5

Picture 6

Research organisation

All measurement of regeneration efficiency by using cryo procedure were realised in laboratory conditions of Faculty of Physical Education and Sports in Bratislava, Slovakia. Research lasted two days and consisted of three testings in off season period in June. First testing was before performance, then followed testing after performance and the third was testing after cryo procedure. After short warming up players had the first testing which showed entry level of dijunctive reaction abilities. Then came loading represented by 400 meters run where 60 seconds time limit has been established. Then followed the second testing. Finaly the regeneration procedure was applied and after that the third testing was done. After cryo procedure aplication all players did warming up for six minutes by using low intensity running.

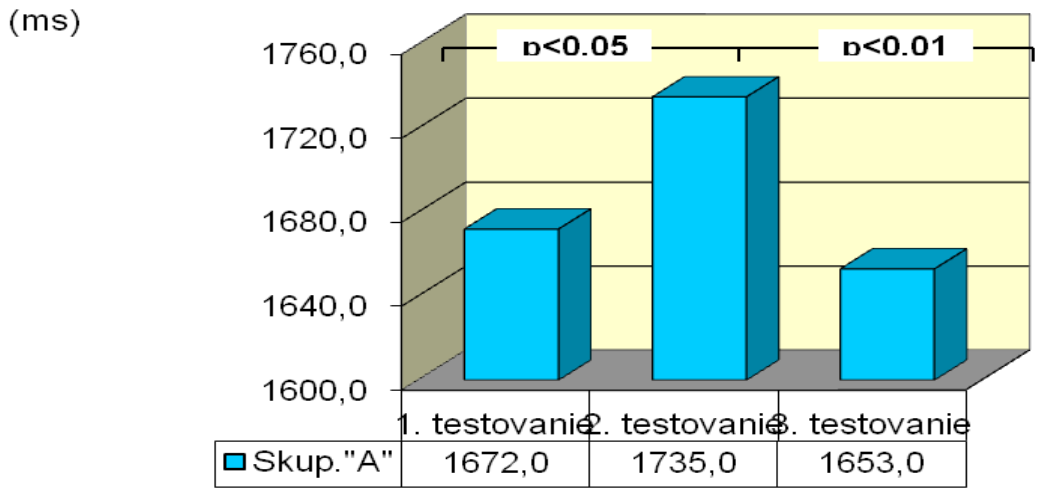
RESULTS AND DISCUSSION

Evaluation of disjunctive reaction time

For evaluation of achieved results we used basic statistic parameters (median, variance, minimum, maximum, mean, standart deviation). Comparison between testings were calculated with the hepl of nonparametric Wilcoxon T-test. Values are in miliseconds (ms).

Test 1 – before sport eprformance achieved values 1672 ± 352 ms, test 2 – after sport performance had values 1735 ± 415 ms and tha last test 3 – after cryo procedure showed results 1653 ± 452 ms. All mentioned results are presented in picture 7. There appeared high significant difference between test after sport performance (test 1)and after regeneration means – cryo procedure (test 2) on level $p < 0,01$. This difference confirmed our hypothesis.

Median (after cryo procedure)



Picture 7

Legend:
1. – before performance
2. – after performance
3. – after pasive relax

Applied cryo procedure (disjunctive reaction abilitiy)

Table 1: Cryo procedure (disjunctive reaction ability)

		Test 1 – before sport performance			Test 2 –after sport performance			Test 3 –after cryo procedure		
	Name	**1.**	**2.**	**Max.**	**1.**	**2.**	**Max.**	**1.**	**2.**	**Max.**
1.	P.P.	1794	1743	1794,0	1660	1706	1706,0	1588	1562	1588,0
2.	A.S.	1682	1613	1682,0	1586	1556	1586,0	1511	1505	1511,0
3.	A.V	1621	1597	1621,0	1618	1620	1620,0	1548	1535	1548,0
4.	S.J	1583	1591	1591,0	1735	1676	1735,0	1627	1653	1653,0
5.	Z.T	1578	1672	1672,0	1788	1754	1788,0	1640	1622	1640,0
6.	P.W.	1668	1610	1668,0	1889	1811	1889,0	1701	1713	1713,0
7.	S.H.	1609	1555	1609,0	1719	1779	1779,0	1570	1603	1603,0
8.	G.A.	1635	1592	1635,0	1724	1695	1724,0	1514	1525	1525,0
9.	M.C.	1892	1815	1892,0	1921	1891	1921,0	1810	1743	1810,0
10.	R.F.	1625	1610	1625,0	1713	1695	1713,0	1702	1689	1702,0
11.	J.G.	1831	1743	1831,0	1972	1897	1972,0	1813	1749	1813,0
12.	P.B.	1943	1891	1943,0	2001	1994	2001,0	1941	1963	1963,0
13.	R.M.	1845	1813	1845,0	1923	1894	1923,0	1824	1883	1883,0
14.	T.B.	1634	1691	1691,0	1702	1725	1725,0	1603	1673	1673,0
15.	M.B.	1516	1601	1601,0	1689	1708	1708,0	1542	1536	1542,0

	Test 1 – before sport performance			Test 2 - after sport performance			Test 3 - after cryo procedure		
	A1	A2	A3	B1	B2	B3	C1	C2	C3
Average.	1697,1	1675,8	1713,3	1776,0	1760,1	1786,0	1662,3	1663,6	1677,8
St.dev.	129,65	102,47	116,05	131,95	118,08	126,49	131,78	132,98	137,12
Median	1635,0	1613,0	1672,0	1724,0	1725,0	1735,0	1627,0	1653,0	1653,0
Min	1516	1555	1591	1586	1556	1586	1511	1505	1511
Max	1943	1891	1943	2001	1994	2001	1941	1963	1963
Var	427	336	352	415	438	415	430	458	452

	A3	B3	C3
Average	1713,3	1786,0	1677,8
St.dev.	116,05	126,49	137,12
Median	1672,0	1735,0	1653,0
Min	1591	1586	1511
Max	1943	2001	1963
Var	352	415	452

Pair	A3 –B3	A3 - C3	B3 -C3
Wilcoxon	2,442*	1,278	3,379**
Sign.	p < 0,05		p < 0,01

CONCLUSIONS

It is confirmed that cryo procedure as a new modern means improves speed and quality of response which was expressed by duration of disjunctive reaction time for lower extremities. Also the whole regeneration process seems to be faster.

Conclusions for sport praxis

We suggest to apply cryo procedure to places where absents till now and in case of using for adults, it is possible to use it in junior categories as well. Main reasons are high effectivity and low expenses. Suitable activity shoul be offered information to sport public, especially to regeneration persons, masseaurs, physiotherapists. Last but not least seems to be very useful to transfer these knowledges to coaches, sport managers and their cooperated staff. Except of faster regeneration of reaction abilities we could clearly recognize faster treatment of muscle injuries, microtraumas, muscle fever and other damages.

REFERENCES

1. ŠTULRAJTER, V. – JÁNOŠDEÁK, J.: Niektoré fyziologické aspekty regenerácie a masáže. In: ŠTULRAJTER, V., JÁNOSDEÁK, J., et al.: Regenerácia a masáž. Bratislava : Peter Mačura – PEEM, 2003, s. 32–53.
2. ŠTULRAJTER, V.: Prednáška o regenerácii, Rukopis. 2007

3. ŠIMONEK, J. – ŠTULRAJTER, V.: Reakčná schopnosť. In: SÝKORA et al., Telesná výchova a šport. Terminologický a výkladový slovník. (Vol. 2). Bratislava : Vydavateľstvo F.R.G., 1995. 215 s.
4. KRIŽAN, L.: Fotografia kryoprocedúr Realu Madrid. Osobná informácia, 2007.
5. KOMADEL, L. – ŠTULRAJTER, V.: Reakčný čas. In: Komadel, et al., Telovýchovné vademecum, Bratislava, Slovenská Spol. telových. Lek. Berlin- Chemie, Menarini Group, 1997, s. 169-170.
6. ZEMKOVÁ, E.: Diagnostika koordinačných schopností. Bratislava : Peter Mačura – PEEM, 2008. 116 s.
7. ZEMKOVÁ, E. – HAMAR, D.: Posudzovanie dijunktívnych reakčno-rýchlostných schopností. Bratislava : Oddelenie telovýchovného lekárstva Ústavu vied o športe, FTVŠ UK v Bratislave, 2001. 32 s.
8. CABAN, E.: Liečenie lokálnym podchladením (hypotermiou) a pomocou extrémne nízkych teplôt (kryoterapiou). In: DINKA, P. et al.: Voda a chlad. Bratislava : Formát @ Liečreh Gúth, 2008, s. 191 – 197.
9. CABAN, E.: Kryoterapia. Banská Bystrica :2006. s. 61.
10. HOLIENKA, M.: Rýchlostné schopnosti a herný výkon hráča vo futbale. In: Pro futbal, roč. 2, 2004, č. 1, s. 26-28.
11. MALOVIČ, P.: Kryoterapia – Liečba chladom a jej možnosti využitia vo futbale. In: Tréner, 1998, č. 18, s. 40 – 41.
12. KAMPMILLER, T. – VANDERKA, M.: Teoretické východiská štruktúry a rozvoja silových schopností. In: MORAVEC, R. et al.: Teória a didaktika výkonnostného a vrcholového športu. Bratislava : FTVŠ UK, 2007, s. 89 – 106.
13. ŠIMONEK, J. – ZAPLETALOVÁ. L.: Koordinačné schopnosti (význam, charakteristika a rozvoj). In: ŠIMONEK, J.: Koordinačné schopnosti – Súbor regerátov zo seminára VMR SÚV ČSZTV : SÚV ŠZTV v Športe, 1985. 60 s.