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Research Article

Hockey Experimental Study on the Characteristics of Different Exercise Load

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Abstract: As times and technology advances, hockey movement with the hockey field of artificial ground improvement, hockey rod material improvement, rules changes and so on , the hockey players ' physical fitness and technique also had higher requirements. Research field hockey shooting technology, passing and catching skills, dribbling, sports competitions and small unit in different load characteristics of movement become hot. This research through the different physiological function load index, quantified shot technology, catch technology, dribbling technical movement, sports technical movement unit and small site game load related research, the results show that the movement technology action unit and small site game heart rate load is obviously higher than that of the total playing time and intermittent playing time heart rate load and pure game time load no significant difference; Different physiological function and energy consumption load index difference comparison shows, a single technical action of load between no significant difference, small site game load is obviously higher than that of the motion unit load.

Keywords: Experimental research, hockey, load characteristics, movement

INTRODUCTION

At present, there is a little research about hockey game tactics using load. For hockey training and match the load characteristics of the study often attack and keep technical movement times, running game indices such as statistical analysis. Although these studies to explore hockey load have certain help, but due to the characteristics of the hockey movement in the game, some technical movement is not pronounced movement distance and athlete's heart rate and energy consumption is very high, physiological function changes a lot, which produce high sports load. Action number of statistics can't accurately understand the consumption of athletes training and competition, so the single from attack and keep technical movement times, the game running distance index cannot from deeper understanding hockey game load characteristics. In recent years the heart rate table and portable movement heart lungs function tester and the development of instrument and equipment applied gradually in sports training, application of advanced instruments and equipment output of scientific research achievements, we develop the horizon for in-depth understanding of hockey movement form and game load characteristics opens up a new train of thought Reilly (1990).

Research has shown that basketball game is shooting; passing and other technical action heart rate load close with the playing time of heart rate load, but handball game shooting, passing and movement is a single technology is obviously higher than that of the game load heart rate (Aziz and Chia, 2000). The hockey game shooting, passing and other technical action is obviously lower than game heart rate load, this may have connection with the hockey players action with all kinds of technology, hockey club with local muscle movement range small technical movement, hockey can obtain larger impulse, produce the faster speed. Compared with the other ball games single technical movement, hockey individual technology action use muscles relatively less and movement range are also small, this may be caused by hockey single technical movement load index lower reason. Zhang (2008) using SUNNTO team edition heart rate table at a high level of basketball player game behavior load is analyzed, the study of the game behavior into attacking a ball behavior, without the ball behavior, defensive prevention with the ball and without the ball prevention behavior and comprehensive behavior and so on, these behavior is divided into several motion technology unit, such as: catch-breakthrough-shot; Catch a ball - fake - breakthrough-pass motion technology unit. The average heart rate of that college basketball team is 153.39+/-16.61 b/min, the study on individual technical movement, two technical movement combination, three technical movement combination, four technical movement combination and five technical movement combination unit of heart rate load separately carried on the analysis, with the combination of technical action unit a single technical movement increases, the heart rate load has also increased, a single technical movement load and two technical movement combination of heart rate and total game heart rate close, three, four, five technical movement combination of

heart rate load is obviously higher than that of the total game heart rate load (Zhang Wei, 2008). Lang and Liu (2010) with 4 vs 4 small ground game training method to Beijing youth women athletes for 3 months training. The results show that 4 to 4 training method can effectively improve the athlete's body function and movement quality, in aerobic capacity, lactic acid decomposition and strength increased obviously, etc. Beijing youth football women with 4 to 4 game method for training the average heart rate reached 177 b/min above, maximum oxygen uptake of 94.81 ml/min/kg; Three months to 4 vs 4 games before and after the training method of increasing load test run table shows that young women's athletes maximum oxygen uptake, average heart rate and acid proof ability all have different degrees of improvement and statistics show that differ significantly.

Hockey is the same confrontational collective ball project, to become a good hockey player at least to have the following several aspects: the ability of physical fitness, techniques and tactics. In addition to the above characteristics besides, hockey player body function development is also very important. Game analysis clearly shows a high level of hockey game has high strength, non continuous and intermittent load characteristics, this determines the athletes in the game body function change is very complicated and the hockey classified as high load movement. Foreign researchers put hockey player physiological function is divided into aerobic capacity and anaerobic capacity. As the same with other confrontational collective ball events, hockey run is intermittent, including runs of different acceleration and deceleration, transform run in different directions (Feng *et al.*, 2003). Dribbling in a body half-bent State and load on the run is Hockey's unique characteristics compared with other with confrontational collective ball project which is hockey to impose additional athletes and loads of unique features. Research has shown that hockey game ball handling time of the whole game time 17.5-30%, dribbling with the result of the match has important influence (Ling *et al.*, 2011). The study of Reilly (1990) and Seaton. A shows that hockey players need to unique body posture and technology action, including running and dribbling all need trunk half equine posture movement. They bowed to the trunk bending dribbling technology caused by the action of physiological load was measured, 7 man on a treadmill hockey players per hour 8, 10 km speed run 5 min, participants in the same speed dribble 5 min, the energy consumption dribble than running more than 15-16 kj/min, heart rate and subjective sense of sports load has also increased. The trunk bending and dribble movement is the main reason for the increased load.

Dai (2006) Song, using the MAX-II gas metabolic system measuring walking and running speed of different energy consumption, the study found that with the increase of the running speed, the unit time of heart rate, oxygen uptake, respiratory quotient, total energy consumption and unit energy consumption gradually increase; Jiang (2011), use Cortex MetaMax 3B portable gas metabolic instrument separately carried on the run table and field test speed increases gradually running, the study found that, along with the movement of the load increases gradually, oxygen uptake, relative oxygen uptake, respiratory quotient, minute ventilation, heart rate, energy consumption and energy consumption per kilogram of body weight of load index gradually increase.

This study applies K4b2 movement cardiopulmonary function tester and Santo heart rate table, simulation hockey game main technical movement, in training experiment test, it is concluded that some single action, combined action and small venues local game against some of the sports load indicators, in order to obtain the hockey movement form in the game physiological function, energy consumption and heart rate and other load index change characteristics of hockey different sports form of load characteristics have a thorough understanding, in order to better guide hockey training, for hockey movement to raise the level of training provide scientific basis.

THE RESEARCH OBJECT AND RESEARCH METHOD

The research object: Tianjin men's hockey team athletes for the test object. Each test select 3 people, forward, avant-garde and defender players each one, five test of 15 people, are all above level athletes.

Measuring instrument: To test use portable K4b2 cardiopulmonary exercise functional tester and Suunto heart rate meter to measure the different forms of exercise energy consumption and exercise stress, wear a closed mask, during the test, through the connection mask pipe collect subjects inhalation and breathe out of gas and through this system for gas analysis, frequency for every 5s sampling time, wearing a face mask with comfortable for degrees. Output results including Heart Rate (HR), respiratory frequency RF, Tidal Volume (VT), Ventilation (VE), Oxygen uptake (VO2), per Kg weight oxygen uptake (VO2/Kg), oxygen pulse (VO2/HR), Energy consumption (EEm) per kilogram of body weight and energy consumption (EEKg), etc.

Test content: First, a single technical movement include: Shooting: In the hockey field, ball placed in solid line arc line, continuous ten times to shoot, Pass and catch the ball: In the hockey field, Half distance long pass balls and catch ball, continuous ten times; dribble: In the hockey field, Dribble distance for 1/4 hockey venues, For the first time, Linear dribbling, For the second and third time, Continuous around to call the ball, the athletes in the state of maximum speed dribble, each dribble between athletes not fully recovered, the heart rate back to 130, start the next dribble. Second, Motion unit: A quarter of hockey venues, left right continuous dial the ball-the long pass ball-a quarter site sprints-stop 3 sec-a quarter site sprints-a quarter site

jogging-after receiving full shot. Third, small site game: 5 vs 5 small ground games, field size is 20×30 m, playing time 3 min, the game use several balls, immediately after the ball went out of bounds for the ball, immediately after a foul penalty, match reduce intermittent time, keep the continuity.

RESULTS AND ANALYSIS

The hockey project is consist of different running speed, different load a single action, different sports technology unit, game rarely appears simple one action sports load, Basically different speed ranges running confrontation conditions to the completion of a technical action or some combination of technical action and the real game is hard to copy, Therefore, the study on the training condition test hockey single technical movement, movement unit and small site game load and with the game analysis of load for the coaches make training program, select training method, determining the training load measurement provide a reference basis.

Various forms of exercise hockey game heart rate and heart rate load contrast: A single technical movement, movement technology unit and small site game of heart rate respectively with the Tianjin man lacrosse players in the game of total playing time heart rate, pure game time heart rate and intermittent playing time heart rate were compared. The total time heartbeat is average heart rate of the game time; Intermittent game time heart rate is that the game play is interrupted time suspended, substitutions, fouls, ball out of bounds, the athletes were injured happens, referee blows his whistle or game stop start, at the end of the game to start the heart rate, Pure game time heartbeat is rest and remove the game play is interrupted time of heart rate, Concrete such as Table 1, 2 and 3.

The results of the study show that, Shot, catch and dribble three technical movement between heart rate load have no significant difference; The above three action of heart rate load was significantly lower than the movement technology unit of heart rate load and small site game of heart rate load; Motion unit of heart rate load is obviously less than small ground game load. Show that the above three single technical movement of the load is low. Motion unit and small site game of heart rate load is obviously higher than that of the total playing time and intermittent playing time of heart rate load; there is no significant difference between motion unit of heart rate load and pure game time heart rate load; Small ground game heart rate load is obviously higher than that of the pure game heart rate load. This suggests that motion unit and small site game load is higher, especially the small court game of heart rate load is obviously higher than that of the other sports form of heart rate load.

Through the field observation and interview the coaches and athletes to know that the small field strength of the game than formal the field of play, Many competing antagonistic collective ball games the competitive level of developed countries in a big load coach training class, not only with running method, but the small site training method. This fully shows the small court game load is very big, small site game training method can be used as a big strength training method, Small site training method heart rate load more than pure game time heart rate load and high load training content and way close to the practice. The training mode was significantly better than that from the game simple track and field type running practice and simple strength training Of course also cannot deny

Table 1: Hockey players all competitions total game time, intermittent playing time, pure game time heart rate list

Name	Total game time	Pure game time	Intermittent playing time
Heart rate	156.13±10.08	165.26±4.64	153.5±8.2

Table 2: Hockey different forms of exercise heart rate list

Name	Shooting	Passing and catching	Dribbling	Sports unit	Small ground game
Heart rate	145.26±7.20	142.08±6.27	147.16±9.43	165.66±11.15	170.84±8.93

Table 3: Different movement forms and different game time heart rate multiple comparison

Name	Shooting	Passing and catching	Dribbling	Sports unit	Small ground game
Total game time	0.000	0.000	0.001	0.000	0.000
Pure game time	0.000	0.000	0.000	0.881	0.031
Intermittent playing time	0.000	000	0.012	0.000	0.000

Table 4: The list of hockey experimental study on the characteristics of different exercise load

Name	Shooting	Passing and catching	Dribbling	Sports unit	Small ground game
RF (b/min)	33.42±6.19	33.80±5.95	32.70±5.26	41.92±4.83	42.20±5.25
VT (l)	0.96±0.31	1.01±0.21	1.22±0.28	1.52±0.31	1.66±0.10
VE (l/min)	31.47±10.00	33.30±5.14	41.74±7.14	65.86±10.37	69.62±8.32
VO2 (ml/min)	1377.12±552.91	1494.19±313.76	1599.16±422.39	2248.16±598.21	2524.76±371.65
VO2/Kg(ml/min/kg)	20.34±8.22	21.99±4.70	23.20±6.97	33.10±8.89	37.10±5.59
VO2/HR(ml/bmp)	9.38±3.64	10.47±2.05	10.66±2.86	13.47±3.14	14.74±1.82
EEm(Kcal/min)	6.37±2.56	6.90±1.45	7.63±2.14	11.30±2.87	12.65±1.73
EEKg (Kal/kg/day)	134.88±53.48	146.00±29.77	161.26±44.73	239.05±60.25	267.61±35.90

Table 5: Research the different forms of exercise load comparison list

Name	F(b/min)	VT (l)	VE (l/min)	VO2 (ml/min)	VO2/Kg (ml/min/kg)	VO2/HRml/bmp	EEm(Kcal/min)	EKg(Kal/kg/day)
P	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

running training and strength training effect, but small site matches can be used as high strength training methods and means.

Hockey different forms of exercise load characteristics analysis: At present has not yet found a way to use portable gas breathing apparatus to collective ball games played load and forms of exercise load measurement. Using relevant instrument measuring the research mainly is walking and running speed of different physiological function load index and energy consumption, This research use Italian K4b2 portable cardiopulmonary function instrument measuring hockey athletes different motion forms of load characteristics, The statistical results such as Table 4 and 5.

These study different forms of exercise load index as the load increased and a single movement technology and movement between units and small site game between different load index significantly.

The results showed that shooting, passing and catching. Such as a single technical movement of physiological function and energy consumption load index was significantly lower than the motion unit and small site game load index and motion unit load was significantly lower than the small court game load.

The results of the study and hockey different motion forms of heart rate load index research results are consistent.

CONCLUSION

Through the different physiological function, energy consumption and heart rate load index, quantified shot technology, passing and catching technology, dribbling technical movement unit, sports technical movement unit and small site game load.

Shooting, catching and dribbling technology action heart rate load was significantly lower than the total game time, intermittent game time and pure game time heart rate load; Sports technical movement unit and small ground game heart rate load is obviously higher than that of the total playing time and intermittent playing time heart rate load, motion unit and pure game time heart rate load no significant difference; Small ground game heart rate load is obviously higher than that of the pure game time heart rate load. Different physiological function load index have significant differences, sports technical movement unit and small site game load is obviously higher than that of the shot, catch and dribbling and single technical movement load, a single technical movement load no significant difference, small site game load is obviously higher than that of the motion unit load.

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