

THE DYNAMICS OF CHANGES IN THE INDICES OF SPECIAL PHYSICAL PREPAREDNESS OF PROFESSIONAL FIELD HOCKEY PLAYERS BY APPLYING THE METHOD OF «ENDOGENOUS-HYPOXIC BREATHING»

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Abstract

In preparing of professional field hockey players we should use the additional tools that would help to improve the abdominal type of breathing. This fact would have the positive impact to the improving of their special physical preparedness. *The goal of the* research is to identify the influence of learning and training classes with the use of the method of creating the state of hypercapnic hypoxia on specialized physical preparedness of field hockey players on the stage of the highest possible realization of individual abilities. *Results of the study.* 29 field hockey players aged 19–21 took part in the study. The study was conducted for 24 weeks of the first preparatory and competitive periods of yearly macro cycle. During the shaping experiment, the athletes' starting speed increased by 10 and 30 meters in 4,37 and 1,89 %, respectively, and the result of the «shuttle run 180 m» test (in 0,73 %) also improved. In hockey players on the grass of the control group, only the running time by 10 m decreased (in 3,21 %). *Conclusions.* It has been established that studies using the «endogenous-hypoxic breathing» technique contribute to a significant increase in the starting speed and special endurance in conditions of providing muscular work at the expense of lactate energy supply processes.

Key words: field hockey, hypoxia, hypercapnia, physical preparedness.

Алла Сулима, Наталія Гаврилова. Динаміка змін показників спеціальної фізичної підготовленості кваліфікованих хокеїстів на траві за допомогою застосування методики ендогенно-гіпоксичного дихання. *Актуальність.* У підготовці кваліфікованих хокеїстів на траві варто використовувати додаткові засоби, які б сприяли вдосконаленню черевного типу дихання, що позитивно впливатиме на підвищення рівня їхньої спеціальної фізичної підготовленості. *Завдання* – визначення ефективності впливу навчально-тренувальних занять із застосуванням методики ендогенно-гіпоксичного дихання на підвищення рівня спеціальної фізичної підготовленості кваліфікованих хокеїстів на траві. *Результати.* У дослідженні взяли участь 29 хокеїстів на траві віком 19–21 рік. Дослідження проводили протягом 24 тижнів у перший підготовчий і змагальний періоди річного макроциклу. За період формувального експерименту в спортсменів зросла стартова швидкість за результатами бігу на 10 і 30 м на 4,37 та 1,89 %, відповідно, а також покращився результат тесту «човниковий біг 180 м» (на 0,73 %). У хокеїстів на траві контрольної групи зменшився лише час бігу на 10 м (на 3,21 %). *Висновки.* Установлено, що заняття із застосуванням методики «ендогенно-гіпоксичного дихання» сприяють вірогідному підвищенню стартової швидкості та спеціальної витривалості в умовах забезпечення м'язової роботи за рахунок лактатних процесів енергозабезпечення.

Ключові слова: хокей на траві, гіпоксія, гіперкапія, фізична підготовленість.

Алла Сулима, Наталія Гаврилова. Динамика изменений показателей специальной физической подготовленности квалифицированных хоккеистов на траве путем применения методики эндогенно-гипоксического дыхания. *Актуальность.* В подготовке квалифицированных хоккеистов на траве следует применять дополнительные средства, которые бы способствовали совершенствованию брюшного типа дыхания, положительно влияли на повышение уровня их специальной физической подготовленности. *Задание* – определение эффективности влияния учебно-тренировочных занятий с применением методики эндогенно-гипоксического дыхания на повышение уровня специальной физической подготовленности квалифицированных хоккеистов на траве. *Результаты.* В исследовании приняли участие 29 хоккеистов на траве в возрасте 19–21 год. Исследование проводили в течение 24 недель в первый подготовительный и соревновательный периоды годичного макроцикла. За период формирующего эксперимента у спортсменов повысилась стартовая скорость по результатам бега на 10 и 30 м на 4,37 и 1,89 %, соответственно, а также улучшился результат теста «челночный бег 180 м» (на 0,73%). В хоккеистов на траве контрольной группы уменьшилось только время бега на 10 м (на 3,21 %). *Выводы.* Установлено, что занятия с применением методики эндогенно-гипоксического дыхания способствуют достоверному

повышению стартовой скорости и специальной выносливости в условиях обеспечения мышечной работы за счет лактатных процессов энергообеспечения.

Ключевые слова: хоккей на траве, гипоксия, гиперкапния, физическая подготовленность.

Introduction. Long-term sport training of qualified field hockey players is a special-purpose process of physical education, based on using of various physical exercises with a purpose to develop and improve physical qualities and abilities which determine the preparedness of a sportsman to take part in competitions [5; 7]. The fulfillment of physical activity during a game of field hockey players gets complicated by so called «typical» pose – a bent position of a trunk that causes an insignificant tension of muscles of shoulder girdle which increases the hypoxia of physical load [8]. Under such conditions as compensatory phenomenon a front wall of abdomen loosens up partly and this assists to the ventilation of a lower part of lungs through facilitation of work of abdominal prelum and diaphragm muscles which helps to compensate the insufficient ventilation of upper and lower parts of lungs [9]. Therefore it is reasonable to intensify the ventilation of lungs of field hockey players at the expense of activation of abdominal type of respiration through the increase of functional abilities of aforesaid muscles.

The analysis of scientific methodological literature allowed to define that various means are used during the learning and training process of sportsmen for the complete realization of functional reserves of an organism on different stages of a long-term sport training [2; 4; 10]. These methods increase the effect of physical exercises. Thus, some scientists recommend to use special methods during a learning and training process in order to improve the physical preparedness of sportsmen with different specializations. These methods stimulate the state of hypoxia in sportsmen that is not concerned with «hypoxia of physical load [6; 14].

The methods of creating the condition of hypoxia in a sportsman's organism through the stay in hypobaric conditions are widely used. Pressure chambers or stay in the conditions of Srednogorie are used for it [2; 15]. However with the increase of altitude partial pressure of gases in the inhaled air is reduced which leads to the reduction of effectiveness of muscle activity in the conditions of the highland on account of lowered gradient of pressure, influencing negatively the transportation of oxygen to the tissues [3; 15]. Using of such a model of hypoxic training may lead to the negative structural changes in some organs which reveals itself in 25 % of sportsmen as collapses, faints, unequal reaction of arterial vessels [1; 6]. Therefore, the methods of creating the artificial hypoxia in normobaric conditions are safer and not less effective for the increase of level of physical preparedness of sportsmen. Among such methods some authors single out the method of «endogenous-hypoxic breathing» (EHB) with the use of the device «Endogenic-01» which allows to stimulate so called state of the moderate hypoxia and distinct hypercapnia, i.e. hypercapnic hypoxia under constant parameters of oxygen and carbonic acid contents [12].

In spite of the availability of works concerning the use of different additional means for intensification of the effect of physical exercises in a learning and training process of sportsmen with different specializations [4; 6; 10; 11; 14], scientific knowledge about the possibility of using the normobaric hypercapnic hypoxia during learning and training classes of qualified field hockey players. Therefore, having analyzed scientific-methodical literature we foresaw that the using of EHB method during a learning and training process of field hockey players will assist the increase of their specialized physical preparedness level during preparatory and competitive periods of yearly macro cycle.

The goal of the research is to investigate the influence of learning and training classes with the use of the method of «endogenous-hypoxic breathing» on the increase of the level of specialized physical preparedness of field hockey players.

For achieving this aim we solved such **tasks**:

- to study the state of the researched topic according to the data of scientific literature;
- to research the influence of learning and training classes with the use of the method of creating the state of hypercapnic hypoxia on specialized physical preparedness of field hockey players on the stage of the highest possible realization of individual abilities.

Materials and methods of the study. The viewing of literature sources; pedagogical observation; pedagogical experiment; pedagogical testing of specialized physical preparedness of qualified field hockey players during preparatory and competitive periods of yearly macro cycle, methods of mathematical statistics.

Applied methods of research allowed to define the indices which describe specialized physical preparedness of field hockey players of high qualification, namely: starting speed (10 meter race and 30 meter

high start race), speed-power qualities (5-time leap on two feet), special endurance in conditions of ensuring the muscle work at the expense of lactate processes of energy-supply (180 meter shuttle race) [7, 13].

Field hockey players aged 19-21 took part in the research. Sport qualifications of sportsmen are candidate masters of sports and masters of sports. Sportsmen were divided into two groups: Control group (CG) which numbered 14 people and a Main group (MG) – 15 people. Training classes were held six times a week. Field hockey players from the CG were training in accordance with a regular learning and training programme [13]. Sportsmen of the MG, as opposed to the CG used at the beginning of the prefatory part the method of artificial creating of moderate hypoxia and distinct hypercapnia in an organism by respiration through the device «Endogenic-01 according to the formed «route map [9]. This method expects stepped adaptation to the norm baric hypercapnic hypoxia through increase of the water amount in the device (from 2 ml to 20 ml), increase of the time of a slowed exhalation (from 8 seconds to 27 seconds), and also the increase of the classes duration (from 2 min to 20 min).

The checkup of sportsmen had four stages: before the shaping experiment and also after 8, 16 and 24 weeks from the beginning. Observable indices were registered in the morning (between 9 and 13 o'clock). For determination of the effectiveness of influence of classes with use of method EHB on specialized physical preparedness of qualified field hockey players we were comparing average arithmetic values of linked samples and we were determining credible distinctions between them by criterion of Student.

Discussion and the results of the study. Results of the research showed that learning and training classes with use of the method EHB and use of the device «Endogenic-01 stimulate positive changes of the indices of specialized physical preparedness. In 8 weeks after the start of shaping experiment no credible changes were revealed among the indices of specialized physical preparedness (table 1).

Researches testified that in 16 weeks after the start of the experiment such indices of specialized physical preparedness as start speed improved among field hockey players according to the results of 10 meters and 30 meters race thereafter by 3,28 % ($p<0,05$) and 1,18 % ($p<0,05$). It is significant that among field hockey players of CG credible improvement of only the test's result of «10m race with a head start is registered. And it appeared to be somewhat lower in percent correlation than the result among sportsmen of the MG. The time of 10m race among field hockey players of MG was reduced to 2,13 % ($p<0,05$).

Table 1

The Influence of Training Classes with the Use of the Method of «Endogenous-Hipoxic Breathing on the Indices of Specialized Physical Preparedness of Field Hockey Players of Control (n=14) and Main (n=15) Groups

Indices		Average values, $\bar{X} \pm S$			
		Before the Shaping Experiment	After 8 Weeks From the Beginning	After 16 Weeks From the Beginning	After 24 Weeks From the Beginning
10m race with a head start, s	CG	1,87±0,01	1,86±0,01	1,83±0,01*	1,81±0,02*
	MG	1,83±0,02	1,80±0,02	1,77±0,02*	1,75±0,02*
30m race with a head start, s	CG	4,27±0,01	4,24±0,01	4,23±0,02	4,21±0,02
	MG	4,22±0,02	4,20±0,01	4,17±0,01*	4,14±0,01*
180 meter shuttle race, s	CG	38,20±0,10	38,17±0,19	38,14±0,19	38,06±0,18
	MG	38,13±0,10	38,09±0,09	37,99±0,08	37,85±0,07*
5-time leap on two feet, m	CG	12,12±0,07	12,14±0,06	12,15±0,07	12,16±0,12
	MG	12,09±0,08	12,18±0,10	12,2±0,08	12,23±0,07

Notes: CG – Control group; MG – Main group; * – credible changes relative data-out ($p<0,05$).

During the shaping experiment among qualified field hockey players who were not using the method of «endogenous-hypoxic breathing the increase of the result of a 180 meter shuttle race is observed which is a token of increase of specialized endurance in conditions of ensuring the muscle work at the expense of lactate processes of energy-supply. But the credible changes of this index are not registered.

Influenced by the trainings in which the method of creating the state of norm baric hypercapnic hypoxia in an organism of a sportsman was used, the credible increase of the index of specialized physical preparedness by the test «180 meter shuttle race was registered among field hockey players of the MG after

24 weeks since start of the classes. This test characterizes specialized endurance in conditions of ensuring muscle work at the expense of lactate processes of energy-supply to 0,73 % ($p < 0,05$).

It is significant that both in two groups of sportsmen during the period of holding the shaping experiment no reliable changes of explosive power in conditions of fulfillment of dynamic work by test «5 times leap on two feet are revealed.

Conclusions. The analysis of scientific-methodological literature concerning training of qualified sportsmen makes possible to state that it is reasonable to use additional means of training in order to increase the effectiveness of learning and training process. The method of creating the artificial state of the moderate hypoxia and distinct hypercapnia in an organism is the safest and effective.

The results of the researches testified that using of the method of «endogenous-hypoxic breathing with using of the device «Endogenic-01 during learning and training process of the field hockey players assist the improvement of specialized physical preparedness by the following indices: start speed, specialized endurance in conditions of ensuring the muscle work at the expense of lactate processes of energy-supply.

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