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EVALUATION OF THE PHYSIOLOGICAL INDICATORS OF TRAINING LOADS OF YOUNG LIGHT ATHLETIC SPRINTERS

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Abstract
This article examines the impact of specialized running loads on the physiological state of 13-14-year-old girls engaged in track and field (sprint). The main attention is paid to the indicators of the cardiovascular system, heart rate variability (HRV), and recovery rate after anaerobic loads. The research is aimed at optimizing the training process, taking into account the age-related characteristics of the body.

Keywords. Track and field sprinters, physiological indicators, cardiovascular system, training process, age.

Introduction

Аннотация
В данной статье рассматривается влияние специализированных беговых нагрузок на физиологическое состояние девушек 13–14 лет, занимающихся легкой атлетикой (спринт). Основное внимание уделяется показателям сердечно-сосудистой системы, вариабельности сердечного ритма (ВСР) и скорости восстановления после нагрузок анаэробного характера. Исследование направлено на оптимизацию тренировочного процесса с учетом возрастных особенностей организма.

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Ключевые слова: Легкоатлеток-спринтеров, физиологических показателей, сердечно-сосудистой системы, тренировочного процесс, возраст.

Introduction

Track and field is one of the most popular sports. The growth in sprint achievements is primarily determined by the improvement of the start and the runner's training methods. Sprint is a visiting card for track and field and, despite its speed, is the most spectacular sport, especially when highly qualified sprinters are running. Highly qualified sprinters achieve this through thorough development and training of motor qualities and building logical biomechanics, which allows them to effectively and quickly implement these qualities on the running track [2].

Short-distance runners' physical load carries work of maximum intensity (80-90% of maximum) and minimum duration (5-20 seconds), which is provided by the creatine phosphate system. The training work performed is carried out with a high heart rate and places high demands on the cardiovascular system of sprinters. Such physical loads often lead to the depletion of the athlete's body's adaptive potential and the development of a state of maladaptation, which can affect the autonomic maintenance of heart rhythm, central hemodynamic parameters, and physical performance as an indicator of health [1]. Consequently, it is important not only to apply various training methods but also to monitor the athlete's condition, which is based on knowledge of the biological processes actually occurring in the human body.The age of 13-14 is a crucial stage in the training of track and field athletes. On the one hand, this is the period of active formation of speed-strength qualities, and on the other hand, the time of deep physiological restructuring (puberty). An error in the dosing of sprint load intensity can lead to fatigue and failure of adaptation.

Purpose of the Research

Identify the dynamics of physiological markers in response to training loads of various orientations in sprinters of this age group. The study involved (n-6)

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female athletes aged 13-14 years. The following indicators were used to assess: heart rate (HR) at rest, at peak exertion, and during recovery. BP (Arterial pressure) for assessing a vegetative reaction. Ruffier-Dixon test for determining heart function. Response time for assessing the state of the central nervous system (CNS) after serial starts.

Research Results

During the observation of the training cycle, the following data were obtained:

Type of load and HR by training cycle for 13-14 year old track and field athletes

Load type peak Lactate level (calculated)	HR (beats/min)	Recovery time up to 120 beats/min	Lactate level (calculated)
30-60m Repeat Run	185–195	2–3 minutes	High
Technical work	140–160	1 minute	Low
Tempo run	170–180	4–5 minutes	Average

Repeated running (30-60 m) Maximum HR values (185-195 bpm) indicate high body mobilization and adequate response to speed load. Recovery time (2-3 min) is standard for this age, confirming good adaptation to anaerobic loads.

The technical work indicators of heart rate (140-160 bpm) and rapid recovery (1 min) indicate that the work is proceeding in a "comfort" zone. This allows athletes to focus on the biomechanics of movements without accumulating critical fatigue.

The longest recovery (4-5 min) at a moderately high heart rate (170-180 bpm) indicates a significant accumulation of metabolic products (lactate). For 13-14 years old, this is the most energy-intensive type of work, requiring strict control of rest breaks.Load adequacy: The recorded HR indicators correspond to age norms and the specifics of sprint training. Recovery dynamics have shown that fast running requires 2 times more recovery time compared to short sprints, despite the lower peak HR.

Practical advice: when conducting repeated runs, maintain a pause of at least 3 minutes between runs to fully restore the phosphagene system.When running at

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a speed, increase the rest intervals or reduce the volume if the recovery time exceeds 5 minutes to avoid overtraining.

The SSS reaction in 30% of subjects shows slowed recovery after glycolytic-oriented loads, indicating incomplete formation of energy supply mechanisms.

The impact of high-intensity sprint loads on the CNS causes rapid fatigue of the nerve centers, which is manifested in the increase in the latent period of the motor reaction in the second half of the training.For 13-14 year old track and field athletes, it is recommended to individualize rest pauses, focusing not on time, but on the decrease in heart rate to 115-120 bpm.

Load Type	Average HRV	Conditional load (1-10)	Index (HR / Load)	Interpretation
Repeated sprint	190	10	19.0	High mobilization
Technical work	150	4	37.5	Economical mode
Tempo run	175	8	21.8	Mechanism tension

Control of cycle phases taking into account the biological age and phases of MC when planning maximum speed loads.Priority of the technique is the use of "unlimited" speeds (90-95% of max.) to prevent the formation of a "speed barrier" and excessive oxidation.

Calculation of the Heart Economy Index (IE). This indicator helps to understand what "price" the body pays for the work performed. We will calculate it as the ratio of the HR to the conditional intensity (load zones).

Conclusion:

The most "expensive" for the cardiovascular system of girls aged 13-14 is the tempo run, as with a relatively high heart rate, the recovery time is as long as possible.

Recovery index (K) to assess adaptation, we use the pulse rate drop formula:

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$$К = \frac{ЧСС\ max - ЧСС120}{T\ min}$$

Repeated sprint : $x = \frac{190-120}{2.5} = 28$ beats/minute

Technical work: $\frac{150-120}{1} = 30$ bpm/min

Tempo run: $\frac{175-120}{4.5} = 12.2$ beats/minute

Critical observation: the recovery rate in a fast run is 2.5 times lower than in a sprint. This indicates that the glycolytic mechanism of energy supply in 13-14 year old girls is not yet fully formed and is a "narrow point" of preparation.

Summary for the trainer. Sprint (30-60 m) can be used in full, the heart rate is excellent. Tempo running requires caution, and it is recommended to break the distance into shorter segments while maintaining the total volume to avoid "hanging" of the pulse at high values.

Conclusion

Physiological monitoring shows that the body of girls aged 13-14 has high plasticity, but is sensitive to overloads of the anaerobic type. Effective preparation should be built on the combination of narrowly specialized sprinting exercises with adequate recovery periods and control of vegetative tone.

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