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DETERMINING THE FUNCTIONAL STATE OF HIGHLY SKILLED BOXERS USING POLAR TEAM PRO TECHNOLOGY

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ABOUT ARTICLE

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Abstract: This article presents information on the functional state, distance covered, calories burned, and intensity zones of highly skilled boxers using Polar Team Pro technology.

Relevance.

In modern sports, monitoring boxers' technical, tactical preparation, and physical capabilities is essential. These aspects are continuously tracked during training and competitions. Considering the significant improvement in athletes' performance, it is crucial to emphasize their contribution to sporting achievements. Since the introduction of Polar heart rate monitoring technology, numerous studies have been conducted in the fields of sports, physical exercise, and health. More than 400 scientific studies have explored its application in competitive sports and training across various disciplines [2, 6], fitness and health-related exercises [1, 7], as well as rehabilitation [3, 4, 5].

Recent training methodologies highlight the necessity of using innovative technologies in athlete preparation, which is supported by expert teams and collaborative problem-solving strategies to provide valuable insights. From this perspective, achieving sporting success—particularly in boxing—requires high technology, including real-time functional state monitoring, GPS integration, and movement tracking of boxers.

Recent research indicates that the widespread use of technology in sports science has driven advancements in monitoring systems, integrating software and hardware solutions. Tracking energy expenditure through Polar technology is crucial for managing a boxer's diet and weight, especially during intense training periods or competition preparation. Burke et al. (2018) emphasized the importance of aligning caloric intake with training demands, helping to maintain muscle mass and reduce fatigue. Accurate calorie tracking ensures that athletes properly fuel their bodies during demanding training phases, optimizing performance and recovery.

Research Objectives and Methodology

Objective:

To determine the functional state of highly skilled boxers.

Tasks:

Utilizing Polar TEAM Pro technology to assess the functional state of elite boxers.

Research Methods:

- Analysis of scientific and methodological literature
- Pedagogical observations
- Pedagogical experiments
- Application of Polar TEAM Pro technology

Research Findings and Discussion

To evaluate the functional state of highly skilled boxers, training sessions of 10 athletes were analyzed during both conditional and free sparring. Table 1 presents the data on the distance covered, intensity zones, and kilocalories expended by boxers in the preparation phase for a prestigious competition.

Polar TEAM Pro technology provides specific requirements for each athlete and demonstrates the sequential dynamics of their preparation. Analysis of heart rate zones indicates that as boxers gain experience and skill, their ability to sustain effort in intensity zones and recover efficiently improves.

- Intensity Zone 1 (50-59% – Light Aerobic Zone):

This zone is characterized by low-intensity exercises, primarily used for warm-ups, recovery, and endurance training at low intensity. It enhances cardiovascular health while placing minimal stress on the body's systems, making it ideal for active recovery and preparation for more intensive workloads (Foster & Porcari, 2010).

Analysis of Heart Rate Zone Distribution and Training Load for Elite Boxers Using Polar

TEAM Pro Technology

Boxer	Time	HR		Distance km	Time in sport zones			
		Average	Maximum		50-59	60-69	70-79	80-89
X.D.	1:34:35	129	193	5.378	00:15:35	00:16:55	00:13:24	00:11:
SH.M.	1:34:35	131	216	7.335	00:10:39	00:33:23	00:26:52	00:10:
A.X.	1:34:35	136	195	6.927	00:16:02	00:17:34	00:25:22	00:15:
R.A.	1:34:35	154	192	8121	00:04:30	00:17:38	00:13:43	00:33:
D.A.	1:34:35	145	231	6.934	00:12:50	00:25:07	00:19:38	00:16:
M.T.	1:34:35	146	217	7.661	00:11:56	00:17:46	00:14:40	00:20:
X.A.	1:34:35	142	200	4.850	00:14:53	00:21:05	00:18:48	00:16:
J.Yo‘.	1:34:35	136	184	6.450	00:21:18	00:18:52	00:18:03	00:26:
A.Mo‘.	1:34:35	143	199	7.249	00:11:13	00:26:27	00:24:26	00:20:
N.T.	1:34:35	151	191	7.110	00:04:40	00:22:44	00:22:17	00:23:

Note: Boxer-Bokschi, Time-vaqt, Heart rate-yurak urish tezligi, Average-o‘rtacha, Maximum-maksimal, Distance km-Masofa km, Time in sport zones - Sport zonalaridagi vaqt, HR Zones (% of total time)-Yurak urish tezligi zonalari (% umumiy vaqtning), Kcal-kilokaloriya

Second Intensity Zone: 60-69% (Moderate Intensity Aerobic Zone).

In this zone, training intensity is moderate and aimed at improving the body's aerobic capacity. It strengthens the heart and lungs, enhances endurance, and improves the body's ability to use oxygen efficiently during prolonged exercise. This zone plays a crucial role in developing a strong aerobic base, which supports sustained energy expenditure during a fight (Jeukendrup & Gleeson, 2010).

Third Intensity Zone: 70-79% (Aerobic Threshold Zone).

Training at this level brings the athlete close to the lactate threshold, where lactate begins to accumulate more rapidly and becomes harder to clear. This intensity improves endurance and the ability to sustain prolonged exercise while delaying fatigue during extended physical exertion. Boxers training in this zone condition their bodies for prolonged high-intensity rounds (Seiler, 2018).

Fourth Intensity Zone: 80-89% (Anaerobic Threshold Zone).

This high-intensity zone is crucial for enhancing the body's ability to manage and clear lactate, which accumulates during intense physical activity. Training in this zone improves a boxer's anaerobic capacity, allowing them to perform high-intensity, short-duration explosive movements such as punches, combinations, and rapid footwork while developing resilience against fatigue (Mujika, 2019).

Fifth Intensity Zone: 90-100% (Maximal Effort Zone).

This is the highest level of effort, pushing the body to its physiological limits. Training in this zone focuses on maximizing power output and developing endurance for very short, high-intensity bursts of force, which are crucial for executing explosive movements during a fight. Additionally, working in this zone enhances recovery efficiency between maximal efforts (Buchheit, 2014).

In the study, when analyzing the functional state of highly skilled boxers using Polar TEAM Pro technology, it was found that athlete X.D. had a maximum heart rate of 193 bpm. His performance in the fifth intensity zone accounted for 17%, with a caloric expenditure of 694 kcal. In comparison, athlete M.T. covered a distance of 7,661 meters, spent 24% of the time in the fifth intensity zone, and burned 1,542 kcal. The functional condition analysis of these two athletes revealed that X.D. had a significantly higher training level and experience than M.T. The results also demonstrated that higher training levels and preparation enhance heart rate recovery.

In another comparison, boxer A.X. recorded a maximum heart rate of 195 bpm, while D.A.'s maximum heart rate reached 231 bpm. The total distance covered was 6,927 meters for A.X. and 6,934 meters for D.A., showing almost identical distances. However, despite working for the same duration in the fifth intensity zone, their caloric expenditure differed significantly. This analysis suggests that D.A. has a lower functional preparedness compared to A.X.

CONCLUSION

Utilizing Polar technology for heart rate monitoring and training load analysis provides valuable insights into the physiological demands of high-performance boxers. By examining time spent in different heart rate zones, coaches and athletes can tailor training intensities to achieve specific training goals, from developing aerobic endurance to enhancing anaerobic performance. Real-time monitoring and analysis of these indicators help optimize training plans, ensuring the right balance between high-intensity efforts and recovery, ultimately

leading to improved athletic performance. Incorporating Polar technology into training and recovery strategies is a key factor in optimizing the performance of elite boxers.

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