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The Effect of Walking on Akhal-teke Horses on the Recovery of Athlete's Training Fatigue

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Abstract

Based on theoretical and experimental scientific analyses, this study presents the scientific foundations of how horseback riding on Akhal-Teke horses improves athletes' training fatigue, recovery, and psycho-emotional state. The structure of the Akhal-Teke horse's body, the biomechanics of its movement, and concepts of hippotherapy were examined, measured at the scientific laboratory of the Turkmen State Institute of Physical Education and Sports. A total of 68 athletes from the national teams of Turkmenistan specializing in wrestling and various team sports participated in the study. Horseback riding in open air was conducted at the Turkmen Horse Breeding Complex, where relevant measurements were taken. A pilot study was conducted on a small sample group based on the hypothesis that interaction with a horse (horseback riding) positively influences the psycho-emotional state of an individual—leading to improved well-being, mood, increased activity, heightened psychological arousal, interest, emotional tone, and comfort, while reducing stress. It was concluded that horseback riding in sunny, open-air environments at high altitudes helps fully relieve fatigue and restore psychological balance in athletes. Therefore, we propose incorporating this method into regular training programs.

Keywords: Horseback Riding, Anaerobic Training, Recovery, Sunlight Exposure, Hippotherapy.

Introduction

The Akhal-Teke horse is a riding breed that was developed in the territory of present-day Turkmenistan approximately five thousand years ago. It is considered one of the oldest cultured horse breeds and has influenced many others, including the Arabian and Thoroughbred. This breed is distinguished by its unique appearance. It has a long back and loin with well-developed musculature, making it highly suitable for horseback riding. Its movements are elastic and comfortable for the rider, requiring no special riding technique [1].

The positive effects of horseback riding on human health have been known since the time of Hippocrates. Today, horseback riding is actively developing in Turkmenistan and around the world as a comprehensive health-enhancing method. It has a holistic impact on the human body, influencing physical, mental, and social spheres. Since ancient times, people have believed that horses absorb negative energy from humans and return positive energy. Alongside these traditional beliefs, modern science is now attempting to explain the mechanisms of horseback riding's beneficial effects on the human body and psyche.

The Akhal-Teke horse transmits approximately 110 oscillatory impulses to the rider per minute. These include vertical movements (against gravity), forward and backward shifts along the frontal axis, side-to-side sway around the sagittal axis, and diagonal movements across the body's center of gravity. The complex muscle activity of the horse, composed of numerous elements, provides a massaging and warming effect (as the horse's body temperature is about 1.5°C higher than a human's), par-

ticularly on the rider's leg muscles and pelvic organs, thereby improving blood circulation in the limbs.
Denis Diderot once wrote, that horseback riding holds first and primary plac among physical exercises

Horseback riding helps normalize the functioning of the central nervous system, cardiovascular system, respiratory and digestive systems. Its health benefits include:

- Physical and emotional interaction between horse and rider,
- Enhanced self-esteem and relief from depressive states,
- Improved motor coordination and normalized muscle tone.

Hippotherapy is a method of rehabilitation through horseback riding and is part of adaptive physical education. It is used for therapeutic purposes [2, 3]. Hippotherapy is recommended for children with cerebral palsy, amputations, arthritis, cerebral circulation disorders, traumatic brain injuries, sensory organ loss, myopathies, multiple sclerosis, epilepsy [4-10].

Recent studies have shown that hippotherapy positively affects the musculoskeletal system, circulatory organs, digestion, nervous, respiratory, and endocrine systems.

The positive psychological effects of equine-assisted interventions and hippotherapy are described in the works of K.S. Kovtun (2019), I.V. Motova and E.V. Selezneva (2021), M.A. Filatova-Safronova (2002), N.V. Ryzhkina, T.I. Tumasyan, A.Yu. Brovashova and A.N. Korban (2022), G.V. Sorokoumova and A.A. Pechnikov (2021), A.M. Choińska et al. (2022), and L. Badin et al. (2022).

Despite many years of research, horseback riding has not yet become a universally recognized method of psychological therapy and support. However, its unique influence on the human body is increasingly acknowledged due to the combination of physical activity, emotional engagement, and novel sensory input [11].

Since hippotherapy is primarily used for medical rehabilitation, it has not been applied for post-training recovery in athletes. As a result, there is a lack of scientific data on using horseback riding to alleviate training-induced fatigue. Thus, this research aims to investigate a new method for post-training recovery in athletes, making it a significant topic of scientific and methodological importance.

Method

Scientific Analysis

This scientific study employed methods including a review of scholarly literature, testing, modern measurement techniques, elements of mathematical statistics, and computer-based calculations using specialized software. The research was conducted at the Olympic Scientific Research Center of the Turkmen State Institute of Physical Education and Sports, while horseback riding sessions took place at the National Equestrian Complex of Turkmenistan. To assess changes in lactate levels in athletes, a portable express analyzer, Lactate Scout Analyzer, was used. It quickly and accurately determines the level of lactic acid in the blood from a single drop and provides results within 10–12 seconds; it is suitable for use in field conditions. To measure arterial blood pressure and heart rate, modern portable "Smart" fitness bracelets of the Healthband Pro No. 5M brand were used.

Practical Analysis

The study involved athletes from Turkmenistan's national teams in wrestling and team sports. A total of 68 athletes participated: 28 were Masters of Sport, 32 were Candidates for Master of Sport, and 6 held First-Class sports ranks. At the Olympic research center, athletes' heart rate (HR) and arterial blood pressure (BP) were monitored using specialized devices. Blood lactate concentration and vitamin D levels were measured using medical-biological equipment.

Horseback riding sessions were conducted in the early morning under open sunlight at an altitude of 350–380 meters above sea level at the equestrian complex. According to barometric calculations, the atmospheric pressure at this altitude is approximately 720 mmHg.

The athletes underwent aerobic and anaerobic training loads, and their fatigue levels were assessed before and after each training session. Measurements confirmed that fatigue accumulated progressively throughout the week, leading to residual fatigue each day. The athletes' lactate concentration in the body was found to exceed 4 mmol/L. Furthermore, the resting heart rate of athletes increased by 5–6 beats per minute compared to normal [12]. On the rest day, the athletes engaged in horseback riding on Akhal-Teke horses at an altitude of 350–380 meters above sea level. The horse and the rider formed a single biological system, and improvements were recorded in blood circulation and heart rate, which stabilized at 40–45 beats per minute. Under the influence of ultraviolet rays from sunlight, vitamin D levels in the body were normalized, while infrared radiation helped reduce lactic acid levels in muscle fibers, as confirmed by measurements. The psychological effects of horseback riding were assessed using special tests.

Assessment Analysis

To assess the athletes' psycho-emotional state before and after horseback riding, the following psychological tools were used: the "Well-being–Activity–Mood" (WAM) questionnaire developed by V.A. Doskin, N.A. Lavrentieva, M.P. Miroshnikov, and V.B. Sharay; and the "Assessment of Mental Activation, Interest, Emotional Tone, Tension, and Comfort" questionnaire by L.A. Kurgansky. Based on these standardized tests, institution-specific versions adapted to national cultural characteristics were developed and evaluated by qualified specialists.

Results

One of the main advantages of horseback riding is its holistic impact on the human body. While sitting in the saddle and moving in sync with the horse, the rider activates the vestibular system as well as the muscles of the core, particularly the abdominal and back muscles. This activity enhances blood circulation and strengthens the respiratory system, training the heart and lungs. Horseback riding also has a strong positive effect on mental health: interaction with the horse, being outdoors, and the very process of riding help reduce stress levels and improve mood. Horses possess a unique ability to sense the rider's emotional state, and their interaction facilitates relaxation and emotional release [13].

In this study, athlete training loads were divided into three groups: low, moderate, and high. Low-intensity training does

not stimulate dynamic improvement in the athlete. Such training contributes to the maintenance of general health and promotes a healthy lifestyle throughout life, but does not support success in competitive sports. Moderate and high loads must be carefully balanced by coaches to identify the optimal level. Excessively high training loads can harm the athlete's health, while moderate loads may not exceed 2–4% in terms of performance gains, which still may not be sufficient for success at international competitions.

Developing a training program is complicated by the fact that every athlete differs physically and psychologically, and therefore, results achieved by one cannot be generalized to another. Given the large number of athletes training globally, probability theory should be used when planning training programs. Personal training plans are essential for achieving top-level results. Athletes followed a weekly training cycle, and their fatigue levels were assessed by measuring blood lactate concentration. The data are presented in Table 1. On the second, fourth, and sixth days of the week, increased lactate levels were observed. This was attributed to the intensive anaerobic training performed on these days with short rest intervals. To achieve effective training results, training intensity should be increased by up to 10%. If the training is consistently too intense, however, it becomes difficult to perform well in competitions [14, 15].

Additionally, it was found that fatigue did not fully subside between training days. Residual fatigue accumulated throughout the week and was stored in the body in an additive manner, until the day of rest.

Table 1: Lactate Levels (mmol/L) in Athletes During Training Days.

Athlete Group	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Wrestling athletes	4.9–5.0	5.6–5.8	4.6–4.7	6.8–7.2	5.1–5.3	6.2–6.4	Rest day
Team sports athletes	4.6–4.7	5.4–5.6	4.4–4.5	6.6–6.8	4.7–4.9	5.8–5.9	Rest day

In addition to lactate levels, athlete fatigue levels were assessed by measuring heart rate at rest and after training. Measurements were performed using Polar heart rate monitors, and data were processed using computer software. An increase of 5–7 beats per minute in resting heart rate is considered an indicator of increased fatigue level (Peter Jansen, 2006).

Table 2: Lactate Levels (mmol/L) in Athletes During Training Days.

Athlete Group	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Resting Condition
Wrestling athletes	50–54	52–56	48–52	53–57	47–51	54–58	46–50
Team sports athletes	49–53	51–55	47–51	52–56	46–50	53–57	44–48

Recovery Methods and Their Limitations. Several methods were used and evaluated for reducing post-training fatigue in athletes. Each of these has certain drawbacks:

Proper Nutrition
Main limitation: Due to modern environmental pollution and ecological degradation, it is difficult to provide athletes with clean, ecologically safe food products.

Massage Techniques: Includes manual massage, mechanical massage, electro-stimulation, magneto-stimulation, and laser therapy.

Main limitation: These methods cannot simultaneously
Stimulate all muscle groups: each must be treated separately, limiting holistic body recovery.

Walking or Cycling Outdoors
Main limitation: As duration increases, so does fatigue. Heart rate may rise to 90–110 bpm, preventing full fatigue elimination.

Swimming Main limitation: Water pressure adds to atmospheric pressure, compressing blood vessels and increasing arterial pressure and heart rate.

Passive Resting
Main limitation: Factors like geomagnetic disturbances, high solar activity, and urban environmental pollution hinder proper sleep and increase psychological tension.

Horseback Riding as an Alternative Recovery Method. To address the above limitations, horseback riding was introduced as an alternative method for alleviating fatigue and psychological tension. Before starting the morning horseback riding session, athletes' arterial blood pressure measured 76/114 mmHg. The riding area was situated at 350–380 meters above sea level, where the atmospheric pressure is approximately 720 mmHg. This relative reduction in pressure may cause vasodilation, lowering heart rate. We hypothesize that the decrease in heart rate is due to this atmospheric pressure effect.

Table 3: Shows cardiovascular changes before and after horseback riding.

Type of Sport	Before Horseback Riding	After Horseback Riding
Wrestling	86–128	77–114
Team sports	84–126	75–112

During horseback riding, the athlete and the horse form a unified biological system. This harmony results in synchronization of physiological processes. The horse's resting heart rate is typically between 28–40 beats per minute. Consequently, the rider's heart rate tends to approximate that of the horse during riding, promoting a state of deep relaxation.

Table 4: Effect of Horseback Riding on Athletes' Heart Rate (beats/min)

Type of Sport	Before Horseback Riding	After Horseback Riding
Wrestling	50–54	44–47
Team sports	49–53	43–46

Early morning horseback riding in open fresh air has multiple physiological benefits. Sunlight positively influences the athlete's body through ultraviolet rays, helping restore vitamin D levels that are often deficient due to indoor training environments. Infrared rays penetrate deeply into the muscles, reducing lactic acid concentrations — a primary contributor to muscular fatigue. As a result, athletes experience full recovery from training-related fatigue.

Additionally, psychological stress reduction was assessed through standardized tests, and the results confirmed that horseback riding contributed significantly to athletes' mental relaxation and emotional restoration.

Comparative Analysis of Psychophysiological Indicators Before and After Horseback Riding: The next stage of the research involved performing a comparative analysis using the Wilcoxon T-test, which helps establish statistically significant differences in the expression of the studied indicators before and after the horseback riding session (see Table 5).

Table 5: Results of the Comparative Analysis of Participants' Psychophysiological State Before and After Horseback Riding

Indicator (Scale)	Rank Correlation	T	p
Well-being	Before < after	–1.374	.169
Activity		–1.836	.066
Mood		–1.332	.183
Mental Activation	Before < after	–0.983	.326
Interest		–1.625	.100
Emotional Tone		–0.850	.395
Tension		–1.380	.168
Comfort	Before < after	–1.781	.045

Note: Boldface indicates statistically significant indicators; italicized values indicate trends toward significance.

Interpretation of Results: The results of the comparative analysis revealed a statistically significant difference in the level of comfort among the participants before and after horseback riding (T = –1.781, p = .045). Before the ride, participants reported a lower sense of comfort, whereas afterward, the feeling of comfort was significantly more pronounced. This indicates that after interacting with horses (through horseback riding), participants felt more carefree, content, calm, and satisfied.

Additionally, attention should be given to the results for the activity (T = –1.836, p = .066) and interest (T = –1.625, p = .100) indicators, which show trends towards significance. With an increased number of participants in future studies, these differences are expected to shift into the realm of statistical significance. Nonetheless, it can already be concluded that after horseback riding, participants felt more active, energized, and eager to engage in further actions. They expressed a greater desire to learn more about horses and indicated a wish to return to the stables for another visit.

Conclusion

The results obtained were analyzed and discussed. To date, there have been no scientific findings specifically focused on the use of Akhal-teke horses to reduce athletes' fatigue. Based on our theoretical research, we reached the following conclusions:

- **Horseback Riding as a Biomechanical System:** During horseback riding, the rider and the horse should be viewed as a single biological system. The biomechanical movement of the horse, along with the rider's movements, should be integrated into a unified motion model. It is crucial to identify the specific effects of the horse's movements on different parts of the rider's body.
- **Impact of Morning Horseback Riding:** The horseback riding session was conducted early in the morning for one hour in an open environment. It was found that the rider's heart rate normalized, and blood pressure improved during the session.
- **Fatigue Measurement:** The fatigue level of the athletes was measured based on the amount of lactate in their bodies. It was determined that the build-up of fatigue was linked to lactate levels.
- **Effect of Sunlight:** The ultraviolet and infrared rays of sunlight positively impacted the athlete's body during the early morning horseback riding session, enhancing their well-being.
- According to the analysis of average values, participants reported an improvement in mood, well-being, and increased activity levels after horseback riding. They felt more energized, engaged in the process, and noted a reduction in tension.
- The comparative analysis revealed statistically significant differences in the expression of the comfort indicator before and after horseback riding. After the ride, participants felt more carefree, satisfied, calm, and content. Indicators of activity and interest showed trends toward significance[16-19].

Practical Implications

- **Incorporating Horseback Riding into Training Plans:** Athletes training under heavy loads should include a horse-

back riding session early in the morning as part of their weekly training schedule.

- **Training in Natural Conditions:** Horseback riding sessions should take place in clean, natural environments, and suitable horses should be chosen for training.
- **Rehabilitation Using Horses:** Health institutions should be advised on methods of utilizing horses for athlete rehabilitation.

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